IN THE UNITED STATES DISTRICT COURT FOR THE NORTHERN DISTRICT OF OHIO EASTERN DIVISION

TERVES LLC, Plaintiff vs. **YUEYANG AEROSPACE NEW MATERIALS CO., LTD., et al**. Defendants.	**Case No. 1:19-cv-1611** **JUDGE DONALD C. NUGENT**

THE ECOMETAL DEFENDANTS' FINAL INVALIDITY, NON-INFRINGEMENT, AND UNENFORCEABILITY CONTENTIONS

Ecometal Inc., and Nick Yuan (collectively, the "Defendants") pursuant to Order entered on Mar. 30, 2021 [Doc. 91] granting the parties Joint Motion for extension of Scheduling Order [Doc. 90], provide these Final Invalidity and Unenforceability Contentions to Plaintiff Terves, LLC.

I. Introduction

Terves LLC (hereinafter "Terves") accuses defendants Ecometal Inc., and Nick Yuan (hereinafter "Ecometal") of infringing on claims of U.S. Patent No. 9,903,010 ("'010 or '010 Patent"), claims of U.S. Pat. 10,329,653 ("'653 or '653 Patent"), and claims of U.S. Pat. 10,689,740 ("'740 or '740 Patent") with the product AJM-006; AJM-010; AJM-012; AJM-016; AJM-017; AJM-018; and AJM -023 (hereinafter "Purported Infringing Materials").

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II. Asserted Claims in the Patents

a. Asserted Claims – U.S. Pat. 9,903,010 (‘010 Patent)

Terves has withdrawn infringement contentions for U.S. Pat. of U.S. Patent No. 9,903,010. *See* Terves’s Final Infringement Contentions at 2. Terves has not alleged infringement of any claims of the’010 patent on any of Defendants’ products. Therefore, the Defendants will not comment on any invalidity or unenforceability contentions.

b. Asserted Claims – U.S. Pat. 10,329,653 (‘653)

The asserted claims of the ‘653 patent that Terves asserts are directly infringed under 35 U.S.C. § 271(a) are claims 1-5, 7-15, 18-20, 23-61, 64, 66-67, and 69-74. The asserted claims of the ‘653 patent that Terves asserts are indirectly infringed under 35 U.S.C. § 271(b) are claims 1-5, 7-15, 18-20, 23-61, 64, 66-67, and 69-74.

However, Terves has not alleged infringement of claims 6, 16, 17, 21, 22, 62, 63, 65, 68, and 75 – 78 of the’653 patent. *See generally* Terves’s Final Infringement Contentions. Further, in an email dated Jul. 2, 2021, Matthew J. Cavanagh, counsel for Terves, indicated that “we have decided to drop the following claims: ’653 patent: 8, 11, 24, 28, 32, 36, 40, 44, 48, 51, 71, 72, and 75.”

c. Asserted Claims – U.S. Pat. 10,689,740 (‘740)

The asserted claims of the ‘740 patent that Terves asserts are directly infringed under 35 U.S.C. § 271(a) are claims 2-14, 16-47, 49-69, and 76-103. The asserted claims of the ‘740 patent that Terves asserts are indirectly infringed under 35 U.S.C. § 271(b) are claims 2-14, 16-47, 49-69, and 76-103.

Terves has not alleged infringement of claims 1, 15, 48, and 70-75 of the ’740

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patent. Terves's Final Infringement Contentions at 2. Further, in an email dated Jul. 2, 2021, Matthew J. Cavanagh, counsel for Terves, indicated that "we have decided to drop the following claims: … '740 patent: 18."

III. Prior Art

The U.S. Provisional Application 61/981,425 was filed on Apr. 18, 2014, after the effective date of March 16, 2013 for the American Invents Act for the first to file provisions. Leahy–Smith America Invents Act, Pub. L. No. 112-29, Sep. 16, 2011; 125 Stat 284. U.S. Patents '653 and '740 fall under the provisions of the American Invent Acts. Also, prior art that "was patented, described in a printed publication, or in public use, on sale, or otherwise available to the public" no later than the critical date of Apr. 17, 2014, the day before the filing of the provisional patent application, would be prior art against '865 and '740.

IV. Overview of Legal Bases for Invalidity

The United States patent laws grant a patent to "[w]hoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title." 35 U.S.C. § 101. The conditions and requirements are that the invention be "Novelty Requirement," 35 U.S.C. § 102, and "Non-obviousness Requirement," 35 U.S.C. § 103 and that the invention be presented in proper written form, 35 U.S.C. § 112 ("Written Description").

As is demonstrated here and in the Appendices A – F, incorporated herein by reference`, the asserted claims of the '653 and '740 patents fail to meet all the Novelty,

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Non-obviousness, or Written Description requirements and are therefore invalid. The failures to meet these requirements presented herein and in Appendices A – F are presented as alternative bases for invalidity.

a. The Novelty Requirement

A patent fails the Novelty Requirement of the patent statues if

> (1) the claimed invention was patented, described in a printed publication, or in public use, on sale, or otherwise available to the public before the effective filing date of the claimed invention; or
>
> (2) the claimed invention was described in a patent issued under section 151, or in an application for patent published or deemed published under section 122(b), in which the patent or application, as the case may be, names another inventor and was effectively filed before the effective filing date of the claimed invention.

35 U.S.C. § 102(a). As shown in Appendices C and D, the '653 and '740 patent claims fail as to the Novelty Requirement due to Chinese Patent App. No. 201310284659.X (Xiao), filed July 8, 2013; CN 103343271 A published Nov. 10, 2013; CN 103343271 B published July 1, 2015 (hereinafter, "Xiao").

b. The Non-obviousness Requirement

A patent fails the Non-obviousness Requirement of the patent statues if

> notwithstanding that the claimed invention is not identically disclosed as set forth in section 102, if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains. Patentability shall not be negated by the manner in which the invention was made.

35 U.S.C. § 103. As shown in Appendices C and D, the '653 and '740 patent claims fail as to the Non-obviousness Requirement due to Xiao or Xiao in light of Hassan, S.F.,

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Gupta, M., Development of High Strength Magnesium Based Composites Using Elemental Nickel Particulates as Reinforcement. Journal of Materials Science 37, 2467–2474 (2002) (hereinafter, "Hassan").

c. The Written Description Requirement

The patent statutes require that

> [t]he specification [of the patent application] shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor or joint inventor of carrying out the invention.

35 U.S.C. § 112(a). Further, "the specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the inventor or a joint inventor regards as the invention." 35 U.S.C. § 112(b). If inventors were given the opportunity, particularly in infringement actions, the scope of their patent claims would be limitless. For example, the overbreadth of Terves's ideal patent claims were acknowledged by Andrew Sherman:

> Q. Is it your position that all dissolvable magnesiums that match the elemental composition of the TervAlloy infringe the 653 patent?
>
> A. Yes, that would be my position.

Jun. 11, 2020 Andrew Sherman Dep. at 140 17-20. Mr. Sherman made this statement despite the obvious limitations present in even the broadest claims of the '653 and '740 patents. The Written Description requirement serves to provide the public the necessary information to understand the limited scope of the claims regardless of the inventor's views after the patent issues.

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The determination of lack of enablement is a question of law. 35 USC 112(a). However, a decision on enablement, "requires determination of whether a person skilled in the pertinent art, using the knowledge available … and the disclosure in the patent document, could make and use the invention without undue experimentation." *Northem Telecom, Inc. v. Datapoint Corp.*, 908 F.2d 931, 941(Fed. Cir. 1990); cert. denied, 498 U.S. 920 (1990). The trier of fact, therefore, must first determine the level of skill in the art and then, from this viewpoint, determine whether the claimed invention is enabled.

> A patent drafter could resolve the ambiguities of a functional limitation in a number of ways. For example, the ambiguity might be resolved by using a quantitative metric (e.g., numeric limitation as to a physical property) rather than a qualitative functional feature. The claim term might also be sufficiently definite if the specification provided a formula for calculating a property along with examples that meet the claim limitation and examples that do not.
>
> In this case, Halliburton differentiated its invention from the prior art because it was a "fragile gel." As discussed above, Halliburton's proposed definition of that term is not sufficiently definite because it does not adequately distinguish the fragileness of the invention from disclosed prior art, it is ambiguous as to whether an upper bound of fragileness is contemplated, and it is ambiguous as to its requisite ability to suspend drill cuttings. In other words, Halliburton's proposed construction of "fragile gel" as used in the claims of the ′832 patent is indefinite because it is ambiguous as to the requisite degree of the fragileness of the gel, the ability of the gel to suspend drill cuttings (i.e., gel strength), and/or some combination of the two. We discern no other construction that can properly be adopted that would render the claims definite.

Halliburton Energy Servs., Inc. v. M-I LLC, 514 F.3d 1244, 1255–56 (Fed. Cir. 2008)(internal citations omitted). As shown in Appendices A and B, the '653 and '740 patent claims fail as to the Written Description Requirement. The discussion that follows are not an exhaustive legal basis for invalidity given the facts identified in Appendices A

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and B.

Several of the '653 and '740 patent claims are in improper form by not including a transition word or phrase.

> A claim typically contains three parts: the preamble, the transition, and the body." 3 Chisum on Patents § 8.06 (2018). Acceleration's poor claim drafting will not be an excuse for it to infuse confusion into its claim scope. We conclude that "game environment" and "information delivery service" are part of the preamble of the claims. We see no beneficial purpose to be served by failing to include a transition word in a claim to clearly delineate the claim's preamble from the body, and we caution patentees against doing so.
>
> Because the terms at issue appear in preambles, we must determine whether the terms are limitations. A preamble limits the invention if it recites essential structure or steps, or is "necessary to give life, meaning, and vitality" to the claim. A preamble is not limiting where a patentee defines a structurally complete invention in the claim body and uses the preamble only to state a purpose or intended use for the invention.

Acceleration Bay, LLC v. Activision Blizzard Inc., 908 F.3d 765, 770 (Fed. Cir. 2018)(internal citations and quotations omitted). Several of Terves claims omit the standard transition word or phrase. Therefore, at least in those cases the preamble serves to limit the scope of the claims.

"The Patent Act requires that a patent specification 'conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as [the] invention.'" *Nautilus, Inc. v. Biosig Instruments, Inc.*, 572 U.S. 898, 901, 134 S. Ct. 2120, 2124, 189 L. Ed. 2d 37 (2014)(quoting 35 U.S.C. § 112(b))

Several of the '653 and '740 patent claims reference a "dissolution rate," but the term "dissolution rate" is not adequately specified in the claims or the specification. The '654 patent provides only limited guidance as to what the term "dissolution rate" is meant

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to be:

> For purposes of this invention, primary dissolution is measured for valve components and plugs as the time the part removes itself from the seat of a valve or plug arrangement or can become free floating in the system. For example, when the part is a plug in a plug system, primary dissolution occurs when the plug has degraded or dissolved to a point that it can no long function as a plug and thereby allows fluid to flow about the plug. For purposes of this invention, secondary dissolution is measured in the time the part is fully dissolved into sub-mm particles.

'653 1:62-2:4.[1] The '740 patent has a similar, but even less helpful definition:

> Primarily, dissolution is measured as the time the ball removes itself from the seat or can become free floating in the system. Secondarily, dissolution is measured in the time the ball is substantially or fully dissolved into submicron particles.

'653 1:62-2:4.

The PHOSITA is left to their imagination as to how to determine the dissolution rate. Indeed, Terves's expert, Dr. Lee A Swanger attempted to fill the void left by this ambiguous limitation by using a ASTM standard method. ASTM International, the American Society for Testing Materials, publishes standard testing laboratory procedures for a wide variety of properties of materials. ASTM is widely cited by scientists and engineers to provide increased certainty into how properties of materials are to be determined to allow some degree of uniformity in the results of those determinations. See generally, ASTM International - Standards Worldwide (last visited Jul. 3, 2021). Terves's expert used one such definition of "dissolution rate" on which to base his report.

> Exponent, Inc. received ten samples of different grades of magnesium

[1] The notation N:XX–YY refers to column (or page) number N, and lines XX to YY of a reference.

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> composite billets that Ecometal imports from China to the U.S. We tested the samples for elemental composition and for dissolution rate as specified in the '653 patent, consistent with *ASTM G31: Standard Practice for Laboratory Immersion Corrosion Testing of Metals*.

April 28, 2020 Report of Lee A. Swanger, Ph.D., P.E. at 3 (emphasis added). Dr. Swanger specified ASTM G31 as his method for determining dissolution rate of the materials received by Exponent, Inc. Not specifying a standard test procedure would make his determination of dissolution meaningless. Without such a defined standard defined any results that he would have determined would be open for wide and ambiguous interpretation.

The '653 and '740 provided no such guidance rendering all claims limiting their scope by "dissolution rate" characteristics invalid. The '653 and '710 patents do not mention such a standard and therefore leave the term "dissolution rate" undefined leaving a PHOSITA unable to determine such a rate as specified. For this reason, Terves use of a "dissolution rate" to limit its claims renders those claims indefinite and invalid under 35 U.S.C. 112.

V. Non-Infringement Contentions

a. Direct Infringement

The U.S. Supreme Court has held that "[e]ach element contained in a patent claim is deemed material to defining the scope of the patented invention, and thus the doctrine of equivalents must be applied to individual elements of the claim, not to the invention as a whole." *Warner-Jenkinson Co. v. Hilton Davis Chem. Co.*, 520 U.S. 17, 29 (1997). Even if the invalidity claims discussed *infra* fail, the Defendants are not liable for literal

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infringement or under the doctrine of equivalents as demonstrated in Appendices E and F.

b. Induced Infringement

Induced infringement under § 271(b) requires knowledge that the induced acts constitute patent infringement." *Glob.-Tech Appliances, Inc. v. SEB S.A.*, 563 U.S. 754, 766 (2011). This requires that the Defendants were aware that they were infringing. *See Asia Vital Components Co. v. Asetek Danmark A/S*, 377 F. Supp. 3d 990, 1016 (N.D. Cal. 2019). Even assuming the Defendants have directly infringed valid patents, as Terves has not shown any evidence to prove the Defendants had actual knowledge there can be no induced infringement.

VI. Conclusion

For the reasons given herein, the Defendant's have demonstrated that the Asserted Claims in the '653 and '740 Patents are invalid as failing to meet the Novelty, Non-Obviousness or Written Description Requirements of the patent statutes. *See* Appendices A-D. In the alternative, the Defendant's assert that the Purported Infringing Materials do not infringe the Asserted Claims, either literally or under the doctrine of equivalents. *See* Appendices E and F.

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CERTIFICATE OF SERVICE

I hereby certify that on this 6th day of July 2020, a true and correct copy of the above and foregoing instrument was emailed to the following:

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Appendix A

U.S. Patent No. 10,329,653 ('653 Patent) Lack of Written Description, Indefiniteness, and Non-enabling Invalidity Claim Chart

'653 Patent Claims[1]	Patent Claims that fail to meet the written description requirement of 35 U.S.C. 112.
1. A magnesium composite that includes in situ precipitation of galvanically-active intermetallic phases to enable controlled dissolution of said magnesium composite,	
said magnesium composite comprising a mixture of magnesium or a magnesium alloy and an additive material,	This claim is an independent claim. The patent claim teaches a magnesium composition comprising "a mixture of magnesium or a magnesium alloy and an additive material." Neither the claim nor the specification provides the PHOSITA necessary information about what "magnesium alloy" should be employed. There are a multitude of magnesium alloys that could be employed and leaving this term undefined renders this claim indefinite. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
said additive material having a greater melting point temperature than a solidus temperature of said magnesium,	
said additive material constituting about 0.05 wt %-45 wt % of said mixture,	
said additive material forming precipitant in	

[1] Independent claims 1, 12, 25, 29, 33, 37, 41, 45, 49, 73, and 74 are shaded for easier reference.

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said magnesium composite,	
said additive material includes one or more metals selected from the group consisting of copper, nickel, iron, and cobalt,	
said magnesium composite has a dissolution rate of at least 5 mg/cm^2/hr. in 3 wt % KCI water mixture at 90°C.	The claim requires that "magnesium composite has a dissolution rate of at least 5 mg/cm^2/hr. in 3 wt % KCl water mixture at 90°C." This limitation is indefinite. The specification and the claims provide no guidance to narrow down the wide range of possibilities of how the dissolution rate is to be determined. The specification provides qualitative information about how the morphology of the composite affects dissolution rates, *See* '653 11:38-7, 12:51-61, but no guidance is provided as how to measure dissolution rate. The PHOSITA would need significant additional information to determine what the inventors mean by the dissolution rate. See Exhibit 1 - Standard Guide for Laboratory Immersion Corrosion Testing of Metals, NACE TM0169/G31 – 21 (2021). That standard procedure provides "factors include apparatus, sampling, test specimen, test conditions (test solution composition, temperature, gas sparging, fluid motion, solution volume, method of supporting test specimens, duration of test), methods of cleaning test specimens, interpretation of results, and calculation of corrosion rates. This guide also emphasizes the importance of recording all pertinent data and provides a checklist for reporting test data." Id. at ¶1.1. Neither the specification of '653 or this claim provides teaching of how this dissolution rate should be calculated. No amount of experimentation would provide the PHOSITA an answer to that question of dissolution rate because the specification does provide no guidance on how the inventors measured that dissolution rate. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
2. The magnesium composite as defined in claim 1, wherein said magnesium alloy includes over 50 wt %	As this claim depends on claim 1 and claim 1 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a).

magnesium and one or more metals selected from the group consisting of aluminum, boron, bismuth, zinc, zirconium, and manganese.	Claim 1 teaches a magnesium composition comprising "a mixture of magnesium or a magnesium alloy and an additive material." In other words, claim 1 teaches using either pure magnesium or a magnesium alloy – a mixture of magnesium and presumably and other metal. However, this claim does not permit the choice of pure magnesium. If pure magnesium were selected as defined in claim 1, the remainder of claim 2 would be superfluous. Claim 2 seems to indicate that a PHOSITA practicing this invention could have both pure magnesium and a magnesium mixture at the same time. The specification provides no guidance for the circumstance that the PHOSITA chooses magnesium. Claim 2 is invalid as failing to meet the written description requirement. Furthermore, if a magnesium alloy were chosen, the claim provides the option of "over 50 wt % magnesium." This claim If the PHOSITA would choose pure magnesium then the claim is ambiguous as to which of the "aluminum, boron, bismuth, zinc, zirconium, and manganese" group would be left removed. This claim is ambiguous as to what the inventors claim to be their invention. Lastly, if a pure magnesium was chosen, as permitted by claim 1 upon which this claim depends, then this claim becomes entirely ambiguous. The "magnesium composite" would become pure magnesium and no other component including any one of the group of "aluminum, boron, bismuth, zinc, zirconium, and manganese" could be included in the "composite." Neither the claim nor the written specification provides guidance to the PHOSITA on how to resolve this ambiguity. This claim is ambiguous as to what the inventors claim to be their invention. Therefore, this claim is invalid as the written description fails to provide "using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same" 35 U.S.C. 112(a). For the reasons provided above, this claim is also invalid as not "enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same," This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).

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3. The magnesium composite as defined in claim 1, wherein said magnesium alloy includes over 50 wt % magnesium and one or more metals selected from the group consisting of aluminum in an amount of about 0.5-10 wt %, zinc in amount of about 0.1-3 wt %, zirconium in an amount of about 0.01-1 wt %, manganese in an amount of about 0.15-2 wt %, boron in amount of about 0.0002-0.04 wt %, and bismuth in amount of about 0.4-0.7 wt %.	As this claim depends on claim 1 and claim 1 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). Claim 1, a claim from which this claim depends, teaches a magnesium composition comprising "a mixture of magnesium or a magnesium alloy and an additive material." In other words, claim 1 teaches using either pure magnesium or a magnesium alloy – a mixture of magnesium – and presumably and other metals. However, this claim does not permit the choice of pure magnesium. If pure magnesium were selected as permitted in claim 1, the remainder of claim 2 would be superfluous. Claim 2 seems to indicated that a PHOSITA practicing this invention could have both pure magnesium and a magnesium mixture at the same time. The specification provides no guidance for the circumstance that the PHOSITA chooses magnesium. Claim 2 is invalid as failing to meet the written description requirement. Furthermore, if a magnesium alloy were chosen, the claim provides the option of "over 50 wt % magnesium." If the PHOSITA would choose pure magnesium ("includes over 50 wt % magnesium") then the claim is ambiguous as to which of the "aluminum, boron, bismuth, zinc, zirconium, and manganese" group would be left out of the composite. This claim is ambiguous as to what the inventors claim to be their invention. Furthermore, if a pure magnesium was chosen, as permitted by claim 1 upon which this claim depends, then this claim becomes entirely ambiguous. The "magnesium composite" would become pure magnesium and no other component including any one of the group of "aluminum, boron, bismuth, zinc, zirconium, and manganese" could be included in the "composite." Neither the claim nor the written specification provides guidance to the PHOSITA on how to resolve this ambiguity. This claim is ambiguous as to what the inventors claim to be their invention. Therefore, this claim is invalid as the written description fails to provide "using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with

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	which it is most nearly connected, to make and use the same" 35 U.S.C. 112(a). For the reasons provided above, this claim is also invalid as not "enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same …."
4. The magnesium composite as defined in claim 1, wherein said additive material includes nickel,	As this claim depends on claim 1 and claim 1 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The patent claim teaches a magnesium composition comprising "a mixture of magnesium or a magnesium alloy and an additive material." Neither the claim nor the specification provides the PHOSITA necessary information about what "magnesium alloy" should be employed. There are a multitude of magnesium alloys that could be employed and leaving this term undefined renders this claim indefinite. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
said nickel constitutes about 0.05-35 wt % of said magnesium composite,	
said nickel forms galvanically-active in situ precipitate in said magnesium composite.	This claim limitation is ambiguous and is invalid as failing to meet the written description requirement of 35 U.S.C. 112(a). The patent claim teaches a magnesium composition comprising "a mixture of magnesium or a magnesium alloy and an additive material." Neither the claim nor the specification provides the PHOSITA necessary information about what "magnesium alloy" should be employed. There are a multitude of magnesium alloys that could be employed and leaving this term undefined renders this claim indefinite. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).

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5. The magnesium composite as defined in claim 1, wherein said additive material includes copper,	As this claim depends on claim 1 and claim 1 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The patent claim teaches a magnesium composition comprising "a mixture of magnesium or a magnesium alloy and an additive material." Neither the claim nor the specification provides the PHOSITA necessary information about what "magnesium alloy" should be employed. There are a multitude of magnesium alloys that could be employed and leaving this term undefined renders this claim indefinite. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
said copper constitutes about 0.05-35 wt % of said magnesium composite,	
said copper forms galvanically-active in situ precipitate in said magnesium composite.	
6. The magnesium composite as defined in claim 1, wherein said additive material includes cobalt, said cobalt constitutes about 0.05-35 wt. % of said magnesium composite, said cobalt forms galvanically-active in situ precipitate in said magnesium composite.	***No infringement alleged. See Terves's Final Infringement Contentions at 4-5.***

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7. The magnesium composite as defined in claim 1, where said magnesium composite is subjected to a deformation processing to reduce grain size of said magnesium composite, increase tensile yield strength of said magnesium composite, increase elongation of said magnesium composite, or combinations thereof.	As this claim depends on claim 1 and claim 1 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The patent claim teaches a magnesium composition comprising "a mixture of magnesium or a magnesium alloy and an additive material." Neither the claim nor the specification provides the PHOSITA necessary information about what "magnesium alloy" should be employed. There are a multitude of magnesium alloys that could be employed and leaving this term undefined renders this claim indefinite. Further, this claim is indefinite as leaving undefined "deformation processing." The universe of "deformation processing" procedures is enormous. The PHOSITA would be forced to choose from many indefinite procedures with many processing parameters leading to an endless amount of experimentation for the PHOSITA. For this reason, this claim is indefinite. Further, this claim is indefinite as leaving undefined what is meant by "to reduce grain size." The PHOSITA is provided no guidance as to how little or how much grain size would need to be reduced to "increase yield strength, or "increase tensile yield strength," "increase elongation" of said magnesium composite, or combinations thereof. Further, yield strength, and tensile yield strength are intrinsic properties of materials that do not depend on size or shape of a material. On the other hand, elongation is commonly measured by a "standard tensile strength test" that strictly specifies the shape of the material to be tested (typically a "dog bone" shape) and the method of performing such a test. No such guidance is provided by this claim or by the specification. Forced to choose from an endless number of procedures with a large number of processing parameters would lead to an endless amount of experimentation for the PHOSITA which would inevitably lead to a result different than what the inventors measured. For this reason, this claim is indefinite. The term "tensile yield strength" is itself indefinite. The PHOSITA is provided no guidance as to how "tensile yield strength" is to be determine as no standard method is defined. The term leaves to the PHOSITA's imagination how the material to be tested is to be machined or otherwise prepared for testing. There is no teaching for whether the edges or corners should or should not be ground. There

	is no teaching for whether the edges or corners should or should not be surfaced finished. No guidance is provided even for the geometry of the sample to be test. No guidance is provided even for the type of test grips or geometry of test grips to be used. Lack guidance in these areas and others provides an enormous number of unknown factors to the PHOSITA as to render this claim element indefinite. Claim 7 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
8. The magnesium composite as defined in claim 1, wherein said magnesium composite is subjected to a surface treatment to improve a surface hardness of said magnesium composite,	***Infringement contention withdrawn pursuant to July 2, 2021 email from Matthew J. Cavanagh.***
said surface treatment including peening, heat treatment, aluminizing, or combinations thereof.	
9. The magnesium composite as defined in claim 1, wherein a dissolution rate of said magnesium composite is about 5-325 $mg/cm^2/hr.$ in 3 wt % KCl water mixture at 90°C.	As this claim depends on claim 1 and claim 1 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The claim requires that the "dissolution rate of said magnesium composite is about 5-325 $mg/cm^2/hr.$ in 3 wt % KCl water mixture at 90°C." This claim limitation is indefinite as failing to adequately specify how dissolution rate is to be determine. The specification and the claims provide no guidance to narrow down the wide range of possibilities of how the dissolution rate is to be determined. The specification provides qualitative information about how the morphology of the composite affects dissolution rates, *See* '653 11:38-7, 12:51-61, but no guidance is provided as how to measure dissolution rate. The PHOSITA would need significant additional information to determine what the inventors mean by the dissolution

	rate. See Exhibit 1 - Standard Guide for Laboratory Immersion Corrosion Testing of Metals, NACE TM0169/G31 – 21 (2021). That standard procedure provides "factors include apparatus, sampling, test specimen, test conditions (test solution composition, temperature, gas sparging, fluid motion, solution volume, method of supporting test specimens, duration of test), methods of cleaning test specimens, interpretation of results, and calculation of corrosion rates. This guide also emphasizes the importance of recording all pertinent data and provides a checklist for reporting test data." Id. at ¶1.1. Neither the specification of '653 or this claim provides teaching of how this dissolution rate should be calculated. No amount of experimentation would provide the PHOSITA an answer to that question of dissolution rate because the specification does provide no guidance on how the inventors measured that dissolution rate. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
10. The magnesium composite as defined in claim 1, wherein a dissolution rate of said magnesium composite is controlled by an amount and size of said in situ formed galvanically-active particles whereby smaller average sized particles of said in situ formed galvanically-active particles, a greater weight percent of said in situ formed galvanically-active particles in said magnesium composite, or combinations thereof increases said dissolution rate of said magnesium composite.	As this claim depends on claim 1 and claim 1 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). Further, the limitation "dissolution rate of said magnesium composite is controlled by an amount and size of said in situ formed galvanically-active particles whereby smaller average sized particles of said in situ formed galvanically-active particles" is ambiguous and indefinite. The PHOSITA is provided no guidance as how to the dissolution rate is "controlled" by the "amount and size" of *in situ* formed "galvanically-active particles." The PHOSITA is not taught how to control the "amount and size" of the particles. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).

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11. The magnesium composite as defined in claim 1, wherein said additive material is a metal or metal alloy.	***Infringement contention withdrawn pursuant to July 2, 2021 email from Matthew J. Cavanagh.***
12. A magnesium composite that includes in situ precipitation of galvanically-active intermetallic phases to enable controlled dissolution of said magnesium composite comprising a mixture of a magnesium or a magnesium alloy and an additive material,	Claim 12 is an independent claim that is invalid as being indefinite and as failing to meet the written description requirement of 35 U.S.C. 112(a). The undefined terms "in situ precipitation," "galvanically-active," "intermetallic phases" and "to enable controlled dissolution" provide no guidance to the PHOSITA as to how to practice this claim. The preamble to this claim "A magnesium composite that includes in situ precipitation of galvanically-active intermetallic phases to enable controlled dissolution of said magnesium composite comprising …" serves to limit this claim. *Bicon, Inc. v. Straumann Co.*, 441 F.3d 945, 952 (Fed. Cir. 2006). Here the preamble term "to enable controlled dissolution" is the basis of the entire claim. The preamble must impose this limitation on the claim because not all composites of "magnesium or a magnesium alloy and an additive material" will dissolve defeating the purpose of the invention. Given that this preamble term limits the claim, its meaning is indefinite. The term "to enable controlled dissolution" is wildly indefinite. The PHOSITA is given no guidance as to "enable controlled dissolution." No guidance as given to any process or method to "enable controlled dissolution." The individual terms themselves are indefinite. The PHOSITA is not taught how to "enable" anything in the composite. The PHOSITA is given no guidance as to what the inventors considered a "controlled dissolution rate" The patent claim teaches a magnesium composition comprising "a mixture of magnesium or a magnesium alloy and an additive material." Neither the claim nor the specification provides the PHOSITA necessary information about what "magnesium alloy" should be employed. There are a multitude of magnesium alloys that could be employed and leaving this term undefined renders this claim indefinite.

	This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
said additive material having a greater melting point temperature than a solidus temperature of said magnesium,	
said composite including greater than 50 wt % magnesium,	This claim is invalid as failing to meet the written description requirement. This claim teaches "said composite including greater than 50 wt % magnesium." In other words, claim 12 teaches using either pure magnesium or a magnesium alloy – a mixture of magnesium – and presumably and other metals. If pure magnesium were selected as permitted in this claim, the remainder of the claim would be superfluous. Claim 12 seems to indicated that a PHOSITA practicing this invention could have both pure magnesium and a magnesium mixture at the same time. The specification provides no guidance for the circumstance that the PHOSITA chooses magnesium. Claim 12 is invalid as failing to meet the written description requirement. Furthermore, if a magnesium alloy were chosen, the claim provides the option of "over 50 wt % magnesium." If the PHOSITA would choose pure magnesium ("includes over 50 wt % magnesium") then the claim is ambiguous as to which of the "aluminum, boron, bismuth, zinc, zirconium, and manganese" group would be left out of the composite. This claim is ambiguous as to what the inventors claim to be their invention. Furthermore, if a pure magnesium was chosen, as permitted by claim 1 upon which this claim depends, then this claim becomes entirely ambiguous. The "magnesium composite" would become pure magnesium and no other component including any one of the group of "aluminum, boron, bismuth, zinc, zirconium, and manganese" could be included in the "composite." Neither the claim nor the written specification provides guidance to the PHOSITA on how to resolve this ambiguity. This claim is ambiguous as to what the inventors claim to be their invention. Therefore, this claim is invalid as the written description fails to provide "using it, in such full, clear, concise, and exact terms as to

	enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same" 35 U.S.C. 112(a).
said additive material constituting about 0.05-45 wt % of said magnesium composite,	
said additive material having a melting point temperature that is 100°C. greater than a melting temperature of said magnesium or magnesium alloy,	
said additive material including one or more metals selected from the group consisting of copper, nickel, cobalt, titanium, and iron,	
at least a portion of said additive material remaining unalloyed additive material,	
said magnesium composite including in situ precipitation of galvanically-active intermetallic phases that includes said unalloyed additive material,	
said magnesium composite has a dissolution rate of at least 5 mg/cm^2/hr. in 3	The claim requires that the "magnesium composite has a dissolution rate of at least 5 mg/cm^2/hr. in 3 wt % KCl water mixture at 90°C." This limitation is indefinite. The specification and the claims provide no guidance to narrow down the wide range of possibilities of how the dissolution rate is to be determined. The specification provides qualitative information about how the morphology of the composite

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wt % KCl water mixture at 90°C.	affects dissolution rates, *See* '653 11:38-7, 12:51-61, but no guidance is provided as how to measure dissolution rate. The PHOSITA would need significant additional information to determine what the inventors mean by the dissolution rate. See Exhibit 1 - Standard Guide for Laboratory Immersion Corrosion Testing of Metals, NACE TM0169/G31 – 21 (2021). That standard procedure provides "factors include apparatus, sampling, test specimen, test conditions (test solution composition, temperature, gas sparging, fluid motion, solution volume, method of supporting test specimens, duration of test), methods of cleaning test specimens, interpretation of results, and calculation of corrosion rates. This guide also emphasizes the importance of recording all pertinent data and provides a checklist for reporting test data." Id. at ¶1.1. Neither the specification of '653 or this claim provides teaching of how this dissolution rate should be calculated. No amount of experimentation would provide the PHOSITA an answer to that question of dissolution rate because the specification does provide no guidance on how the inventors measured that dissolution rate. Claim 12 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
13. The magnesium composite as defined in claim 12, wherein said additive material is added to said magnesium or magnesium alloy while said magnesium or magnesium alloy is at a temperature that is above said solidus temperature of said magnesium and a temperature that is less than a melting point of said additive material to form said mixture.	As this claim depends on claim 12 and claim 12 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). This limitation also renders this claim invalid as failing to meet the written description requirement of 35 U.S.C. 112(a). Claim 12 teaches a magnesium composition comprising "a mixture of a magnesium or a magnesium alloy and an additive material." In other words, claim 12 teaches using either pure magnesium or a magnesium alloy – a mixture of magnesium and presumably and other additive material. This claim permits the choice of pure magnesium ("including greater than 50 wt % magnesium," Claim 12) which renders the claim ambiguous and indefinite. If pure magnesium were selected as defined in claim 12, the remainder of claim 13 would be superfluous. Claims 12 and 13 seems to indicate that a PHOSITA practicing this invention could have both pure magnesium and a magnesium mixture at the same time. The specification provides no guidance for the circumstance that the PHOSITA chooses magnesium as taught by

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	this claim. Claim 13 is invalid as failing to meet the written description requirement. Furthermore, if a magnesium alloy were chosen, the claim provides the option of "over 50 wt % magnesium." This claim If the PHOSITA would choose pure magnesium then the claim is ambiguous as to which of the "aluminum, boron, bismuth, zinc, zirconium, and manganese" group would be left removed or reduced in composition. This claim is ambiguous as to what the inventors claim to be their invention. For the reasons provided above, this claim is also invalid as not "enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same," This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
14. The magnesium composite as defined in claim 13, wherein said magnesium alloy includes over 50 wt % magnesium and one or more metals selected from the group consisting of aluminum in an amount of about 0.5-10 wt %, zinc in amount of about 0.1-3 wt %, zirconium in an amount of about 0.01-1 wt %, manganese in an amount of about 0.15-2 wt %, boron in amount of about 0.0002-0.04 wt %, and bismuth in an amount of about 0.4-0.7 wt %.	As this claim depends on base independent claim 12 and claim 12 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). This claim depends on claim 13 which in turn depends on claim 12. This claim is invalid as failing to meet the written description requirement of 35 U.S.C. 112(a). This claim teaches adding the limitation "includes over 50 wt % magnesium" and one or more metals the group consisting of aluminum, zirconium, manganese, boron in amount of about 0.0002-0.04 wt %, and bismuth in an amount of about 0.4-0.7 wt %." In other words, this claim teaches using either pure magnesium or a magnesium alloy – a mixture of magnesium and presumably and other metal. However, this claim does not permit the choice of pure magnesium. If pure magnesium were selected as defined in claim 1, the remainder of claim 2 would be superfluous. Claim 2 seems to indicate that a PHOSITA practicing this invention could have both pure magnesium and a magnesium mixture at the same time. The specification provides no guidance for the circumstance that the PHOSITA chooses pure magnesium. This claim is invalid as failing to meet the written description requirement.

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	Furthermore, if a magnesium alloy were chosen, the claim provides the option of "over 50 wt % magnesium." This claim If the PHOSITA would choose pure magnesium then the claim is ambiguous as to which of the "aluminum, boron, bismuth, zinc, zirconium, and manganese" group would be left removed. This claim is ambiguous as to what the inventors claim to be their invention. Lastly, if a pure magnesium was chosen, as permitted by claim 1 upon which this claim depends, then this claim becomes entirely ambiguous. The "magnesium composite" would become pure magnesium and no other component including any one of the group of "aluminum, boron, bismuth, zinc, zirconium, and manganese" could be included in the "composite." Neither the claim nor the written specification provides guidance to the PHOSITA on how to resolve this ambiguity. This claim is ambiguous as to what the inventors claim to be their invention. Therefore, this claim is invalid as the written description fails to provide "using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same" 35 U.S.C. 112(a). For the reasons provided above, this claim is also invalid as not "enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same," This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
15. The magnesium composite as defined in claim 14, wherein said additive material includes nickel,	This claim depends on claim 14 which in turn is dependent on claims 13 and the independent claim 12. As this claim depends on base independent claim 12 and claim 12 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a).
said nickel constitutes about 0.05-35 wt % of said magnesium composite,	This claim is invalid as failing to meet the written description requirement of 35 U.S.C. 112(a). This claim teaches the limitation "wherein said additive material includes nickel and said nickel constitutes about 0.05-35 wt % of said magnesium composite …." In other words, this claim teaches using either pure magnesium or a magnesium alloy – a mixture of magnesium and presumably and

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	other metal. However, this claim does not permit the choice of pure magnesium. If pure magnesium were selected as defined in claim 1, the remainder of claim 2 would be superfluous. Claim 2 seems to indicate that a PHOSITA practicing this invention could have both pure magnesium and a magnesium mixture at the same time. The specification provides no guidance for the circumstance that the PHOSITA chooses pure magnesium. This claim is invalid as failing to meet the written description requirement. Furthermore, if a magnesium alloy were chosen, the claim provides the option of "over 50 wt % magnesium." This claim If the PHOSITA would choose pure magnesium then the claim is ambiguous as to which of the "aluminum, boron, bismuth, zinc, zirconium, and manganese" group would be left removed. This claim is ambiguous as to what the inventors claim to be their invention. Lastly, if a pure magnesium was chosen, as permitted by claim 1 upon which this claim depends, then this claim becomes entirely ambiguous. The "magnesium composite" would become pure magnesium and no other component including any one of the group of "aluminum, boron, bismuth, zinc, zirconium, and manganese" could be included in the "composite." Neither the claim nor the written specification provides guidance to the PHOSITA on how to resolve this ambiguity. This claim is ambiguous as to what the inventors claim to be their invention. Therefore, this claim is invalid as the written description fails to provide "using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same" 35 U.S.C. 112(a). For the reasons provided above, this claim is also invalid as not "enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same," This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
said nickel forms galvanically-active in situ precipitate in said magnesium composite.	

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16. The magnesium composite as defined in claim 15, wherein said additive material includes nickel,	***No infringement alleged for this claim. See Terves's Final Infringement Contentions at 7.***
said nickel constitutes about 3-7 wt % of said magnesium composite.	
17. The magnesium composite as defined in claim 15, wherein said additive material includes nickel,	***No infringement alleged for this claim. See Terves's Final Infringement Contentions at 7.***
said nickel constitutes about 7-10 wt % of said magnesium composite.	
18. The magnesium composite as defined in claim 15, wherein a dissolution rate of said magnesium composite is at least 45 mg/cm2/hr. in 3 wt % KCl water mixture at 90°C. and up to 325 mg/cm^2/hr. in 3 wt % KCl water mixture at 90°C.	This claim depends on claim 15 which in turn is dependent on claims 14, 13, and the base independent claim 12. As this claim depends on base independent claim 12 and claim 12 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The claim requires that "dissolution rate of said magnesium composite is at least 45 mg/cm2/hr. in 3 wt % KCl water mixture at 90°C.= and up to 325 mg/cm^2/hr. in 3 wt % KCl water mixture at 90°C." This limitation is indefinite. The specification and the claims provide no guidance to narrow down the wide range of possibilities of how the dissolution rate is to be determined. The specification provides qualitative information about how the morphology of the composite affects dissolution rates, *See* '653 11:38-7, 12:51-61, but no guidance is provided as how to measure dissolution rate. The PHOSITA would need significant additional information to determine what the inventors mean by the dissolution rate. See Exhibit 1 - Standard Guide for Laboratory Immersion Corrosion Testing of Metals, NACE TM0169/G31 – 21 (2021). That standard procedure provides "factors include apparatus,

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	sampling, test specimen, test conditions (test solution composition, temperature, gas sparging, fluid motion, solution volume, method of supporting test specimens, duration of test), methods of cleaning test specimens, interpretation of results, and calculation of corrosion rates. This guide also emphasizes the importance of recording all pertinent data and provides a checklist for reporting test data." Id. at ¶1.1. Neither the specification of '653 or this claim provides teaching of how this dissolution rate should be calculated. No amount of experimentation would provide the PHOSITA an answer to that question of dissolution rate because the specification does provide no guidance on how the inventors measured that dissolution rate. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
19. The magnesium composite as defined in claim 12, wherein said magnesium alloy includes over 50 wt % magnesium and one or more metals selected from the group consisting of aluminum in an amount of about 0.5-10 wt %, zinc in amount of about 0.1-6 wt %, zirconium in an amount of about 0.01-3 wt %, manganese in an amount of about 0.15-2 wt %, boron in amount of about 0.0002-0.04 wt %, and bismuth in an amount of about 0.4-0.7 wt %.	This claim depends on independent claim 12. As this claim depends on independent claim 12 and claim 12 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a).
20. The magnesium composite as defined in claim 12, said additive	This claim depends on independent claim 12. As this claim depends on independent claim 12 and claim 12 is invalid as being indefinite

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material includes nickel,	and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a).
said nickel constitutes about 0.05-35 wt % of said magnesium composite,	
said nickel forms galvanically-active in situ precipitate in said magnesium composite.	
21. The magnesium composite as defined in claim 20, wherein said additive material includes nickel,	***No infringement alleged for this claim. See Terves's Final Infringement Contentions at 8.***
said nickel constitutes about 3-7 wt % of said magnesium composite.	
22. The magnesium composite as defined in claim 20, wherein said additive material includes nickel,	***No infringement alleged for this claim. See Terves's Final Infringement Contentions at 8.***
said nickel constitutes about 7-10 wt % of said magnesium composite.	
23. The magnesium composite as defined in claim 12, wherein a dissolution rate of said magnesium composite is at least 45	This claim depends on claims 12. The claim requires that the "dissolution rate of said magnesium composite is at least 45 $mg/cm^2/hr.$ in 3 wt % KCl water mixture at 90°C. and up to 325 $mg/cm^2/hr.$ in 3 wt % KCl water mixture at 90°C." This limitation is indefinite.

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mg/cm^2/hr. in 3 wt % KCl water mixture at 90°C. and up to 325 mg/cm^2/hr. in 3 wt % KCl water mixture at 90°C.	The specification and the claims provide no guidance to narrow down the wide range of possibilities of how the dissolution rate is to be determined. The specification provides qualitative information about how the morphology of the composite affects dissolution rates, *See* '653 11:38-7, 12:51-61, but no guidance is provided as how to measure dissolution rate. The PHOSITA would need significant additional information to determine what the inventors mean by the dissolution rate. See Exhibit 1 - Standard Guide for Laboratory Immersion Corrosion Testing of Metals, NACE TM0169/G31 – 21 (2021). That standard procedure provides "factors include apparatus, sampling, test specimen, test conditions (test solution composition, temperature, gas sparging, fluid motion, solution volume, method of supporting test specimens, duration of test), methods of cleaning test specimens, interpretation of results, and calculation of corrosion rates. This guide also emphasizes the importance of recording all pertinent data and provides a checklist for reporting test data." Id. at ¶1.1. Neither the specification of '653 or this claim provides teaching of how this dissolution rate should be calculated. No amount of experimentation would provide the PHOSITA an answer to that question of dissolution rate because the specification does provide no guidance on how the inventors measured that dissolution rate. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
24. The magnesium composite as defined in claim 12, wherein said additive material is a metal or metal alloy.	***Infringement contention withdrawn pursuant to July 2, 2021 email from Matthew J. Cavanagh.***
25. A dissolvable magnesium alloy composite for use in a ball or other tool component in a well drilling or completion operation,	This claim is an independent claim that is invalid as being indefinite and as failing to meet the written description requirement of 35 U.S.C. 112(a). The undefined term "has a dissolution rate of at least 5 mg/cm^2/hr. in 3 wt % KCI water mixture at 90°C" provides no guidance to the PHOSITA as to how to practice this claim.
said dissolvable magnesium alloy composite comprising	

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at least 85 wt % magnesium;	
one or more metals selected from the group consisting of 0.5-10 wt % aluminum, 0.05-6 wt % zinc, 0.01-3 wt % zirconium, and 0.15-2 wt % manganese; and about 0.05-45 wt % of a secondary metal to form a galvanically-active intermetallic particle that promotes corrosion of said dissolvable magnesium alloy composite,	
said secondary metal including one or more metals selected from the group consisting of copper, nickel, cobalt, titanium and iron,	
said magnesium alloy composite has a dissolution rate of at least 5 mg/cm^2/hr. in 3 wt % KCI water mixture at 90°C.	The claim requires that the "magnesium alloy composite has a dissolution rate of at least 5 mg/cm^2/hr. in 3 wt % KCl water mixture at 90°C." This limitation is indefinite. The specification and the claims provide no guidance to narrow down the wide range of possibilities of how the dissolution rate is to be determined. The specification provides qualitative information about how the morphology of the composite affects dissolution rates, *See* '653 11:38-7, 12:51-61, but no guidance is provided as how to measure dissolution rate. The PHOSITA would need significant additional information to determine what the inventors mean by the dissolution rate. See Exhibit 1 - Standard Guide for Laboratory Immersion Corrosion Testing of Metals, NACE TM0169/G31 – 21 (2021). That standard procedure provides "factors include apparatus, sampling, test specimen, test conditions (test solution composition, temperature, gas sparging, fluid motion, solution volume, method of supporting test specimens, duration of test), methods of cleaning test specimens, interpretation of results, and calculation of corrosion rates. This guide also emphasizes the importance of recording all

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	pertinent data and provides a checklist for reporting test data." Id. at ¶1.1. Neither the specification of '653 or this claim provides teaching of how this dissolution rate should be calculated. No amount of experimentation would provide the PHOSITA an answer to that question of dissolution rate because the specification does provide no guidance on how the inventors measured that dissolution rate. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
26. The dissolvable magnesium alloy composite as defined in claim 25, wherein a dissolution rate of said magnesium alloy composite is 100-325 mg/cm^2/hr. in 3 wt % KCl water mixture at 90°C.	This claim depends on independent claim 25. As this claim depends on independent claim 25 and claim 25 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). Further, the claim requires that the "dissolution rate of said magnesium alloy composite is 100-325 mg/cm^2/hr. in 3 wt % KCl water mixture at 90°C." This limitation is indefinite. The specification and the claims provide no guidance to narrow down the wide range of possibilities of how the dissolution rate is to be determined. The specification provides qualitative information about how the morphology of the composite affects dissolution rates, *See* '653 11:38-7, 12:51-61, but no guidance is provided as how to measure dissolution rate. The PHOSITA would need significant additional information to determine what the inventors mean by the dissolution rate. See Exhibit 1 - Standard Guide for Laboratory Immersion Corrosion Testing of Metals, NACE TM0169/G31 – 21 (2021). That standard procedure provides "factors include apparatus, sampling, test specimen, test conditions (test solution composition, temperature, gas sparging, fluid motion, solution volume, method of supporting test specimens, duration of test), methods of cleaning test specimens, interpretation of results, and calculation of corrosion rates. This guide also emphasizes the importance of recording all pertinent data and provides a checklist for reporting test data." Id. at ¶1.1. Neither the specification of '653 or this claim provides teaching of how this dissolution rate should be calculated. No amount of experimentation would provide the PHOSITA an answer to that question of dissolution rate because the specification does provide no guidance on how the inventors measured that dissolution rate. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).

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27. The dissolvable magnesium composite as defined in claim 25, wherein said secondary metal includes nickel,	This claim depends on independent claim 25. As this claim depends on independent claim 25 and claim 25 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a).
said nickel forms galvanically-active in situ precipitate in said magnesium composite.	
28. The dissolvable magnesium alloy composite as defined in claim 25, wherein said additive material is a metal or metal alloy.	***Infringement contention withdrawn pursuant to July 2, 2021 email from Matthew J. Cavanagh.***
29. A dissolvable magnesium alloy composite for use in a ball or other tool component in a well drilling or completion operation,	This claim is an independent claim that is invalid as being indefinite and as failing to meet the written description requirement of 35 U.S.C. 112(a). The undefined term "has a dissolution rate of at least 5 mg/cm^2/hr. in 3 wt % KCI water mixture at 90°C" provides no guidance to the PHOSITA as to how to practice this claim.
said dissolvable magnesium alloy composite comprising 60-95 wt % magnesium; 0.01-1 wt % zirconium; and about 0.05-45 wt % of a secondary metal	
to form a galvanically-active intermetallic particle that promotes corrosion of said	

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dissolvable magnesium alloy composite,	
said secondary metal including one or more metals selected from the group consisting of copper, nickel, cobalt, titanium and iron,	
said magnesium alloy composite has a dissolution rate of at least 5 mg/cm^2/hr. in 3 wt % KCl water mixture at 90°C.	The specification and the claims provide no guidance to narrow down the wide range of possibilities of how the dissolution rate is to be determined. The specification provides qualitative information about how the morphology of the composite affects dissolution rates, *See* '653 11:38-7, 12:51-61, but no guidance is provided as how to measure dissolution rate. The PHOSITA would need significant additional information to determine what the inventors mean by the dissolution rate. See Exhibit 1 - Standard Guide for Laboratory Immersion Corrosion Testing of Metals, NACE TM0169/G31 – 21 (2021). That standard procedure provides "factors include apparatus, sampling, test specimen, test conditions (test solution composition, temperature, gas sparging, fluid motion, solution volume, method of supporting test specimens, duration of test), methods of cleaning test specimens, interpretation of results, and calculation of corrosion rates. This guide also emphasizes the importance of recording all pertinent data and provides a checklist for reporting test data." Id. at ¶1.1. Neither the specification of '653 or this claim provides teaching of how this dissolution rate should be calculated. No amount of experimentation would provide the PHOSITA an answer to that question of dissolution rate because the specification does provide no guidance on how the inventors measured that dissolution rate. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
30. The dissolvable magnesium alloy composite as defined in claim 29, wherein a dissolution rate of said magnesium alloy composite is 5-325 mg/cm^2/hr. in 3 wt %	This claim is invalid under 35 U.S.C. 112 for being indefinite because it depends on invalid claim 29. The claim requires that the "dissolution rate of said magnesium alloy composite is 5-325 mg/cm^2/hr. in 3 wt % KCl water mixture at 90°C." This limitation is indefinite. The specification and the claims provide no guidance to narrow down the wide range of possibilities of how the dissolution rate is to be determined. The specification provides qualitative information about how the morphology of the composite affects dissolution rates,

KCl water mixture at 90°C.	*See* '653 11:38-7, 12:51-61, but no guidance is provided as how to measure dissolution rate. The PHOSITA would need significant additional information to determine what the inventors mean by the dissolution rate. See Exhibit 1 - Standard Guide for Laboratory Immersion Corrosion Testing of Metals, NACE TM0169/G31 – 21 (2021). That standard procedure provides "factors include apparatus, sampling, test specimen, test conditions (test solution composition, temperature, gas sparging, fluid motion, solution volume, method of supporting test specimens, duration of test), methods of cleaning test specimens, interpretation of results, and calculation of corrosion rates. This guide also emphasizes the importance of recording all pertinent data and provides a checklist for reporting test data." Id. at ¶1.1. Neither the specification of '653 or this claim provides teaching of how this dissolution rate should be calculated. No amount of experimentation would provide the PHOSITA an answer to that question of dissolution rate because the specification does provide no guidance on how the inventors measured that dissolution rate. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
31. The dissolvable magnesium composite as defined in claim 29, wherein said secondary metal includes nickel,	This claim is invalid under 35 U.S.C. 112 for being indefinite because it depends on invalid claim 29. The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim.
said nickel forms galvanically-active in situ precipitate in said magnesium composite.	
32. The dissolvable magnesium alloy composite as defined in claim 29, wherein said additive material is a metal or metal alloy.	***Infringement contention withdrawn pursuant to July 2, 2021 email from Matthew J. Cavanagh.***

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33. A dissolvable magnesium alloy composite for use in a ball or other tool component in a well drilling or completion operation,	This is an independent claim which includes no transition phrase such as comprising or consisting of. "[P]oor poor claim drafting will not be an excuse for it to infuse confusion into its claim scope. *Acceleration Bay, LLC v. Activision Blizzard Inc.*, 908 F.3d 765, 770 (Fed. Cir. 2018). In this claim, the limitations "magnesium alloy" and "for use in a ball or other tool component" are wildly ambiguous These supposed limitations provide the PHOSITA with no guidance whatsoever as to how to construct a "magnesium alloy composite." This claim is invalid as being indefinite and as failing to meet the written description requirement of 35 U.S.C. 112(a).
said dissolvable magnesium alloy composite comprising 60-95 wt. % magnesium; 0.5-10 wt. % aluminum; 0.05-6 wt. % zinc; 0.15-2 wt. % manganese; and about 0.05-45 wt. % of a secondary metal to form a galvanically-active intermetallic particle that promotes corrosion of said dissolvable magnesium alloy composite,	
said secondary metal including one or more metals selected from the group consisting of copper, nickel, cobalt, titanium and iron,	
said magnesium alloy composite has a dissolution rate of at least 5 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C.	

34. The dissolvable magnesium alloy composite as defined in claim 33, wherein a dissolution rate of said magnesium alloy composite is 5-325 mg/cm′/hr. in 3 wt. % KCl water mixture at 90° C.	This claim is invalid under 35 U.S.C. 112 for being indefinite because it depends on invalid claim 33. Further, the specification and the claims provide no guidance to narrow down the wide range of possibilities of how the dissolution rate is to be determined. The specification provides qualitative information about how the morphology of the composite affects dissolution rates, *See* '653 11:38-7, 12:51-61, but no guidance is provided as how to measure dissolution rate. The PHOSITA would need significant additional information to determine what the inventors mean by the dissolution rate. See Exhibit 1 - Standard Guide for Laboratory Immersion Corrosion Testing of Metals, NACE TM0169/G31 – 21 (2021). That standard procedure provides "factors include apparatus, sampling, test specimen, test conditions (test solution composition, temperature, gas sparging, fluid motion, solution volume, method of supporting test specimens, duration of test), methods of cleaning test specimens, interpretation of results, and calculation of corrosion rates. This guide also emphasizes the importance of recording all pertinent data and provides a checklist for reporting test data." Id. at ¶1.1. Neither the specification of '653 or this claim provides teaching of how this dissolution rate should be calculated. No amount of experimentation would provide the PHOSITA an answer to that question of dissolution rate because the specification does provide no guidance on how the inventors measured that dissolution rate. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
35. The dissolvable magnesium composite as defined in claim 33, wherein said secondary metal includes nickel, said nickel forms galvanically-active in situ precipitate in said magnesium composite.	This claim depends on independent claim 33. This claim is invalid under 35 U.S.C. 112 for being indefinite because it depends on invalid claim 33. The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim.
36. The dissolvable magnesium alloy composite as defined in	***Infringement contention withdrawn pursuant to July 2, 2021 email from Matthew J. Cavanagh.***

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claim 33, wherein said additive material is a metal or metal alloy.	
37. A dissolvable magnesium alloy composite for use in a ball or other tool component in a well drilling or completion operation, said dissolvable magnesium alloy composite comprising	This independent claim is invalid under 35 U.S.C. 112 for being indefinite.
60-95 wt. % magnesium; 0.05-6 wt. % zinc; 0.01-1 wt. % zirconium; and about 0.05-45 wt. % of a secondary metal to form a galvanically-active intermetallic particle that promotes corrosion of said dissolvable magnesium alloy composite,	
said secondary metal including one or more metals selected from the group consisting of copper, nickel, cobalt, titanium and iron,	
said magnesium alloy composite has a dissolution rate of at least 5 mg/cm^2/hr. in 3	The claim limitation requires that the "magnesium alloy composite has a dissolution rate of at least 5 mg/cm^2/hr. in 3 wt. % KCl water mixture at 90° C." This limitation is indefinite. The specification and the claims provide no guidance to narrow down the wide range of possibilities of how the dissolution rate is to be determined. The specification provides qualitative information

wt. % KCl water mixture at 90° C.	about how the morphology of the composite affects dissolution rates, *See* '653 11:38-7, 12:51-61, but no guidance is provided as how to measure dissolution rate. The PHOSITA would need significant additional information to determine what the inventors mean by the dissolution rate. See Exhibit 1 - Standard Guide for Laboratory Immersion Corrosion Testing of Metals, NACE TM0169/G31 – 21 (2021). That standard procedure provides "factors include apparatus, sampling, test specimen, test conditions (test solution composition, temperature, gas sparging, fluid motion, solution volume, method of supporting test specimens, duration of test), methods of cleaning test specimens, interpretation of results, and calculation of corrosion rates. This guide also emphasizes the importance of recording all pertinent data and provides a checklist for reporting test data." Id. at ¶1.1. Neither the specification of '653 or this claim provides teaching of how this dissolution rate should be calculated. No amount of experimentation would provide the PHOSITA an answer to that question of dissolution rate because the specification does provide no guidance on how the inventors measured that dissolution rate. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
38. The dissolvable magnesium alloy composite as defined in claim 37, wherein a dissolution rate of said magnesium alloy composite is 5-325 mg/cm^2/hr. in 3 wt. % KCl water mixture at 90° C.	This claim is invalid under 35 U.S.C. 112 for being indefinite because it depends on invalid claim 37. The claim limitation requires that "dissolution rate of said magnesium alloy composite is 5-325 mg/cm^2/hr. in 3 wt. % KCl water mixture at 90° C." This limitation is indefinite. The specification and the claims provide no guidance to narrow down the wide range of possibilities of how the dissolution rate is to be determined. The specification provides qualitative information about how the morphology of the composite affects dissolution rates, *See* '653 11:38-7, 12:51-61, but no guidance is provided as how to measure dissolution rate. The PHOSITA would need significant additional information to determine what the inventors mean by the dissolution rate. See Exhibit 1 - Standard Guide for Laboratory Immersion Corrosion Testing of Metals, NACE TM0169/G31 – 21 (2021). That standard procedure provides "factors include apparatus, sampling, test specimen, test conditions (test solution composition, temperature, gas sparging, fluid motion, solution volume, method of supporting test specimens, duration of test), methods of cleaning test specimens, interpretation of results, and calculation of corrosion rates. This guide also emphasizes the importance of recording all pertinent data and provides a checklist for reporting test data." Id. at ¶1.1. Neither the specification of '653 or this claim provides teaching

	of how this dissolution rate should be calculated. No amount of experimentation would provide the PHOSITA an answer to that question of dissolution rate because the specification does provide no guidance on how the inventors measured that dissolution rate. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
39. The dissolvable magnesium composite as defined in claim 37, wherein said secondary metal includes nickel, said nickel forms galvanically-active in situ precipitate in said magnesium composite.	This claim is invalid under 35 U.S.C. 112 for being indefinite because it depends on invalid claim 37. The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
40. The dissolvable magnesium alloy composite as defined in claim 37, wherein said additive material is a metal or metal alloy.	***Infringement contention withdrawn pursuant to July 2, 2021 email from Matthew J. Cavanagh.***
41. A dissolvable magnesium alloy composite for use in a ball or other tool component in a well drilling or completion operation, said dissolvable magnesium alloy composite comprising	This independent claim is invalid under 35 U.S.C. 112 for being indefinite.
over 50 wt. % magnesium; one or more metals selected from the group consisting of 0.5-10 wt. % aluminum, 0.1-2 wt. % zinc, 0.01-1 wt. % zirconium, and 0.15-2	

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wt. % manganese; and about 0.05-45 wt. % of a secondary metal to form a galvanically-active intermetallic particle that promotes corrosion of said dissolvable magnesium alloy composite,	
said secondary metal including one or more metals selected from the group consisting of copper, nickel and cobalt,	
said magnesium alloy composite has a dissolution rate of at least 5 mg/cm^2/hr. in 3 wt. % KCl water mixture at 90° C.	The claim limitation requires that the "magnesium alloy composite has a dissolution rate of at least 5 mg/cm^2/hr. in 3 wt. % KCl water mixture at 90° C." This limitation is indefinite. The specification and the claims provide no guidance to narrow down the wide range of possibilities of how the dissolution rate is to be determined. The specification provides qualitative information about how the morphology of the composite affects dissolution rates, *See* '653 11:38-7, 12:51-61, but no guidance is provided as how to measure dissolution rate. The PHOSITA would need significant additional information to determine what the inventors mean by the dissolution rate. See Exhibit 1 - Standard Guide for Laboratory Immersion Corrosion Testing of Metals, NACE TM0169/G31 – 21 (2021). That standard procedure provides "factors include apparatus, sampling, test specimen, test conditions (test solution composition, temperature, gas sparging, fluid motion, solution volume, method of supporting test specimens, duration of test), methods of cleaning test specimens, interpretation of results, and calculation of corrosion rates. This guide also emphasizes the importance of recording all pertinent data and provides a checklist for reporting test data." Id. at ¶1.1. Neither the specification of '653 or this claim provides teaching of how this dissolution rate should be calculated. No amount of experimentation would provide the PHOSITA an answer to that question of dissolution rate because the specification does provide no guidance on how the inventors measured that dissolution rate. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
42. The dissolvable magnesium alloy	This claim is invalid under 35 U.S.C. 112 for being indefinite because it depends on invalid claim 41. The limitations provided in

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composite as defined in claim 41, wherein a dissolution rate of said magnesium alloy composite is 5-325 mg/cm^2/hr. in 3 wt. % KCl water mixture at 90° C.	this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
43. The dissolvable magnesium composite as defined in claim 41, wherein said secondary metal includes nickel, said nickel forms galvanically-active in situ precipitate in said magnesium composite.	This claim is invalid under 35 U.S.C. 112 for being indefinite because it depends on invalid claim 41. The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
44. The dissolvable magnesium alloy composite as defined in claim 41, wherein said additive material is a metal or metal alloy.	***Infringement contention withdrawn pursuant to July 2, 2021 email from Matthew J. Cavanagh.***
45. A dissolvable magnesium alloy composite for use in a ball or other tool component in a well drilling or completion operation, said dissolvable magnesium alloy composite comprising	This independent claim is invalid under 35 U.S.C. 112 for being indefinite.
over 50 wt. % magnesium; one or more metals selected from the group consisting of 0.1-3 wt. % zinc, 0.01-1 wt. % zirconium, 0.05-1 wt. % manganese, 0.0002-	

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0.04 wt. % boron, and 0.4-0.7 wt. % bismuth; and about 0.05-45 wt. % of a secondary metal to form a galvanically-active intermetallic particle that promotes corrosion of said dissolvable magnesium alloy composite,	
said secondary metal including one or more metals selected from the group consisting of copper, nickel, and cobalt,	
said magnesium alloy composite has a dissolution rate of at least 5 mg/cm^2/hr. in 3 wt. % KCl water mixture at 90° C.	The claim limitation requires that the "magnesium alloy composite has a dissolution rate of at least 5 mg/cm^2/hr. in 3 wt. % KCl water mixture at 90° C." This limitation is indefinite. The specification and the claims provide no guidance to narrow down the wide range of possibilities of how the dissolution rate is to be determined. The specification provides qualitative information about how the morphology of the composite affects dissolution rates, *See* '653 11:38-7, 12:51-61, but no guidance is provided as how to measure dissolution rate. The PHOSITA would need significant additional information to determine what the inventors mean by the dissolution rate. See Exhibit 1 - Standard Guide for Laboratory Immersion Corrosion Testing of Metals, NACE TM0169/G31 – 21 (2021). That standard procedure provides "factors include apparatus, sampling, test specimen, test conditions (test solution composition, temperature, gas sparging, fluid motion, solution volume, method of supporting test specimens, duration of test), methods of cleaning test specimens, interpretation of results, and calculation of corrosion rates. This guide also emphasizes the importance of recording all pertinent data and provides a checklist for reporting test data." Id. at ¶1.1. Neither the specification of '653 or this claim provides teaching of how this dissolution rate should be calculated. No amount of experimentation would provide the PHOSITA an answer to that question of dissolution rate because the specification does provide no guidance on how the inventors measured that dissolution rate. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).

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46. The dissolvable magnesium alloy composite as defined in claim 45, wherein a dissolution rate of said magnesium alloy composite is 5-325 $mg/cm^2/hr.$ in 3 wt. % KCl water mixture at 90° C.	This claim is invalid under 35 U.S.C. 112 for being indefinite because it depends on invalid claim 45. The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
47. The dissolvable magnesium composite as defined in claim 45, wherein said secondary metal includes nickel, said nickel forms galvanically-active in situ precipitate in said magnesium composite.	This claim is invalid under 35 U.S.C. 112 for being indefinite because it depends on invalid claim 45. The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
48. The dissolvable magnesium alloy composite as defined in claim 45, wherein said additive material is a metal or metal alloy.	***Infringement contention withdrawn pursuant to July 2, 2021 email from Matthew J. Cavanagh.***
49. A magnesium composite that includes in situ precipitation of galvanically-active intermetallic phases to enable controlled dissolution of said magnesium composite, said magnesium composite comprising	This independent claim is invalid under 35 U.S.C. 112 for being indefinite.
a mixture of magnesium or a magnesium alloy and an additive material, said additive material	

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constituting about 0.05-45 wt. % of said mixture, said additive material includes one or more metals selected from the group consisting of copper, nickel, titanium, iron, and cobalt,	
said magnesium composite including in situ precipitation of galvanically-active intermetallic phases that include said additive material,	
said additive material located in sufficient quantities in said galvanically-active intermetallic phases so as to obtain a composition and morphology of said galvanically-active intermetallic phases such that a galvanic corrosion rate along said galvanically-active intermetallic phases causes said magnesium composite to have a dissolution rate of at least at least 5 mg/cm^2/hr. in 3 wt. % KCl water mixture at 90° C.	This claim limitation requires "additive material located in sufficient quantities in said galvanically-active intermetallic phases …." This limitation is wildly ambiguous and indefinite. This limitation provides no guidance to the PHOSITA as to how what "sufficient quantities" are necessary to "obtain a composition and morphology of said galvanically-active intermetallic phases …." The PHOSITA is left to endlessly experiment to search for the "sufficient quantities" required. This limitation is indefinite. Further, this claim limitation requires the "magnesium composite to have a dissolution rate of at least at least 5 mg/cm^2/hr. in 3 wt. % KCl water mixture at 90° C." This limitation is indefinite. The specification and the claims provide no guidance to narrow down the wide range of possibilities of how the dissolution rate is to be determined. The specification provides qualitative information about how the morphology of the composite affects dissolution rates, *See* '653 11:38-7, 12:51-61, but no guidance is provided as how to measure dissolution rate. The PHOSITA would need significant additional information to determine what the inventors mean by the dissolution rate. See Exhibit 1 - Standard Guide for Laboratory Immersion Corrosion Testing of Metals, NACE TM0169/G31 – 21 (2021). That standard procedure provides "factors include apparatus, sampling, test specimen, test conditions (test solution composition, temperature, gas sparging, fluid motion, solution volume, method of supporting test specimens, duration of test), methods of cleaning test specimens, interpretation of results, and calculation of corrosion rates. This guide also emphasizes the importance of recording all pertinent data and provides a checklist for reporting test data." Id. at ¶1.1. Neither the specification of '653 or this claim provides teaching

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	of how this dissolution rate should be calculated. No amount of experimentation would provide the PHOSITA an answer to that question of dissolution rate because the specification does provide no guidance on how the inventors measured that dissolution rate. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
50. The magnesium composite as defined in claim 49, wherein said additive material includes one or more metals selected from the group consisting of copper, nickel, and cobalt.	This claim is invalid under 35 U.S.C. 112 for being indefinite because it depends on invalid claim 49. The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
51. The magnesium composite as defined in claim 49, wherein said additive material includes particles having an average particle diameter size of about 0.1-500 microns.	***Infringement contention withdrawn pursuant to July 2, 2021 email from Matthew J. Cavanagh.***
52. The magnesium composite as defined in claim 49, wherein said magnesium alloy includes over 50 wt. % magnesium, and one or more metals selected from the group consisting of aluminum, boron, bismuth, zinc, zirconium, and manganese.	This claim is invalid under 35 U.S.C. 112 for being indefinite because it depends on invalid claim 49. The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).

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53. The magnesium composite as defined in claim 49, wherein said magnesium alloy includes over 50 wt. % magnesium, and one or more metals selected from the group consisting of aluminum in an amount of about 0.5-10 wt. %, zinc in an amount of about 0.1-6 wt. %, zirconium in an amount of about 0.01-3 wt. %, manganese in an amount of about 0.15-2 wt. %, boron in an amount of about 0.0002-0.04 wt. %, and bismuth in amount of about 0.4-0.7 wt. %.	This claim is invalid under 35 U.S.C. 112 for being indefinite because it depends on invalid claim 49. The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
54. The magnesium composite as defined in claim 49, wherein said magnesium alloy includes over 50 wt. % magnesium, and one or more metals selected from the group consisting of aluminum in an amount of about 0.5-10 wt. %, zinc in an amount of about 0.1-3 wt. %, zirconium in an amount of about 0.01-1 wt. %, manganese in an amount of about 0.15-2 wt. %, boron in an amount of about 0.0002-0.04 wt. %, and bismuth in an amount of about 0.4-0.7 wt. %.	This claim is invalid under 35 U.S.C. 112 for being indefinite because it depends on invalid claim 49. The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).

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55. The magnesium composite as defined in claim 49, wherein said magnesium alloy includes at least 85 wt. % magnesium, and one or more metals selected from the group consisting of 0.5-10 wt. % aluminum, 0.05-6 wt. % zinc, 0.01-3 wt. % zirconium, and 0.15-2 wt. % manganese.	This claim is invalid under 35 U.S.C. 112 for being indefinite because it depends on invalid claim 49. The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
56. The magnesium composite as defined in claim 49, wherein said magnesium alloy includes 60-95 wt. % magnesium and 0.01-1 wt. % zirconium.	This claim is invalid under 35 U.S.C. 112 for being indefinite because it depends on invalid claim 49. The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
57. The magnesium composite as defined in claim 56, wherein said magnesium alloy further includes 0.05-6 wt. % zinc.	This claim is invalid under 35 U.S.C. 112 for being indefinite because it depends on claim 56 which in turn depends on invalid claim 49. The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
58. The magnesium composite as defined in claim 49, wherein said magnesium alloy includes 60-95 wt. % magnesium, 0.5-10 wt. % aluminum, 0.05-6 wt. % zinc, and 0.15-2 wt. % manganese.	This claim is invalid under 35 U.S.C. 112 for being indefinite because it depends on invalid claim 49. The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).

59. The magnesium composite as defined in claim 49, wherein said magnesium alloy includes over 50 wt. % magnesium and one or more metals selected from the group consisting of 0.5-10 wt. % aluminum, 0.1-2 wt. % zinc, 0.01-1 wt. % zirconium, and 0.15-2 wt. % manganese.	This claim is invalid under 35 U.S.C. 112 for being indefinite because it depends on invalid claim 49. The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
60. The magnesium composite as defined in claim 49, wherein said magnesium alloy includes over 50 wt. % magnesium, and one or more metals selected from the group consisting of 0.1-3 wt. % zinc, 0.01-1 wt. % zirconium, 0.05-1 wt. % manganese, 0.0002-0.04 wt. % boron, and 0.4-0.7 wt. % bismuth.	This claim is invalid under 35 U.S.C. 112 for being indefinite because it depends on invalid claim 49. The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
61. The magnesium composite as defined in claim 49, wherein said additive material includes nickel, said nickel constitutes about 0.05-35 wt. % of said magnesium composite, said nickel forms galvanically-active in situ precipitate in said magnesium composite.	This claim is invalid under 35 U.S.C. 112 for being indefinite because it depends on invalid claim 49. The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).

62. The magnesium composite as defined in claim 61, wherein said nickel constitutes about 3-7 wt. % of said magnesium composite.	***No infringement alleged. See Terves's Final Infringement Contentions at 18***
63. The magnesium composite as defined in claim 61, wherein said nickel constitutes about 7-10 wt. % of said magnesium composite.	***No infringement alleged. See Terves's Final Infringement Contentions at 18***
64. The magnesium composite as defined in claim 49, wherein said additive material includes copper, said copper constitutes about 0.05-35 wt. % of said magnesium composite, said copper forms the galvanically-active in situ precipitate in said magnesium composite.	This claim is invalid under 35 U.S.C. 112 for being indefinite because it depends on invalid claim 49. The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
65. The magnesium composite as defined in claim 49, wherein said additive material includes cobalt, said cobalt constitutes about 0.05-35 wt. % of said magnesium composite, said cobalt forms the galvanically-active in situ precipitate in said magnesium composite.	***No infringement alleged for this claim. See Terves's Final Infringement Contentions at 18.***
66. The magnesium composite as defined in	This claim is invalid under 35 U.S.C. 112 for being indefinite because it depends on invalid claim 49. The limitations provided in

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claim 49, wherein a dissolution rate of said magnesium composite is about 5-325 mg/cm^2/hr. in 3 wt. % KCI water mixture at 90° C.	this dependent claim do not cure the indefiniteness of the underlying claim. Further, this claim limitation requires "a dissolution rate of said magnesium composite is about 5-325 mg/cm^2/hr. in 3 wt. % KCI water mixture at 90° C." This limitation is indefinite. The specification and the claims provide no guidance to narrow down the wide range of possibilities of how the dissolution rate is to be determined. The specification provides qualitative information about how the morphology of the composite affects dissolution rates, *See* '653 11:38-7, 12:51-61, but no guidance is provided as how to measure dissolution rate. The PHOSITA would need significant additional information to determine what the inventors mean by the dissolution rate. See Exhibit 1 - Standard Guide for Laboratory Immersion Corrosion Testing of Metals, NACE TM0169/G31 – 21 (2021). That standard procedure provides "factors include apparatus, sampling, test specimen, test conditions (test solution composition, temperature, gas sparging, fluid motion, solution volume, method of supporting test specimens, duration of test), methods of cleaning test specimens, interpretation of results, and calculation of corrosion rates. This guide also emphasizes the importance of recording all pertinent data and provides a checklist for reporting test data." Id. at ¶1.1. Neither the specification of '653 or this claim provides teaching of how this dissolution rate should be calculated. No amount of experimentation would provide the PHOSITA an answer to that question of dissolution rate because the specification does provide no guidance on how the inventors measured that dissolution rate This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
67. The magnesium composite as defined in claim 49, wherein a dissolution rate of said magnesium composite is at least 45 mg/cm^2/hr. in 3 wt. % KCl water mixture at 90° C. and up to 325 mg/cm^2/hr. in 3 wt. % KCl water mixture at 90° C.	This claim is invalid under 35 U.S.C. 112 for being indefinite because it depends on invalid claim 49. The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. Further, this claim limitation requires "a dissolution rate of said magnesium composite is at least 45 mg/cm^2/hr. in 3 wt. % KCl water mixture at 90° C. and up to 325 mg/cm^2/hr. in 3 wt. % KCl water mixture at 90° C." This limitation is also indefinite. The specification and the claims provide no guidance to narrow down the wide range of possibilities of how the dissolution rate is to be determined. The specification provides qualitative information

	about how the morphology of the composite affects dissolution rates, *See* '653 11:38-7, 12:51-61, but no guidance is provided as how to measure dissolution rate. The PHOSITA would need significant additional information to determine what the inventors mean by the dissolution rate. See Exhibit 1 - Standard Guide for Laboratory Immersion Corrosion Testing of Metals, NACE TM0169/G31 – 21 (2021). That standard procedure provides "factors include apparatus, sampling, test specimen, test conditions (test solution composition, temperature, gas sparging, fluid motion, solution volume, method of supporting test specimens, duration of test), methods of cleaning test specimens, interpretation of results, and calculation of corrosion rates. This guide also emphasizes the importance of recording all pertinent data and provides a checklist for reporting test data." Id. at ¶1.1. Neither the specification of '653 or this claim provides teaching of how this dissolution rate should be calculated. No amount of experimentation would provide the PHOSITA an answer to that question of dissolution rate because the specification does provide no guidance on how the inventors measured that dissolution rate This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
68. The magnesium composite as defined in claim 49, wherein a dissolution rate of said magnesium composite is up to 1 mg/cm^2/hr. in 3 wt. % KCl water mixture at 21° C.	***No infringement alleged for this claim. See Terves's Final Infringement Contentions at 19.***
69. The magnesium composite as defined in claim 49, wherein said additive material has a melting point temperature that is 100° C. greater than a melting temperature of said magnesium or magnesium alloy.	Further, Neither the claim nor the specification provides the PHOSITA necessary information about what "magnesium alloy" should be employed as a comparison for melting point. In addition, what concentration should this magnesium alloy have? The solidus temperature will depend greatly on the composition of this undefined alloy. There are a multitude of magnesium alloys that could be employed and leaving this term undefined renders this claim indefinite. This claim is invalid under 35 U.S.C. 112 for being indefinite because it depends on invalid claim 49.

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70. The magnesium composite as defined in claim 49, wherein said magnesium composite is at least partially included in a down hole well component, said down hole well component including one or more components selected from the group consisting of a sleeve, frac ball, hydraulic actuating tooling, tube, valve, valve component, or plug.	
71. The magnesium composite as defined in claim 49, wherein at least a portion of said additive material remains unalloyed additive material in said magnesium composite.	***Infringement contention withdrawn pursuant to July 2, 2021 email from Matthew J. Cavanagh.***
72. The magnesium composite as defined in claim 49, wherein said additive material is a metal or metal alloy.	***Infringement contention withdrawn pursuant to July 2, 2021 email from Matthew J. Cavanagh.***
73. A dissolvable magnesium composite for use in a ball or other tool component in a well drilling or completion operation, said dissolvable magnesium composite includes in situ	

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precipitation of galvanically-active intermetallic phases to enable controlled dissolution of said magnesium composite, said magnesium composite comprising a mixture of magnesium or a magnesium alloy and an additive material, said additive material constituting about 0.05 wt. % of said mixture, said additive material is a metal or metal alloy, said additive material includes one or more metals selected from the group consisting of copper, nickel, titanium, iron, silicon, and cobalt, said magnesium composite including in situ precipitation of galvanically-active intermetallic phases that include said additive material, said additive material located in sufficient quantities in said galvanically-active intermetallic phases so as to obtain a composition and morphology of said galvanically-active intermetallic phases such that a galvanic corrosion rate along said galvanically-active intermetallic phases causes said magnesium	

composite to have a dissolution rate of at least at least 5 $mg/cm^2/hr.$ in 3 wt. % KCl water mixture at 90° C.	
74. A dissolvable magnesium composite for use in a ball or other tool component in a well drilling or completion operation, said dissolvable magnesium composite includes in situ precipitation of galvanically-active intermetallic phases to enable controlled dissolution of said magnesium composite, said magnesium composite comprising	
a mixture of magnesium or a magnesium alloy and an additive material,	This independent claim teaches a magnesium composition comprising "a mixture of magnesium or a magnesium alloy and an additive material." Neither the claim nor the specification provides the PHOSITA necessary information about what "magnesium alloy" should be employed. There are a multitude of magnesium alloys that could be employed and leaving this term undefined renders this claim indefinite.
said additive material constituting at least 0.1 wt. % of said mixture,	
said magnesium in said magnesium composite constituting at least 85 wt. %,	
said additive material is a metal material selected from the group consisting of copper, nickel and cobalt,	

said magnesium composite including in situ precipitation of galvanically-active intermetallic phases that include said additive material,	
said magnesium composite has a dissolution rate of 84-325 mg/cm^2/hr. in 3 wt. % KCl water mixture at 90° C.	This claim limitation requires that the "magnesium composite has a dissolution rate of 84-325 mg/cm^2/hr. in 3 wt. % KCl water mixture at 90° C." This claim limitation is indefinite as failing to adequately specify how dissolution rate is to be determine. The specification and the claims provide no guidance to narrow down the wide range of possibilities of how the dissolution rate is to be determined. The specification provides qualitative information about how the morphology of the composite affects dissolution rates, *See* '653 11:38-7, 12:51-61, but no guidance is provided as how to measure dissolution rate. The PHOSITA would need significant additional information to determine what the inventors mean by the dissolution rate. See Exhibit 1 - Standard Guide for Laboratory Immersion Corrosion Testing of Metals, NACE TM0169/G31 – 21 (2021). That standard procedure provides "factors include apparatus, sampling, test specimen, test conditions (test solution composition, temperature, gas sparging, fluid motion, solution volume, method of supporting test specimens, duration of test), methods of cleaning test specimens, interpretation of results, and calculation of corrosion rates. This guide also emphasizes the importance of recording all pertinent data and provides a checklist for reporting test data." Id. at ¶1.1. Neither the specification of '653 or this claim provides teaching of how this dissolution rate should be calculated. No amount of experimentation would provide the PHOSITA an answer to that question of dissolution rate because the specification does provide no guidance on how the inventors measured that dissolution rate. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a). This claim limitation is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
75. The magnesium composite as defined in claim 74, wherein said	***Infringement contention withdrawn pursuant to July 2, 2021 email from Matthew J. Cavanagh.***

magnesium alloy is an AZ91D magnesium alloy that includes aluminum and zinc.	***No infringement alleged for this claim. See Terves's Final Infringement Contentions at 21.***
76. The magnesium composite as defined in claim 74, wherein said additive material includes nickel, a content of said nickel in said magnesium composite is at least 0.3 wt. %.	***No infringement alleged for this claim. See Terves's Final Infringement Contentions at 21.***
77. The magnesium composite as defined in claim 74, wherein said additive material includes nickel, a content of said nickel in said magnesium composite is at least 7 wt. %.	***No infringement alleged for this claim. See Terves's Final Infringement Contentions at 21.***
78. The magnesium composite as defined in claim 74, wherein said additive material includes nickel, a content of said nickel in said magnesium composite is at least 10 wt. %.	***No infringement alleged for this claim. See Terves's Final Infringement Contentions at 21.***

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Appendix B

U.S. Patent No. 10,689,740 ('740 Patent) Lack of Written Description, Indefiniteness, and Non-Enabling Invalidity Claim Chart

'740 Patent Claims[1]	Patent Claims that fail to meet the written description requirement of 35 U.S.C. 112.
1. A dissolvable magnesium alloy in which additions of high electronegative intermetallic formers are selected from one or more elements with an electronegativity of greater than 1.75 and 0.2-5 wt. % of one or more elements with an electronegativity of 1.25 or less, a magnesium content in said dissolvable magnesium alloy is greater than 50 wt. %, said one or more elements with an electronegativity of greater than 1.75 form a precipitate, particle, and/or intermetallic phase in said dissolvable magnesium alloy, said one or more elements with an electronegativity of greater than 1.75 include one or more elements selected from the group of tin, nickel, iron, cobalt, silicon, nickel, chromium, copper, bismuth, lead, tin, antimony, indium, silver, aluminum, gold,	***No infringement alleged. See Terves's Final Infringement Contentions at 21***

[1] Independent claims 1, 2, 19, and 94 are shaded for easier reference.

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platinum, cadmium, selenium, arsenic, boron, germanium, carbon, molybdenum, tungsten, manganese, zinc, rhenium and gallium, said one or more elements with an electronegativity of 1.25 or less are selected from the group of calcium, strontium, barium, potassium, neodymium, cerium, sodium, lithium, cesium, yttrium, lanthanum, samarium, europium, gadolinium, terbium, dysprosium, holmium and ytterbium, said dissolvable magnesium alloy has a dissolution rate of at least 5 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C.	
2. A dissolvable magnesium composite that at least partially forms a ball, a frac ball, a tube, a plug or other tool component that is to be used in a well drilling or completion operation,	This is an independent claim which includes no transition phrase such as comprising or consisting of. "[P]oor poor claim drafting will not be an excuse for it to infuse confusion into its claim scope. *Acceleration Bay, LLC v. Activision Blizzard Inc.*, 908 F.3d 765, 770 (Fed. Cir. 2018). In this claim, the limitation "or other tool component" are wildly ambiguous. These supposed limitations provide the PHOSITA with no guidance whatsoever as to how to construct a "magnesium alloy composite" for "another tool component." This claim limitation is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
said dissolvable dissolvable [sic] magnesium composite includes in situ precipitate,	In this claim, the limitation "magnesium alloy" and "dissolvable dissolvable [sic] magnesium composite" are wildly ambiguous.

	These supposed limitations provide the PHOSITA with no guidance whatsoever as to how to construct a "magnesium alloy composite." Further, the claim is indefinite has failed to distinctly point out what is meant by a "in situ precipitate." Neither the claim nor the specification provides guidance to the PHOSITA. One portion of the specification teaches "[o]nce the mixing process is complete, the mixture of molten 60 magnesium or magnesium alloy, $SMMg_x$, SM_xMg, and/or any unalloyed additive is cooled and an *in situ* precipitate is formed in the solid magnesium composite." '740 6:59-62. Later in the specification the *in situ* precipitate is defined as "magnesium composite that is 65 over 50 wt. % magnesium and about 0.05-49.5 wt. % nickel (and all values or ranges therebetween) is added to the magnesium or magnesium alloy to form intermetallic Mg_2Ni as a galvanically-active *in situ* precipitate." '740 6:64-7:1. Later, the specification teaches "the magnesium or magnesium alloy to form galvanically active *in situ* precipitate that includes bismuth and/or bismuth alloy." '740 8:16-18. There are numerous references in the specification teaching different types of *in situ* precipitate. So numerous as to give this limitation no guidance to the PHOSITA as to what *in situ* precipitate to use to practice this claim. This claim limitation is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
said dissolvable magnesium composite comprising a mixture of magnesium or a magnesium alloy and an additive material,	The patent claim teaches a magnesium composition comprising "a mixture of magnesium or a magnesium alloy and an additive material." Neither the claim nor the specification provides the PHOSITA necessary information about what "magnesium alloy" should be employed. There are a multitude of magnesium alloys that could be employed and leaving this term undefined renders this claim indefinite. Neither the claim nor the specification provides the PHOSITA necessary information about what "additive material" should be employed. This limitation is wildly ambiguous and provides no guidance to the PHOSITA as to what to add to the "mixture of magnesium or a magnesium alloy." This claim limitation is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).

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said magnesium composite includes greater than 50 wt. % magnesium, said in situ precipitate includes	
said additive material, said additive material [sic] includes one or more metal materials selected from the group consisting of a) copper wherein said copper constitutes 0.1-35 wt. % of said dissolvable magnesium composite, b) wt. % nickel wherein said nickel constitutes 0.1-23.5 wt. % of said dissolvable magnesium composite, and c) cobalt wherein said cobalt constitutes 0.1-20 wt. % of said dissolvable magnesium composite,	In this claim, the limitation "said additive material, said additive material [sic]" is confusing and ambiguous. These supposed limitations provide the PHOSITA with no guidance whatsoever as to how to construct a "magnesium alloy composite." This claim limitation was not subject to any Certificate of Correction before the USPTO. This claim limitation is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
said dissolvable magnesium composite has a dissolution rate of at least 75 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C.	The claim defines the magnesium composite has having a dissolution rate "of at least 75 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C." This claim limitation is indefinite as failing to adequately specify how dissolution rate is to be determine. The specification and the claims provide no guidance to narrow down the wide range of possibilities of how the dissolution rate is to be determined. The specification provides qualitative information about how the morphology of the composite affects dissolution rates, *See* '653 11:38-7, 12:51-61, but no guidance is provided as how to measure dissolution rate. The PHOSITA would need significant additional information to determine what the inventors mean by the dissolution rate. See Exhibit 1 - Standard Guide for Laboratory Immersion Corrosion Testing of Metals, NACE TM0169/G31 – 21 (2021). That standard procedure provides "factors include apparatus, sampling, test specimen, test conditions (test solution composition, temperature, gas sparging, fluid motion, solution volume, method of supporting test specimens, duration of test), methods of cleaning test specimens, interpretation of results, and calculation of corrosion rates. This guide also emphasizes the importance of recording all pertinent data and provides a checklist for reporting test data." Id. at ¶1.1. Neither the specification of '653 or this claim provides teaching of how this

	dissolution rate should be calculated. No amount of experimentation would provide the PHOSITA an answer to that question of dissolution rate because the specification does provide no guidance on how the inventors measured that dissolution rate. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a). This claim limitation is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
3. The dissolvable magnesium composite as defined in claim 2, wherein said dissolvable magnesium composite has a dissolution rate of 75-325 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C.	As this claim depends on claim 2 and claim 2 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. Further, this claim limitation defines the magnesium composite has having a "has a dissolution rate of 75-325 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C." This limitation is indefinite. The specification and the claims provide no guidance to narrow down the wide range of possibilities of how the dissolution rate is to be determined. The specification provides qualitative information about how the morphology of the composite affects dissolution rates, *See* '653 11:38-7, 12:51-61, but no guidance is provided as how to measure dissolution rate. The PHOSITA would need significant additional information to determine what the inventors mean by the dissolution rate. See Exhibit 1 - Standard Guide for Laboratory Immersion Corrosion Testing of Metals, NACE TM0169/G31 – 21 (2021). That standard procedure provides "factors include apparatus, sampling, test specimen, test conditions (test solution composition, temperature, gas sparging, fluid motion, solution volume, method of supporting test specimens, duration of test), methods of cleaning test specimens, interpretation of results, and calculation of corrosion rates. This guide also emphasizes the importance of recording all pertinent data and provides a checklist for reporting test data." *Id*. at ¶1.1. Neither the specification of '740 or this claim provides teaching of how this dissolution rate should be calculated. No amount of experimentation would provide the PHOSITA an answer to that question of dissolution rate because the specification does provide no guidance on how the inventors measured that dissolution rate. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).

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4. The dissolvable magnesium composite as defined in claim 2, wherein said dissolvable magnesium composite has a dissolution rate of 84-325 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C.	As this claim depends on claim 2 and that claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. The claim defines the magnesium composite has having a "has a dissolution rate of 84-325 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C." This limitation is indefinite. The specification and the claims provide no guidance to narrow down the wide range of possibilities of how the dissolution rate is to be determined. The specification provides qualitative information about how the morphology of the composite affects dissolution rates, *See* '653 11:38-7, 12:51-61, but no guidance is provided as how to measure dissolution rate. The PHOSITA would need significant additional information to determine what the inventors mean by the dissolution rate. See Exhibit 1 - Standard Guide for Laboratory Immersion Corrosion Testing of Metals, NACE TM0169/G31 – 21 (2021). That standard procedure provides "factors include apparatus, sampling, test specimen, test conditions (test solution composition, temperature, gas sparging, fluid motion, solution volume, method of supporting test specimens, duration of test), methods of cleaning test specimens, interpretation of results, and calculation of corrosion rates. This guide also emphasizes the importance of recording all pertinent data and provides a checklist for reporting test data." *Id*. at ¶1.1. Neither the specification of '740 or this claim provides teaching of how this dissolution rate should be calculated. No amount of experimentation would provide the PHOSITA an answer to that question of dissolution rate because the specification does provide no guidance on how the inventors measured that dissolution rate. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
5. The dissolvable magnesium composite as defined in claim 2, wherein said dissolvable magnesium composite has a dissolution rate of 100-325 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C.	As this claim depends on claim 2 and claim 2 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. The claim defines the magnesium composite has having a "has a dissolution rate of 100-325 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C." This limitation is indefinite. The specification and the claims provide no guidance to narrow down the wide range of

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	possibilities of how the dissolution rate is to be determined. The specification provides qualitative information about how the morphology of the composite affects dissolution rates, *See* '653 11:38-7, 12:51-61, but no guidance is provided as how to measure dissolution rate. The PHOSITA would need significant additional information to determine what the inventors mean by the dissolution rate. See Exhibit 1 - Standard Guide for Laboratory Immersion Corrosion Testing of Metals, NACE TM0169/G31 – 21 (2021). That standard procedure provides "factors include apparatus, sampling, test specimen, test conditions (test solution composition, temperature, gas sparging, fluid motion, solution volume, method of supporting test specimens, duration of test), methods of cleaning test specimens, interpretation of results, and calculation of corrosion rates. This guide also emphasizes the importance of recording all pertinent data and provides a checklist for reporting test data." *Id*. at ¶1.1. Neither the specification of '740 or this claim provides teaching of how this dissolution rate should be calculated. No amount of experimentation would provide the PHOSITA an answer to that question of dissolution rate because the specification does provide no guidance on how the inventors measured that dissolution rate. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
6. The dissolvable magnesium composite as defined in claim 2, wherein said dissolvable magnesium composite has a dissolution rate of 0.6-1 mg/cm2/hr. in 3 wt. % KCl water mixture at 21° C.	As this claim depends on claim 2 and claim 2 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. The claim defines the magnesium composite has having a "has a dissolution rate of 0.6-1 mg/cm2/hr. in 3 wt. % KCl water mixture at 21° C." This limitation is indefinite. The specification and the claims provide no guidance to narrow down the wide range of possibilities of how the dissolution rate is to be determined. The specification provides qualitative information about how the morphology of the composite affects dissolution rates, *See* '653 11:38-7, 12:51-61, but no guidance is provided as how to measure dissolution rate. The PHOSITA would need significant additional information to determine what the inventors mean by the dissolution rate. See Exhibit 1 - Standard Guide for Laboratory Immersion Corrosion Testing of Metals, NACE TM0169/G31 – 21 (2021). That standard procedure provides "factors include apparatus, sampling, test specimen, test conditions (test solution composition, temperature, gas sparging, fluid motion, solution volume, method of supporting test

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	specimens, duration of test), methods of cleaning test specimens, interpretation of results, and calculation of corrosion rates. This guide also emphasizes the importance of recording all pertinent data and provides a checklist for reporting test data." *Id*. at ¶1.1. Neither the specification of '740 or this claim provides teaching of how this dissolution rate should be calculated. No amount of experimentation would provide the PHOSITA an answer to that question of dissolution rate because the specification does provide no guidance on how the inventors measured that dissolution rate. Further, this claim is impossible to practice given the incompatible limitations in this claim and claim 2, the independent claim upon which this claim is based. Claim 2 requires "a dissolution rate of at least 75 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C." Yet, this claim calls for a "a dissolution rate 0.6-1 mg/cm2/hr. in 3 wt. % KCl water mixture at 21° C." The concentration ranges are incompatible and make the claim indefinite. In addition, claim 2 requires a dissolution rate in a "3 wt. % KCl water mixture at 90° C." In contrast, this claim calls for a dissolution rate in "0.6-1 mg/cm2/hr. in 3 wt. % KCl water mixture at 21° C." It would be impossible for the PHOSITA to decided whether to perform dissolution experiments at 90 °C or 21 °C to meet the teaching of this claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
7. The dissolvable magnesium composite as defined in claim 2, wherein said dissolvable magnesium composite has a dissolution rate of 0.5-1 mg/cm2/hr. in 3 wt. % KCl water mixture at 20° C.	As this claim depends on claim 2 and claim 2 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. The claim defines the magnesium composite has having a "0.5-1 mg/cm2/hr. in 3 wt. % KCl water mixture at 20° C." This limitation is indefinite. The specification and the claims provide no guidance to narrow down the wide range of possibilities of how the dissolution rate is to be determined. The specification provides qualitative information about how the morphology of the composite affects dissolution rates, *See* '653 11:38-7, 12:51-61, but no guidance is provided as how to measure dissolution rate. The PHOSITA would need significant additional information to determine what the inventors mean by the dissolution rate. See Exhibit 1 - Standard Guide for Laboratory Immersion Corrosion Testing of Metals, NACE

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	TM0169/G31 – 21 (2021). That standard procedure provides "factors include apparatus, sampling, test specimen, test conditions (test solution composition, temperature, gas sparging, fluid motion, solution volume, method of supporting test specimens, duration of test), methods of cleaning test specimens, interpretation of results, and calculation of corrosion rates. This guide also emphasizes the importance of recording all pertinent data and provides a checklist for reporting test data." *Id*. at ¶1.1. Neither the specification of '740 or this claim provides teaching of how this dissolution rate should be calculated. No amount of experimentation would provide the PHOSITA an answer to that question of dissolution rate because the specification does provide no guidance on how the inventors measured that dissolution rate. Further, this claim is impossible to practice given the incompatible limitations in this claim and claim 2, the independent claim upon which this claim is based. Claim 2 calls for "has a dissolution rate of at least 75 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C." Yet, this claim calls for "a dissolution rate 0.5-1 mg/cm2/hr. in 3 wt. % KCl water mixture at 20° C." This ranges are incompatible and makes this claim indefinite. In addition, claim 2 requires a dissolution rate in a "3 wt. % KCl water mixture at 90° C." In contrast, this claim calls for a dissolution rate in "0.6-1 mg/cm2/hr. in 3 wt. % KCl water mixture at 20° C." It would be impossible for the PHOSITA to decided whether to perform dissolution experiments at 90 °C or 20 °C to meet the teaching of this claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
8. The dissolvable magnesium composite as defined in claim 2, wherein said magnesium alloy comprises greater than 50 wt. % magnesium and no more than 10 wt. % aluminum, and one or more metals selected from the group consisting of 0.5-10 wt. % aluminum, 0.1-2 wt. % zinc, 0.01-1 wt. %	As this claim depends on claim 2 and claim 2 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).

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zirconium, and 0.15-2 wt. % manganese.	
9. The dissolvable magnesium composite as defined in claim 2, wherein said magnesium alloy comprises greater than 50 wt. % magnesium and no more than 10 wt. % aluminum, and one or more metals selected from the group consisting of 0.1-3 wt. % zinc, 0.05-1 wt. % zirconium, 0.05-0.25 wt. % manganese, 0.0002-0.04 wt. % boron, and 0.4-0.7 wt. % bismuth.	As this claim depends on claim 2 and claim 2 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
10. The dissolvable magnesium composite as defined in claim 2, wherein said additive material includes nickel.	As this claim depends on claim 2 and claim 2 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
11. The dissolvable magnesium composite as defined in claim 2, wherein said additive material includes nickel, said nickel constitutes 0.3-7 wt. % of said dissolvable magnesium composite.	As this claim depends on claim 2 and claim 2 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
12. The dissolvable magnesium composite as defined in claim 2, wherein said additive	***No infringement alleged. See Terves's Final Infringement Contentions at 24.***

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material includes nickel, said nickel constitutes 7-10 wt. % of said dissolvable magnesium composite.	
13. The dissolvable magnesium composite as defined in claim 2, wherein said additive material includes copper.	As this claim depends on claim 2 and claim 2 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
14. The dissolvable magnesium composite as defined in claim 2, wherein said additive material includes copper, said copper constitutes 0.5-15 wt. % of said dissolvable magnesium composite.	As this claim depends on claim 2 and claim 2 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
15. The dissolvable magnesium composite as defined in claim 2, wherein said additive material includes copper, said copper constitutes 15-35 wt. % of said dissolvable magnesium composite.	***No infringement alleged. See Terves's Final Infringement Contentions at 24.***
16. The dissolvable magnesium composite as defined in claim 2, wherein said magnesium content in said dissolvable magnesium composite is at least 75 wt. %.	As this claim depends on claim 2 and claim 2 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).

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17. The dissolvable magnesium composite as defined in claim 2, wherein said magnesium content in said dissolvable magnesium composite is at least 85 wt. %.	As this claim depends on claim 2 and claim 2 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
18. The dissolvable magnesium composite as defined in claim 2, wherein said additive material is a metal or metal alloy.	***Infringement contention withdrawn pursuant to July 2, 2021 email from Matthew J. Cavanagh.***
19. A dissolvable magnesium cast composite comprising	
a mixture of magnesium or a magnesium alloy and an additive material, said additive material includes one or more metals selected from the group consisting of a) copper wherein said copper constitutes at least 0.01 wt. % of said dissolvable magnesium cast composite, b) nickel wherein said nickel constitutes at least 0.01 wt. % of said dissolvable magnesium cast composite, and c) cobalt wherein said cobalt constitutes at least 0.01 wt. % of said dissolvable magnesium cast composite,	This claim is an independent claim. The patent claim teaches a magnesium composition comprising "a mixture of magnesium or a magnesium alloy and an additive material." Neither the claim nor the specification provides the PHOSITA necessary information about what "magnesium alloy" should be employed. There are a multitude of magnesium alloys that could be employed and leaving this term undefined renders this claim indefinite. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
said magnesium composite includes in situ precipitate,	This claim limitation is indefinite by failing to distinctly point out what is meant by a "in situ precipitate." Neither the claim nor the

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	specification provides guidance to the PHOSITA. One portion of the specification teaches "[o]g the mixing process is complete, the mixture of molten 60 magnesium or magnesium alloy, g, SM_xMg, and/or any unalloyed additive is cooled and an *in situ* precipitate is formed in the solid magnesium composite." '740 6:59-62. Later in the specification the *in situ* precipitate is defined as "magnesium composite that is 65 over 50 wt. % magnesium and about 0.05-49.5 wt. % nickel (and all values or ranges therebetween) is added to the magnesium or magnesium alloy to form intermetallic Mg_2Ni as a galvanically-active *in situ* precipitate." '740 6:64-7:1. Later, the specification teaches "the magnesium or magnesium alloy to form galvanically active *in situ* precipitate that includes bismuth and/or bismuth alloy." '740 8:16-18. There are numerous references in the specification teaching different types of *in situ* precipitate. So numerous as to give this limitation no guidance to the PHOSITA as to what *in situ* precipitate to use to practice this claim. This claim limitation is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
said in situ precipitate includes said additive material, a plurality of particles of said in situ precipitate having a size of no more than 50 μm,	
said magnesium composite has a dissolution rate of at least 5 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C.	The claim defines the magnesium composite that "has a dissolution rate of at least 5 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C" This claim limitation is indefinite as failing to adequately specify how dissolution rate is to be determine. The specification and the claims provide no guidance to narrow down the wide range of possibilities of how the dissolution rate is to be determined. The specification provides qualitative information about how the morphology of the composite affects dissolution rates, *See* '653 11:38-7, 12:51-61, but no guidance is provided as how to measure dissolution rate. The PHOSITA would need significant additional information to determine what the inventors mean by the dissolution rate. See Exhibit 1 - Standard Guide for Laboratory Immersion Corrosion Testing of Metals, NACE TM0169/G31 – 21 (2021). That standard procedure provides "factors include apparatus, sampling, test specimen, test conditions (test solution composition, temperature, gas sparging, fluid motion, solution volume, method of supporting

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	test specimens, duration of test), methods of cleaning test specimens, interpretation of results, and calculation of corrosion rates. This guide also emphasizes the importance of recording all pertinent data and provides a checklist for reporting test data." Id. at ¶1.1. Neither the specification of '653 or this claim provides teaching of how this dissolution rate should be calculated. No amount of experimentation would provide the PHOSITA an answer to that question of dissolution rate because the specification does provide no guidance on how the inventors measured that dissolution rate. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a). This claim limitation is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
20. The dissolvable magnesium cast composite as defined in claim 19, wherein said magnesium composite includes at least 85 wt. % magnesium.	As this claim depends on claim 19 and that claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
21. The dissolvable magnesium cast composite as defined in claim 19, wherein said magnesium composite has a dissolution rate of at least 40 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C.	As this claim depends on claim 19 and that claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
22. The dissolvable magnesium cast composite as defined in claim 20, wherein said magnesium composite has a dissolution rate of at least 40 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C.	As this claim depends on claim 20 which in turn depends on claim 19. Since claim 19 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).

23. The dissolvable magnesium cast composite as defined in claim 19, wherein said magnesium composite includes no more than 10 wt. % aluminum.	As this claim depends on claim 19 and that claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
24. The dissolvable magnesium cast composite as defined in claim 20, wherein said magnesium composite includes no more than 10 wt. % aluminum.	This claim depends on claim 20 which in turn depends on claim 19. Since claim 19 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
25. The dissolvable magnesium cast composite as defined in claim 21, wherein said magnesium composite includes no more than 10 wt. % aluminum.	This claim depends on claim 21 which in turn depends on claims 20 and 19. Since claim 19 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
26. The dissolvable magnesium cast composite as defined in claim 22, wherein said magnesium composite includes no more than 10 wt. % aluminum.	This claim depends on claim 22 which in turn depends on claims 20 and 19. Since claim 19 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).

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27. The dissolvable magnesium cast composite as defined in claim 23, wherein said magnesium composite includes at least 50 wt. % magnesium.	This claim depends on claim 23 which in turn depends on claim 19. Since claim 19 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
28. The dissolvable magnesium cast composite as defined in claim 25, wherein said magnesium composite includes at least 50 wt. % magnesium.	This claim depends on claim 25 which in turn depends on claims 21, 20 and 19. Since claim 19 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
29. The dissolvable magnesium cast composite as defined in claim 19, wherein said dissolvable magnesium cast composite has a dissolution rate of 40-325 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C.	This claim depends on claim 19. Since claim 19 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
30. The dissolvable magnesium cast composite as defined in claim 20, wherein said dissolvable magnesium cast composite has a dissolution rate of 40-325 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C.	This claim depends on claim 20 which in turn depends on claim 19. Since claim 19 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).

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31. The dissolvable magnesium cast composite as defined in claim 22, wherein said dissolvable magnesium cast composite has a dissolution rate of 40-325 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C.	This claim depends on claim 22 which in turn depends on claims 20 and 19. Since claim 19 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
32. The dissolvable magnesium cast composite as defined in claim 23, wherein said dissolvable magnesium cast composite has a dissolution rate of 40-325 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C.	This claim depends on claim 23 which in turn depends on claim 19. Since claim 19 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
33. The dissolvable magnesium cast composite as defined in claim 27, wherein said dissolvable magnesium cast composite has a dissolution rate of 40-325 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C.	This claim depends on claim 27 which in turn depends on claims 23 and claim 19. Since claim 19 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
34. The dissolvable magnesium cast composite as defined in claim 28, wherein said dissolvable magnesium cast composite has a dissolution rate of 40-325 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C.	This claim depends on claim 28 which in turn depends on claims 25, 21, 20 and 19. Since claim 19 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).

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35. The dissolvable magnesium cast composite as defined in claim 27, wherein said magnesium alloy includes over 50 wt. % magnesium and one or more metals selected from the group consisting of aluminum, boron, bismuth, zinc, zirconium, and manganese.	This claim depends on claim 27 which in turn depends on claims 23 and claim 19. Since claim 19 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
36. The dissolvable magnesium cast composite as defined in claim 28, wherein said magnesium alloy includes over 50 wt. % magnesium and one or more metals selected from the group consisting of aluminum, boron, bismuth, zinc, zirconium, and manganese.	This claim depends on claim 28 which in turn depends on claims 25, 21, 20 and 19. Since claim 19 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
37. The dissolvable magnesium cast composite as defined in claim 27, wherein said magnesium alloy includes over 50 wt. % magnesium and one or more metals selected from the group consisting of aluminum in an amount of 0.5-10 wt. %, zinc in an amount of 0.1-6 wt. %, zirconium in an amount of 0.01-3 wt. %, manganese in an	This claim depends on claim 27 which in turn depends on claims 23 and claim 19. Since claim 19 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).

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amount of 0.15-2 wt. %, boron in an amount of 0.0002-0.04 wt. %, and bismuth in an amount of 0.4-0.7 wt. %.	
38. The dissolvable magnesium cast composite as defined in claim 28, wherein said magnesium alloy includes over 50 wt. % magnesium and one or more metals selected from the group consisting of aluminum in an amount of 0.5-10 wt. %, zinc in an amount of 0.1-6 wt. %, zirconium in an amount of 0.01-3 wt. %, manganese in an amount of 0.15-2 wt. %, boron in an amount of 0.0002-0.04 wt. %, and bismuth in an amount of 0.4-0.7 wt. %.	This claim depends on claim 28 which in turn depends on claims 25, 21, 20 and 19. Since claim 19 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
39. The dissolvable magnesium cast composite as defined in claim 27, wherein said magnesium alloy includes over 50 wt. % magnesium and one or more metals selected from the group consisting of aluminum in an amount of 0.5-10 wt. %, zinc in an amount of 0.1-3 wt. %, zirconium in an amount of 0.01-1 wt. %, manganese in an	This claim depends on claim 27 which in turn depends on claims 23 and claim 19. Since claim 19 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).

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amount of 0.15-2 wt. %, boron in an amount of 0.0002-0.04 wt. %, and bismuth in amount of 0.4-0.7 wt. %.	
40. The dissolvable magnesium cast composite as defined in claim 28, wherein said magnesium alloy includes over 50 wt. % magnesium and one or more metals selected from the group consisting of aluminum in an amount of 0.5-10 wt. %, zinc in an amount of 0.1-3 wt. %, zirconium in an amount of 0.01-1 wt. %, manganese in an amount of 0.15-2 wt. %, boron in an amount of 0.0002-0.04 wt. %, and bismuth in amount of 0.4-0.7 wt. %.	This claim depends on claim 28 which in turn depends on claims 25, 21, 20 and 19. Since claim 19 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
41. The dissolvable magnesium cast composite as defined in claim 20, wherein said magnesium alloy includes at least 85 wt. % magnesium and one or more metals selected from the group consisting of 0.5-10 wt. % aluminum, 0.05-6 wt. % zinc, 0.01-3 wt. % zirconium, and 0.15-2 wt. % manganese.	This claim depends on claim 20 which in turn depends on claim 19. Since claim 19 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
42. The dissolvable magnesium cast composite as defined in	This claim depends on claim 22 which in turn depends on claims 20 and 19. Since claim 19 is invalid as being indefinite and failing to

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claim 22, wherein said magnesium alloy includes at least 85 wt. % magnesium and one or more metals selected from the group consisting of 0.5-10 wt. % aluminum, 0.05-6 wt. % zinc, 0.01-3 wt. % zirconium, and 0.15-2 wt. % manganese.	meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
43. The dissolvable magnesium cast composite as defined in claim 23, wherein said magnesium alloy includes at least 85 wt. % magnesium and one or more metals selected from the group consisting of 0.5-10 wt. % aluminum, 0.05-6 wt. % zinc, 0.01-3 wt. % zirconium, and 0.15-2 wt. % manganese.	This claim depends on claim 23 which in turn depends on claim 19. Since claim 19 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
44. The dissolvable magnesium cast composite as defined in claim 27, wherein said magnesium alloy comprises greater than 50 wt. % magnesium and one or more metals selected from the group consisting of 0.5-10 wt. % aluminum, 0.1-2 wt. % zinc, 0.01-1 wt. % zirconium, and 0.15-2 wt. % manganese.	This claim depends on claim 27 which in turn depends on claims 23 and claim 19. Since claim 19 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
45. The dissolvable magnesium cast composite as defined in claim 28, wherein said	This claim depends on claim 28 which in turn depends on claims 25, 21, 20 and 19. Since claim 19 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C.

magnesium alloy comprises greater than 50 wt. % magnesium and one or more metals selected from the group consisting of 0.5-10 wt. % aluminum, 0.1-2 wt. % zinc, 0.01-1 wt. % zirconium, and 0.15-2 wt. % manganese.	112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
46. The dissolvable magnesium cast composite as defined in claim 27, wherein said magnesium alloy comprises greater than 50 wt. % magnesium and one or more metals selected from the group consisting of 0.1-3 wt. % zinc, 0.05-1 wt. % zirconium, 0.05-0.25 wt. % manganese, 0.0002-0.04 wt. % boron, and 0.4-0.7 wt. % bismuth.	This claim depends on claim 27 which in turn depends on claims 23 and claim 19. Since claim 19 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
47. The dissolvable magnesium cast composite as defined in claim 28, wherein said magnesium alloy comprises greater than 50 wt. % magnesium and one or more metals selected from the group consisting of 0.1-3 wt. % zinc, 0.05-1 wt. % zirconium, 0.05-0.25 wt. % manganese, 0.0002-0.04 wt. % boron, and 0.4-0.7 wt. % bismuth.	This claim depends on claim 28 which in turn depends on claims 25, 21, 20 and 19. Since claim 19 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).

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48. The dissolvable magnesium cast composite as defined in claim 19, wherein said magnesium alloy comprises 60-95 wt. % magnesium, 0.5-10 wt. % aluminum, 0.05-6 wt. % zinc, and 0.15-2 wt. % manganese.	***No infringement alleged. See Terves's Final Infringement Contentions at 31.***
49. The dissolvable magnesium cast composite as defined in claim 19, wherein said magnesium alloy includes 60-95 wt. % magnesium and 0.01-1 wt. % zirconium.	This claim depends on claim 19. Since claim 19 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
50. The dissolvable magnesium cast composite as defined in claim 19, wherein said magnesium alloy includes 60-95 wt. % magnesium, 0.05-6 wt. % zinc, and 0.01-1 wt. % zirconium.	This claim depends on claim 19. Since claim 19 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
51. The dissolvable magnesium cast composite as defined in claim 19, wherein said magnesium alloy includes over 50 wt. % magnesium and one or more metals selected from the group consisting of 0.1-3 wt. % zinc, 0.01-1 wt. % zirconium, 0.05-1 wt. % manganese, 0.0002-0.04 wt. % boron, and 0.4-0.7 wt. % bismuth.	This claim depends on claim 19. Since claim 19 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).

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52. The dissolvable magnesium cast composite as defined in claim 19, wherein said additive material includes nickel, said nickel constitutes 0.1-23.5 wt. % of said dissolvable magnesium cast composite.	This claim depends on claim 19. Since claim 19 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
53. The dissolvable magnesium cast composite as defined in claim 20, wherein said additive material includes nickel, said nickel constitutes 0.1-23.5 wt. % of said dissolvable magnesium cast composite.	This claim depends on claim 20 which in turn depends on claim 19. Since claim 19 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
54. The dissolvable magnesium cast composite as defined in claim 22, wherein said additive material includes nickel, said nickel constitutes 0.1-23.5 wt. % of said dissolvable magnesium cast composite.	This claim depends on claim 22 which in turn depends on claims 20 and 19. Since claim 19 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
55. The dissolvable magnesium cast composite as defined in claim 23, wherein said additive material includes nickel, said nickel constitutes 0.1-23.5 wt. % of said dissolvable magnesium cast composite.	This claim depends on claim 23 which in turn depends on claim 19. Since claim 19 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).

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56. The dissolvable magnesium cast composite as defined in claim 27, wherein said additive material includes nickel, said nickel constitutes 0.1-23.5 wt. % of said dissolvable magnesium cast composite.	This claim depends on claim 27 which in turn depends on claims 23 and claim 19. Since claim 19 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
57. The dissolvable magnesium cast composite as defined in claim 28, wherein said wherein said additive material includes nickel, said nickel constitutes 0.1-23.5 wt. % of said dissolvable magnesium cast composite.	This claim depends on claim 28 which in turn depends on claims 25, 21, 20 and 19. Since claim 19 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
58. The dissolvable magnesium cast composite as defined in claim 19, wherein said additive material includes copper, said copper constitutes 0.01-35 wt. % of said dissolvable magnesium cast composite.	As this claim depends on claim 19 and that claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
59. The dissolvable magnesium cast composite as defined in claim 20, wherein said additive material includes copper, said copper constitutes 0.01-35 wt. % of said dissolvable magnesium cast composite.	As this claim depends on claim 20 which in turn depends on claim 19. Since claim 19 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).

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60. The dissolvable magnesium cast composite as defined in claim 22, wherein said additive material includes copper, said copper constitutes 0.01-35 wt. % of said dissolvable magnesium cast composite.	This claim depends on claim 22 which in turn depends on claims 20 and 19. Since claim 19 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
61. The dissolvable magnesium cast composite as defined in claim 23, wherein said additive material includes copper, said copper constitutes 0.01-35 wt. % of said dissolvable magnesium cast composite.	This claim depends on claim 23 which in turn depends on claim 19. Since claim 19 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
62. The dissolvable magnesium cast composite as defined in claim 17, wherein said additive material includes copper, said copper constitutes 0.01-35 wt. % of said dissolvable magnesium cast composite.	As this claim depends on claim 17 which in turn depends on claim 2. Claim 2 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
63. The dissolvable magnesium cast composite as defined in claim 28, wherein said additive material includes copper, said copper constitutes 0.01-35 wt. % of said dissolvable magnesium cast composite.	This claim depends on claim 28 which in turn depends on claims 25, 21, 20 and 19. Since claim 19 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
64. The dissolvable magnesium cast	As this claim depends on claim 19 and that claim is invalid as being indefinite and failing to meet the written description requirement of

composite as defined in claim 19, wherein said additive material includes copper, said copper constitutes 0.5-15 wt. % of said dissolvable magnesium cast composite.	35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
65. The dissolvable magnesium cast composite as defined in claim 20, wherein said additive material includes copper, said copper constitutes 0.5-15 wt. % of said dissolvable magnesium cast composite.	As this claim depends on claim 20 which in turn depends on claim 19. Since claim 19 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
66. The dissolvable magnesium cast composite as defined in claim 22, wherein said additive material includes copper, said copper constitutes 0.5-15 wt. % of said dissolvable magnesium cast composite.	This claim depends on claim 22 which in turn depends on claims 20 and 19. Since claim 19 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
67. The dissolvable magnesium cast composite as defined in claim 23, wherein said additive material includes copper, said copper constitutes 0.5-15 wt. % of said dissolvable magnesium cast composite.	This claim depends on claim 23 which in turn depends on claim 19. Since claim 19 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
68. The dissolvable magnesium cast composite as defined in	This claim depends on claim 27 which in turn depends on claims 23 and claim 19. Since claim 19 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this

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claim 27, wherein said additive material includes copper, said copper constitutes 0.5-15 wt. % of said dissolvable magnesium cast composite.	claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
69. The dissolvable magnesium cast composite as defined in claim 28, wherein said additive material includes copper, said copper constitutes 0.5-15 wt. % of said dissolvable magnesium cast composite.	This claim depends on claim 28 which in turn depends on claims 25, 21, 20 and 19. Since claim 19 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
70. The dissolvable magnesium cast composite as defined in claim 19, wherein said additive material includes cobalt, said cobalt constitutes 0.1-20 wt. % of said magnesium composite.	***No infringement alleged. See Terves's Final Infringement Contentions at 34 – 35.***
71. The dissolvable magnesium cast composite as defined in claim 20, wherein said wherein said additive material includes cobalt, said cobalt constitutes 0.1-20 wt. % of said magnesium composite.	***No infringement alleged. See Terves's Final Infringement Contentions at 34 – 35.***
72. The dissolvable magnesium cast composite as defined in claim 22, wherein said wherein said additive material includes	***No infringement alleged. See Terves's Final Infringement Contentions at 34 – 35.***

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cobalt, said cobalt constitutes 0.1-20 wt. % of said magnesium composite.	
73. The dissolvable magnesium cast composite as defined in claim 23, wherein said wherein said additive material includes cobalt, said cobalt constitutes 0.1-20 wt. % of said magnesium composite.	***No infringement alleged. See Terves's Final Infringement Contentions at 34 – 35.***
74. The dissolvable magnesium cast composite as defined in claim 27, wherein said wherein said additive material includes cobalt, said cobalt constitutes 0.1-20 wt. % of said magnesium composite.	***No infringement alleged. See Terves's Final Infringement Contentions at 34 – 35.***
75. The dissolvable magnesium cast composite as defined in claim 28, wherein said wherein said additive material includes cobalt, said cobalt constitutes 0.1-20 wt. % of said magnesium composite.	***No infringement alleged. See Terves's Final Infringement Contentions at 34 – 35.***
76. The dissolvable magnesium cast composite as defined in claim 19, wherein said additive material includes one or more metal materials selected from the group	This claim depends on claim 19. Since claim 19 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim.

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consisting of 0.1-35 wt. % copper, 0.1-24.5 wt. % nickel and 0.1-20 wt. % cobalt.	This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
77. The dissolvable magnesium cast composite as defined in claim 29, wherein said additive material includes one or more metal materials selected from the group consisting of 0.1-35 wt. % copper, 0.1-24.5 wt. % nickel and 0.1-20 wt. % cobalt.	This claim depends on claim 29 which in turn depends on claim 19. Since claim 19 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
78. The dissolvable magnesium cast composite as defined in claim 22, wherein said additive material includes one or more metal materials selected from the group consisting of 0.1-35 wt. % copper, 0.1-24.5 wt. % nickel and 0.1-20 wt. % cobalt.	This claim depends on claim 22 which in turn depends on claims 20 and 19. Since claim 19 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
79. The dissolvable magnesium cast composite as defined in claim 23, wherein said additive material includes one or more metal materials selected from the group consisting of 0.1-35 wt. % copper, 0.1-24.5 wt. % nickel and 0.1-20 wt. % cobalt.	This claim depends on claim 23 which in turn depends on claim 19. Since claim 19 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).

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80. The dissolvable magnesium cast composite as defined in claim 27, wherein said additive material includes one or more metal materials selected from the group consisting of 0.1-35 wt. % copper, 0.1-24.5 wt. % nickel and 0.1-20 wt. % cobalt.	This claim depends on claim 27 which in turn depends on claims 23 and claim 19. Since claim 19 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
81. The dissolvable magnesium cast composite as defined in claim 28, wherein said additive material includes one or more metal materials selected from the group consisting of 0.1-35 wt. % copper, 0.1-24.5 wt. % nickel and 0.1-20 wt. % cobalt.	This claim depends on claim 28 which in turn depends on claims 25, 21, 20 and 19. Since claim 19 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
82. The dissolvable magnesium cast composite as defined in claim 19, wherein said dissolvable magnesium cast composite has one or more properties selected from the group consisting of a) a tensile strength of at least 14 ksi, b) a shear strength of at least 11 ksi, and c) an elongation of at least 3%.	As this claim depends on claim 19 and that claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. The term "tensile yield strength" is itself indefinite. The PHOSITA is provided no guidance as to how "tensile yield strength" is to be determine as no standard method is defined. The term leaves to the PHOSITA's imagination how the material to be tested is to be machined or otherwise prepared for testing. There is no teaching for whether the edges or corners should or should not be ground. There is no teaching for whether the edges or corners should or should not be surfaced finished. No guidance is provided even for the geometry of the sample to be test. No guidance is provided even for the type of test grips or geometry of test grips to be used. Lack guidance in these areas and others provides such an enormous number of unknown

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	factors to the PHOSITA requiring experimentation as to render this claim element indefinite. The term "tensile strength" is itself indefinite. The PHOSITA is provided no guidance as to how "tensile strength" is to be determine as no standard method is defined. The term leaves to the PHOSITA's imagination how the material to be tested is to be machined or otherwise prepared for testing. There is no teaching for whether the edges or corners should or should not be ground. There is no teaching for whether the edges or corners should or should not be surfaced finished. No guidance is provided even for the geometry of the sample to be test. No guidance is provided even for the type of test grips or geometry of test grips to be used. Lack guidance in these areas and others provides such an enormous number of unknown factors to the PHOSITA requiring experimentation as to render this claim element indefinite. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
83. The dissolvable magnesium cast composite as defined in claim 20, wherein said dissolvable magnesium cast composite has one or more properties selected from the group consisting of a) a tensile strength of at least 14 ksi, b) a shear strength of at least 11 ksi, and c) an elongation of at least 3%.	This claim depends on claim 20 which in turn depends on claim 19. Since claim 19 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. The term "tensile strength" is itself indefinite. The PHOSITA is provided no guidance as to how "tensile yield strength" is to be determine as no standard method is defined. The term leaves to the PHOSITA's imagination how the material to be tested is to be machined or otherwise prepared for testing. There is no teaching for whether the edges or corners should or should not be ground. There is no teaching for whether the edges or corners should or should not be surfaced finished. No guidance is provided even for the geometry of the sample to be test. No guidance is provided even for the type of test grips or geometry of test grips to be used. Lack guidance in these areas and others provides such an enormous number of unknown factors to the PHOSITA requiring experimentation as to render this claim element indefinite.

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	This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
84. The dissolvable magnesium cast composite as defined in claim 22, wherein said dissolvable magnesium cast composite has one or more properties selected from the group consisting of a) a tensile strength of at least 14 ksi, b) a shear strength of at least 11 ksi, and c) an elongation of at least 3%.	This claim depends on claim 22 which in turn depends on claims 20 and 19. Since claim 19 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. The term "tensile strength" is itself indefinite. The PHOSITA is provided no guidance as to how "tensile yield strength" is to be determine as no standard method is defined. The term leaves to the PHOSITA's imagination how the material to be tested is to be machined or otherwise prepared for testing. There is no teaching for whether the edges or corners should or should not be ground. There is no teaching for whether the edges or corners should or should not be surfaced finished. No guidance is provided even for the geometry of the sample to be test. No guidance is provided even for the type of test grips or geometry of test grips to be used. Lack guidance in these areas and others provides such an enormous number of unknown factors to the PHOSITA requiring experimentation as to render this claim element indefinite. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
85. The dissolvable magnesium cast composite as defined in claim 25, wherein said dissolvable magnesium cast composite has one or more properties selected from the group consisting of a) a tensile strength of at least 14 ksi, b) a shear strength of at least 11 ksi, and c) an elongation of at least 3%.	This claim depends on claim 25 which in turn depends on claims 21, 20 and 19. Since claim 19 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. The term "tensile strength" is itself indefinite. The PHOSITA is provided no guidance as to how "tensile yield strength" is to be determine as no standard method is defined. The term leaves to the PHOSITA's imagination how the material to be tested is to be machined or otherwise prepared for testing. There is no teaching for whether the edges or corners should or should not be ground. There is

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	no teaching for whether the edges or corners should or should not be surfaced finished. No guidance is provided even for the geometry of the sample to be test. No guidance is provided even for the type of test grips or geometry of test grips to be used. Lack guidance in these areas and others provides such an enormous number of unknown factors to the PHOSITA requiring experimentation as to render this claim element indefinite. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
86. The dissolvable magnesium cast composite as defined in claim 27, wherein said dissolvable magnesium cast composite has one or more properties selected from the group consisting of a) a tensile strength of at least 14 ksi, b) a shear strength of at least 11 ksi, and c) an elongation of at least 3%.	This claim depends on claim 27 which in turn depends on claims 23 and claim 19. Since claim 19 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. The term "tensile strength" is itself indefinite. The PHOSITA is provided no guidance as to how "tensile yield strength" is to be determine as no standard method is defined. The term leaves to the PHOSITA's imagination how the material to be tested is to be machined or otherwise prepared for testing. There is no teaching for whether the edges or corners should or should not be ground. There is no teaching for whether the edges or corners should or should not be surfaced finished. No guidance is provided even for the geometry of the sample to be test. No guidance is provided even for the type of test grips or geometry of test grips to be used. Lack guidance in these areas and others provides such an enormous number of unknown factors to the PHOSITA requiring experimentation as to render this claim element indefinite. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
87. The dissolvable magnesium cast composite as defined in claim 28, wherein said dissolvable magnesium cast composite has one or more properties	This claim depends on claim 28 which in turn depends on claims 25, 21, 20 and 19. Since claim 19 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim.

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selected from the group consisting of a) a tensile strength of at least 14 ksi, b) a shear strength of at least 11 ksi, and c) an elongation of at least 3%.	The term "tensile strength" is itself indefinite. The PHOSITA is provided no guidance as to how "tensile yield strength" is to be determine as no standard method is defined. The term leaves to the PHOSITA's imagination how the material to be tested is to be machined or otherwise prepared for testing. There is no teaching for whether the edges or corners should or should not be ground. There is no teaching for whether the edges or corners should or should not be surfaced finished. No guidance is provided even for the geometry of the sample to be test. No guidance is provided even for the type of test grips or geometry of test grips to be used. Lack guidance in these areas and others provides such an enormous number of unknown factors to the PHOSITA requiring experimentation as to render this claim element indefinite. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
88. The dissolvable magnesium cast composite as defined in claim 19, wherein said dissolvable magnesium cast composite has one or more properties selected from the group consisting of a) a tensile strength of 14-50 ksi, b) a shear strength of 11-25 ksi, and c) an elongation of at least 3%.	This claim depends on claim 19. Since claim 19 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. The term "tensile strength" is itself indefinite. The PHOSITA is provided no guidance as to how "tensile yield strength" is to be determine as no standard method is defined. The term leaves to the PHOSITA's imagination how the material to be tested is to be machined or otherwise prepared for testing. There is no teaching for whether the edges or corners should or should not be ground. There is no teaching for whether the edges or corners should or should not be surfaced finished. No guidance is provided even for the geometry of the sample to be test. No guidance is provided even for the type of test grips or geometry of test grips to be used. Lack guidance in these areas and others provides such an enormous number of unknown factors to the PHOSITA requiring experimentation as to render this claim element indefinite. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).

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89. The dissolvable magnesium cast composite as defined in claim 20, wherein said dissolvable magnesium cast composite has one or more properties selected from the group consisting of a) a tensile strength of 14-50 ksi, b) a shear strength of 11-25 ksi, and c) an elongation of at least 3%.	This claim depends on claim 20 which in turn depends on claim 19. Since claim 19 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. The term "tensile strength" is itself indefinite. The PHOSITA is provided no guidance as to how "tensile yield strength" is to be determine as no standard method is defined. The term leaves to the PHOSITA's imagination how the material to be tested is to be machined or otherwise prepared for testing. There is no teaching for whether the edges or corners should or should not be ground. There is no teaching for whether the edges or corners should or should not be surfaced finished. No guidance is provided even for the geometry of the sample to be test. No guidance is provided even for the type of test grips or geometry of test grips to be used. Lack guidance in these areas and others provides such an enormous number of unknown factors to the PHOSITA requiring experimentation as to render this claim element indefinite. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
90. The dissolvable magnesium cast composite as defined in claim 22, wherein said dissolvable magnesium cast composite has one or more properties selected from the group consisting of a) a tensile strength of 14-50 ksi, b) a shear strength of 11-25 ksi, and c) an elongation of at least 3%.	This claim depends on claim 22 which in turn depends on claims 20 and 19. Since claim 19 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. The term "tensile strength" is itself indefinite. The PHOSITA is provided no guidance as to how "tensile yield strength" is to be determine as no standard method is defined. The term leaves to the PHOSITA's imagination how the material to be tested is to be machined or otherwise prepared for testing. There is no teaching for whether the edges or corners should or should not be ground. There is no teaching for whether the edges or corners should or should not be surfaced finished. No guidance is provided even for the geometry of the sample to be test. No guidance is provided even for the type of

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	test grips or geometry of test grips to be used. Lack guidance in these areas and others provides such an enormous number of unknown factors to the PHOSITA requiring experimentation as to render this claim element indefinite. The term "shear strength" is itself indefinite. The PHOSITA is provided no guidance as to how "shear strength" is to be determine as no standard method is defined. The term leaves to the PHOSITA's imagination how the material to be tested is to be machined or otherwise prepared for testing. There is no teaching for whether the edges or corners should or should not be ground. There is no teaching for whether the edges or corners should or should not be surfaced finished. No guidance is provided even for the geometry of the sample to be test. No guidance is provided even for the type of test grips or geometry of test grips to be used. Lack guidance in these areas and others provides such an enormous number of unknown factors to the PHOSITA requiring experimentation as to render this claim element indefinite. The term "tensile strength" is itself indefinite. The PHOSITA is provided no guidance as to how "tensile yield strength" is to be determine as no standard method is defined. The term leaves to the PHOSITA's imagination how the material to be tested is to be machined or otherwise prepared for testing. There is no teaching for whether the edges or corners should or should not be ground. There is no teaching for whether the edges or corners should or should not be surfaced finished. No guidance is provided even for the geometry of the sample to be test. No guidance is provided even for the type of test grips or geometry of test grips to be used. Lack guidance in these areas and others provides such an enormous number of unknown factors to the PHOSITA requiring experimentation as to render this claim element indefinite. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
91. The dissolvable magnesium cast composite as defined in claim 23, wherein said dissolvable magnesium cast composite has one	This claim depends on claim 23 which in turn depends on claim 19. Since claim 19 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this

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or more properties selected from the group consisting of a) a tensile strength of 14-50 ksi, b) a shear strength of 11-25 ksi, and c) an elongation of at least 3%.	dependent claim do not cure the indefiniteness of the underlying claim. The term "tensile strength" is itself indefinite. The PHOSITA is provided no guidance as to how "tensile yield strength" is to be determine as no standard method is defined. The term leaves to the PHOSITA's imagination how the material to be tested is to be machined or otherwise prepared for testing. There is no teaching for whether the edges or corners should or should not be ground. There is no teaching for whether the edges or corners should or should not be surfaced finished. No guidance is provided even for the geometry of the sample to be test. No guidance is provided even for the type of test grips or geometry of test grips to be used. Lack guidance in these areas and others provides such an enormous number of unknown factors to the PHOSITA requiring experimentation as to render this claim element indefinite. The term "shear strength" is itself indefinite. The PHOSITA is provided no guidance as to how "shear strength" is to be determine as no standard method is defined. The term leaves to the PHOSITA's imagination how the material to be tested is to be machined or otherwise prepared for testing. There is no teaching for whether the edges or corners should or should not be ground. There is no teaching for whether the edges or corners should or should not be surfaced finished. No guidance is provided even for the geometry of the sample to be test. No guidance is provided even for the type of test grips or geometry of test grips to be used. Lack guidance in these areas and others provides such an enormous number of unknown factors to the PHOSITA requiring experimentation as to render this claim element indefinite. The term "tensile strength" is itself indefinite. The PHOSITA is provided no guidance as to how "tensile yield strength" is to be determine as no standard method is defined. The term leaves to the PHOSITA's imagination how the material to be tested is to be machined or otherwise prepared for testing. There is no teaching for whether the edges or corners should or should not be ground. There is no teaching for whether the edges or corners should or should not be surfaced finished. No guidance is provided even for the geometry of the sample to be test. No guidance is provided even for the type of test grips or geometry of test grips to be used. Lack guidance in these

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	areas and others provides such an enormous number of unknown factors to the PHOSITA requiring experimentation as to render this claim element indefinite. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
92. The dissolvable magnesium cast composite as defined in claim 27, wherein said dissolvable magnesium cast composite has one or more properties selected from the group consisting of a) a tensile strength of 14-50 ksi, b) a shear strength of 11-25 ksi, and c) an elongation of at least 3%.	This claim depends on claim 27 which in turn depends on claims 23 and claim 19. Since claim 19 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. The term "tensile strength" is itself indefinite. The PHOSITA is provided no guidance as to how "tensile yield strength" is to be determine as no standard method is defined. The term leaves to the PHOSITA's imagination how the material to be tested is to be machined or otherwise prepared for testing. There is no teaching for whether the edges or corners should or should not be ground. There is no teaching for whether the edges or corners should or should not be surfaced finished. No guidance is provided even for the geometry of the sample to be test. No guidance is provided even for the type of test grips or geometry of test grips to be used. Lack guidance in these areas and others provides such an enormous number of unknown factors to the PHOSITA requiring experimentation as to render this claim element indefinite. The term "shear strength" is itself indefinite. The PHOSITA is provided no guidance as to how "shear strength" is to be determine as no standard method is defined. The term leaves to the PHOSITA's imagination how the material to be tested is to be machined or otherwise prepared for testing. There is no teaching for whether the edges or corners should or should not be ground. There is no teaching for whether the edges or corners should or should not be surfaced finished. No guidance is provided even for the geometry of the sample to be test. No guidance is provided even for the type of test grips or geometry of test grips to be used. Lack guidance in these areas and others provides such an enormous number of unknown

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	factors to the PHOSITA requiring experimentation as to render this claim element indefinite. The term "tensile strength" is itself indefinite. The PHOSITA is provided no guidance as to how "tensile yield strength" is to be determine as no standard method is defined. The term leaves to the PHOSITA's imagination how the material to be tested is to be machined or otherwise prepared for testing. There is no teaching for whether the edges or corners should or should not be ground. There is no teaching for whether the edges or corners should or should not be surfaced finished. No guidance is provided even for the geometry of the sample to be test. No guidance is provided even for the type of test grips or geometry of test grips to be used. Lack guidance in these areas and others provides such an enormous number of unknown factors to the PHOSITA requiring experimentation as to render this claim element indefinite. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
93. The dissolvable magnesium cast composite as defined in claim 28, wherein said dissolvable magnesium cast composite has one or more properties selected from the group consisting of a) a tensile strength of 14-50 ksi, b) a shear strength of 11-25 ksi, and c) an elongation of at least 3%.	This claim depends on claim 28 which in turn depends on claims 25, 21, 20 and 19. Since claim 19 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. The term "tensile strength" is itself indefinite. The PHOSITA is provided no guidance as to how "tensile yield strength" is to be determine as no standard method is defined. The term leaves to the PHOSITA's imagination how the material to be tested is to be machined or otherwise prepared for testing. There is no teaching for whether the edges or corners should or should not be ground. There is no teaching for whether the edges or corners should or should not be surfaced finished. No guidance is provided even for the geometry of the sample to be test. No guidance is provided even for the type of test grips or geometry of test grips to be used. Lack guidance in these areas and others provides such an enormous number of unknown factors to the PHOSITA requiring experimentation as to render this claim element indefinite.

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	The term "shear strength" is itself indefinite. The PHOSITA is provided no guidance as to how "shear strength" is to be determine as no standard method is defined. The term leaves to the PHOSITA's imagination how the material to be tested is to be machined or otherwise prepared for testing. There is no teaching for whether the edges or corners should or should not be ground. There is no teaching for whether the edges or corners should or should not be surfaced finished. No guidance is provided even for the geometry of the sample to be test. No guidance is provided even for the type of test grips or geometry of test grips to be used. Lack guidance in these areas and others provides such an enormous number of unknown factors to the PHOSITA requiring experimentation as to render this claim element indefinite. The term "tensile strength" is itself indefinite. The PHOSITA is provided no guidance as to how "tensile yield strength" is to be determine as no standard method is defined. The term leaves to the PHOSITA's imagination how the material to be tested is to be machined or otherwise prepared for testing. There is no teaching for whether the edges or corners should or should not be ground. There is no teaching for whether the edges or corners should or should not be surfaced finished. No guidance is provided even for the geometry of the sample to be test. No guidance is provided even for the type of test grips or geometry of test grips to be used. Lack guidance in these areas and others provides such an enormous number of unknown factors to the PHOSITA requiring experimentation as to render this claim element indefinite. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
94. A dissolvable magnesium cast composite comprising	This is an independent claim.
a mixture of magnesium or a magnesium alloy and an additive material,	This claim limitation attempts to teach a magnesium composition comprising "a mixture of magnesium or a magnesium alloy and an additive material." Neither the claim nor the specification provides the PHOSITA necessary information about what "magnesium alloy" should be employed. There are a multitude of magnesium alloys that could be employed and leaving this term undefined renders this claim indefinite.

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	This claim element is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a) and renders the entire claim invalid and indefinite.
said additive material includes a) nickel wherein said nickel constitutes 0.01-5 wt. % of said dissolvable magnesium cast composite or b) nickel wherein said nickel constitutes 0.1-23.5 wt. % of said dissolvable magnesium cast composite,	
said dissolvable magnesium cast composite includes in situ precipitate,	Further, the claim is indefinite has failed to distinctly point out what is meant by a "in situ precipitate." Neither the claim nor the specification provide guidance to the PHOSITA. One portion of the specification teaches "[o]nce the mixing process is complete, the mixture of molten 60 magnesium or magnesium alloy, $SMMg_x$, SM_xMg, and/or any unalloyed additive is cooled and an *in situ* precipitate is formed in the solid magnesium composite." '740 6:59-62. Later in the specification the *in situ* precipitate is defined as "magnesium composite that is 65 over 50 wt. % magnesium and about 0.05-49.5 wt. % nickel (and all values or ranges therebetween) is added to the magnesium or magnesium alloy to form intermetallic Mg_2Ni as a galvanically-active *in situ* precipitate." '740 6:64-7:1. Later, the specification teaches "the magnesium or magnesium alloy to form galvanically active *in situ* precipitate that includes bismuth and/or bismuth alloy." '740 8:16-18. There are numerous references in the specification teaching different types of *in situ* precipitate. So numerous as to give this limitation no guidance to the PHOSITA as to what *in situ* precipitate to use to practice this claim. This claim element is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a) and renders the entire claim invalid and indefinite.
said in situ precipitate includes said additive material,	
said dissolvable magnesium cast composite has a	The claim defines the magnesium composite that "has a dissolution rate of at least 75 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C." This claim limitation is indefinite as failing to adequately specify

dissolution rate of at least 75 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C.	how dissolution rate is to be determine. The specification and the claims provide no guidance to narrow down the wide range of possibilities of how the dissolution rate is to be determined. The specification provides qualitative information about how the morphology of the composite affects dissolution rates, *See* '653 11:38-7, 12:51-61, but no guidance is provided as how to measure dissolution rate. The PHOSITA would need significant additional information to determine what the inventors mean by the dissolution rate. See Exhibit 1 - Standard Guide for Laboratory Immersion Corrosion Testing of Metals, NACE TM0169/G31 – 21 (2021). That standard procedure provides "factors include apparatus, sampling, test specimen, test conditions (test solution composition, temperature, gas sparging, fluid motion, solution volume, method of supporting test specimens, duration of test), methods of cleaning test specimens, interpretation of results, and calculation of corrosion rates. This guide also emphasizes the importance of recording all pertinent data and provides a checklist for reporting test data." Id. at ¶1.1. Neither the specification of '653 or this claim provides teaching of how this dissolution rate should be calculated. No amount of experimentation would provide the PHOSITA an answer to that question of dissolution rate because the specification does provide no guidance on how the inventors measured that dissolution rate. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a). This claim element is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a) and renders the entire claim invalid and indefinite.
95. The dissolvable magnesium cast composite as defined in claim 94, wherein said dissolvable magnesium cast composite includes no more than 10 wt. % aluminum.	As this claim depends on claim 94 and claim 94 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
96. The dissolvable magnesium cast composite as defined in claim 94, wherein said dissolvable magnesium composite cast includes	As this claim depends on claim 94 and claim 94 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim.

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at least 85 wt. % magnesium.	This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
97. The dissolvable magnesium cast composite as defined in claim 95, wherein said dissolvable magnesium cast composite includes at least 85 wt. % magnesium.	This claim depends on claim 95 which in turn depends on claim 94. Since claim 94 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
98. The dissolvable magnesium cast composite as defined in claim 94, wherein said dissolvable magnesium cast composite has a dissolution rate of 75-325 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C.	As this claim depends on claim 94 and claim 94 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
99. The dissolvable magnesium cast composite as defined in claim 97, wherein said dissolvable magnesium cast composite has a dissolution rate of 75-325 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C.	This claim depends on claim 97 which in turn depends on claims 95 and 94. Since claim 94 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
100. The dissolvable magnesium cast composite as defined in claim 94, wherein said nickel constitutes 0.1-23.5 wt. % of said dissolvable magnesium cast composite.	As this claim depends on claim 94 and claim 94 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).

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101. The dissolvable magnesium cast composite as defined in claim 99, wherein said nickel constitutes 0.1-23.5 wt. % of said dissolvable magnesium cast composite.	This claim depends on claim 99 which in turn depends on claims 97, 95, and 94. Since claim 94 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
102. The dissolvable magnesium cast composite as defined in claim 94, wherein said dissolvable magnesium cast composite has one or more properties selected from the group consisting of a) a tensile strength of at least 14 ksi, b) a shear strength of at least 11 ksi, and c) an elongation of at least 3%.	As this claim depends on claim 94 and claim 94 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. The term "tensile strength" is itself indefinite. The PHOSITA is provided no guidance as to how "tensile yield strength" is to be determine as no standard method is defined. The term leaves to the PHOSITA's imagination how the material to be tested is to be machined or otherwise prepared for testing. There is no teaching for whether the edges or corners should or should not be ground. There is no teaching for whether the edges or corners should or should not be surfaced finished. No guidance is provided even for the geometry of the sample to be test. No guidance is provided even for the type of test grips or geometry of test grips to be used. Lack guidance in these areas and others provides such an enormous number of unknown factors to the PHOSITA requiring experimentation as to render this claim element indefinite. The term "shear strength" is itself indefinite. The PHOSITA is provided no guidance as to how "shear strength" is to be determine as no standard method is defined. The term leaves to the PHOSITA's imagination how the material to be tested is to be machined or otherwise prepared for testing. There is no teaching for whether the edges or corners should or should not be ground. There is no teaching for whether the edges or corners should or should not be surfaced finished. No guidance is provided even for the geometry of the sample to be test. No guidance is provided even for the type of test grips or geometry of test grips to be used. Lack guidance in these areas and others provides such an enormous number of unknown

	factors to the PHOSITA requiring experimentation as to render this claim element indefinite. The term "tensile strength" is itself indefinite. The PHOSITA is provided no guidance as to how "tensile yield strength" is to be determine as no standard method is defined. The term leaves to the PHOSITA's imagination how the material to be tested is to be machined or otherwise prepared for testing. There is no teaching for whether the edges or corners should or should not be ground. There is no teaching for whether the edges or corners should or should not be surfaced finished. No guidance is provided even for the geometry of the sample to be test. No guidance is provided even for the type of test grips or geometry of test grips to be used. Lack guidance in these areas and others provides such an enormous number of unknown factors to the PHOSITA requiring experimentation as to render this claim element indefinite. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).
103. The dissolvable magnesium cast composite as defined in claim 101, wherein said dissolvable magnesium cast composite has one or more properties selected from the group consisting of a) a tensile strength of at least 14 ksi, b) a shear strength of at least 11 ksi, and c) an elongation of at least 3%.	This claim depends on claim 101 which in turn depends on claims 99, 97, 95, and 94. Since claim 94 is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a), this claim is also invalid under 35 U.S.C. 112(a). The limitations provided in this dependent claim do not cure the indefiniteness of the underlying claim. The term "tensile strength" is itself indefinite. The PHOSITA is provided no guidance as to how "tensile yield strength" is to be determine as no standard method is defined. The term leaves to the PHOSITA's imagination how the material to be tested is to be machined or otherwise prepared for testing. There is no teaching for whether the edges or corners should or should not be ground. There is no teaching for whether the edges or corners should or should not be surfaced finished. No guidance is provided even for the geometry of the sample to be test. No guidance is provided even for the type of test grips or geometry of test grips to be used. Lack guidance in these areas and others provides such an enormous number of unknown factors to the PHOSITA requiring experimentation as to render this claim element indefinite.

	The term "shear strength" is itself indefinite. The PHOSITA is provided no guidance as to how "shear strength" is to be determine as no standard method is defined. The term leaves to the PHOSITA's imagination how the material to be tested is to be machined or otherwise prepared for testing. There is no teaching for whether the edges or corners should or should not be ground. There is no teaching for whether the edges or corners should or should not be surfaced finished. No guidance is provided even for the geometry of the sample to be test. No guidance is provided even for the type of test grips or geometry of test grips to be used. Lack guidance in these areas and others provides such an enormous number of unknown factors to the PHOSITA requiring experimentation as to render this claim element indefinite. The term "tensile strength" is itself indefinite. The PHOSITA is provided no guidance as to how "tensile yield strength" is to be determine as no standard method is defined. The term leaves to the PHOSITA's imagination how the material to be tested is to be machined or otherwise prepared for testing. There is no teaching for whether the edges or corners should or should not be ground. There is no teaching for whether the edges or corners should or should not be surfaced finished. No guidance is provided even for the geometry of the sample to be test. No guidance is provided even for the type of test grips or geometry of test grips to be used. Lack guidance in these areas and others provides such an enormous number of unknown factors to the PHOSITA requiring experimentation as to render this claim element indefinite. This claim is invalid as being indefinite and failing to meet the written description requirement of 35 U.S.C. 112(a).

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Appendix C - U.S. Patent No. 10,329,653 Anticipation and Obviousness Invalidity Claim Chart

The following prior art methods and/or compositions render obvious claims 1–78 of the '653 Patent under 35 U.S.C. § 103, either alone or in combination with other prior art references (and/or in combination with the knowledge of a person of ordinary skill at the time of the invention), under the plain and ordinary meaning of the claims as properly construed. Evidence of the public availability of prior art methods and compositions to be used includes the following:

- Chinese Patent App. No. 201310284659.X (Xiao), filed July 8, 2013; CN 103343271 A published Nov. 10, 2013; CN 103343271 B published July 1, 2015 (hereinafter, "Xiao").
    - Xiao (Xiao) was filed on July 8, 2013 and published October 9, 2013. Xiao qualifies as a printed publication and prior art under 35 U.S.C. § 102(b)
- Hassan, S.F., Gupta, M., *Development of High Strength Magnesium Based Composites Using Elemental Nickel Particulates as Reinforcement*. Journal of Materials Science 37, 2467–2474 (2002) (hereinafter, "Hassan").

Prior art-based grounds of invalidity presently include the following:

- Ground I: Claims 1, 4, 5, 11, 29, 37, 41, 43, 45, 49, 69, 70, and 73 are Anticipated by Xiao; and
- Ground II: Claims 8, 25, 33, 55, and 74 are Anticipated, or at Least Made Obvious, by Xiao
- Ground III: Claims 7, 12, 13, and 71 are Obvious over Xiao in Combination with Hassan

Overview of Xiao

Xiao, entitled "Light and pressure-proof fast-decomposed cast magnesium alloy," discloses a "cast magnesium alloy, which can be used as a tripping ball material for a multi-stage sliding sleeve staged-fracturing technique." ¶ 0001, ECOMETAL-010548. Xiao explains "[i]n recent years, the United States has made breakthroughs in the technologies of shale gas exploration and development, and the output has grown rapidly." "After the completion of all rock fracturing, it is necessary to depressurize the well tubing to facilitate the later production of the oil and gas well. In the past, the conventional method is to use the low-layer pressure to push the ball back to the well opening, or use a drilling tool to drill the sliding sleeve ball seat and the tripping ball, so as to destroy them." ¶ 0002, ECOMETAL-010548.

Xiao identifies the need for "the development of a tripping ball that can withstand the high pressure of fracturing construction and the high temperature at the bottom of the well, and has the feature of self-decomposition in the fluid environment of a well, can effectively reduce the construction risk and improve the construction efficiency." *Id.*

Xiao sought to meet this need by proposing a "method for preparing a light and pressure-proof fast-decomposed cast magnesium alloy by means of optimizing the alloy composition design using

a self-made flux containing a rare earth element and adopting a smelting casting method." *Id.* at ¶ 0004. Specifically, Xiao discloses a "magnesium alloy with a high aluminum content (13 to 25% by weight) and a high zinc content (2 to 10% by weight), and further adds elements of Fe, Cu, Ni and Ag which can enhance the corrosion performance of the magnesium alloy, and at the same time adds Zr, Ti element as grain refiners to improve the compressive strength of the formed material, in which the purpose of adding the high content of aluminum is to produce a large amount of cathode phase, the β ($Mg_{17}Al_{12}$) phase and eutectic phase on the grain boundary of the magnesium alloy, and the magnesium matrix α phase functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which [micro-batteries] greatly accelerate the corrosion decomposition of magnesium alloy." *Id.* at ¶ 0026.

An English-language abstract of Xiao was provided to the examiner. See Ex. 1004. Using MS Word, that English-language abstract was compared to the "Abstract of the Disclosures" section of the Certified translation (ECOMETAL-010544-61). The comparison (Ex. 1008) shows that the abstracts would have been considered practically identical by a POSITA. However, both Abstracts failed to disclose the important subject matter of the Xiao reference: they say nothing about Xiao's disclosures of galvanic-activity, corrosion or accelerating the dissolution. Rather, the Abstracts say that "the alloy decomposition performance exceeds that of a traditional cast magnesium alloy." This portion of the final sentence of the Xiao Abstract likely led the patent examiner to incorrectly believe that Xiao—like much of the magnesium alloy prior art (see, e.g., Ex. 1001, at 3:19-24) and JP'030 (considered the closest reference by the examiner)—disclosed nothing more than "magnesium alloys [that] either improve corrosion resistance or are corrosion resistant." Ex. 1003, at 606–07.

Overview of Hassan

Prior art Hassan (introduced above) recognized that "[m]agnesium based materials due to their inherently low density and ensuing potential to exhibit high specific mechanical properties are actively sought for weight-critical structural application." Abstract, ECOMETAL-010503. Hassan discloses the "synthesis of monolithic and nickel reinforced magnesium composites (Mg/Nip)," including "superheating the magnesium turning with reinforcement particulates (placed in multi-layer sandwich form) to 750°C" and stirring the "molten slurry." *Id.* at ECOMETAL-010504.

Hassan describes its study as using "magnesium turnings . . . as the base material and elemental nickel particulates of 99.9% purity (Johnson Matthey, MA, USA) with an average size of 29±19 μm were used as reinforcement phase." *Id*. Figure 1 of Hassan demonstrates "representative SEM micrographs showing distribution of nickel and its reaction product in: (a) Mg/7.3 Nip, (b) Mg/14.0Nip and (c) Mg/24.9Nip matrices:"

Hassan also discloses that the deposited magnesium ingots may then be subjected to secondary processing. For example, Hassan teaches that the nickel-reinforced magnesium ingots are machined and hot extruded to obtain rods of 8 mm diameter. *Id*. Analysis of the composite of Hassan "showed the reduction in the size of elemental nickel particulates in the extruded composites" (see Table 1 of Hassan). In other words, the extrusion in Hassan resulted in a reduction of particulate size of the magnesium composite. Hassan was not considered by the patent examiner during the prosecution of the '653 Patent.

Motivation to Combine Xiao and Hassan

A POSITA in April 2014 would have been motivated to combine the disclosures of Xiao with the teachings of Hassan. First, Xiao and Hassan are both directed to improving the properties of magnesium based materials, especially those for use in devices or tools. Hassan, for instance, teaches that:

> increasing hostile service conditions that the modern engineering devices have to withstand have led the materials scientists across the globe to create new materials with enhanced properties when compared to the conventional materials. One way to improve the properties of conventional metallic materials is to reinforce them judiciously keeping the end application in mind. Among the reinforced metallic materials, magnesium based composites are becoming the strong candidates for lightweight structural application due to their superior specific mechanical properties.

ECOMETAL-010553. Hassan also recognizes that type of processing, type, size, and volume fraction of reinforcement are "common factors governing the end properties of a metal matrix composite[]." *Id.*

Xiao similarly teaches in the context of its smelt casted magnesium alloy, the use of reinforcing metals or metal alloys to enhance corrosion performance and/or improve the compressive strength of the formed magnesium material. *Id*. In particular, Xiao noted that existing magnesium alloys (such as AZ91D) had low compressive strength and slow decomposition rates, making them unsuitable as material for, for example, a tripping ball used in oil well drilling. *Id* at ¶ 0003. Xiao responded to those recognized problems in the art by "adjusting the chemical composition and preparation process" to prepare a light and pressure-proof cast magnesium alloy that adds elements which can enhance the corrosion performance of the magnesium alloy. *Id*. at ¶ 0004.

A POSITA would have been motivated to modify the disclosed magnesium alloys and magnesium-alloy-based tripping ball material taught in Xiao to further increase and/or control the rate of dissolution. More specifically, a POSITA would look to Hassan, which teaches pure magnesium reinforced with nickel particulates that exhibits improved physical and mechanical properties over magnesium alloy AZ91. Ex. 1007 at p. 2467, col. 2. Hassan also teaches that careful "selection of reinforcing phase remains one of the most critical factors in developing a composite material with superior properties when compared to its monolithic counterparts." *Id.* Additionally, Hassan notes that its magnesium composites possess improved thermal expansion and mechanical characteristics, which would be beneficial in oil field applications. *Id.* Accordingly, a POSITA in April 2014 would have recognized the benefits set forth in Hassan applied to the magnesium alloy used in the tools taught in Xiao. *Id.*

Hassan also teaches subjecting magnesium ingots to secondary processing. A POSITA in April 2014 would have been motivated to treat the magnesium alloys disclosed in Xiao using the secondary processing techniques disclosed by Hassan such that the size of additive particulates and magnesium composite could be controlled and optimized.

Xiao already disclosed that controlling the particulate size of its magnesium alloy was desirable with argon treatment and a refining agent (rather than the deformation processing claimed in the '653 Patent). ¶¶ 0036 and 0044, ECOMETAL-010555-56. A POSITA in April 2014 would have

had a reasonable expectation of successfully combining the magnesium alloy of Xiao with the secondary processing techniques of Hassan, which were conventionally techniques known for decades to optimize particulate size of metal alloys and improve metal properties. Moreover, such processing techniques have been known for decades to optimize particulate size of metal alloys. See, e.g., Ex. 1203, 1:20-23 ("Powder metal technology is well known to the persons skilled in the art and generally comprises the formation of metal powders which are compacted and then subjected to an elevated temperature so as to produce a sintered product.").

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Shorthand	Description of Prior Art and Other Documents Reviewed
'653 Patent	U.S. Patent No. 10,329,653 B2
Medlin Declaration	Declaration of Dana J. Medlin, Ph.D., P.E., FASM Under 37 C.F.R. § 1.68I in Support of Request for *Ex Parte* Reexamination of U.S. Patent No. 10,329,653
'653 Patent PH	Prosecution History for U.S. Patent No. 10,329,653 B2
Chinese-Language Xiao	Chinese Patent Publication No. CN103343271A (Xiao) (Chinese-language accompanied by an English language abstract)
Xiao	Chinese Pat. Pub. No. CN 103343271 (Xiao) (Certified English Language Translation)
Hassan	Development of High Strength Magnesium Based Composites Using Elemental Nickel Particulates as Reinforcement. Hassan, S.F., Gupta, M., *Journal of Materials Science* 37, 2467–2474 (2002).
1008	Abstract Comparison of the English-language abstract and "Abstract of the Disclosures" section of the Certified English-language translation of Chinese Pat. Pub. No. CN 103343271 (Xiao)
1009	US Provisional Patent Application 61982425
1201	Review of Recent Studies in Magnesium Matrix Composters, Yai Zhi Ye, Xing Yang, Liu, *Journal of Materials Science 39 (2004)*
1202	Fracture Behavior of Cryogenically solidified aluminum-alloy reinforced with Nano-ZrO2 Metal Matrix Composites (CNMMCs), Joel Hemanth. *Journal of Chemical Engineering and Materials Science Vol. 2(8), August 2011*

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1203	US Patent No. 5,476,632 (Shivanath, et al)
1204	Corrosion Resistance of Magnesium Alloys, Barbara A. Shaw, Pennsylvania State University. *ASM Handbook, Volume 13A Corrosion: Fundamentals, Testing, and Protection*
1205	Al-Fe Diagram: Charles H. Henager, Hydrogen Permeation Barrier Coatings, Materials for the Hydrogen Economy, Chapter 8, CRC Press 2007, Editors: R. H. Jones, G. J. Thomas, pp 181-190
1206	Al-Ni Diagram: Laszlo J. Kecskes et al., Army Research Laboratory ARL-TR-5507, April 2011, ACombustion Synthesis Reaction Behavior of Cold-Rolled Ni/Al and Ti/Al Multilayers. p. 5
1207	Al-Cu Diagram: https://sites.google.com/site/eampotentials/Home/AlCu downloaded June 20, 2020.
1208	Al-Ag Diagram: A. J. McAlister, Bull. Alloy Phase Diagrams, 8(6):526-533, 1987
1209	Cu-Ni Phase Diagram. *Teach Yourself Phase Diagrams and Phase Transformations*, Professor Mike Ashby, 5th Edition, March 2009 Cambridge
1210	Illustrated portion of Cu-Ni Chart Phase Diagram. *Materials Science and Engineering*, *6th Edition by Callister and Rethwisch, 2003*
1211	Ag-Cu Binary Phase Diagram. *ASM Metals Handbook, 8th Edition, Vol. 8, Metallography, Structures and Phase Diagrams, 1973*
1212	Mg-Pb Phase Diagram. *ASM Metals Handbook, 8th Edition, Vol. 8, Metallography, Structures and Phase Diagrams, 1973*
1213	Al-Mg Phase Diagram. *ASM Metals Handbook, 8th Edition, Vol. 8, Metallography, Structures and Phase Diagrams, 1973*

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1214	Mg-Ni Diagram. *ASM Metals Handbook, 8th Edition, Vol. 8, Metallography, Structures and Phase Diagrams, 1973*
1215	Galvanic Series table referred to by POSITAs
1216	Mass/Balance. Dana J. Medlin

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‘653 Patent Claims[1]	Anticipated by CN 103343271 A Xiao et al.	At Least Made Obvious By CN 103343271 A Xiao et al.	Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag…
1. A magnesium composite that includes in situ precipitation of galvanically-active intermetallic phases to enable controlled dissolution of said magnesium composite,	Xiao discloses a “magnesium alloy...and further adds elements of Fe, Cu, Ni, and Ag which can enhance the corrosion performance of the magnesium alloy...” ¶ 0026, ll. 1-3. Xiao discloses a novel magnesium alloy with high aluminum and zinc content further adding elements Fe, Cu, Ni and Ag which can form intermetallics and enhance the corrosion performance of the magnesium alloy. Xiao explains the corrosion mechanism within a magnesium alloy in terms of a cathode phase, which Xiao explains includes “the β (Mg17Al12) phase and eutectic phase on the grain boundary of the magnesium alloy,” and “the magnesium matrix α phase which functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which [micro-batteries] greatly accelerate the corrosion decomposition of magnesium alloy.” ¶ 0026. A POSITA in August 2014 would have understood this disclosure of “intermetallic composite micro-particles” to be a reference to intermetallic precipitate. A POSITA reading the Xiao reference in April 2014 would have recognized that the precipitation of galvanically-active intermetallic phases (“micro-batteries”) are naturally and necessarily generated by the in situ reaction between magnesium and any and all of the disclosed metal additives forming in situ precipitate. Thus, this claim element was disclosed by Xiao.		
said magnesium composite comprising a mixture of magnesium or a magnesium alloy and an additive material,	Xiao discloses “first loading pure magnesium and pure aluminum into a smelting furnace . . . next loading pure zinc and an [sic] intermediate alloys of trace element components into a resulting magnesium-aluminum alloy melt after melting.” ¶ 0022. Xiao discloses that “Al-Fe ... Al-Ni ... Al-Cu ... Al- Ag ... Al-Zr ... and ... Al-Ti intermediate alloy[s], are heated to dry and then added to the magnesium-aluminum alloy melt.” Id. at ¶ 0023. These intermediate alloys meet the parties' agreed construction of “additive material,” i.e., “a		

[1] Independent claims 1, 12, 25, 29, 33, 37, 41, 45, 49, 73, and 74 are shaded for easier reference.

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	material that is added" (ECF #89). The addition of these intermediate alloys to the melted magnesium alloy necessarily results in a mixture of the additive material and magnesium alloy.		
said additive material having a greater melting point temperature than a solidus temperature of said magnesium,	Using a typical phase diagram, a POSITA in April 2014 would have readily determined that the solidus temperature of magnesium is the temperature at which a metal first begins to melt during heating and not necessarily when the metal is completely liquidus. A POSITA would also use this phase diagram to find the solidus temperature of the magnesium-aluminum alloy disclosed in Xiao to be in a range of 650°C for pure magnesium and down to 437°C for aluminum additions in the range of 13 wt% to 25% and even up to 40 wt%. The POSITA using typical phase diagrams for each of the additive materials (here the Al-Fe, Al-Ni, Al-Cu, Al-Ag, Al-Zr, Al-Ti "intermediate alloys" disclosed in Xiao) would be able to readily determine the melting point temperature (i.e. "temperature at which liquid is first formed" (Court's construction (ECF #89))) for each intermediate alloy. (¶ 0023). For example, the Al-Fe phase diagram (Ex. 1205) shows a variable melting point temperature ranging from 1538°C (pure iron) down to 655°C for a eutectic temperature between about 63 wt% aluminum to near 99 wt% aluminum. The Al-Ni phase diagram (Ex. 1206) shows a variable melting point temperature that ranges from 1640°C down to 640°C depending upon the alloy content. The Al-Cu (Ex. 1207) phase diagram shows a variable melting point temperature ranging from 548°C up to 1084°C depending upon the alloy mixture. A POSITA in April 2014 would have readily determined the specific melting temperature of a specific alloy mixture based on these phase diagrams. Xiao discloses a variety of Al-Fe, Al-Ni, Al-Cu, Al-Ag, Al-Zr, Al-Ti alloy mixtures with a variety of constituencies. For instance, Xiao specifically teaches in Example 7 that:		

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	The composition of the alloy and the respective percentages by weight are as follows: 25% Al-10% Zn-1% Fe-0.5% Ni-0.1% Cu- 0.5% Ti-0.05% Zr, and the remainder is Mg. ¶¶ 0058-59. Xiao teaches that the magnesium alloy of Example 7, as a whole, ends up with the maximum amount of aluminum (i.e. 25 wt%) taught as being within the invention of Xiao (see, ¶ 0026). Xiao specifically discloses—with respect to Example 7—that portions of that aluminum content are added into a magnesium-aluminum melt as an Al-Fe intermediate alloy, an Al-Ni intermediate alloy, an Al-Cu intermediate alloy, an Al-Ag intermediate alloy, an Al-Zr intermediate alloy, and an Al-Ti intermediate alloy. ¶ 0060. By converting weight percentages to grams and calculating mass balances, a POSITA would first determine the relative concentrations of the pure magnesium and pure aluminum initially loaded into the smelting furnace in order to determine its solidus temperature. As a result, a POSITA would have understood in April 2014 that Example 7 of Xiao includes 62.85 total grams of magnesium. The following intermediate alloy compositions were chosen for the initial mass balance calculations: Al-Fe (30 wt% Fe), Al-Ni (45 wt% Ni), Al-Cu (40 wt% Cu), Al-Ti (10 wt% Ti), Al-Zr (20 wt% Zr) alloy mixtures. A POSITA in April 2014 would have performed the initial mass balances, included as Exhibit 1216, on these compositions. Using these initially selected alloy compositions would have resulted in 7.79 grams of Aluminum being added as components of the intermediate alloys. Since Example 7 of Xiao calls for a total of 25 grams (i.e. 25 wt%) of Aluminum, 17.21 grams of Aluminum would have had to have been initially loaded into the smelting furnace in Example 7 along with the 62.85 grams of magnesium (see calculation above). Thus, the initial melt of Example 7 (using the intermediate alloys selected) would have had a composition of 78.5 wt% Mg and 21.5 wt% Al. A POSITA in April 2014 would have next consulted the Mg-Al phase diagram to determine that the solidus temperature of that initial magnesium alloy (i.e. 78.5 wt% Mg and 21.5 wt% Al) would be 437 °C. A POSITA would also consult the relevant phase diagram to determine the melting point		

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	temperature of the various additive materials disclosed in Xiao. Id. at ¶ 122. An aluminum-iron alloy with 30 wt% iron would have a melting point temperature of 655 °C, an aluminum-nickel alloy with 45 wt% Ni would have a melting point temperature of 854 °C, an aluminum-copper alloy with 40 wt% Cu would have a melting point temperature of 548°C, an aluminum-titanium alloy with 10 wt% Ti would have a melting point temperature of 665°C, and an aluminum-zirconium alloy with 20 wt% Zr would have a melting point temperature of 661°C. Thus, each of these additive materials from Example 7 of Xiao (with the constituencies selected above) would have had a greater melting point temperature than the solidus temperature (i.e. 437°C) of the magnesium-aluminum alloy (78.5 wt% Mg and 21.5 wt% Al) calculated as the amount of pure aluminum and magnesium initially loaded into the smelting furnace in Example 7. A POSITA in April 2014 would have recognized that other compositions would have fallen within the teachings of Example 7 and other disclosures of Xiao resulting in Al-Fe, Al-Ni, and Al-Cu intermediate alloys having greater melting point temperatures than the solidus temperature of initial magnesium alloy loaded in the various disclosures of Xiao. Thus, Xiao discloses all of the limitations of this claim element.		
said additive material constituting about 0.05 wt %-45 wt % of said mixture,	Claim 1 of Xiao discloses: a “magnesium alloy, comprising the components at the weight percentages as follows: Al: 13 to 25%, Zn: 2 to 15%, the remainder is Mg, and a sum of the weight percentages of the components is 100%.” Claim 2 discloses: a “magnesium alloy, according to Claim 1, further comprising the trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%; and a sum of the weight percentages of the components is 100%.” These metallic elements are found in the additive materials generally disclosed by Xiao (i.e., intermediate alloys: Al-Fe, Al-Ni, Al-Cu, Al-Ti) (¶ 0023) and particularly described in association with Example 7 of Xiao (Id. at ¶¶ 0057–0060) for		

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	which a POSITA could calculate the specific weight percentage (ranges) of each additive material or secondary metal. In doing so, a POSITA would determine that the additive materials aluminum-iron with 30 wt% iron, aluminum-nickel with 45 wt% nickel, and aluminum-copper with 40 wt% copper also fall well within the range of about 0.05 wt% to 45 wt% of the mixture. For example, the aluminum-iron additive constitutes 3.3 wt% of the mixture; the aluminum-nickel additive constitutes 1.1 wt% of the mixture; and the aluminum-copper additive constitutes 0.25 wt% of the mixture. A POSITA in April 2014 would have also recognized that other intermediate alloy compositions would have fallen within the teachings of Example 7 and other disclosures of Xiao resulting in Al-Fe, Al-Ni, and Al-Cu intermediate alloys constituting about 0.05 wt% to 45 wt% of the mixture. Accordingly, this claim element was disclosed by Xiao.		
said additive material forming precipitant in said magnesium composite,	Xiao discloses a novel magnesium alloy with high aluminum and zinc content further adding elements Fe, Cu, Ni and Ag which can form intermetallics and enhance the corrosion performance of the magnesium alloy. ¶ 0026. Xiao explains the corrosion mechanism within a magnesium alloy in terms of a cathode phase, which Xiao explains includes "the β (Mg17Al12) phase and eutectic phase on the grain boundary of the magnesium alloy," and "the magnesium matrix α phase which functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which [micro- batteries] greatly accelerate the corrosion decomposition of magnesium alloy." Id. These elements are among the claimed "secondary metals" disclosed by Xiao. Thus, all of the limitations of this claim element are disclosed by Xiao.		
said additive material includes one or more metals selected from the group consisting of copper, nickel, iron, and cobalt,	Xiao teaches the use of a variety of metals as additive materials. See, e.g., ¶ 0026. For instance, Xiao claims that the novel magnesium alloy may "further compris[e] trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%. . ." Id. at Claim 2. In addition, Example 7 of Xiao particularly discloses intermediate alloys Al-Fe, Al-Ni, Al-		

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	Ag, Al-Cu, Al-Zr, Al-Ti and Zinc as additive materials. Id. at ¶ 0060. A POSITA in April 2014 would have understood that all of these intermediate alloys contain metal, including, in particular, copper, nickel, and iron, among other metals. Thus, Xiao discloses a number of metal additives, including copper, nickel, and iron and, hence fully discloses all of the limitations of these claim elements.		
said magnesium composite has a dissolution rate of at least 5 mg/cm^2/hr. in 3 wt % KCI water mixture at 90°C.	A POSITA in April 2014 would have recognized that Xiao disclosed a table of dissolution rates ("decomposition rates") because the units of measurement are the units used by POSITAs to measure dissolution rates. The disclosed table provides seven examples (excluding the comparative [prior art] example). ¶ 0064. Xiao provides dissolution rates in g/cm2/hr, while the claims of the '653 Patent express dissolution rates in mg/cm2/hr. A POSITA would have known converting between g/cm2/hr to mg/cm2/hr, merely requires multiplication by 1,000. Thus, each of Xiao's seven examples (excluding the comparative [prior art] example) has a dissolution rate of at least three times the claimed "at least 5 mg/cm2/hr in 3 wt.% KCl water" at both 70°C or 93°C (with Example 7 being more than seven times that floor). A POSITA in April 2014 would have recognized that the dissolution rate of the examples in Xiao would necessarily have been well above the claimed floor of "at least of 5 mg/cm2/hr" at the claimed 90°C.		
2. The magnesium composite as defined in claim 1, wherein said magnesium alloy includes over 50 wt % magnesium and one or more metals selected from the group consisting of aluminum, boron, bismuth, zinc, zirconium, and manganese.	Xiao discloses a "magnesium alloy...and further adds elements of Fe, Cu, Ni, and Ag which can enhance the corrosion performance of the magnesium alloy..." ¶ 0026, ll. 1-3. Claim 1 of Xiao discloses a "magnesium alloy, comprising the components at the weight percentages as follows: Al: 13 to 25%, Zn: 2 to 15%; the remainder is Mg, and a sum of the weight percentages of the components is 100%." Claim 1. Thus, Xiao discloses a range of magnesium 54.5-85 wt%, which overlaps and covers much of the claimed range set forth in these claim elements.		

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	Xiao teaches 0.05-0.5 wt% zirconium and 2-15 wt% zinc. A claim is invalid as anticipated when it is in Markush form and a prior art reference disclosed one of the claimed elements. See Fresenius USA, Inc. v. Baxter Int'l, Inc., 582 F.3d 1288, 1298 (Fed. Cir. 2009). See also Abbott Labs. v. Baxter Pharm. Prods., Inc., 334 F.3d 1274, 1280 (Fed.Cir.2003); Schering Corp. v. Geneva Pharms., Inc., 339 F.3d 1373, 1380 (Fed.Cir.2003); Thus, Xiao teaches all of these claim limitations.		
3. The magnesium composite as defined in claim 1, wherein said magnesium alloy includes over 50 wt % magnesium and one or more metals selected from the group consisting of aluminum in an amount of about 0.5-10 wt %, zinc in amount of about 0.1-3 wt %, zirconium in an amount of about 0.01-1 wt %, manganese in an amount of about 0.15-2 wt %, boron in amount of about 0.0002-0.04 wt %, and bismuth in amount of about 0.4-0.7 wt %.	Xiao discloses a "magnesium alloy...and further adds elements of Fe, Cu, Ni, and Ag which can enhance the corrosion performance of the magnesium alloy..." ¶ 0026, ll. 1-3. Claim 1 of Xiao discloses a "magnesium alloy, comprising the components at the weight percentages as follows: Al: 13 to 25%, Zn: 2 to 15%; the remainder is Mg, and a sum of the weight percentages of the components is 100%." Claim 1. Thus, Xiao discloses a range of magnesium 54.5-85 wt%, which overlaps and covers much of the claimed range set forth in these claim elements. This claim element would be anticipated solely by the zirconium concentrations falling within the 0.01-3 wt% range. Claim 3 also requires, in addition to a similar zirconium concentration to the Markush claims, a zinc concentration of 0.1-3 wt%. Xiao teaches 0.05-0.5 wt% zirconium, which touches and covers at least a portion of these claimed ranges. Xiao similarly teaches 2-15 wt% zinc, which covers much of the claimed (0.1-3 wt%) zinc concentration. A claim is invalid as anticipated when it is in Markush form and a prior art reference disclosed one of the claimed elements. See Fresenius USA, Inc. v. Baxter Int'l, Inc., 582 F.3d 1288, 1298 (Fed. Cir. 2009). See also Abbott Labs. v. Baxter Pharm. Prods., Inc., 334 F.3d 1274, 1280 (Fed.Cir.2003); Schering Corp. v. Geneva Pharms., Inc., 339 F.3d 1373, 1380		

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	(Fed.Cir.2003); Thus, Xiao teaches all of these claim limitations.		
4. The magnesium composite as defined in claim 1, wherein said additive material includes nickel,	Xiao discloses a "magnesium alloy...and further adds elements of Fe, Cu, Ni, and Ag which can enhance the corrosion performance of the magnesium alloy..." ¶ 0026, ll. 1-3. Xiao teaches the use of a variety of metals as additive materials. See, e.g., ¶ 0026. For instance, Xiao claims that the novel magnesium alloy may "further compris[e] trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%. . ." Id. at Claim 2. In addition, Example 7 of Xiao particularly discloses intermediate alloys Al-Fe, Al-Ni, Al-Ag, Al-Cu, Al-Zr, Al-Ti and Zinc as additive materials. Id. at ¶ 0060. A POSITA in April 2014 would have understood that all of these intermediate alloys contain metal, including, in particular, nickel, among other metals. Thus, Xiao discloses a number of metal additives, including nickel, and hence fully discloses all of the limitations of this claim element.		
said nickel constitutes about 0.05-35 wt % of said magnesium composite,	Claim 1 of Xiao discloses: a "magnesium alloy, comprising the components at the weight percentages as follows: Al: 13 to 25%, Zn: 2 to 15%, the remainder is Mg, and a sum of the weight percentages of the components is 100%." Claim 2 discloses: a "magnesium alloy, according to Claim 1, further comprising the trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%; and a sum of the weight percentages of the components is 100%." These metallic elements are found in the additive materials generally disclosed by Xiao (i.e., intermediate alloys: Al-Fe, Al-Ni, Al-Cu, Al-Ti) (¶ 0023) and particularly described in association with Example 7 of Xiao (Id. at ¶¶ 0057–0060) for which a POSITA could calculate the specific weight percentage (ranges) of each additive material or secondary metal. In doing so, a POSITA would determine that the additive materials aluminum-iron with 30 wt% iron, aluminum-nickel with 45 wt% nickel, and aluminum-copper		

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	with 40 wt% copper also fall well within the range of about 0.05 wt% to 45 wt% of the mixture. For example, the aluminum-iron additive constitutes 3.3 wt% of the mixture; the aluminum-nickel additive constitutes 1.1 wt% of the mixture; and the aluminum-copper additive constitutes 0.25 wt% of the mixture. A POSITA in April 2014 would have also recognized that other intermediate alloy compositions would have fallen within the teachings of Example 7 and other disclosures of Xiao resulting in Al-Fe, Al-Ni, and Al-Cu intermediate alloys constituting about 0.05 wt% to 35 wt% of the mixture. Accordingly, this claim element was disclosed by Xiao.		
said nickel forms galvanically-active in situ precipitate in said magnesium composite.	Xiao discloses a novel magnesium alloy with high aluminum and zinc content further adding elements Fe, Cu, Ni and Ag which can form intermetallics and enhance the corrosion performance of the magnesium alloy. ¶ 0026. Xiao explains the corrosion mechanism within a magnesium alloy in terms of a cathode phase, which Xiao explains includes "the β (Mg17Al12) phase and eutectic phase on the grain boundary of the magnesium alloy," and "the magnesium matrix α phase which functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which [micro-batteries] greatly accelerate the corrosion decomposition of magnesium alloy." *Id.* These elements are among the claimed "secondary metals" disclosed by Xiao. Thus, all of the limitations of this claim element are disclosed by Xiao.		
5. The magnesium composite as defined in claim 1, wherein said additive material includes copper,	Xiao discloses a "magnesium alloy...and further adds elements of Fe, Cu, Ni, and Ag which can enhance the corrosion performance of the magnesium alloy..." ¶ 0026, ll. 1-3. Xiao teaches the use of a variety of metals as additive materials. See, e.g., ¶ 0026. For instance, Xiao claims that the novel magnesium alloy may "further compris[e] trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%. . ." *Id.* at Claim 2. In addition, Example 7 of Xiao		

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	particularly discloses intermediate alloys Al-Fe, Al-Ni, Al-Ag, Al-Cu, Al-Zr, Al-Ti and Zinc as additive materials. Id. at ¶ 0060. A POSITA in April 2014 would have understood that all of these intermediate alloys contain metal, including, in particular, copper, among other metals. Thus, Xiao discloses a number of metal additives, including copper, and hence fully discloses all of the limitations of these claim elements.		
said copper constitutes about 0.05-35 wt % of said magnesium composite,	Claim 1 of Xiao discloses: a "magnesium alloy, comprising the components at the weight percentages as follows: Al: 13 to 25%, Zn: 2 to 15%, the remainder is Mg, and a sum of the weight percentages of the components is 100%." Claim 2 discloses: a "magnesium alloy, according to Claim 1, further comprising the trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%; and a sum of the weight percentages of the components is 100%." These metallic elements are found in the additive materials generally disclosed by Xiao (i.e., intermediate alloys: Al-Fe, Al-Ni, Al-Cu, Al-Ti) (¶ 0023) and particularly described in association with Example 7 of Xiao (*Id.* at ¶¶ 0057–0060) for which a POSITA could calculate the specific weight percentage (ranges) of each additive material or secondary metal. In doing so, a POSITA would determine that the additive materials aluminum-iron with 30 wt% iron, aluminum-nickel with 45 wt% nickel, and aluminum-copper with 40 wt% copper also fall well within the range of about 0.05 wt% to 45 wt% of the mixture. For example, the aluminum-iron additive constitutes 3.3 wt% of the mixture; the aluminum-nickel additive constitutes 1.1 wt% of the mixture; and the aluminum-copper additive constitutes 0.25 wt% of the mixture. A POSITA in April 2014 would have also recognized that other intermediate alloy compositions would have fallen within the teachings of Example 7 and other disclosures of Xiao resulting in Al-Fe, Al-Ni, and Al-Cu intermediate alloys constituting about 0.05 wt% to 35 wt% of the mixture. Accordingly, this claim element was disclosed by Xiao.		
said copper forms galvanically-active in situ	Xiao discloses a novel magnesium alloy with high aluminum and zinc content further adding elements Fe, Cu, Ni and Ag		

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precipitate in said magnesium composite.	which can form intermetallics and enhance the corrosion performance of the magnesium alloy. ¶ 0026. Xiao explains the corrosion mechanism within a magnesium alloy in terms of a cathode phase, which Xiao explains includes "the β (Mg17Al12) phase and eutectic phase on the grain boundary of the magnesium alloy," and "the magnesium matrix α phase which functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which [micro-batteries] greatly accelerate the corrosion decomposition of magnesium alloy." Id. These elements are among the claimed "secondary metals" disclosed by Xiao. Thus, all of the limitations of this claim element are disclosed by Xiao.		
6. The magnesium composite as defined in claim 1, wherein said additive material includes cobalt, said cobalt constitutes about 0.05-35 wt. % of said magnesium composite, said cobalt forms galvanically-active in situ precipitate in said magnesium composite.	***No infringement alleged. See Terves's Final Infringement Contentions at 4-5.***		
7. The magnesium composite as defined in claim 1, where said magnesium composite is subjected to a deformation processing to reduce grain size of said magnesium composite, increase tensile yield strength of said magnesium composite, increase elongation of said			As set forth in Ground I, supra, Xiao already discloses each and every element of the magnesium composition of Claim 1. Xiao does not disclose subjecting that magnesium composite to deformation processing. Hassan explicitly discloses deformation processing. In particular, Hassan discloses that the deposited magnesium ingots may then be subjected to secondary processing. For example, Hassan teaches that the nickel-reinforced magnesium ingots are machined and hot extruded to obtain rods of 8 mm diameter. *Id.* Analysis of the composite of Hassan "showed the reduction in the size of elemental nickel

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magnesium composite, or combinations thereof.			particulates in the extruded composites" (see Table 1 (from Hassan (above)). In other words, the extrusion in Hassan resulted in a reduction of grain size of the magnesium composite. A POSITA in April 2014 would have been motivated to combine the disclosure of Xiao with this disclosure of deformation processing in Hassan rendering Claim 7 obvious. Accordingly, Claim 7 should be found obvious over Xiao in view of Hassan.
8. The magnesium composite as defined in claim 1, wherein said magnesium composite is subjected to a surface treatment to improve a surface hardness of said magnesium composite,	***Infringement contention withdrawn pursuant to July 2, 2021 email from Matthew J. Cavanagh.***	As set forth in Ground I, supra, Xiao already discloses each and every element of the magnesium composition of Claim 1. Xiao does not claim, nor disclose in any novel embodiment, subjecting any of its novel magnesium composites to surface treatments (i.e. peening, heat treatment, aluminizing or combinations thereof) nor does it teach that surface treatment would achieve any of the benefits set forth in Claim 8 of the '653 Patent. However, Xiao discloses that a U.S. Patent Publication teaches a method "for preparing a composite material having a decomposable multilayer coated core-shell structure (U.S. Patent No. US2011/0132143A1, 2011). ¶ 0002. It is explicitly noted in Xiao that this U.S. patent publication discloses an electroless plating process applied on the surface of particles of nanoscale core metal powders (such as magnesium, aluminum, zinc, manganese and alloys thereof) to coat multiple layers of a nano-shell of different metals or metal oxides, such as Al, Ni, Al2O3, and the like, and then the composite powder is sintered to form a nanocomposite material having certain decomposition feature [sic]." Id. A POSITA in April 2014 would have understood that this sintering process discussed within Xiao was a well-known type of surface treatment that can be used to improve the surface hardness of the sintered metal. See also, e.g., Ex. 1203 ("Powder metal technology is well known to the persons skilled in the art and generally comprises the formation of metal powders which are compacted and then subjected to an elevated temperature so as to produce a sintered product.").	

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		Consequently, Xiao teaches a magnesium composite subjected to a heat treating surface treatment to improve surface hardness of the magnesium.	
said surface treatment including peening, heat treatment, aluminizing, or combinations thereof.		As set forth in Ground I, supra, Xiao already discloses each and every element of the magnesium composition of Claim 1. Xiao does not claim, nor disclose in any novel embodiment, subjecting any of its novel magnesium composites to surface treatments (i.e. peening, heat treatment, aluminizing or combinations thereof) nor does it teach that surface treatment would achieve any of the benefits set forth in Claim 8 of the '653 Patent. However, Xiao discloses that a U.S. Patent Publication teaches a method "for preparing a composite material having a decomposable multilayer coated core-shell structure (U.S. Patent No. US2011/0132143A1, 2011). ¶ 0002. It is explicitly noted in Xiao that this U.S. patent publication discloses an electroless plating process applied on the surface of particles of nanoscale core metal powders (such as magnesium, aluminum, zinc, manganese and alloys thereof) to coat multiple layers of a nano-shell of different metals or metal oxides, such as Al, Ni, Al2O3, and the like, and then the composite powder is sintered to form a nanocomposite material having certain decomposition feature [sic]." *Id.* A POSITA in April 2014 would have understood that this sintering process discussed within Xiao was a well-known type of surface treatment that can be used to improve the surface hardness of the sintered metal. See also, *e.g.*, Ex. 1203 ("Powder metal technology is well known to the persons skilled in the art and generally comprises the formation of metal powders which are compacted and then subjected to an elevated temperature so as to produce a sintered product."). Consequently, Xiao teaches a magnesium composite subjected to a heat treating surface treatment to improve surface hardness of the magnesium.	
9. The magnesium composite as defined in claim 1, wherein a	A POSITA in April 2014 would have recognized that Xiao disclosed a table of dissolution rates ("decomposition rates") because the units of measurement are the units used by		

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dissolution rate of said magnesium composite is about 5-325 mg/cm^2/hr. in 3 wt % KCl water mixture at 90°C.	POSITAs to measure dissolution rates. The disclosed table provides seven examples (excluding the comparative [prior art] example). ¶ 0064. Xiao provides dissolution rates in g/cm2/hr, while the claims of the '653 Patent express dissolution rates in mg/cm2/hr. A POSITA would have known converting between g/cm2/hr to mg/cm2/hr, merely requires multiplication by 1,000. Thus, each of Xiao's seven examples (excluding the comparative [prior art] example) has a dissolution rate of at least three times the claimed "about 5-325 mg/cm^2/hr in 3 wt.% KCl water" at both 70°C or 93°C (with Example 7 being more than seven times that floor). A POSITA in April 2014 would have recognized that the dissolution rate of the examples in Xiao would necessarily have been well above the claimed floor of "about 5-325 mg/cm^2/hr" at the claimed 90°C.		
11. The magnesium composite as defined in claim 1, wherein said additive material is a metal or metal alloy.	***Infringement contention withdrawn pursuant to July 2, 2021 email from Matthew J. Cavanagh***. Xiao discloses a "magnesium alloy...and further adds elements of Fe, Cu, Ni, and Ag which can enhance the corrosion performance of the magnesium alloy..." ¶ 0026, ll. 1-3. Xiao teaches the use of a variety of metals as additive materials. See, e.g., ¶ 0026. For instance, Xiao claims that the novel magnesium alloy may "further compris[e] trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%. . ." Id. at Claim 2. In addition, Example 7 of Xiao particularly discloses intermediate alloys Al-Fe, Al-Ni, Al-Ag, Al-Cu, Al-Zr, Al-Ti and Zinc as additive materials. Id. at ¶ 0060. A POSITA in April 2014 would have understood that all of these intermediate alloys contain metal(s). Accordingly, EXample 7 of Xiao discloses this claim element.		

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12. A magnesium composite that includes in situ precipitation of galvanically-active intermetallic phases to enable controlled dissolution of said magnesium composite comprising a mixture of a magnesium or a magnesium alloy and an additive material,			Xiao discloses a "magnesium alloy...and further adds elements of Fe, Cu, Ni, and Ag which can enhance the corrosion performance of the magnesium alloy..." ¶ 0026, ll. 1-3. Xiao discloses a novel magnesium alloy with high aluminum and zinc content further adding elements Fe, Cu, Ni and Ag which can form intermetallics and enhance the corrosion performance of the magnesium alloy. Xiao explains the corrosion mechanism within a magnesium alloy in terms of a cathode phase, which Xiao explains includes "the β (Mg17Al12) phase and eutectic phase on the grain boundary of the magnesium alloy," and "the magnesium matrix α phase which functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which [micro-batteries] greatly accelerate the corrosion decomposition of magnesium alloy." ¶ 0026. A POSITA in August 2014 would have understood this disclosure of "intermetallic composite micro-particles" to be a reference to intermetallic precipitate. A POSITA reading the Xiao reference in April 2014 would have recognized that the precipitation of galvanically-active intermetallic phases ("micro-batteries") are naturally and necessarily generated by the in situ reaction between magnesium and any and all of the disclosed metal additives forming in situ precipitate. Thus, this claim element was disclosed by Xiao. Xiao discloses "first loading pure magnesium and pure aluminum into a smelting furnace . . . next loading pure zinc and an [sic] intermediate alloys of trace element components into a resulting magnesium-aluminum alloy melt after melting." ¶ 0022. Xiao discloses that "Al-Fe ... Al-Ni ... Al-Cu ... Al- Ag ... Al-Zr ... and ... Al-Ti intermediate alloy[s], are heated to dry and then added to the magnesium-aluminum alloy melt." Id. at ¶ 0023. The addition of these intermediate alloys to the melted magnesium alloy necessarily results in a mixture of the additive material and magnesium alloy.
said additive material having a greater melting			Using a typical phase diagram, a POSITA in April 2014 would have readily determined that the solidus temperature of

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point temperature than a solidus temperature of said magnesium,			magnesium is the temperature at which a metal first begins to melt during heating and not necessarily when the metal is completely liquidus. Diagram omitted. Ex. 1213. A POSITA would also use this phase diagram to find the solidus temperature of the magnesium-aluminum alloy disclosed in Xiao to be in a range of 650°C for pure magnesium and down to 437°C for aluminum additions in the range of 13 wt% to 25% and even up to 40 wt%. The POSITA using typical phase diagrams for each of the additive materials (here the Al-Fe, Al-Ni, Al-Cu, Al-Ag, Al-Zr, Al-Ti "intermediate alloys" disclosed in Xiao) would be able to readily determine the melting point temperature (i.e. "temperature at which liquid is first formed" (Court's construction (ECF #89))) for each intermediate alloy. (¶ 0023). For example, the Al-Fe phase diagram (Ex. 1205) shows a variable melting point temperature ranging from 1538°C (pure iron) down to 655°C for a eutectic temperature between about 63 wt% aluminum to near 99 wt% aluminum. The Al-Ni phase diagram (Ex. 1206) shows a variable melting point temperature that ranges from 1640°C down to 640°C depending upon the alloy content. The Al-Cu (Ex. 1207) phase diagram shows a variable melting point temperature ranging from 548°C up to 1084°C depending upon the alloy mixture. A POSITA in April 2014 would have readily determined the specific melting temperature of a specific alloy mixture based on these phase diagrams. Xiao discloses a variety of Al-Fe, Al-Ni, Al-Cu, Al-Ag, Al-Zr, Al-Ti alloy mixtures with a variety of constituencies. For instance, Xiao specifically teaches in Example 7 that: The composition of the alloy and the respective percentages by weight are as follows: 25% Al-10% Zn-1% Fe-0.5% Ni-0.1% Cu- 0.5% Ti-0.05% Zr, and the remainder is Mg. ¶ 0058-59. Xiao teaches that the magnesium alloy of Example 7, as a whole, ends up with the maximum amount of aluminum (i.e. 25 wt%) taught as being within the invention of Xiao (see, ¶ 0026). Xiao specifically discloses—with

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			respect to Example 7—that portions of that aluminum content are added into a magnesium-aluminum melt as an Al-Fe intermediate alloy, an Al-Ni intermediate alloy, an Al-Cu intermediate alloy, an Al-Ag intermediate alloy, an Al-Zr intermediate alloy, and an Al-Ti intermediate alloy. ¶ 0060. By converting weight percentages to grams and calculating mass balances, a POSITA would first determine the relative concentrations of the pure magnesium and pure aluminum initially loaded into the smelting furnace in order to determine its solidus temperature. As a result, a POSITA would have understood in April 2014 that Example 7 of Xiao includes 62.85 total grams of magnesium. The following intermediate alloy compositions were chosen for the initial mass balance calculations: Al-Fe (30 wt% Fe), Al-Ni (45 wt% Ni), Al-Cu (40 wt% Cu), Al-Ti (10 wt% Ti), Al-Zr (20 wt% Zr) alloy mixtures. A POSITA in April 2014 would have performed the initial mass balances, included as Exhibit 1216, on these compositions. Using these initially selected alloy compositions would have resulted in 7.79 grams of Aluminum being added as components of the intermediate alloys. Since Example 7 of Xiao calls for a total of 25 grams (i.e. 25 wt%) of Aluminum, 17.21 grams of Aluminum would have had to have been initially loaded into the smelting furnace in Example 7 along with the 62.85 grams of magnesium (see calculation above). Thus, the initial melt of Example 7 (using the intermediate alloys selected) would have had a composition of 78.5 wt% Mg and 21.5 wt% Al. A POSITA in April 2014 would have next consulted the Mg-Al phase diagram to determine that the solidus temperature of that initial magnesium alloy (i.e. 78.5 wt% Mg and 21.5 wt% Al) would be 437 °C. A POSITA would also consult the relevant phase diagram to determine the melting point temperature of the various additive materials disclosed in Xiao. *Id.* at ¶ 122. An aluminum-iron alloy with 30 wt% iron would have a melting point temperature of 655 °C, an aluminum-nickel alloy with 45 wt% Ni would have a melting point temperature of 854 °C, an aluminum-copper alloy with 40 wt% Cu would have a melting point temperature of 548°C, an aluminum-titanium alloy with 10 wt% Ti would have a

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			melting point temperature of 665°C, and an aluminum-zirconium alloy with 20 wt% Zr would have a melting point temperature of 661°C. Thus, each of these additive materials from Example 7 of Xiao (with the constituencies selected above) would have had a greater melting point temperature than the solidus temperature (i.e. 437°C) of the magnesium-aluminum alloy (78.5 wt% Mg and 21.5 wt% Al) calculated as the amount of pure aluminum and magnesium initially loaded into the smelting furnace in Example 7. A POSITA in April 2014 would have recognized that other compositions would have fallen within the teachings of Example 7 and other disclosures of Xiao resulting in Al-Fe, Al-Ni, and Al-Cu intermediate alloys having greater melting point temperatures than the solidus temperature of initial magnesium alloy loaded in the various disclosures of Xiao. Thus, Xiao discloses all of the limitations of this claim element.
said composite including greater than 50 wt % magnesium,			Claim 1 of Xiao discloses a “magnesium alloy, comprising the components at the weight percentages as follows: Al: 13 to 25%, Zn: 2 to 15%; the remainder is Mg, and a sum of the weight percentages of the components is 100%.” Claim 1. Thus, Xiao discloses a range of magnesium 54.5-85 wt%, which overlaps and covers much of the claimed ranges set forth in these claim elements.
said additive material constituting about 0.05-45 wt % of said magnesium composite,			Claim 1 of Xiao discloses: a “magnesium alloy, comprising the components at the weight percentages as follows: Al: 13 to 25%, Zn: 2 to 15%, the remainder is Mg, and a sum of the weight percentages of the components is 100%.” Claim 2 discloses: a “magnesium alloy, according to Claim 1, further comprising the trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%; and a sum of the weight percentages of the components is 100%.” These metallic elements are found in the additive materials generally disclosed by Xiao (i.e., intermediate alloys: Al-Fe, Al-Ni, Al-Cu, Al-Ti) (¶ 0023) and particularly described in association with Example 7 of Xiao (Id. at ¶¶ 0057–0060) for which a POSITA could calculate the specific weight

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			percentage (ranges) of each additive material or secondary metal. In doing so, a POSITA would determine that the additive materials aluminum-iron with 30 wt% iron, aluminum-nickel with 45 wt% nickel, and aluminum-copper with 40 wt% copper also fall well within the range of about 0.05 wt% to 45 wt% of the mixture. For example, the aluminum-iron additive constitutes 3.3 wt% of the mixture; the aluminum-nickel additive constitutes 1.1 wt% of the mixture; and the aluminum-copper additive constitutes 0.25 wt% of the mixture. A POSITA in April 2014 would have also recognized that other intermediate alloy compositions would have fallen within the teachings of Example 7 and other disclosures of Xiao resulting in Al-Fe, Al-Ni, and Al-Cu intermediate alloys constituting about 0.05 wt% to 45 wt% of the mixture. Accordingly, this claim element was disclosed by Xiao.
said additive material having a melting point temperature that is 100°C. greater than a melting temperature of said magnesium or magnesium alloy,			A POSITA in April 2014 would have understood "melting temperature" in this claim element to be a reference to the smelting temperature or temperature of the melt when the additive material is being added to the magnesium or magnesium alloy, not the "melting point temperature" as that measurement is used for the additive material. Xiao generally discloses "loading pure magnesium and pure aluminum into a smelting furnace and increasing the temperature to 700 to 730 °C, next loading pure zinc and an [sic] intermediate alloys . . . into a resulting magnesium-aluminum alloy melt after melting and increasing the temperature to 740 to 780°C . . . ." ¶¶ 0021–0022; see also *Id.* at Claim 5 ("the melting temperature of the pure magnesium and pure aluminum is from 700 to 730 °C.") Examples 1–7 of Xiao teach a range of smelting temperatures for the magnesium-aluminum alloy from 700°C (Example 1) to 730°C (Examples 2, 5, and 7). ¶¶ 0034–0060. The additive materials noted above are one or more of the intermediate alloys: Al-Fe, Al-Ni, Al-Cu, Al-Ag, Al-Zr, Al-Ti. Id. at ¶ 0023. A POSITA using typical phase diagrams for each of these additive materials would be able to readily determine the melting point temperature.

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			Example 7 of Xiao specifically discloses a melting or smelting temperature of 730°C. ¶ 0060. A POSITA in April 2014 would have recognized from Example 7 of Xiao that at least an aluminum-nickel additive having 45 wt% nickel has a melting point temperature of 854°C which is 100°C greater than the melting or smelting temperatures of the magnesium aluminum alloy used in Example 7 (i.e., 730°C) and otherwise taught generally by Xiao (i.e., 700-730°C). A POSITA in April 2014 would have also recognized that other intermediate alloy compositions could have fallen within the teachings of Example 7 and other disclosures of Xiao and resulted in Al-Fe, Al-Ni, and Al-Cu intermediate alloys that would have had melting point temperatures that were 100°C. greater than the smelting temperatures of the magnesium alloy generally taught by Xiao (i.e., 700- 730°C). Thus, this claim element was disclosed by Xiao.
said additive material including one or more metals selected from the group consisting of copper, nickel, cobalt, titanium, and iron,			Xiao teaches the use of a variety of metals as additive materials. See, e.g., ¶ 0026. For instance, Xiao claims that the novel magnesium alloy may "further compris[e] trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%. . ." Id. at Claim 2. In addition, Example 7 of Xiao particularly discloses intermediate alloys Al-Fe, Al-Ni, Al-Ag, Al-Cu, Al-Zr, Al-Ti and Zinc as additive materials. Id. at ¶ 0060. A POSITA in April 2014 would have understood that all of these intermediate alloys contain metal, including, in particular, copper, nickel, and iron, among other metals. Thus, Xiao discloses a number of metal additives, including copper, nickel, and iron and, hence fully discloses all of the limitations of these claim elements.
at least a portion of said additive material remaining unalloyed additive material,			Xiao discloses that "[e]lements such as Fe, Cu, Ni, Ag, etc., in the micro-particles." ¶ 0026. However, Xiao does not disclose whether any of the additive material remains "unalloyed". Hassan explicitly discloses that magnesium composites containing additive materials, such as nickel may remain unreacted. In particular, Hassan discloses that the [s]evere reaction between magnesium melt and nickel particulates during DMD processing led to the reduction of the particulate size and formation of Mg2Ni intermetallics [13]. The results

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			of quantitative determination of unreacted nickel (see Table I), microstructural characterization illustrating the presence of reaction products (see Fig. 1) and XRD results (see Table II) showing the presence of Mg2Ni supports the experimental observations."Thus, Hassan specifically provides experimental data showing— under similar conditions of magnesium composite fabrication as those in Xiao—that some of the additives, particularly nickel, will remain unreacted and unalloyed. Given the motivation to combine Xiao with Hassan, a POSITA in April 2014 would have combined these two references thereby providing further rationale that a POSITA in April 2014 would find Claim 12 of the '653 Patent obvious.
said magnesium composite including in situ precipitation of galvanically-active intermetallic phases that includes said unalloyed additive material,			Xiao discloses a novel magnesium alloy with high aluminum and zinc content further adding elements Fe, Cu, Ni and Ag which can form intermetallics and enhance the corrosion performance of the magnesium alloy. ¶ 0026. Xiao explains the corrosion mechanism within a magnesium alloy in terms of a cathode phase, which Xiao explains includes "the β (Mg17Al12) phase and eutectic phase on the grain boundary of the magnesium alloy," and "the magnesium matrix α phase which functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which [micro-batteries] greatly accelerate the corrosion decomposition of magnesium alloy." *Id.* A POSITA in August 2014 would have understood this disclosure of "intermetallic composite micro-particles" to be a reference to intermetallic precipitate. As noted above, at least Fe, Cu, and Ni are "additive materials." Consequently, the in-situ precipitation of galvanically-active intermetallic phases will include one or more of these additive materials. Thus, Xiao discloses all of this claim limitation. Xiao discloses that "[e]lements such as Fe, Cu, Ni, Ag, etc., in the micro- particles." *Id.* at ¶ 0026. However, Xiao does not disclose whether any of the additive material remains "unalloyed".

			Hassan explicitly discloses that magnesium composites containing additive materials, such as nickel may remain unreacted. In particular, Hassan discloses that the [s]evere reaction between magnesium melt and nickel particulates during DMD processing led to the reduction of the particulate size and formation of Mg2Ni intermetallics [13]. The results of quantitative determination of unreacted nickel (see Table I), microstructural characterization illustrating the presence of reaction products (see Fig. 1) and XRD results (see Table II) showing the presence of Mg2Ni supports the experimental observations." Ex. 1007 at 2472. Thus, Hassan specifically provides experimental data showing— under similar conditions of magnesium composite fabrication as those in Xiao—that some of the additives, particularly nickel, will remain unreacted and unalloyed. Given the motivation to combine Xiao with Hassan, a POSITA in April 2014 would have combined these two references thereby providing further rationale that a POSITA in April 2014 would find Claims 12 and 71 of the '653 Patent obvious.
said magnesium composite has a dissolution rate of at least 5 mg/cm^2/hr. in 3 wt % KCl water mixture at 90°C.			A POSITA in April 2014 would have recognized that Xiao disclosed a table of dissolution rates ("decomposition rates") because the units of measurement are the units used by POSITAs to measure dissolution rates. The disclosed table provides seven examples (excluding the comparative [prior art] example). ¶ 0064. Xiao provides dissolution rates in g/cm2/hr, while the claims of the '653 Patent express dissolution rates in mg/cm2/hr. A POSITA would have known converting between g/cm2/hr to mg/cm2/hr, merely requires multiplication by 1,000. Thus, each of Xiao's seven examples (excluding the comparative [prior art] example) has a dissolution rate of at least three times the claimed "at least 5 mg/cm2/hr in 3 wt.% KCl water" at both 70°C or 93°C (with Example 7 being more than seven times that floor). A POSITA in April 2014 would have recognized that the dissolution rate of the examples in

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			Xiao would necessarily have been well above the claimed floor of "at least of 5 mg/cm2/hr" at the claimed 90°C.
13. The magnesium composite as defined in claim 12, wherein said additive material is added to said magnesium or magnesium alloy while said magnesium or magnesium alloy is at a temperature that is above said solidus temperature of said magnesium and a temperature that is less than a melting point of said additive material to form said mixture.			With respect to the additional limitations added by this dependent claim, Xiao discloses "first loading pure magnesium and pure aluminum into a smelting furnace, next loading pure zinc and an [sic] intermediate alloys . . . into a resulting magnesium-aluminum alloy melt after melting." Claim 4. Hassan, discloses, in particular, magnesium as a base material "and elemental nickel particulates of 99.9% purity (Johnson Matthey, MA, USA) with an average size of 29±19 μm were used as reinforcement phase" and that "[t]he synthesis of the composites involved superheating the magnesium turnings with reinforcement particulates (placed in multi-layer sandwich form) to 750°C under inert Ar gas atmosphere in a graphite crucible." *Id.* at p. 2468. A POSITA would have known in April 2014 that the melting point of pure magnesium is 650°C and the melting point of pure nickel is 1455°C using standard phase diagrams for Mg and Ni, respectively. Given these values and the disclosure in Hassan of heating only to 750°C, the combination of Xiao and Hassan necessarily teach the limitations of Claim 13.
14. The magnesium composite as defined in claim 13, wherein said magnesium alloy includes over 50 wt % magnesium and one or more metals selected from the group consisting of aluminum in an amount of about 0.5-10 wt %, zinc in amount of about 0.1-3 wt %, zirconium in an amount of			Xiao discloses a "magnesium alloy...and further adds elements of Fe, Cu, Ni, and Ag which can enhance the corrosion performance of the magnesium alloy..." ¶ 0026, ll. 1–9. Claim 1 of Xiao discloses a "magnesium alloy, comprising the components at the weight percentages as follows: Al: 13 to 25%, Zn: 2 to 15%; the remainder is Mg, and a sum of the weight percentages of the components is 100%." Xiao at Claim 1 (emphasis added). Dr. Medlin opines that a POSITA would have understood that the total range of the non-magnesium elements disclosed in Claim 1 of Xiao is 15 to

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about 0.01-1 wt %, manganese in an amount of about 0.15-2 wt %, boron in amount of about 0.0002-0.04 wt %, and bismuth in an amount of about 0.4-0.7 wt %.			40%, leaving 60-85 wt% for magnesium. A POSITA would also note Xiao's disclosure that the "Examples of Xiao disclose a range of magnesium from 54.5 wt% - 79.2 wt%." Id. Thus, Xiao discloses a range of magnesium 54.5-85 wt%, which overlaps and covers much of the claimed range. This claim element would be anticipated solely by the zirconium concentrations falling within the 0.01-1 and/or 0.01-3 wt% ranges. Claim 14 also requires, in addition to a similar zirconium concentration to the Markush claims, a zinc concentration of 0.1-3 wt%.
15. The magnesium composite as defined in claim 14, wherein said additive material includes nickel,			Xiao discloses a "magnesium alloy...and further adds elements of Fe, Cu, Ni, and Ag which can enhance the corrosion performance of the magnesium alloy..." ¶ 0026, ll. 1–9. Xiao teaches the use of a variety of metals as additive materials. See, *e.g.*, at ¶ 0026. For instance, Xiao claims that the novel magnesium alloy may "further compris[e] trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%. . ." *Id.* at Claim 2. In addition, Example 7 of Xiao particularly discloses intermediate alloys Al-Fe, Al-Ni, Al-Ag, Al-Cu, Al-Zr, Al-Ti and Zinc as additive materials. *Id.* at ¶ 0060. A POSITA in April 2014 would have understood that all of these intermediate alloys contain metal, including nickel, among other metals. ¶ 145. Thus, Xiao discloses a number of metal additives, including nickel, and hence fully discloses all of the limitations of these claim elements.
said nickel constitutes about 0.05-35 wt % of said magnesium composite,			Claim 1 of Xiao discloses: a "magnesium alloy, comprising the components at the weight percentages as follows: Al: 13 to 25%, Zn: 2 to 15%, the remainder is Mg, and a sum of the weight percentages of the components is 100%." Claim 1. And Claim 2 discloses: a "magnesium alloy, according to Claim 1, further comprising the trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%; and a sum of

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			the weight percentages of the components is 100%." *Id.* at Claim 2. These metallic elements are found in the additive materials generally disclosed by Xiao (i.e., intermediate alloys: Al-Fe, Al-Ni, Al-Cu, Al-Ti) (¶ 0023) and particularly described in association with Example 7 of Xiao (*Id.* at ¶¶ 0057–0060) for which a POSITA would calculate for Example 7 of Xiao the specific weight percentage (ranges) of each additive material or secondary metal. In particular, a POSITA would determine that the additive materials aluminum-iron with 30 wt% iron, aluminum-nickel with 45 wt% nickel, and aluminum-copper with 40 wt% copper also fall well within the range of about 0.05 wt% to 45 wt% of the mixture. *Id.* ¶ 122. For example, the aluminum-iron additive constitutes 3.3 wt% of the mixture; the aluminum-nickel additive constitutes 1.1 wt% of the mixture; and the aluminum-copper additive constitutes 0.25 wt% of the mixture. Dr. Medlin expressed his opinion that a POSITA in April 2014 would have also recognized that other intermediate alloy compositions would have fallen within the teachings of Example 7 and other disclosures of Xiao resulting in Al-Fe, Al-Ni, and Al-Cu intermediate alloys constituting about 0.05 wt% to 45 wt% of the mixture. *Id.* at ¶ 125. Accordingly, this claim element was disclosed by Xiao.
said nickel forms galvanically-active in situ precipitate in said magnesium composite.			Xiao discloses a novel magnesium alloy with high aluminum and zinc content further adding elements Fe, Cu, Ni and Ag which can form intermetallics and enhance the corrosion performance of the magnesium alloy. ¶ 0026. Xiao explains the corrosion mechanism within a magnesium alloy in terms of a cathode phase, which Xiao explains includes "the β (Mg17Al12) phase and eutectic phase on the grain boundary of the magnesium alloy," and "the magnesium matrix α phase which functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which [micro-batteries] greatly accelerate the corrosion decomposition of magnesium alloy." *Id.* These elements are among the claimed "secondary metals" disclosed by Xiao. Thus, all of the limitations of this claim element are disclosed by Xiao.

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16. The magnesium composite as defined in claim 15, wherein said additive material includes nickel,	***No infringement alleged for this claim.*** ***See Terves' Final Infringement Contentions at 7.***		
said nickel constitutes about 3-7 wt % of said magnesium composite.			Claim 1 of Xiao discloses: a "magnesium alloy, comprising the components at the weight percentages as follows: Al: 13 to 25%, Zn: 2 to 15%, the remainder is Mg, and a sum of the weight percentages of the components is 100%." And Claim 2 discloses: a "magnesium alloy, according to Claim 1, further comprising the trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%; and a sum of the weight percentages of the components is 100%." *Id.* at Claim 2. These metallic elements are found in the additive materials generally disclosed by Xiao (i.e., intermediate alloys: Al-Fe, Al-Ni, Al-Cu, Al-Ti) (¶ 0023) and particularly described in association with Example 7 of Xiao (Id. at ¶¶ 0057–0060) for which a POSITA would calculate for Example 7 of Xiao the specific weight percentage (ranges) of each additive material or secondary metal (i.e. "a material that is added" or "an additional metal that is added". In particular, a POSITA would determine that the additive materials aluminum-iron with 30 wt% iron, aluminum-nickel with 45 wt% nickel, and aluminum-copper with 40 wt% copper also fall well within the range of about 0.05 wt% to 45 wt% of the mixture. *Id.* at ¶ 122. For example, the aluminum-iron additive constitutes 3.3 wt% of the mixture; the aluminum-nickel additive constitutes 1.1 wt% of the mixture; and the aluminum-copper additive constitutes 0.25 wt% of the mixture. A POSITA in April 2014 would have also recognized that other intermediate alloy compositions would have fallen within the teachings of Example 7 and other disclosures of Xiao resulting in Al-Fe, Al-Ni, and Al-Cu intermediate alloys constituting about 0.05 wt% to 45 wt% of the mixture. *Id.* at ¶ 125. Accordingly, this claim element was disclosed by Xiao.

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17. The magnesium composite as defined in claim 15, wherein said additive material includes nickel,	***No infringement alleged for this claim.*** ***See Terves' Final Infringement Contentions at 7***		
said nickel constitutes about 7-10 wt % of said magnesium composite.			
18. The magnesium composite as defined in claim 15, wherein a dissolution rate of said magnesium composite is at least 45 mg/cm2/hr. in 3 wt % KCl water mixture at 90°C. and up to 325 mg/cm^2/hr. in 3 wt % KCl water mixture at 90°C.			A POSITA in April 2014 would have recognized that Xiao disclosed a table of dissolution rates ("decomposition rates") because the units of measurement are the units used by POSITAs to measure dissolution rates. ¶ 129. The disclosed table provides seven examples (excluding the comparative [prior art] example). ¶ 0064. Xiao provides dissolution rates in g/cm2/hr, while the claims of the '653 Patent express dissolution rates in mg/cm2/hr. A POSITA would have known converting between g/cm2/hr to mg/cm2/hr, merely requires multiplication by 1,000. Six of the seven examples (excluding the comparative [prior art] example) provided in Xiao therefore discloses a dissolution rate of "at least 45 mg/cm2/hr in 3 wt % KCl water" and "up to 325 mg/cm2/hr in 3 wt % KCl water" at 93°C. Given that the dissolution rates of Xiao slightly above (i.e., 3°C above) 90°C are almost all above the claimed floor of "at least 45 mg/cm2/hr". As such, a POSITA in April 2014 would have expected the dissolution rate of the examples in Xiao at 90°C to also be necessarily above the claimed floor of "at least 45 mg/cm2/hr." Thus, this element is disclosed by Xiao.
19. The magnesium composite as defined in claim 12, wherein said magnesium alloy includes over 50 wt % magnesium and one or more metals			Xiao discloses a "magnesium alloy...and further adds elements of Fe, Cu, Ni, and Ag which can enhance the corrosion performance of the magnesium alloy..." ¶ 0026, ll. 1–9.

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selected from the group consisting of aluminum in an amount of about 0.5-10 wt %, zinc in amount of about 0.1-6 wt %, zirconium in an amount of about 0.01-3 wt %, manganese in an amount of about 0.15-2 wt %, boron in amount of about 0.0002-0.04 wt %, and bismuth in an amount of about 0.4-0.7 wt %.			Claim 1 of Xiao discloses a "magnesium alloy, comprising the components at the weight percentages as follows: Al: 13 to 25%, Zn: 2 to 15%; the remainder is Mg, and a sum of the weight percentages of the components is 100%." Claim 1. A POSITA would have understood that the total range of the non-magnesium elements disclosed in Claim 1 of Xiao is 15 to 40%, leaving 60-85 wt% for magnesium. A POSITA would also note that the "Examples of Xiao disclose a range of magnesium from 54.5 wt% - 79.2 wt%." *Id.* Thus, Xiao discloses a range of magnesium 54.5-85 wt%, which overlaps and covers much of the claimed range. This claim element would be anticipated solely by the zirconium concentrations falling within the 0.01-1 and/or 0.01-3 wt% ranges. Claim 14 also requires, in addition to a similar zirconium concentration to the Markush claims, a zinc concentration of 0.1-3 wt%.
20. The magnesium composite as defined in claim 12, said additive material includes nickel,			Xiao discloses a "magnesium alloy...and further adds elements of Fe, Cu, Ni, and Ag which can enhance the corrosion performance of the magnesium alloy..." ¶ 0026, ll. 1–9. Xiao teaches the use of a variety of metals as additive materials. See, *e.g.*, ¶ 0026. For instance, Xiao claims that the novel magnesium alloy may "further compris[e] trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%. . ." *Id.* at Claim 2. In addition, Example 7 of Xiao particularly discloses intermediate alloys Al-Fe, Al-Ni, Al-Ag, Al-Cu, Al-Zr, Al-Ti and Zinc as additive materials. *Id.* at ¶ 0060. A POSITA in April 2014 would have understood that all of these intermediate alloys contain metal, including nickel, among other metals. Thus, Xiao discloses a number of metal additives, including nickel, and hence fully discloses all of the limitations of these claim elements.
said nickel constitutes about 0.05-35 wt % of said magnesium composite,			Claim 1 of Xiao discloses: a "magnesium alloy, comprising the components at the weight percentages as follows: Al: 13 to 25%, Zn: 2 to 15%, the remainder is Mg, and a sum of the weight percentages of the components is 100%." Claim 1.

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			And Claim 2 discloses: a "magnesium alloy, according to Claim 1, further comprising the trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%; and a sum of the weight percentages of the components is 100%." *Id.* at Claim 2. These metallic elements are found in the additive materials generally disclosed by Xiao (i.e., intermediate alloys: Al-Fe, Al-Ni, Al-Cu, Al-Ti) (¶ 0023) and particularly described in association with Example 7 of Xiao (*Id.* at ¶¶ 0057–0060) for which a POSITA would calculate for Example 7 of Xiao the specific weight percentage (ranges) of each additive material or secondary metal. In particular, a POSITA would determine that the additive materials aluminum-iron with 30 wt% iron, aluminum-nickel with 45 wt% nickel, and aluminum-copper with 40 wt% copper also fall well within the range of about 0.05 wt% to 45 wt% of the mixture. *Id.* at ¶ 122. For example, the aluminum-iron additive constitutes 3.3 wt% of the mixture; the aluminum-nickel additive constitutes 1.1 wt% of the mixture; and the aluminum-copper additive constitutes 0.25 wt% of the mixture. A POSITA in April 2014 would have also recognized that other intermediate alloy compositions would have fallen within the teachings of Example 7 and other disclosures of Xiao resulting in Al-Fe, Al-Ni, and Al-Cu intermediate alloys constituting about 0.05 wt% to 45 wt% of the mixture. *Id.* at ¶ 125. Accordingly, this claim element was disclosed by Xiao.
said nickel forms galvanically-active in situ precipitate in said magnesium composite.			Xiao discloses a novel magnesium alloy with high aluminum and zinc content further adding elements Fe, Cu, Ni and Ag which can form intermetallics and enhance the corrosion performance of the magnesium alloy. ¶ 0026. Xiao explains the corrosion mechanism within a magnesium alloy in terms of a cathode phase, which Xiao explains includes "the β (Mg17Al12) phase and eutectic phase on the grain boundary of the magnesium alloy," and "the magnesium matrix α phase which functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which [micro-batteries] greatly accelerate the corrosion decomposition of magnesium alloy." *Id.*

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			These elements are among the claimed "secondary metals" disclosed by Xiao. Thus, all of the limitations of this claim element are disclosed by Xiao.
21. The magnesium composite as defined in claim 20, wherein said additive material includes nickel,	***No infringement alleged for this claim.*** ***See Terves' Final Infringement Contentions at 8.***		
said nickel constitutes about 3-7 wt % of said magnesium composite.			Claim 1 of Xiao discloses: a "magnesium alloy, comprising the components at the weight percentages as follows: Al: 13 to 25%, Zn: 2 to 15%, the remainder is Mg, and a sum of the weight percentages of the components is 100%." Xiao at Claim 1. And Claim 2 discloses: a "magnesium alloy, according to Claim 1, further comprising the trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%; and a sum of the weight percentages of the components is 100%." *Id.* at Claim 2. These metallic elements are found in the additive materials generally disclosed by Xiao (i.e., intermediate alloys: Al-Fe, Al-Ni, Al-Cu, Al-Ti) (¶ 0023) and particularly described in association with Example 7 of Xiao (Id. at ¶¶ 0057–0060) for which a POSITA would calculate for Example 7 of Xiaothe specific weight percentage (ranges) of each additive material or secondary metal. In particular, a POSITA would determine that the additive materials aluminum-iron with 30 wt% iron, aluminum-nickel with 45 wt% nickel, and aluminum-copper with 40 wt% copper also fall well within the range of about 0.05 wt% to 45 wt% of the mixture. Id. ¶ 122. For example, the aluminum-iron additive constitutes 3.3 wt% of the mixture; the aluminum-nickel additive constitutes 1.1 wt% of the mixture; and the aluminum-copper additive constitutes 0.25 wt% of the mixture. A POSITA in April 2014 would have also recognized that other intermediate alloy compositions would have fallen within the teachings of Example 7 and other disclosures of Xiao resulting in Al-Fe, Al-Ni, and Al-Cu intermediate alloys constituting about 0.05

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			wt% to 45 wt% of the mixture. *Id.* at ¶ 125. Accordingly, this claim element was disclosed by Xiao.
22. The magnesium composite as defined in claim 20, wherein said additive material includes nickel,	***No infringement alleged for this claim.*** ***See Terves' Final Infringement Contentions at 8.***		
said nickel constitutes about 7-10 wt % of said magnesium composite.			
23. The magnesium composite as defined in claim 12, wherein a dissolution rate of said magnesium composite is at least 45 mg/cm^2/hr. in 3 wt % KCl water mixture at 90°C. and up to 325 mg/cm^2/hr. in 3 wt % KCl water mixture at 90°C.			A POSITA in April 2014 would have recognized that Xiao disclosed a table of dissolution rates ("decomposition rates") because the units of measurement are the units used by POSITAs to measure dissolution rates. The disclosed table provides seven examples (excluding the comparative [prior art] example). Xiao at ¶ 0064. Xiao provides dissolution rates in g/cm2/hr, while the claims of the '653 Patent express dissolution rates in mg/cm2/hr. A POSITA would have known converting between g/cm2/hr to mg/cm2/hr, merely requires multiplication by 1,000. Six of the seven examples (excluding the comparative [prior art] example) provided in Xiao therefore discloses a dissolution rate of "at least 45 mg/cm2/hr in 3 wt % KCl water" and "up to 325 mg/cm2/hr in 3 wt % KCl water" at 93°C. Given that the dissolution rates of Xiao slightly above (i.e., 3°C above) 90°C are almost all above the claimed floor of "at least 45 mg/cm2/hr". As such, a POSITA in April 2014 would have expected the dissolution rate of the examples in Xiao at 90°C to also be necessarily above the claimed floor of "at least 45 mg/cm2/hr." Ex. 1002 at ¶ 205. Thus, this element is disclosed by Xiao.

24. The magnesium composite as defined in claim 12, wherein said additive material is a metal or metal alloy.	***Infringement contention withdrawn pursuant to July 2, 2021 email from Matthew J. Cavanagh.***		Xiao discloses a "magnesium alloy...and further adds elements of Fe, Cu, Ni, and Ag which can enhance the corrosion performance of the magnesium alloy..." ¶ 0026, ll. 1–9. Xiao teaches the use of a variety of metals as additive materials. See, *e.g.*, ¶ 0026. For instance, Xiao claims that the magnesium alloy may "further compris[e] trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%. . ." *Id.* at Claim 2. In addition, Example 7 of Xiao particularly discloses intermediate alloys Al-Fe, Al-Ni, Al-Ag, Al-Cu, Al-Zr, Al-Ti and Zinc as additive materials. *Id.* at ¶ 0060. A POSITA in April 2014 would have understood that all of these additive materials contain metal(s). Accordingly, Example 7 of Xiao discloses this claim element in accordance with Patent Owner's definition of "additive material."
25. A dissolvable magnesium alloy composite for use in a ball or other tool component in a well drilling or completion operation,		Xiao discloses that the cast magnesium alloy "can be used as a tripping ball material for a multi-stage sliding sleeve staged-fracturing technique." ¶ 0001. A POSITA would have understood that a tripping ball was a type of tool component in an oil well drilling operation.	
said dissolvable magnesium alloy composite comprising at least 85 wt % magnesium;		Claim 1 of Xiao discloses a "magnesium alloy, comprising the components at the weight percentages as follows: Al: 13 to 25%, Zn: 2 to 15%, the remainder is Mg, and a sum of the weight percentages of the components is 100%." A POSITA would have understood that the range of non-magnesium elements in Claim 1 leaves 60-85 wt% for magnesium. Thus, Xiao discloses a range of magnesium up to 85 wt%, which touches the claimed range (i.e. at least 85 wt% magnesium) set forth in this claim element. However, this leaves no room for any of the claimed additive materials. Xiao also discloses a prior art magnesium alloy represented by Mg-Al-Zn (with AZ91D magnesium alloy being the most widely used) wherein the "main components of this alloy and the respective weight percentages are as follows: Al 8.3 to 9.7, Zn 0.35 to 1.0, Mn 0.15 to 0.5, and the remainder [(i.e.	

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		88.8 to 91.2 wt%)] is magnesium." *Id.* at ¶ 0003. Xiao also uses an AZ91D as a comparative example alloy, with a composition of 9 wt% Al, 1 wt% Zn, 0.3 wt% Zr, and 0.1 wt% Mn, with the remainder (i.e. 89.6 wt%) being magnesium. *Id.* at ¶ 0032. Xiao teaches a primary difference between this prior art and its novel magnesium alloy lies in the addition of metallic elements like Iron, Copper, and/or Nickel into the alloy. *Id.* at ¶ 0026 ("[e]lements such as Fe, Cu, Ni, Ag, etc., in the magnesium alloy can form a large number of intermetallic composite micro-particles, which can improve the corrosion performance of the magnesium alloy, thereby promoting the decomposition of the magnesium alloy"). The dissolution data in Xiao (¶ 0061) teaches that the addition of Iron, Copper, and/or Nickel (alongside the Aluminum, Zinc, Zirconium, and Manganese of the prior art AZ91D example) caused a surprisingly large increase in dissolution rates. Thus, Xiao, as a whole, teaches magnesium compositions with magnesium content above 85 wt% and "room" for the novel additive materials (i.e. "Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%" (Xiao at Claim 2)). Thus, Xiao fully discloses a range of magnesium of at least 85 wt %, touching and even overlapping the claimed range.	
one or more metals selected from the group consisting of 0.5-10 wt % aluminum, 0.05-6 wt % zinc, 0.01-3 wt % zirconium, and 0.15-2 wt % manganese; and about 0.05-45 wt % of a secondary metal to form a galvanically-active intermetallic particle that promotes corrosion of said dissolvable magnesium alloy composite,		This claim element would be anticipated solely by the zirconium concentrations falling within the 0.01-3 wt% range. Claim 25 also requires, in addition to a similar zirconium concentration to the Markush claims, a zinc concentration of 0.05-6 wt%. Claim 1 of Xiao discloses "Al: 13 to 25%, Zn: 2 to 15%," and Claim 2 of Xiao discloses secondary metals of "Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%; and a sum of the weight percentages of the components is 100%." Thus, Xiao teaches 0.05-0.5 wt% zirconium, which touches and covers at least a portion of these claimed ranges. Xiao similarly teaches 2-15 wt% zinc, which covers much of the claimed (0.05-6 wt%) zinc concentration. A claim is invalid as anticipated when it is in Markush form and a prior art reference disclosed one of the claimed elements. See	

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		Fresenius USA, Inc. v. Baxter Int'l, Inc., 582 F.3d 1288, 1298 (Fed. Cir. 2009). See also *Abbott Labs. v. Baxter Pharm. Prods., Inc.*, 334 F.3d 1274, 1280 (Fed.Cir.2003); *Schering Corp. v. Geneva Pharms., Inc.*, 339 F.3d 1373, 1380 (Fed.Cir.2003); These metallic elements are found in the additive materials generally disclosed by Xiao (i.e., intermediate alloys: Al-Fe, Al-Ni, Al-Cu, Al-Ti) (¶ 0023) and particularly described in association with Example 7 of Xiao (*Id.* at ¶¶ 0057–0060) for which a POSITA would calculate for Example 7 of Xiao the specific weight percentage (ranges) of each additive material or secondary metal. In particular, a POSITA would determine that the additive materials aluminum-iron with 30 wt% iron, aluminum-nickel with 45 wt% nickel, and aluminum-copper with 40 wt% copper also fall well within the range of about 0.05 wt% to 45 wt% of the mixture. For example, the aluminum-iron additive constitutes 3.3 wt% of the mixture; the aluminum-nickel additive constitutes 1.1 wt% of the mixture; and the aluminum-copper additive constitutes 0.25 wt% of the mixture. A POSITA in April 2014 would have also recognized that other intermediate alloy compositions would have fallen within the teachings of Example 7 and other disclosures of Xiao resulting in Al-Fe, Al-Ni, and Al-Cu intermediate alloys constituting about 0.05 wt% to 45 wt% of the mixture. Accordingly, this claim element was disclosed by Xiao.	
said secondary metal including one or more metals selected from the group consisting of copper, nickel, cobalt, titanium and iron,		Xiao teaches the use of a variety of metals as additive materials. See, e.g., ¶ 0026. For instance, Xiao claims that the novel magnesium alloy may "further compris[e] trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%. . ." *Id.* at Claim 2. In addition, Example 7 of Xiao particularly discloses intermediate alloys Al-Fe, Al-Ni, Al-Ag, Al-Cu, Al-Zr, Al-Ti and Zinc as additive materials. *Id.* at ¶ 0060. A POSITA in April 2014 would have understood that all of these intermediate alloys contain metal, including, in particular, copper, nickel, and iron, among other metals. Thus, Xiao discloses a number of metal additives, including copper,	

		nickel, and iron and, hence fully discloses all of the limitations of these claim elements.	
said magnesium alloy composite has a dissolution rate of at least 5 $mg/cm^2/hr$. in 3 wt % KCI water mixture at 90°C.		A POSITA in April 2014 would have recognized that Xiao disclosed a table of dissolution rates ("decomposition rates") because the units of measurement are the units used by POSITAs to measure dissolution rates. The disclosed table provides seven examples (excluding the comparative [prior art] example). ¶ 0064. Xiao provides dissolution rates in $g/cm^2/hr$, while the claims of the '653 Patent express dissolution rates in $mg/cm^2/hr$. A POSITA would have known converting between $g/cm^2/hr$ to $mg/cm^2/hr$, merely requires multiplication by 1,000. Thus, each of Xiao's seven examples (excluding the comparative [prior art] example) has a dissolution rate of at least three times the claimed "at least 5 $mg/cm^2/hr$ in 3 wt.% KCl water" at both 70°C or 93°C (with Example 7 being more than seven times that floor), a POSITA in April 2014 would have recognized that the dissolution rate of the examples in Xiao would necessarily have been well above the claimed floor of "at least of 5 $mg/cm^2/hr$" at the claimed 90°C.	
26. The dissolvable magnesium alloy composite as defined in claim 25, wherein a dissolution rate of said magnesium alloy composite is 100-325 $mg/cm^2/hr$. in 3 wt % KCl water mixture at 90°C.			
27. The dissolvable magnesium composite as defined in claim 25, wherein said secondary metal includes nickel,		Xiao discloses a "magnesium alloy...and further adds elements of Fe, Cu, Ni, and Ag which can enhance the corrosion performance of the magnesium alloy..." ¶ 0026, ll. 1–9.	

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		Xiao teaches the use of a variety of metals as additive materials. See, *e.g.*, ¶ 0026. For instance, Xiao claims that the novel magnesium alloy may "further compris[e] trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%. . ." *Id.* at Claim 2. In addition, Example 7 of Xiao particularly discloses intermediate alloys Al-Fe, Al-Ni, Al-Ag, Al-Cu, Al-Zr, Al-Ti and Zinc as additive materials. *Id.* at ¶ 0060. A POSITA in April 2014 would have understood that all of these intermediate alloys contain metal, including nickel, among other metals. Thus, Xiao discloses a number of metal additives, including nickel, and hence fully discloses all of the limitations of these claim elements.	
said nickel forms galvanically-active in situ precipitate in said magnesium composite.		Xiao discloses a novel magnesium alloy with high aluminum and zinc content further adding elements Fe, Cu, Ni and Ag which can form intermetallics and enhance the corrosion performance of the magnesium alloy. ¶ 0026. Xiao explains the corrosion mechanism within a magnesium alloy in terms of a cathode phase, which Xiao explains includes "the β (Mg17Al12) phase and eutectic phase on the grain boundary of the magnesium alloy," and "the magnesium matrix α phase which functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which [micro-batteries] greatly accelerate the corrosion decomposition of magnesium alloy." Id. These elements are among the claimed "secondary metals" disclosed by Xiao. Thus, all of the limitations of this claim element are disclosed by Xiao.	
28. The dissolvable magnesium alloy composite as defined in claim 25, wherein said additive material is a metal or metal alloy.	***Infringement contention withdrawn pursuant to July 2, 2021 email from Matthew J. Cavanagh***	Xiao discloses a "magnesium alloy...and further adds elements of Fe, Cu, Ni, and Ag which can enhance the corrosion performance of the magnesium alloy..." ¶ 0026, ll. 1–9. Xiao teaches the use of a variety of metals as additive materials. See, *e.g.*, ¶ 0026. For instance, Xiao claims that the magnesium alloy may "further compris[e] trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%. . ." Id.	

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		at Claim 2. In addition, Example 7 of Xiao particularly discloses intermediate alloys Al-Fe, Al-Ni, Al-Ag, Al-Cu, Al-Zr, Al-Ti and Zinc as additive materials. *Id.* at ¶ 0060. A POSITA in April 2014 would have understood that all of these additive materials contain metal(s). Accordingly, Example 7 of Xiao discloses this claim element in accordance with Patent Owner's definition of "additive material."	
29. A dissolvable magnesium alloy composite for use in a ball or other tool component in a well drilling or completion operation,	Xiao discloses a "magnesium alloy...and further adds elements of Fe, Cu, Ni, and Ag which can enhance the corrosion performance of the magnesium alloy..." ¶ 0026, ll. 1–9. Xiao discloses that the cast magnesium alloy "can be used as a tripping ball material for a multi-stage sliding sleeve staged-fracturing technique." ¶ 0001. A POSITA would have understood that a tripping ball was a type of tool component in an oil well drilling operation.		
said dissolvable magnesium alloy composite comprising 60-95 wt % magnesium; 0.01-1 wt % zirconium; and about 0.05-45 wt % of a secondary metal	Claim 1 of Xiao discloses a "magnesium alloy, comprising the components at the weight percentages as follows: Al: 13 to 25%, Zn: 2 to 15%; the remainder is Mg, and a sum of the weight percentages of the components is 100%." Xiao at Claim 1 (emphasis added). A POSITA would have understood that the total range of the non-magnesium elements disclosed in Claim 1 of Xiao is 15 to 40%, leaving 60-85 wt% for magnesium. Examples of Xiao disclose a range of magnesium from 54.5 wt% - 79.2 wt%. Thus, Xiao discloses a range of magnesium 54.5-85 wt%, which overlaps and covers much of the claimed ranges set forth in these claim elements. This claim element of Claim 29 would be anticipated solely by the zirconium concentrations falling within the 0.01-1 range. Claim 1 of Xiao discloses "Al: 13 to 25%, Zn: 2 to 15%," and Claim 2 of Xiao discloses secondary metals of "Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%; and a sum of the weight percentages of the components is 100%." Thus, Xiao teaches 0.05-0.5 wt% zirconium, which touches and covers at least a portion of these claimed ranges.		

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	Xiao similarly teaches 2-15 wt% zinc, which covers much of the claimed (0.05-6 wt%) zinc concentration. A claim is invalid as anticipated when it is in Markush form and a prior art reference disclosed one of the claimed elements. See Fresenius USA, Inc. v. Baxter Int'l, Inc., 582 F.3d 1288, 1298 (Fed. Cir. 2009). See also Abbott Labs. v. Baxter Pharm. Prods., Inc., 334 F.3d 1274, 1280 (Fed.Cir.2003); Schering Corp. v. Geneva Pharms., Inc., 339 F.3d 1373, 1380 (Fed.Cir.2003); These metallic elements are found in the additive materials generally disclosed by Xiao (i.e., intermediate alloys: Al-Fe, Al-Ni, Al-Cu, Al-Ti) (¶ 0023) and particularly described in association with Example 7 of Xiao (*Id.* at ¶¶ 0057–0060) for which a POSITA would calculate for Example 7 of Xiao the specific weight percentage (ranges) of each additive material or secondary metal. In particular, a POSITA would determine that the additive materials aluminum-iron with 30 wt% iron, aluminum- nickel with 45 wt% nickel, and aluminum-copper with 40 wt% copper also fall well within the range of about 0.05 wt% to 45 wt% of the mixture. For example, the aluminum-iron additive constitutes 3.3 wt% of the mixture; the aluminum-nickel additive constitutes 1.1 wt% of the mixture; and the aluminum-copper additive constitutes 0.25 wt% of the mixture. A POSITA in April 2014 would have also recognized that other intermediate alloy compositions would have fallen within the teachings of Example 7 and other disclosures of Xiao resulting in Al-Fe, Al-Ni, and Al-Cu intermediate alloys constituting about 0.05 wt% to 45 wt% of the mixture. Accordingly, this claim element was disclosed by Xiao.		
to form a galvanically-active intermetallic particle that promotes corrosion of said dissolvable magnesium alloy composite,	Xiao discloses a novel magnesium alloy with high aluminum and zinc content further adding elements Fe, Cu, Ni and Ag which can form intermetallics and enhance the corrosion performance of the magnesium alloy. ¶ 0026. Xiao explains the corrosion mechanism within a magnesium alloy in terms of a cathode phase, which Xiao explains includes “the β (Mg17Al12) phase and eutectic phase on the grain boundary of the magnesium alloy,” and “the magnesium matrix α phase which functions as an anode phase, so that the matrix and the		

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	grain boundary of the magnesium alloy form a large amount of micro-batteries, which [micro-batteries] greatly accelerate the corrosion decomposition of magnesium alloy." *Id.* These elements are among the claimed "secondary metals" disclosed by Xiao. Thus, all of the limitations of this claim element are disclosed by Xiao.		
said secondary metal including one or more metals selected from the group consisting of copper, nickel, cobalt, titanium and iron,	Xiao teaches the use of a variety of metals as additive materials. See, *e.g.*, ¶ 0026. For instance, Xiao claims that the novel magnesium alloy may "further compris[e] trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%. . ."Id. at Claim 2. In addition, Example 7 of Xiao particularly discloses intermediate alloys Al-Fe, Al-Ni, Al-Ag, Al-Cu, Al-Zr, Al-Ti and Zinc as additive materials. *Id.* at ¶ 0060. A POSITA in April 2014 would have understood that all of these intermediate alloys contain metal, including, in particular, copper, nickel, and iron, among other metals. Thus, Xiao discloses a number of metal additives, including copper, nickel, and iron and, hence fully discloses all of the limitations of these claim elements.		
said magnesium alloy composite has a dissolution rate of at least 5 $mg/cm^2/hr$. in 3 wt % KCl water mixture at 90°C.	A POSITA in April 2014 would have recognized that Xiao disclosed a table of dissolution rates ("decomposition rates") because the units of measurement are the units used by POSITAs to measure dissolution rates. The disclosed table provides seven examples (excluding the comparative [prior art] example). Xiao provides dissolution rates in $g/cm^2/hr$, while the claims of the '653 Patent express dissolution rates in $mg/cm^2/hr$. A POSITA would have known that converting between $g/cm^2/hr$ to $mg/cm^2/hr$, merely requires multiplication by 1,000. Thus, each of Xiao's seven examples (excluding the comparative [prior art] example) has a dissolution rate of at least three times the claimed "at least 5 $mg/cm^2/hr$ in 3 wt.% KCl water" at both 70°C or 93°C (with Example 7 being more than seven times that floor). A POSITA in April 2014 would have recognized that the dissolution rate of the examples in		

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	Xiao would necessarily have been well above the claimed floor of "at least of 5 mg/cm^2/hr" at the claimed 90°C.		
30. The dissolvable magnesium alloy composite as defined in claim 29, wherein a dissolution rate of said magnesium alloy composite is 5-325 mg/cm^2/hr. in 3 wt % KCl water mixture at 90°C.	A POSITA in April 2014 would have recognized that Xiao disclosed a table of dissolution rates ("decomposition rates") because the units of measurement are the units used by POSITAs to measure dissolution rates. The disclosed table provides seven examples (excluding the comparative [prior art] example). Xiao at ¶ 0064. Xiao provides dissolution rates in g/cm2/hr, while the claims of the '653 Patent express dissolution rates in mg/cm2/hr. A POSITA would have known converting between g/cm2/hr to mg/cm2/hr, merely requires multiplication by 1,000. Thus, as each of Xiao's seven examples (excluding the comparative [prior art] example) has a dissolution rate within the claimed range of "about 5-325 mg/cm2/hr in 3 wt.% KCl water" at both 70°C or 93°C (with Example 7 being more than seven times that floor), a POSITA in April 2014 would have recognized that the dissolution rate of the examples in Xiao would necessarily have been well above the claimed floor of "about 5" mg/cm2/hr at the claimed 90°C.		
31. The dissolvable magnesium composite as defined in claim 29, wherein said secondary metal includes nickel,	Xiao discloses a "magnesium alloy...and further adds elements of Fe, Cu, Ni, and Ag which can enhance the corrosion performance of the magnesium alloy..." Xiao at ¶ 0026, ll. 1–9. Xiao teaches the use of a variety of metals as additive materials. See, *e.g.*, *id.* at ¶ 0026. For instance, Xiao claims that the novel magnesium alloy may "further compris[e] trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%. . ."*Id.* at Claim 2. In addition, Example 7 of Xiao particularly discloses intermediate alloys Al-Fe, Al-Ni, Al-Ag, Al-Cu, Al-Zr, Al-Ti and Zinc as additive materials. Id. at ¶ 0060. A POSITA in April 2014 would have understood that all of these intermediate alloys contain metal, including nickel, among other metals. Thus, Xiao discloses a number of		

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	metal additives, including nickel, and hence fully discloses all of the limitations of this claim element.		
said nickel forms galvanically-active in situ precipitate in said magnesium composite.	Xiao discloses a novel magnesium alloy with high aluminum and zinc content further adding elements Fe, Cu, Ni and Ag which can form intermetallics and enhance the corrosion performance of the magnesium alloy. Xiao at ¶ 0026. Xiao explains the corrosion mechanism within a magnesium alloy in terms of a cathode phase, which Xiao explains includes "the β (Mg17Al12) phase and eutectic phase on the grain boundary of the magnesium alloy," and "the magnesium matrix α phase which functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which [micro-batteries] greatly accelerate the corrosion decomposition of magnesium alloy." Id. These elements are among the claimed "secondary metals" disclosed by Xiao. Thus, all of the limitations of this claim element are disclosed by Xiao.		
32. The dissolvable magnesium alloy composite as defined in claim 29, wherein said additive material is a metal or metal alloy.	***Infringement contention withdrawn pursuant to July 2, 2021 email from Matthew J. Cavanagh.*** Xiao discloses a "magnesium alloy...and further adds elements of Fe, Cu, Ni, and Ag which can enhance the corrosion performance of the magnesium alloy..." Xiao at ¶ 0026, ll. 1–9. Xiao teaches the use of a variety of metals as additive materials. See, *e.g.*, *id.* at ¶ 0026. For instance, Xiao claims that the magnesium alloy may "further compris[e] trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%. . ." Id. at Claim 2. In addition, Example 7 of Xiao particularly discloses intermediate alloys Al-Fe, Al-Ni, Al-Ag, Al-Cu, Al-Zr, Al-Ti and Zinc as additive materials. Id. at ¶ 0060. A POSITA in April 2014 would have understood that all of these additive materials contain metal(s). Accordingly, Example 7 of Xiao discloses this claim element in accordance with Patent Owner's definition of "additive material."		

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33. A dissolvable magnesium alloy composite for use in a ball or other tool component in a well drilling or completion operation,		Xiao discloses a "magnesium alloy...and further adds elements of Fe, Cu, Ni, and Ag which can enhance the corrosion performance of the magnesium alloy..." Xiao at ¶ 0026, ll. 1–9. Xiao discloses that the cast magnesium alloy "can be used as a tripping ball material for a multi-stage sliding sleeve staged-fracturing technique." ¶ 0001. A POSITA would have understood that a tripping ball was a type of tool component in an oil well drilling operation.	
said dissolvable magnesium alloy composite comprising 60-95 wt % magnesium; 0.5-10 wt % aluminum; 0.05-6 wt % zinc; 0.15-2 wt % manganese; and about 0.05-45 wt % of a secondary metal		Claim 1 of Xiao discloses a "magnesium alloy, comprising the components at the weight percentages as follows: Al: 13 to 25%, Zn: 2 to 15%; the remainder is Mg, and a sum of the weight percentages of the components is 100%." Xiao at Claim 1 (emphasis added).A POSITA would have understood that the total range of the non-magnesium elements disclosed in Claim 1 of Xiao is 15 to 40%, leaving 60-85 wt% for magnesium. Examples of Xiao disclose a range of magnesium from 54.5 wt% - 79.2 wt%." *Id.* Thus, Xiao discloses a range of magnesium 54.5-85 wt%, which overlaps and covers much of the claimed ranges set forth in these claim elements. Claim 2 discloses: a "magnesium alloy, according to Claim 1, further comprising the trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%; and a sum of the weight percentages of the components is 100%." *Id.* at Claim 2. These metallic elements are found in the additive materials generally disclosed by Xiao (i.e., intermediate alloys: Al-Fe, Al-Ni, Al-Cu, Al-Ti) (Xiao at ¶ 0023) and particularly described in association with Example 7 of Xiao (*Id.* at ¶¶ 0057–0060) for which a POSITA would calculate for Example 7 of Xiao the specific weight percentage (ranges) of each additive material or secondary metal. In particular, a POSITA would have determined that the additive materials aluminum-iron with 30 wt% iron, aluminum- nickel with 45 wt% nickel, and aluminum-copper with 40 wt% copper also fall well within the range of about 0.05 wt% to 45 wt% of the	

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		mixture. For example, the aluminum-iron additive constitutes 3.3 wt% of the mixture; the aluminum-nickel additive constitutes 1.1 wt% of the mixture; and the aluminum-copper additive constitutes 0.25 wt% of the mixture. A POSITA in April 2014 would have also recognized that other intermediate alloy compositions would have fallen within the teachings of Example 7 and other disclosures of Xiao resulting in Al-Fe, Al-Ni, and Al-Cu intermediate alloys constituting about 0.05 wt% to 45 wt% of the mixture. Accordingly, these claim elements are disclosed by Xiao. Claim 1 of Xiao discloses a "magnesium alloy, comprising the components at the weight percentages as follows: Al: 13 to 25%, Zn: 2 to 15%, the remainder is Mg, and a sum of the weight percentages of the components is 100%." Xiao (emphasis added). A POSITA would have understood that the range of non-magnesium elements in Claim 1 leaves 60-85 wt% for magnesium. Thus, Xiao discloses a range of magnesium up to 85 wt%, which touches the claimed range (i.e. at least 85 wt% magnesium) set forth in these claim elements. However, this leaves no room for any of the claimed additive materials. Xiao also discloses a prior art magnesium alloy represented by Mg-Al-Zn (with AZ91D magnesium alloy being the most widely used) wherein the "main components of this alloy and the respective weight percentages are as follows: Al 8.3 to 9.7, Zn 0.35 to 1.0, Mn 0.15 to 0.5, and the remainder [(i.e. 88.8 to 91.2 wt%)] is magnesium." Id. at ¶ 0003. Xiao also uses an AZ91D as a comparative example alloy, with a composition of 9 wt% Al, 1 wt% Zn, 0.3 wt% Zr, and 0.1 wt% Mn, with the remainder (i.e. 89.6 wt%) being magnesium. *Id.* at ¶ 0032. Xiao teaches a primary difference between this prior art and its novel magnesium alloy lies in the addition of metallic elements like Iron, Copper, and/or Nickel into the alloy. *Id.* at ¶ 0026 ("[e]lements such as Fe, Cu, Ni, Ag, etc., in the magnesium alloy can form a large number of intermetallic composite micro-particles, which can	

		improve the corrosion performance of the magnesium alloy, thereby promoting the decomposition of the magnesium alloy"). The dissolution data in Xiao (Xiao at ¶ 0061) teaches that the addition of Iron, Copper, and/or Nickel (alongside the Aluminum, Zinc, Zirconium, and Manganese of the prior art AZ91D example) caused a surprisingly large increase in dissolution rates. Thus, Xiao, as a whole, teaches magnesium compositions with magnesium content above 85 wt% and "room" for the novel additive materials (i.e. "Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%" (Xiao at Claim 2)). Thus, Xiao fully discloses a range of magnesium of at least 85 wt %, touching and even overlapping the claim range.	
to form a galvanically-active intermetallic particle that promotes corrosion of said dissolvable magnesium alloy composite,		Xiao discloses a novel magnesium alloy with high aluminum and zinc content further adding elements Fe, Cu, Ni and Ag which can form intermetallics and enhance the corrosion performance of the magnesium alloy. Xiao at ¶ 0026. Xiao explains the corrosion mechanism within a magnesium alloy in terms of a cathode phase, which Xiao explains includes "the β (Mg17Al12) phase and eutectic phase on the grain boundary of the magnesium alloy," and "the magnesium matrix α phase which functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which [micro- batteries] greatly accelerate the corrosion decomposition of magnesium alloy." Id. These elements are among the claimed "secondary metals" disclosed by Xiao. Thus, all of the limitations of this claim element are disclosed by Xiao.	
said secondary metal including one or more metals selected from the group consisting of copper, nickel, cobalt, titanium and iron,		Xiao teaches the use of a variety of metals as additive materials. See, e.g., Xiao at ¶ 0026. For instance, Xiao claims that the novel magnesium alloy may "further compris[e] trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%. . ." Id. at Claim 2. In addition, Example 7 of Xiao particularly discloses intermediate alloys Al-Fe, Al-Ni, Al-	

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		Ag, Al-Cu, Al-Zr, Al-Ti and Zinc as additive materials. Id. at ¶ 0060. A POSITA in April 2014 would have understood that all of these intermediate alloys contain metal, including, in particular, copper, nickel, and iron, among other metals. Thus, Xiao discloses a number of metal additives, including copper, nickel, and iron and, hence fully discloses all of the limitations of these claim elements.	
said magnesium alloy composite has a dissolution rate of at least 5 $mg/cm^2/hr$. in 3 wt % KCl water mixture at 90°C.		A POSITA in April 2014 would have recognized that Xiao disclosed a table of dissolution rates ("decomposition rates") because the units of measurement are the units used by POSITAs to measure dissolution rates. The disclosed table provides seven examples (excluding the comparative [prior art] example). Xiao at ¶ 0064. Xiao provides dissolution rates in $g/cm^2/hr$, while the claims of the '653 Patent express dissolution rates in $mg/cm^2/hr$. A POSITA would have known converting between $g/cm^2/hr$ to $mg/cm^2/hr$, merely requires multiplication by 1,000. Thus, as each of Xiao's seven examples (excluding the comparative [prior art] example) has a dissolution rate of at least three times the claimed "at least 5 $mg/cm^2/hr$ in 3 wt.% KCl water" at both 70°C or 93°C (with Example 7 being more than seven times that floor), a POSITA in April 2014 would have recognized that the dissolution rate of the examples in Xiao would necessarily have been well above the claimed floor of "at least of 5 $mg/cm^2/hr$" at the claimed 90°C.	
34. The dissolvable magnesium alloy composite as defined in claim 33, wherein a dissolution rate of said magnesium alloy composite is 5-325 mg/cm'/hr. in 3 wt % KCl water mixture at 90°C.		A POSITA in April 2014 would have recognized that Xiao disclosed a table of dissolution rates ("decomposition rates") because the units of measurement are the units used by POSITAs to measure dissolution rates. The disclosed table provides seven examples (excluding the comparative [prior art] example). Xiao at ¶ 0064. Xiao provides dissolution rates in g/cm2/hr, while the claims of the '653 Patent express dissolution rates in mg/cm2/hr. A POSITA would have known converting between g/cm2/hr to mg/cm2/hr, merely requires multiplication by 1,000.	

		Thus, each of Xiao's seven examples (excluding the comparative [prior art] example) has a dissolution rate within the claimed range of of at least three times the claimed "about 5-325 mg/cm2/hr in 3 wt.% KCl water" at both 70°C or 93°C (with Example 7 being more than seven times that floor), A POSITA in April 2014 would have recognized that the dissolution rate of the examples in Xiao would necessarily have been well above the claimed floor of "about 5" "about 5-325 mg/cm2/hr" at the claimed 90°C.	
35. The dissolvable magnesium composite as defined in claim 33, wherein said secondary metal includes nickel,		Xiao discloses a "magnesium alloy...and further adds elements of Fe, Cu, Ni, and Ag which can enhance the corrosion performance of the magnesium alloy..." Xiao at ¶ 0026, ll. 1–9. Xiao teaches the use of a variety of metals as additive materials. See, e.g., Xiao at ¶ 0026. For instance, Xiao claims that the novel magnesium alloy may "further compris[e] trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%. . ."Id. at Claim 2. In addition, Example 7 of Xiao particularly discloses intermediate alloys Al-Fe, Al-Ni, Al-Ag, Al-Cu, Al-Zr, Al-Ti and Zinc as additive materials. Id. at ¶ 0060. A POSITA in April 2014 would have understood that all of these intermediate alloys contain metal, including nickel, among other metals. Thus, Xiao discloses a number of metal additives, including nickel, and hence fully discloses all of the limitations of these claim elements.	
said nickel forms galvanically-active in situ precipitate in said magnesium composite.		Xiao discloses a novel magnesium alloy with high aluminum and zinc content further adding elements Fe, Cu, Ni and Ag which can form intermetallics and enhance the corrosion performance of the magnesium alloy. Xiao at ¶ 0026. Xiao explains the corrosion mechanism within a magnesium alloy in terms of a cathode phase, which Xiao explains includes "the β (Mg17Al12) phase and eutectic phase on the grain boundary of the magnesium alloy," and "the magnesium matrix α phase which functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which [micro-batteries]	

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		greatly accelerate the corrosion decomposition of magnesium alloy." Id. These elements are among the claimed "secondary metals" disclosed by Xiao. Thus, all of the limitations of this claim element are disclosed by Xiao.	
36. The dissolvable magnesium alloy composite as defined in claim 33, wherein said additive material is a metal or metal alloy.	***Infringement contention withdrawn pursuant to July 2, 2021 email from Matthew J. Cavanagh***	Xiao discloses a "magnesium alloy...and further adds elements of Fe, Cu, Ni, and Ag which can enhance the corrosion performance of the magnesium alloy..." Xiao at ¶ 0026, ll. 1–9. Xiao teaches the use of a variety of metals as additive materials. See, e.g., Xiao at ¶ 0026. For instance, Xiao claims that the magnesium alloy may "further compris[e] trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%. . ." Id. at Claim 2. In addition, Example 7 of Xiao particularly discloses intermediate alloys Al-Fe, Al-Ni, Al-Ag, Al-Cu, Al-Zr, Al-Ti and Zinc as additive materials. Id. at ¶ 0060. A POSITA in April 2014 would have understood that all of these additive materials contain metal(s). Accordingly, Example 7 of Xiao discloses this claim element in accordance with Patent Owner's definition of "additive material."	
37. A dissolvable magnesium alloy composite for use in a ball or other tool component in a well drilling or completion operation,	Xiao discloses a "magnesium alloy...and further adds elements of Fe, Cu, Ni, and Ag which can enhance the corrosion performance of the magnesium alloy..." Xiao at ¶ 0026, ll. 1–9. Xiao discloses that the cast magnesium alloy "can be used as a tripping ball material for a multi-stage sliding sleeve staged-fracturing technique." ¶ 0001. A POSITA would have understood that a tripping ball was a type of tool component in an oil well drilling operation. Thus, these claim elements were disclosed by Xiao.		
said dissolvable magnesium alloy	Claim 1 of Xiao discloses a "magnesium alloy, comprising the components at the weight percentages as follows: Al: 13 to		

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composite comprising 60-95 wt % magnesium; 0.05-6 wt % zinc; 0.01-1 wt % zirconium;	25%, Zn: 2 to 15%; the remainder is Mg, and a sum of the weight percentages of the components is 100%." Xiao at Claim 1 (emphasis added). A POSITA would have understood that the total range of the non-magnesium elements disclosed in Claim 1 of Xiao is 15 to 40%, leaving 60-85 wt% for magnesium.The examples of Xiao disclose a range of magnesium from 54.5 wt% - 79.2 wt%. Thus, Xiao discloses a range of magnesium 54.5-85 wt%, which overlaps and covers much of the claimed ranges set forth in these claim elements. Claim 2 discloses: a "magnesium alloy, according to Claim 1, further comprising the trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%; and a sum of the weight percentages of the components is 100%." Id. at Claim 2. These metallic elements are found in the additive materials generally disclosed by Xiao (i.e., intermediate alloys: Al-Fe, Al-Ni, Al-Cu, Al-Ti) (Xiao at ¶ 0023) and particularly described in association with Example 7 of Xiao (Id. at ¶¶ 0057–0060) for which a POSITA would calculate for Example 7 of Xiao the specific weight percentage (ranges) of each additive material or secondary metal. In particular, a POSITA would have determined that the additive materials aluminum-iron with 30 wt% iron, aluminum-nickel with 45 wt% nickel, and aluminum-copper with 40 wt% copper also fall well within the range of about 0.05 wt% to 45 wt% of the mixture. For example, the aluminum-iron additive constitutes 3.3 wt% of the mixture; the aluminum-nickel additive constitutes 1.1 wt% of the mixture; and the aluminum-copper additive constitutes 0.25 wt% of the mixture. A POSITA in April 2014 would have also recognized that other intermediate alloy compositions would have fallen within the teachings of Example 7 and other disclosures of Xiao resulting in Al-Fe, Al-Ni, and Al-Cu intermediate alloys constituting about 0.05 wt% to 45 wt% of the mixture. Accordingly, these claim elements are disclosed by Xiao.		
and about 0.05-45 wt % of a secondary metal to form a galvanically-active	Xiao discloses a novel magnesium alloy with high aluminum and zinc content further adding elements Fe, Cu, Ni and Ag which can form intermetallics and enhance the corrosion		

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intermetallic particle that promotes corrosion of said dissolvable magnesium alloy composite,	performance of the magnesium alloy. Xiao at ¶ 0026. Xiao explains the corrosion mechanism within a magnesium alloy in terms of a cathode phase, which Xiao explains includes "the β (Mg17Al12) phase and eutectic phase on the grain boundary of the magnesium alloy," and "the magnesium matrix α phase which functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which [micro-batteries] greatly accelerate the corrosion decomposition of magnesium alloy." Id. These elements are among the claimed "secondary metals" disclosed by Xiao. Thus, all of the limitations of this claim element are disclosed by Xiao.		
said secondary metal including one or more metals selected from the group consisting of copper, nickel, cobalt, titanium and iron,	Xiao teaches the use of a variety of metals as additive materials. See, e.g., Xiao at ¶ 0026. For instance, Xiao claims that the novel magnesium alloy may "further compris[e] trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%. . ." Id. at Claim 2. In addition, Example 7 of Xiao particularly discloses intermediate alloys Al-Fe, Al-Ni, Al-Ag, Al-Cu, Al-Zr, Al-Ti and Zinc as additive materials. Id. at ¶ 0060. A POSITA in April 2014 would have understood that all of these intermediate alloys contain metal, including, in particular, copper, nickel, and iron, among other metals. Thus, Xiao discloses a number of metal additives, including copper, nickel, and iron and, hence fully discloses all of the limitations of these claim elements.		
said magnesium alloy composite has a dissolution rate of at least 5 $mg/cm^2/hr$. in 3 wt % KCl water mixture at 90°C.	A POSITA in April 2014 would have recognized that Xiao disclosed a table of dissolution rates ("decomposition rates") because the units of measurement are the units used by POSITAs to measure dissolution rates. The disclosed table provides seven examples (excluding the comparative [prior art] example). Xiao at ¶ 0064. Xiao provides dissolution rates in $g/cm^2/hr$, while the claims of the '653 Patent express dissolution rates in $mg/cm^2/hr$. A POSITA would have known converting between $g/cm^2/hr$ to $mg/cm^2/hr$, merely requires multiplication by 1,000.		

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	Thus, each of Xiao's seven examples (excluding the comparative [prior art] example) has a dissolution rate of at least three times the claimed "at least 5 mg/cm^2/hr in 3 wt.% KCl water" at both 70°C or 93°C (with Example 7 being more than seven times that floor), a POSITA in April 2014 would have recognized that the dissolution rate of the examples in Xiao would necessarily have been well above the claimed floor of "at least of 5 mg/cm^2/hr" at the claimed 90°C.		
38. The dissolvable magnesium alloy composite as defined in claim 37, wherein a dissolution rate of said magnesium alloy composite is 5-325 mg/cm^2/hr. in 3 wt % KCl water mixture at 90°C.	A POSITA in April 2014 would have recognized that Xiao disclosed a table of dissolution rates ("decomposition rates") because the units of measurement are the units used by POSITAs to measure dissolution rates.The disclosed table provides seven examples (excluding the comparative [prior art] example). Xiao at ¶ 0064. Xiao provides dissolution rates in g/cm2/hr, while the claims of the '653 Patent express dissolution rates in mg/cm2/hr. A POSITA would have known converting between g/cm2/hr to mg/cm2/hr, merely requires multiplication by 1,000. Thus, each of Xiao's seven examples (excluding the comparative [prior art] example) has a dissolution rate within the claimed range of of at least three times the claimed "about 5-325 mg/cm2/hr in 3 wt.% KCl water" at both 70°C or 93°C (with Example 7 being more than seven times that floor),a POSITA in April 2014 would have recognized that the dissolution rate of the examples in Xiao would necessarily have been well above the claimed floor of "about 5" "about 5-325 mg/cm2/hr" at the claimed 90°C.		
39. The dissolvable magnesium composite as defined in claim 37, wherein said secondary metal includes nickel,	Xiao discloses a "magnesium alloy...and further adds elements of Fe, Cu, Ni, and Ag which can enhance the corrosion performance of the magnesium alloy..." Xiao at ¶ 0026, ll. 1–9. Xiao teaches the use of a variety of metals as additive materials. See, e.g., Xiao at ¶ 0026. For instance, Xiao claims that the novel magnesium alloy may "further compris[e] trace elements at the weight percentages as follows: Fe: 0.1 to 5%,		

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	Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%. . .”Id. at Claim 2. In addition, Example 7 of Xiao particularly discloses intermediate alloys Al-Fe, Al-Ni, Al-Ag, Al-Cu, Al-Zr, Al-Ti and Zinc as additive materials. Id. at ¶ 0060. A POSITA in April 2014 would have understood that all of these intermediate alloys contain metal, including nickel, among other metals. Thus, Xiao discloses a number of metal additives, including nickel, and hence fully discloses all of the limitations of these claim elements.		
said nickel forms galvanically-active in situ precipitate in said magnesium composite.	Xiao discloses a novel magnesium alloy with high aluminum and zinc content further adding elements Fe, Cu, Ni and Ag which can form intermetallics and enhance the corrosion performance of the magnesium alloy. Xiao at ¶ 0026. Xiao explains the corrosion mechanism within a magnesium alloy in terms of a cathode phase, which Xiao explains includes “the β (Mg17Al12) phase and eutectic phase on the grain boundary of the magnesium alloy,” and “the magnesium matrix α phase which functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which [micro-batteries] greatly accelerate the corrosion decomposition of magnesium alloy.” Id. These elements are among the claimed “secondary metals” disclosed by Xiao. Thus, all of the limitations of this claim element are disclosed by Xiao.		
40. The dissolvable magnesium alloy composite as defined in claim 37, wherein said additive material is a metal or metal alloy.	***Infringement contention withdrawn pursuant to July 2, 2021 email from Matthew J. Cavanagh.*** Xiao discloses a “magnesium alloy...and further adds elements of Fe, Cu, Ni, and Ag which can enhance the corrosion performance of the magnesium alloy...” Xiao at ¶ 0026, ll. 1–9. Xiao teaches the use of a variety of metals as additive materials. See, e.g., Xiao at ¶ 0026. For instance, Xiao claims that the magnesium alloy may “further compris[e] trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to		

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	0.5%. . .” Id. at Claim 2. In addition, Example 7 of Xiao particularly discloses intermediate alloys Al-Fe, Al-Ni, Al-Ag, Al-Cu, Al-Zr, Al-Ti and Zinc as additive materials. Id. at ¶ 0060. A POSITA in April 2014 would have understood that all of these additive materials contain metal(s). Accordingly, Example 7 of Xiao discloses this claim element in accordance with Patent Owner’s definition of “additive material.”		
41. A dissolvable magnesium alloy composite for use in a ball or other tool component in a well drilling or completion operation,	Xiao discloses a “magnesium alloy...and further adds elements of Fe, Cu, Ni, and Ag which can enhance the corrosion performance of the magnesium alloy...” Xiao at ¶ 0026, ll. 1–9. Xiao discloses that the cast magnesium alloy “can be used as a tripping ball material for a multi-stage sliding sleeve staged-fracturing technique.” ¶ 0001. A POSITA would have understood that a tripping ball was a type of tool component in an oil well drilling operation. Thus, these claim elements were disclosed by Xiao.		
said dissolvable magnesium alloy composite comprising over 50 wt % magnesium; one or more metals selected from the group consisting of 0.5-10 wt % aluminum, 0.1-2 wt % zinc, 0.01-1 wt % zirconium, and 0.15-2 wt % manganese;	Claim 1 of Xiao discloses a “magnesium alloy, comprising the components at the weight percentages as follows: Al: 13 to 25%, Zn: 2 to 15%; the remainder is Mg, and a sum of the weight percentages of the components is 100%.” Xiao at Claim 1 (emphasis added). A POSITA would have understood that the total range of the non-magnesium elements disclosed in Claim 1 of Xiao is 15 to 40%, leaving 60-85 wt% for magnesium. The examples of Xiao disclose a range of magnesium from 54.5 wt% - 79.2 wt%. Thus, Xiao discloses a range of magnesium 54.5-85 wt%, which overlaps and covers much of the claimed ranges set forth in these claim elements. This claim element would be anticipated solely by the zirconium concentrations falling within the 0.01-1 and/or 0.01-3 wt% ranges. Claim 41 also requires, in addition to a similar zirconium concentration to the Markush claims, a zinc concentration of 0.1-2 wt%. Claim 1 of Xiao discloses “Al: 13 to 25%, Zn: 2 to 15%,” and Claim 2 of Xiao discloses secondary metals of “Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to		

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	0.5%; and a sum of the weight percentages of the components is 100%." Thus, Xiao teaches 0.05-0.5 wt% zirconium, which touches and covers at least a portion of these claimed ranges. Xiao similarly teaches 2-15 wt% zinc, which covers much of the claimed (0.05-6 wt%) zinc concentration. A claim is invalid as anticipated when it is in Markush form and a prior art reference disclosed one of the claimed elements. See Fresenius USA, Inc. v. Baxter Int'l, Inc., 582 F.3d 1288, 1298 (Fed. Cir. 2009). See also Abbott Labs. v. Baxter Pharm. Prods., Inc., 334 F.3d 1274, 1280 (Fed.Cir.2003); Schering Corp. v. Geneva Pharms., Inc., 339 F.3d 1373, 1380 (Fed.Cir.2003); Thus, Xiao teaches all of these claim limitations. Claim 2 discloses: a "magnesium alloy, according to Claim 1, further comprising the trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%; and a sum of the weight percentages of the components is 100%." Id. at Claim 2. These metallic elements are found in the additive materials generally disclosed by Xiao (i.e., intermediate alloys: Al-Fe, Al-Ni, Al-Cu, Al-Ti) (Xiao at ¶ 0023) and particularly described in association with Example 7 of Xiao (Id. at ¶¶ 0057–0060) for which a POSITA would calculate for Example 7 of Xiao the specific weight percentage (ranges) of each additive material or secondary metal. In particular, a POSITA would have determined that the additive materials aluminum-iron with 30 wt% iron, aluminum-nickel with 45 wt% nickel, and aluminum-copper with 40 wt% copper also fall well within the range of about 0.05 wt% to 45 wt% of the mixture. For example, the aluminum-iron additive constitutes 3.3 wt% of the mixture; the aluminum-nickel additive constitutes 1.1 wt% of the mixture; and the aluminum-copper additive constitutes 0.25 wt% of the mixture. A POSITA in April 2014 would have also recognized that other intermediate alloy compositions would have fallen within the teachings of Example 7 and other disclosures of Xiao resulting in Al-Fe, Al-Ni, and Al-Cu intermediate alloys constituting about 0.05		

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	wt% to 45 wt% of the mixture. Accordingly, these claim elements are disclosed by Xiao. Xiao discloses a novel magnesium alloy with high aluminum and zinc content further adding elements Fe, Cu, Ni and Ag which can form intermetallics and enhance the corrosion performance of the magnesium alloy. Xiao at ¶ 0026. Xiao explains the corrosion mechanism within a magnesium alloy in terms of a cathode phase, which Xiao explains includes "the β (Mg17Al12) phase and eutectic phase on the grain boundary of the magnesium alloy," and "the magnesium matrix α phase which functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which [micro- batteries] greatly accelerate the corrosion decomposition of magnesium alloy." Id. These elements are among the claimed "secondary metals" disclosed by Xiao. Thus, all of the limitations of this claim element are disclosed by Xiao.		
and about 0.05-45 wt % of a secondary metal to form a galvanically-active intermetallic particle that promotes corrosion of said dissolvable magnesium alloy composite,	Xiao teaches the use of a variety of metals as additive materials. See, e.g., Xiao at ¶ 0026. For instance, Xiao claims that the novel magnesium alloy may "further compris[e] trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%. . ."Id. at Claim 2. In addition, Example 7 of Xiao particularly discloses intermediate alloys Al-Fe, Al-Ni, Al-Ag, Al-Cu, Al-Zr, Al-Ti and Zinc as additive materials. Id. at ¶ 0060. A POSITA in April 2014 would have understood that all of these intermediate alloys contain metal, including, in particular, copper, nickel, and iron, among other metals. Thus, Xiao discloses a number of metal additives, including copper, nickel, and iron and, hence fully discloses all of the limitations of these claim elements.		
said secondary metal including one or more metals selected from the group consisting of copper, nickel and cobalt,	Xiao teaches the use of a variety of metals as additive materials. See, e.g., Xiao at ¶ 0026. For instance, Xiao claims that the novel magnesium alloy may "further compris[e] trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%. . ."Id. at Claim 2. In addition, Example 7 of Xiao		

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	particularly discloses intermediate alloys Al-Fe, Al-Ni, Al-Ag, Al-Cu, Al-Zr, Al-Ti and Zinc as additive materials. Id. at ¶ 0060. A POSITA in April 2014 would have understood that all of these intermediate alloys contain metal, including, in particular, copper, nickel, and iron, among other metals. Thus, Xiao discloses a number of metal additives, including copper, nickel, and iron and, hence fully discloses all of the limitations of these claim elements.		
said magnesium alloy composite has a dissolution rate of at least 5 $mg/cm^2/hr$. in 3 wt % KCl water mixture at 90°C.	A POSITA in April 2014 would have recognized that Xiao disclosed a table of dissolution rates ("decomposition rates") because the units of measurement are the units used by POSITAs to measure dissolution rates. The disclosed table provides seven examples (excluding the comparative [prior art] example). Xiao at ¶ 0064. Xiao provides dissolution rates in $g/cm^2/hr$, while the claims of the '653 Patent express dissolution rates in $mg/cm^2/hr$. A POSITA would have known converting between $g/cm^2/hr$ to $mg/cm^2/hr$, merely requires multiplication by 1,000. Thus, each of Xiao's seven examples (excluding the comparative [prior art] example) has a dissolution rate of at least three times the claimed "at least 5 $mg/cm^2/hr$ in 3 wt.% KCl water" at both 70°C or 93°C (with Example 7 being more than seven times that floor), a POSITA in April 2014 would have recognized that the dissolution rate of the examples in Xiao would necessarily have been well above the claimed floor of "at least of 5 $mg/cm^2/hr$" at the claimed 90°C.		
42. The dissolvable magnesium alloy composite as defined in claim 41, wherein a dissolution rate of said magnesium alloy composite is 5-325 $mg/cm^2/hr$. in 3 wt % KCl water mixture at 90°C.	A POSITA in April 2014 would have recognized that Xiao disclosed a table of dissolution rates ("decomposition rates") because the units of measurement are the units used by POSITAs to measure dissolution rates.The disclosed table provides seven examples (excluding the comparative [prior art] example). Xiao at ¶ 0064. Xiao provides dissolution rates in g/cm2/hr, while the claims of the '653 Patent express dissolution rates in mg/cm2/hr. A POSITA would have known converting between g/cm2/hr to mg/cm2/hr, merely requires multiplication by 1,000.		

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	Thus, as each of Xiao's seven examples (excluding the comparative [prior art] example) has a dissolution rate within the claimed range of of at least three times the claimed "about 5-325 mg/cm2/hr in 3 wt.% KCl water" at both 70°C or 93°C (with Example 7 being more than seven times that floor), a POSITA in April 2014 would have recognized that the dissolution rate of the examples in Xiao would necessarily have been well above the claimed floor of "about 5" "about 5-325 mg/cm2/hr" at the claimed 90°C.		
43. The dissolvable magnesium composite as defined in claim 41, wherein said secondary metal includes nickel,	Xiao discloses a "magnesium alloy...and further adds elements of Fe, Cu, Ni, and Ag which can enhance the corrosion performance of the magnesium alloy..." Xiao at ¶ 0026, ll. 1–9. Xiao teaches the use of a variety of metals as additive materials. See, e.g., Xiao at ¶ 0026. For instance, Xiao claims that the novel magnesium alloy may "further compris[e] trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%. . ."Id. at Claim 2. In addition, Example 7 of Xiao particularly discloses intermediate alloys Al-Fe, Al-Ni, Al-Ag, Al-Cu, Al-Zr, Al-Ti and Zinc as additive materials. Id. at ¶ 0060. A POSITA in April 2014 would have understood that all of these intermediate alloys contain metal, including, in particular, copper, nickel, and iron, among other metals. Thus, Xiao discloses a number of metal additives, including copper, nickel, and iron and, hence fully discloses all of the limitations of these claim elements.		
said nickel forms galvanically-active in situ precipitate in said magnesium composite.	Xiao discloses a novel magnesium alloy with high aluminum and zinc content further adding elements Fe, Cu, Ni and Ag which can form intermetallics and enhance the corrosion performance of the magnesium alloy. Xiao at ¶ 0026. Xiao explains the corrosion mechanism within a magnesium alloy in terms of a cathode phase, which Xiao explains includes "the β (Mg17Al12) phase and eutectic phase on the grain boundary of the magnesium alloy," and "the magnesium matrix α phase which functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a		

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	large amount of micro-batteries, which [micro-batteries] greatly accelerate the corrosion decomposition of magnesium alloy." Id. These elements are among the claimed "secondary metals" disclosed by Xiao. Thus, all of the limitations of this claim element are disclosed by Xiao.		
44. The dissolvable magnesium alloy composite as defined in claim 41, wherein said additive material is a metal or metal alloy.	***Infringement contention withdrawn pursuant to July 2, 2021 email from Matthew J. Cavanagh*** Xiao discloses a "magnesium alloy...and further adds elements of Fe, Cu, Ni, and Ag which can enhance the corrosion performance of the magnesium alloy..." Xiao at ¶ 0026, ll. 1–9. Xiao teaches the use of a variety of metals as additive materials. See, e.g., Xiao at ¶ 0026. For instance, Xiao claims that the magnesium alloy may "further compris[e] trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%. . ." Id. at Claim 2. In addition, Example 7 of Xiao particularly discloses intermediate alloys Al-Fe, Al-Ni, Al-Ag, Al-Cu, Al-Zr, Al-Ti and Zinc as additive materials. Id. at ¶ 0060. A POSITA in April 2014 would have understood that all of these additive materials contain metal(s). Accordingly, Example 7 of Xiao discloses this claim element in accordance with Patent Owner's definition of "additive material."		
45. A dissolvable magnesium alloy composite for use in a ball or other tool component in a well drilling or completion operation,	Xiao discloses a "magnesium alloy...and further adds elements of Fe, Cu, Ni, and Ag which can enhance the corrosion performance of the magnesium alloy..." Xiao at ¶ 0026, ll. 1–9. Xiao discloses that the cast magnesium alloy "can be used as a tripping ball material for a multi-stage sliding sleeve staged-fracturing technique." ¶ 0001. A POSITA would have understood that a tripping ball was a type of tool component in an oil well drilling operation. Thus, these claim elements were disclosed by Xiao.		

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	Claim 2 discloses: a "magnesium alloy, according to Claim 1, further comprising the trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%; and a sum of the weight percentages of the components is 100%." Id. at Claim 2. These metallic elements are found in the additive materials generally disclosed by Xiao (i.e., intermediate alloys: Al-Fe, Al-Ni, Al-Cu, Al-Ti) (Xiao at ¶ 0023) and particularly described in association with Example 7 of Xiao (Id. at ¶¶ 0057–0060) for which a POSITA would have calculated for Example 7 of Xiao the specific weight percentage (ranges) of each additive material or secondary metal . In particular, a POSITA would have determined that the additive materials aluminum-iron with 30 wt% iron, aluminum-nickel with 45 wt% nickel, and aluminum-copper with 40 wt% copper also fall well within the range of about 0.05 wt% to 45 wt% of the mixture. For example, the aluminum-iron additive constitutes 3.3 wt% of the mixture; the aluminum-nickel additive constitutes 1.1 wt% of the mixture; and the aluminum-copper additive constitutes 0.25 wt% of the mixture. A POSITA in April 2014 would have also recognized that other intermediate alloy compositions would have fallen within the teachings of Example 7 and other disclosures of Xiao resulting in Al-Fe, Al-Ni, and Al-Cu intermediate alloys constituting about 0.05 wt% to 45 wt% of the mixture. Accordingly, these claim elements are disclosed by Xiao.		
said dissolvable magnesium alloy composite comprising over 50 wt % magnesium; one or more metals selected from the group consisting of 0.1-3 wt % zinc, 0.01-1 wt % zirconium, 0.05-1 wt % manganese, 0.0002-0.04 wt % boron, and 0.4-0.7 wt % bismuth; and about 0.05-45 wt % of a	Claim 1 of Xiao discloses a "magnesium alloy, comprising the components at the weight percentages as follows: Al: 13 to 25%, Zn: 2 to 15%; the remainder is Mg, and a sum of the weight percentages of the components is 100%." Xiao at Claim 1 (emphasis added). A POSITA would have understood that the total range of the non-magnesium elements disclosed in Claim 1 of Xiao is 15 to 40%, leaving 60-85 wt% for magnesium. The examples of Xiao disclose a range of magnesium from 54.5 wt% - 79.2 wt%. Id. Thus, Xiao discloses a range of magnesium 54.5-85 wt%, which overlaps and covers much of the claimed ranges set forth in these claim elements.		

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secondary metal to form a galvanically-active intermetallic particle that promotes corrosion of said dissolvable magnesium alloy composite	All of the foregoing Markush claim elements (i.e., Claims 25, 41, 45, and 55) and this claim element of Claim 29 would be anticipated solely by the zirconium concentrations falling within the 0.01-1 and/or 0.01-3 wt% ranges. Claim 37 also requires, in addition to a similar zirconium concentration to the Markush claims, a zinc concentration of 0.05-6 wt%. Claim 1 of Xiao discloses "Al: 13 to 25%, Zn: 2 to 15%," and Claim 2 of Xiao discloses secondary metals of "Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%; and a sum of the weight percentages of the components is 100%." Thus, Xiao teaches 0.05-0.5 wt% zirconium, which touches and covers at least a portion of these claimed ranges. Xiao similarly teaches 2-15 wt% zinc, which covers much of the claimed (0.05-6 wt%) zinc concentration. A claim is invalid as anticipated when it is in Markush form and a prior art reference disclosed one of the claimed elements. See Fresenius USA, Inc. v. Baxter Int'l, Inc., 582 F.3d 1288, 1298 (Fed. Cir. 2009). See also Abbott Labs. v. Baxter Pharm. Prods., Inc., 334 F.3d 1274, 1280 (Fed.Cir.2003); Schering Corp. v. Geneva Pharms., Inc., 339 F.3d 1373, 1380 (Fed.Cir.2003); Thus, Xiao teaches all of these claim limitations. Xiao discloses a novel magnesium alloy with high aluminum and zinc content further adding elements Fe, Cu, Ni and Ag which can form intermetallics and enhance the corrosion performance of the magnesium alloy. Xiao at ¶ 0026. Xiao explains the corrosion mechanism within a magnesium alloy in terms of a cathode phase, which Xiao explains includes "the β (Mg17Al12) phase and eutectic phase on the grain boundary of the magnesium alloy," and "the magnesium matrix α phase which functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which [micro- batteries] greatly accelerate the corrosion decomposition of magnesium alloy." Id. These elements are among the claimed "secondary metals" disclosed by Xiao. Thus, all of the limitations of this claim element are disclosed by Xiao.		

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said secondary metal including one or more metals selected from the group consisting of copper, nickel, and cobalt,	Xiao teaches the use of a variety of metals as additive materials. See, e.g., Xiao at ¶ 0026. For instance, Xiao claims that the novel magnesium alloy may "further compris[e] trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%. . ." Id. at Claim 2. In addition, Example 7 of Xiao particularly discloses intermediate alloys Al-Fe, Al-Ni, Al-Ag, Al-Cu, Al-Zr, Al-Ti and Zinc as additive materials. Id. at ¶ 0060. A POSITA in April 2014 would have understood that all of these intermediate alloys contain metal, including, in particular, copper, nickel, and iron, among other metals. Thus, Xiao discloses a number of metal additives, including copper, nickel, and iron and, hence fully discloses all of the limitations of these claim elements.		
said magnesium alloy composite has a dissolution rate of at least 5 $mg/cm^2/hr$. in 3 wt % KCl water mixture at 90°C.	A POSITA in April 2014 would have recognized that Xiao disclosed a table of dissolution rates ("decomposition rates") because the units of measurement are the units used by POSITAs to measure dissolution rates. The disclosed table provides seven examples (excluding the comparative [prior art] example). Xiao at ¶ 0064. Xiao provides dissolution rates in $g/cm^2/hr$, while the claims of the '653 Patent express dissolution rates in $mg/cm^2/hr$. A POSITA would have known that converting between $g/cm^2/hr$ to $mg/cm^2/hr$, merely requires multiplication by 1,000. Thus, each of Xiao's seven examples (excluding the comparative [prior art] example) has a dissolution rate of at least three times the claimed "at least 5 $mg/cm^2/hr$ in 3 wt.% KCl water" at both 70°C or 93°C (with Example 7 being more than seven times that floor), a POSITA in April 2014 would have recognized that the dissolution rate of the examples in Xiao would necessarily have been well above the claimed floor of "at least of 5 $mg/cm^2/hr$" at the claimed 90°C.		
46. The dissolvable magnesium alloy composite as defined in claim 45, wherein a dissolution rate of said	A POSITA in April 2014 would have recognized that Xiao disclosed a table of dissolution rates ("decomposition rates") because the units of measurement are the units used by POSITAs to measure dissolution rates. The disclosed table		

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magnesium alloy composite is 5-325 mg/cm^2/hr. in 3 wt % KCl water mixture at 90°C.	provides seven examples (excluding the comparative [prior art] example). Xiao at ¶ 0064. Xiao provides dissolution rates in g/cm2/hr, while the claims of the '653 Patent express dissolution rates in mg/cm2/hr. A POSITA would have known converting between g/cm2/hr to mg/cm2/hr, merely requires multiplication by 1,000. Thus, as each of Xiao's seven examples (excluding the comparative [prior art] example) has a dissolution rate within the claimed range of "about 5-325 mg/cm2/hr in 3 wt.% KCl water" at both 70°C or 93°C (with Example 7 being more than seven times that floor), a POSITA in April 2014 would have recognized that the dissolution rate of the examples in Xiao would necessarily have been well above the claimed floor of "about 5" mg/cm2/hr at the claimed 90°C.		
47. The dissolvable magnesium composite as defined in claim 45, wherein said secondary metal includes nickel,	Xiao discloses a "magnesium alloy...and further adds elements of Fe, Cu, Ni, and Ag which can enhance the corrosion performance of the magnesium alloy..." Xiao at ¶ 0026, ll. 1–9. Xiao teaches the use of a variety of metals as additive materials. See, e.g., Xiao at ¶ 0026. For instance, Xiao claims that the novel magnesium alloy may "further compris[e] trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%. . ."Id. at Claim 2. In addition, Example 7 of Xiao particularly discloses intermediate alloys Al-Fe, Al-Ni, Al-Ag, Al-Cu, Al-Zr, Al-Ti and Zinc as additive materials. Id. at ¶ 0060. A POSITA in April 2014 would have understood that all of these intermediate alloys contain metal, including nickel, among other metals. Thus, Xiao discloses a number of metal additives, including nickel, and hence fully discloses all of the limitations of these claim elements.		
said nickel forms galvanically-active in situ	Xiao discloses a novel magnesium alloy with high aluminum and zinc content further adding elements Fe, Cu, Ni and Ag		

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precipitate in said magnesium composite.	which can form intermetallics and enhance the corrosion performance of the magnesium alloy. Xiao at ¶ 0026. Xiao explains the corrosion mechanism within a magnesium alloy in terms of a cathode phase, which Xiao explains includes "the β (Mg17Al12) phase and eutectic phase on the grain boundary of the magnesium alloy," and "the magnesium matrix α phase which functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which [micro-batteries] greatly accelerate the corrosion decomposition of magnesium alloy." Id. These elements are among the claimed "secondary metals" disclosed by Xiao. Thus, all of the limitations of this claim element are disclosed by Xiao.		
48. The dissolvable magnesium alloy composite as defined in claim 45, wherein said additive material is a metal or metal alloy.	***Infringement contention withdrawn pursuant to July 2, 2021 email from Matthew J. Cavanagh.*** Xiao discloses a "magnesium alloy...and further adds elements of Fe, Cu, Ni, and Ag which can enhance the corrosion performance of the magnesium alloy..." Xiao at ¶ 0026, ll. 1–9. Xiao teaches the use of a variety of metals as additive materials. See, e.g., Xiao at ¶ 0026. For instance, Xiao claims that the magnesium alloy may "further compris[e] trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%. . ." Id. at Claim 2. In addition, Example 7 of Xiao particularly discloses intermediate alloys Al-Fe, Al-Ni, Al-Ag, Al-Cu, Al-Zr, Al-Ti and Zinc as additive materials. Id. at ¶ 0060. A POSITA in April 2014 would have understood that all of these additive materials contain metal(s).		

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49. A magnesium composite that includes in situ precipitation of galvanically-active intermetallic phases to enable controlled dissolution of said magnesium composite,	Xiao discloses a "magnesium alloy...and further adds elements of Fe, Cu, Ni, and Ag which can enhance the corrosion performance of the magnesium alloy..." Xiao at ¶ 0026, ll. 1–9. This disclosure meets the Patent Owner's construction of "magnesium composite." S Xiao discloses a novel magnesium alloy with high aluminum and zinc content further adding elements Fe, Cu, Ni and Ag which can form intermetallics and enhance the corrosion performance of the magnesium alloy. Xiao explains the corrosion mechanism within a magnesium alloy in terms of a cathode phase, which Xiao explains includes "the β (Mg17Al12) phase and eutectic phase on the grain boundary of the magnesium alloy," and "the magnesium matrix α phase which functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which [micro-batteries] greatly accelerate the corrosion decomposition of magnesium alloy." Xiao at ¶ 0026. A POSITA in August 2014 would have understood this disclosure of "intermetallic composite micro-particles" to be a reference to intermetallic precipitate. A POSITA reading the Xiao reference in April 2014 would have recognized that the precipitation of galvanically-active intermetallic phases ("micro-batteries") are naturally and necessarily generated by the in situ reaction between magnesium and any and all of the disclosed metal additives forming in situ precipitate. Thus, these claim elements were disclosed by Xiao.		
said magnesium composite comprising a mixture of magnesium or a magnesium alloy and an additive material,	Xiao discloses "first loading pure magnesium and pure aluminum into a smelting furnace . . . next loading pure zinc and an [sic] intermediate alloys of trace element components into a resulting magnesium-aluminum alloy melt after melting." Xiao, at ¶ 0022. Xiao discloses that "Al-Fe ... Al-Ni ... Al-Cu ... Al- Ag ... Al-Zr ... and ... Al-Ti intermediate alloy[s], are heated to dry and then added to the magnesium-aluminum alloy melt." Id. at ¶ 0023. These intermediate alloys meet the Patent Owner's definition of "additive		

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	material," i.e., "a material that is added." The addition of these intermediate alloys to the melted magnesium alloy necessarily results in a mixture of the additive material and magnesium alloy.		
said additive material constituting about 0.05-45 wt % of said mixture,	Claim 1 of Xiao discloses: a "magnesium alloy, comprising the components at the weight percentages as follows: Al: 13 to 25%, Zn: 2 to 15%, the remainder is Mg, and a sum of the weight percentages of the components is 100%." Xiao at Claim 1. And Claim 2 discloses: a "magnesium alloy, according to Claim 1, further comprising the trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%; and a sum of the weight percentages of the components is 100%." Id. at Claim 2. These metallic elements are found in the additive materials generally disclosed by Xiao (i.e., intermediate alloys: Al-Fe, Al-Ni, Al-Cu, Al-Ti) (Xiao at ¶ 0023) and particularly described in association with Example 7 of Xiao (Id. at ¶¶ 0057–0060) for which a POSITA would have calculated for Example 7 of Xiao the specific weight percentage (ranges) of each additive material or secondary metal. In particular, a POSITA would have determined that the additive materials aluminum-iron with 30 wt% iron, aluminum- nickel with 45 wt% nickel, and aluminum-copper with 40 wt% copper also fall well within the range of about 0.05 wt% to 45 wt% of the mixture. For example, the aluminum-iron additive constitutes 3.3 wt% of the mixture; the aluminum-nickel additive constitutes 1.1 wt% of the mixture; and the aluminum-copper additive constitutes 0.25 wt% of the mixture. A POSITA in April 2014 would have also recognized that other intermediate alloy compositions would have fallen within the teachings of Example 7 and other disclosures of Xiao resulting in Al-Fe, Al-Ni, and Al-Cu intermediate alloys constituting about 0.05 wt% to 45 wt% of the mixture. Accordingly, these claim elements are disclosed by Xiao.		
said additive material includes one or more metals selected from the group consisting of copper,	Xiao teaches the use of a variety of metals as additive materials. See, e.g., Xiao at ¶ 0026. For instance, Xiao claims that the novel magnesium alloy may "further compris[e] trace elements at the weight percentages as follows: Fe: 0.1 to 5%,		

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nickel, titanium, iron, and cobalt,	Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%. . .”Id. at Claim 2. In addition, Example 7 of Xiao particularly discloses intermediate alloys Al-Fe, Al-Ni, Al-Ag, Al-Cu, Al-Zr, Al-Ti and Zinc as additive materials. Id. at ¶ 0060. A POSITA in April 2014 would have understood that all of these intermediate alloys contain metal, including, in particular, copper, nickel, and iron, among other metals. Thus, Xiao discloses a number of metal additives, including copper, nickel, and iron and, hence fully discloses all of the limitations of these claim elements.		
said magnesium composite including in situ precipitation of galvanically-active intermetallic phases that include said additive material,	Xiao discloses a novel magnesium alloy with high aluminum and zinc content further adding elements Fe, Cu, Ni and Ag which can form intermetallics and enhance the corrosion performance of the magnesium alloy. Xiao at ¶ 0026. Xiao explains the corrosion mechanism within a magnesium alloy in terms of a cathode phase, which Xiao explains includes “the β (Mg17Al12) phase and eutectic phase on the grain boundary of the magnesium alloy,” and “the magnesium matrix α phase which functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which [micro- batteries] greatly accelerate the corrosion decomposition of magnesium alloy.” Id. A POSITA in August 2014 would have understood this disclosure of “intermetallic composite micro-particles” to be a reference to intermetallic precipitate. As noted above, at least Fe, Cu, and Ni are “additive materials.” Consequently, the in-situ precipitation of galvanically- active intermetallic phases will include one or more of these additive materials. Thus, Xiao discloses all of these claim limitations.		
said additive material located in sufficient quantities in said galvanically-active intermetallic phases so as to obtain a composition and morphology of said galvanically-active intermetallic phases such	A POSITA would understand that the galvanically-active intermetallic phases (“composite micro-particles”) have a morphology that enhances the corrosion dissolution rate of the alloy due to a larger number of smaller particles throughout the microstructure. A POSITA would also understand the relationship between “composite micro-particles” and morphology of the galvanically-active intermetallic phases. Id.		

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that a galvanic corrosion rate along said galvanically-active intermetallic phases causes said magnesium composite to have a dissolution rate of at least at least 5 $mg/cm^2/hr$. in 3 wt % KCl water mixture at 90°C.	With respect to the "sufficient quantities" limitation, other claim limitations in Claims 49 and 73, define the weight percentage for the additive material as 0.05-45 wt% and about 0.05 wt%, respectively, which limitations are met by the teaching of Xiao with respect to four metals. In particular, Xiao discloses that "[e]lements such as Fe, Cu, Ni, Ag, etc., in the magnesium alloy can form a large number of intermetallic composite micro-particles, which can improve the corrosion performance of the magnesium alloy, thereby promoting the decomposition of the magnesium alloy." Id. ¶ 0026. And the magnesium alloy may "further compris[e] trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%;..." Id. at Claim 2. As such, Xiao discloses four metals (i.e., Fe, Cu, Ni, and Ti) included within the list of "additive material" set forth in Claim Element M, supra. The claimed weight % quantities of the "additive material" of Claim Element I, supra, also overlap with the weight % ranges of Xiao's "trace elements". As such, Claim Element P of claims 49 and 73—that the "additive materials" are located in "sufficient quantities"--is fully disclosed by Xiao's Claim 2 disclosure of "trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%..." Id. As such, Xiao's four metal "trace elements" are present in "sufficient quantities" to meet Claim Element P of claims 49 and 73. A POSITA in April 2014 would have recognized that Xiao disclosed a table of dissolution rates ("decomposition rates") because the units of measurement are the units used by POSITAs to measure dissolution rates. The disclosed table provides seven examples (excluding the comparative [prior art] example). Xiao at ¶ 0064. Xiao provides dissolution rates in $g/cm^2/hr$, while the claims of the '653 Patent express dissolution rates in $mg/cm^2/hr$. A POSITA would have known converting between $g/cm^2/hr$ to $mg/cm^2/hr$, merely requires multiplication by 1,000. Thus, as each of Xiao's seven examples (excluding the comparative [prior art] example) has a dissolution rate of at least three times the claimed "at least 5 $mg/cm^2/hr$ in 3 wt.%		

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	KCl water" at both 70°C or 93°C (with Example 7 being more than seven times that floor), a POSITA in April 2014 would have recognized that the dissolution rate of the examples in Xiao would necessarily have been well above the claimed floor of "at least of 5 mg/cm^2/hr" at the claimed 90°C. Id. at ¶ 132.		
50. The magnesium composite as defined in claim 49, wherein said additive material includes one or more metals selected from the group consisting of copper, nickel, and cobalt.	Xiao teaches the use of a variety of metals as additive materials. See, e.g., Xiao at ¶ 0026. For instance, Xiao claims that the novel magnesium alloy may "further compris[e] trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%. . ."Id. at Claim 2. In addition, Example 7 of Xiao particularly discloses intermediate alloys Al-Fe, Al-Ni, Al-Ag, Al-Cu, Al-Zr, Al-Ti and Zinc as additive materials. Id. at ¶ 0060. A POSITA in April 2014 would have understood that all of these intermediate alloys contain metal, including, in particular, copper and nickel, among other metals. Ex. 1002 at ¶ 145. Thus, Xiao discloses a number of metal additives, including copper and nickel, and hence fully discloses all of the limitations of these claim elements.		
51. The magnesium composite as defined in claim 49, wherein said additive material includes particles having an average particle diameter size of about 0.1-500 microns.	***Infringement contention withdrawn pursuant to July 2, 2021 email from Matthew J. Cavanagh***		
52. The magnesium composite as defined in claim 49, wherein said magnesium alloy includes over 50 wt % magnesium, and one or more metals selected from the group	Xiao discloses a "magnesium alloy...and further adds elements of Fe, Cu, Ni, and Ag which can enhance the corrosion performance of the magnesium alloy..." Xiao at ¶ 0026, ll. 1–9.		

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consisting of aluminum, boron, bismuth, zinc, zirconium, and manganese.	Claim 1 of Xiao discloses a "magnesium alloy, comprising the components at the weight percentages as follows: Al: 13 to 25%, Zn: 2 to 15%; the remainder is Mg, and a sum of the weight percentages of the components is 100%." Xiao at Claim 1 (emphasis added). A POSITA would have understood that the total range of the non-magnesium elements disclosed in Claim 1 of Xiao is 15 to 40%, leaving 60-85 wt% for magnesium. The examples of Xiao disclose a range of magnesium from 54.5 wt% - 79.2 wt%. *Id.* Thus, Xiao discloses a range of magnesium 54.5-85 wt%, which overlaps and covers much of the claimed range.		
53. The magnesium composite as defined in claim 49, wherein said magnesium alloy includes over 50 wt % magnesium, and one or more metals selected from the group consisting of aluminum in an amount of about 0.5-10 wt %, zinc in an amount of about 0.1-6 wt %, zirconium in an amount of about 0.01-3 wt %, manganese in an amount of about 0.15-2 wt %, boron in an amount of about 0.0002-0.04 wt %, and bismuth in amount of about 0.4-0.7 wt %.	Claim 1 of Xiao discloses a "magnesium alloy, comprising the components at the weight percentages as follows: Al: 13 to 25%, Zn: 2 to 15%; the remainder is Mg, and a sum of the weight percentages of the components is 100%." Xiao at Claim 1 (emphasis added). A POSITA would have understood that the total range of the non-magnesium elements disclosed in Claim 1 of Xiao is 15 to 40%, leaving 60-85 wt% for magnesium. The examples of Xiao disclose a range of magnesium from 54.5 wt% - 79.2 wt%. *Id.* Thus, Xiao discloses a range of magnesium 54.5-85 wt%, which overlaps and covers much of the claimed ranges set forth in these claim elements. This claim element would be anticipated solely by the zirconium concentrations falling within the 0.01-6 wt% range. Claim 3 also requires, in addition to a similar zirconium concentration to the Markush claims, a zinc concentration of 0.1-3 wt%.		
54. The magnesium composite as defined in	Claim 1 of Xiao discloses a "magnesium alloy, comprising the components at the weight percentages as follows: Al: 13 to		

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claim 49, wherein said magnesium alloy includes over 50 wt % magnesium, and one or more metals selected from the group consisting of aluminum in an amount of about 0.5-10 wt %, zinc in an amount of about 0.1-3 wt %, zirconium in an amount of about 0.01-1 wt %, manganese in an amount of about 0.15-2 wt %, boron in an amount of about 0.0002-0.04 wt %, and bismuth in an amount of about 0.4-0.7 wt %.	25%, Zn: 2 to 15%; the remainder is Mg, and a sum of the weight percentages of the components is 100%." Xiao at Claim 1 (emphasis added). A POSITA would have understood that the total range of the non-magnesium elements disclosed in Claim 1 of Xiao is 15 to 40%, leaving 60-85 wt% for magnesium. The examples of Xiao disclose a range of magnesium from 54.5 wt% - 79.2 wt%. *Id.* Thus, Xiao discloses a range of magnesium 54.5-85 wt%, which overlaps and covers much of the claimed ranges set forth in these claim elements. This claim element would be anticipated solely by the zirconium concentrations falling within the 0.01-6 wt% range. Claim 3 also requires, in addition to a similar zirconium concentration to the Markush claims, a zinc concentration of 0.1-3 wt%.		
55. The magnesium composite as defined in claim 49, wherein said magnesium alloy includes at least 85 wt % magnesium, and one or more metals selected from the group consisting of 0.5-10 wt % aluminum, 0.05-6 wt % zinc, 0.01-3 wt % zirconium, and 0.15-2 wt % manganese.		Xiao discloses a "magnesium alloy...and further adds elements of Fe, Cu, Ni, and Ag which can enhance the corrosion performance of the magnesium alloy..." Xiao at ¶ 0026, ll. 1–9. This claim element would be anticipated solely by the zirconium concentrations falling within the 0.01-3 wt% range. Claim 55 also requires, in addition to a similar zirconium concentration to the Markush claims, a zinc concentration of 0.05-6 wt%. Claim 1 of Xiao discloses "Al: 13 to 25%, Zn: 2 to 15%," and Claim 2 of Xiao discloses secondary metals of "Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%; and a sum of the weight percentages of the components is 100%." Thus, Xiao teaches 0.05-0.5 wt% zirconium, which touches and covers at least a portion of these claimed ranges. Xiao similarly teaches 2-15 wt% zinc, which covers much of the claimed (0.05-6 wt%) zinc concentration. A claim is invalid as anticipated when it is in Markush form and a prior art reference disclosed one of the claimed elements. See	

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		Fresenius USA, Inc. v. Baxter Int'l, Inc., 582 F.3d 1288, 1298 (Fed. Cir. 2009). See also Abbott Labs. v. Baxter Pharm. Prods., Inc., 334 F.3d 1274, 1280 (Fed.Cir.2003); Schering Corp. v. Geneva Pharms., Inc., 339 F.3d 1373, 1380 (Fed.Cir.2003); Thus, Xiao teaches all of these claim limitations. Claim 1 of Xiao discloses a "magnesium alloy, comprising the components at the weight percentages as follows: Al: 13 to 25%, Zn: 2 to 15%, the remainder is Mg, and a sum of the weight percentages of the components is 100%." Xiao (emphasis added). A POSITA would have understood that the range of non-magnesium elements in Claim 1 leaves 60-85 wt% for magnesium. Thus, Xiao discloses a range of magnesium up to 85 wt%, which touches the claimed range (i.e. at least 85 wt% magnesium) set forth in these claim elements. However, this leaves no room for any of the claimed additive materials. Xiao also discloses a prior art magnesium alloy represented by Mg-Al-Zn (with AZ91D magnesium alloy being the most widely used) wherein the "main components of this alloy and the respective weight percentages are as follows: Al 8.3 to 9.7, Zn 0.35 to 1.0, Mn 0.15 to 0.5, and the remainder [(i.e. 88.8 to 91.2 wt%)] is magnesium." Id. at ¶ 0003. Xiao also uses an AZ91D as a comparative example alloy, with a composition of 9 wt% Al, 1 wt% Zn, 0.3 wt% Zr, and 0.1 wt% Mn, with the remainder (i.e. 89.6 wt%) being magnesium. Id. at ¶ 0032. Xiao teaches a primary difference between this prior art and its novel magnesium alloy lies in the addition of metallic elements like Iron, Copper, and/or Nickel into the alloy. Id. at ¶ 0026 ("[e]lements such as Fe, Cu, Ni, Ag, etc., in the magnesium alloy can form a large number of intermetallic composite micro-particles, which can improve the corrosion performance of the magnesium alloy, thereby promoting the decomposition of the magnesium alloy"). The dissolution data in Xiao (Xiao at ¶ 0061) teaches that the addition of Iron, Copper, and/or Nickel (alongside the Aluminum, Zinc, Zirconium, and Manganese of the prior art	

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		AZ91D example) caused a surprisingly large increase in dissolution rates. Thus, Xiao, as a whole, teaches magnesium compositions with magnesium content above 85wt% and "room" for the novel additive materials (i.e. "Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%" (Xiao at Claim 2)). Thus, Xiao fully discloses a range of magnesium of at least 85 wt %, touching and even overlapping the claim range. As for the other requirements of dependent claim 55, it has already been established in Ground I that Xiao discloses each and every element of independent claim 49. Ground I also establishes that Xiao discloses at least three of the metals overlapping the weight percentage ranges required by the Markush element of dependent claim 55 (i.e., 0.5-10 wt% aluminum, 0.05-6wt% zinc, and/or 0.01-3 wt% zirconium).	
56. The magnesium composite as defined in claim 49, wherein said magnesium alloy includes 60-95 wt % magnesium and 0.01-1 wt % zirconium.	Claim 1 of Xiao discloses a "magnesium alloy, comprising the components at the weight percentages as follows: Al: 13 to 25%, Zn: 2 to 15%; the remainder is Mg, and a sum of the weight percentages of the components is 100%." Xiao at Claim 1 (emphasis added). A POSITA would have understood that the total range of the non-magnesium elements disclosed in Claim 1 of Xiao is 15 to 40%, leaving 60-85 wt% for magnesium. The examples of Xiao disclose a range of magnesium from 54.5 wt% - 79.2 wt%." *Id.* Thus, Xiao discloses a range of magnesium 54.5-85 wt%, which overlaps and covers much of the claimed ranges set forth in these claim elements. Claim 2 discloses: a "magnesium alloy, according to Claim 1, further comprising the trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%; and a sum of the weight percentages of the components is 100%." Id. at Claim 2.		

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	These metallic elements are found in the additive materials generally disclosed by Xiao (i.e., intermediate alloys: Al-Fe, Al-Ni, Al-Cu, Al-Ti) (Xiao at ¶ 0023) and particularly described in association with Example 7 of Xiao (Id. at ¶¶ 0057–0060) for which a POSITA would have calculated for Example 7 of Xiao the specific weight percentage (ranges) of each additive material or secondary metal. In particular, a POSITA would have determined that the additive materials aluminum-iron with 30 wt% iron, aluminum-nickel with 45 wt% nickel, and aluminum-copper with 40 wt% copper also fall well within the range of about 0.05 wt% to 45 wt% of the mixture. For example, the aluminum-iron additive constitutes 3.3 wt% of the mixture; the aluminum-nickel additive constitutes 1.1 wt% of the mixture; and the aluminum-copper additive constitutes 0.25 wt% of the mixture. A POSITA in April 2014 would have also recognized that other intermediate alloy compositions would have fallen within the teachings of Example 7 and other disclosures of Xiao resulting in Al-Fe, Al-Ni, and Al-Cu intermediate alloys constituting about 0.05 wt% to 45 wt% of the mixture. Accordingly, these claim elements are disclosed by Xiao.		
57. The magnesium composite as defined in claim 56, wherein said magnesium alloy further includes 0.05-6 wt % zinc.	Claim 1 of Xiao discloses a “magnesium alloy, comprising the components at the weight percentages as follows: Al: 13 to 25%, Zn: 2 to 15%; the remainder is Mg, and a sum of the weight percentages of the components is 100%.” Xiao at Claim 1 (emphasis added). A POSITA would have understood that the total range of the non-magnesium elements disclosed in Claim 1 of Xiao is 15 to 40%, leaving 60-85 wt% for magnesium. Ex. 1002 at ¶ 149. The examples of Xiao disclose a range of magnesium from 54.5 wt% - 79.2 wt%. *Id.* Thus, Xiao discloses a range of magnesium 54.5-85 wt%, which overlaps and covers much of the claimed ranges set forth in these claim elements. Claim 2 discloses: a “magnesium alloy, according to Claim 1, further comprising the trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%; and a sum of		

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	the weight percentages of the components is 100%." Id. at Claim 2. These metallic elements are found in the additive materials generally disclosed by Xiao (i.e., intermediate alloys: Al-Fe, Al-Ni, Al-Cu, Al-Ti) (Xiao at ¶ 0023) and particularly described in association with Example 7 of Xiao (Id. at ¶¶ 0057–0060) for which a POSITA would have calculated for Example 7 of Xiao the specific weight percentage (ranges) of each additive material or secondary metal. In particular, a POSITA would have determined that the additive materials aluminum-iron with 30 wt% iron, aluminum-nickel with 45 wt% nickel, and aluminum-copper with 40 wt% copper also fall well within the range of about 0.05 wt% to 45 wt% of the mixture. For example, the aluminum-iron additive constitutes 3.3 wt% of the mixture; the aluminum-nickel additive constitutes 1.1 wt% of the mixture; and the aluminum-copper additive constitutes 0.25 wt% of the mixture. A POSITA in April 2014 would have also recognized that other intermediate alloy compositions would have fallen within the teachings of Example 7 and other disclosures of Xiao resulting in Al-Fe, Al-Ni, and Al-Cu intermediate alloys constituting about 0.05 wt% to 45 wt% of the mixture. Accordingly, these claim elements are disclosed by Xiao.		
58. The magnesium composite as defined in claim 49, wherein said magnesium alloy includes 60-95 wt % magnesium, 0.5-10 wt % aluminum, 0.05-6 wt % zinc, and 0.15-2 wt % manganese.	Claim 1 of Xiao discloses a "magnesium alloy, comprising the components at the weight percentages as follows: Al: 13 to 25%, Zn: 2 to 15%; the remainder is Mg, and a sum of the weight percentages of the components is 100%." Xiao at Claim 1 (emphasis added). A POSITA would have understood that the total range of the non-magnesium elements disclosed in Claim 1 of Xiao is 15 to 40%, leaving 60-85 wt% for magnesium. Ex. 1002 at ¶ 149. The examples of Xiao disclose a range of magnesium from 54.5 wt% - 79.2 wt%. *Id.* Thus, Xiao discloses a range of magnesium 54.5-85 wt%, which overlaps and covers much of the claimed ranges set forth in these claim elements. Claim 2 discloses: a "magnesium alloy, according to Claim 1, further comprising the trace elements at the weight		

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	percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%; and a sum of the weight percentages of the components is 100%." Id. at Claim 2. These metallic elements are found in the additive materials generally disclosed by Xiao (i.e., intermediate alloys: Al-Fe, Al-Ni, Al-Cu, Al-Ti) (Xiao at ¶ 0023) and particularly described in association with Example 7 of Xiao (Id. at ¶¶ 0057–0060) for which a POSITA would have calculated for Example 7 of Xiao the specific weight percentage (ranges) of each additive material or secondary metal. In particular, a POSITA would have determined that the additive materials aluminum-iron with 30 wt% iron, aluminum-nickel with 45 wt% nickel, and aluminum-copper with 40 wt% copper also fall well within the range of about 0.05 wt% to 45 wt% of the mixture. For example, the aluminum-iron additive constitutes 3.3 wt% of the mixture; the aluminum-nickel additive constitutes 1.1 wt% of the mixture; and the aluminum-copper additive constitutes 0.25 wt% of the mixture. A POSITA in April 2014 would have also recognized that other intermediate alloy compositions would have fallen within the teachings of Example 7 and other disclosures of Xiao resulting in Al-Fe, Al-Ni, and Al-Cu intermediate alloys constituting about 0.05 wt% to 45 wt% of the mixture. Accordingly, these claim elements are disclosed by Xiao.		
59. The magnesium composite as defined in claim 49, wherein said magnesium alloy includes over 50 wt % magnesium and one or more metals selected from the group consisting of 0.5-10 wt % aluminum, 0.1-2 wt % zinc, 0.01-1 wt % zirconium, and 0.15-2 wt % manganese.	Claim 1 of Xiao discloses a "magnesium alloy, comprising the components at the weight percentages as follows: Al: 13 to 25%, Zn: 2 to 15%; the remainder is Mg, and a sum of the weight percentages of the components is 100%." Xiao at Claim 1 (emphasis added). A POSITA would have understood that the total range of the non-magnesium elements disclosed in Claim 1 of Xiao is 15 to 40%, leaving 60-85 wt% for magnesium. Ex. 1002 at ¶ 149. The examples of Xiao disclose a range of magnesium from 54.5 wt% - 79.2 wt%. *Id.* Thus, Xiao discloses a range of magnesium 54.5-85 wt%, which overlaps and covers much of the claimed ranges set forth in these claim elements.		

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	Claim 2 discloses: a "magnesium alloy, according to Claim 1, further comprising the trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%; and a sum of the weight percentages of the components is 100%." Id. at Claim 2. These metallic elements are found in the additive materials generally disclosed by Xiao (i.e., intermediate alloys: Al-Fe, Al-Ni, Al-Cu, Al-Ti) (Xiao at ¶ 0023) and particularly described in association with Example 7 of Xiao (Id. at ¶¶ 0057–0060) for which a POSITA would have calculated for Example 7 of Xiao the specific weight percentage (ranges) of each additive material or secondary metal. In particular, a POSITA would have determined that the additive materials aluminum-iron with 30 wt% iron, aluminum-nickel with 45 wt% nickel, and aluminum-copper with 40 wt% copper also fall well within the range of about 0.05 wt% to 45 wt% of the mixture. For example, the aluminum-iron additive constitutes 3.3 wt% of the mixture; the aluminum-nickel additive constitutes 1.1 wt% of the mixture; and the aluminum-copper additive constitutes 0.25 wt% of the mixture. A POSITA in April 2014 would have also recognized that other intermediate alloy compositions would have fallen within the teachings of Example 7 and other disclosures of Xiao resulting in Al-Fe, Al-Ni, and Al-Cu intermediate alloys constituting about 0.05 wt% to 45 wt% of the mixture. Accordingly, these claim elements are disclosed by Xiao.		
60. The magnesium composite as defined in claim 49, wherein said magnesium alloy includes over 50 wt % magnesium, and one or more metals selected from the group consisting of 0.1-3 wt % zinc, 0.01-1 wt % zirconium, 0.05-1 wt % manganese, 0.0002-0.04 wt	Claim 1 of Xiao discloses a "magnesium alloy, comprising the components at the weight percentages as follows: Al: 13 to 25%, Zn: 2 to 15%; the remainder is Mg, and a sum of the weight percentages of the components is 100%." Xiao at Claim 1 (emphasis added). A POSITA would have understood that the total range of the non-magnesium elements disclosed in Claim 1 of Xiao is 15 to 40%, leaving 60-85 wt% for magnesium. Ex. 1002 at ¶ 149. The examples of Xiao disclose a range of magnesium from 54.5 wt% - 79.2 wt%. *Id.* Thus, Xiao discloses a range of magnesium 54.5-85 wt%, which		

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% boron, and 0.4-0.7 wt % bismuth.	overlaps and covers much of the claimed ranges set forth in these claim elements. Claim 2 discloses: a "magnesium alloy, according to Claim 1, further comprising the trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%; and a sum of the weight percentages of the components is 100%." Id. at Claim 2. These metallic elements are found in the additive materials generally disclosed by Xiao (i.e., intermediate alloys: Al-Fe, Al-Ni, Al-Cu, Al-Ti) (Xiao at ¶ 0023) and particularly described in association with Example 7 of Xiao (Id. at ¶¶ 0057–0060) for which a POSITA would have calculated for Example 7 of Xiao the specific weight percentage (ranges) of each additive material or secondary metal. In particular, a POSITA would have determined that the additive materials aluminum-iron with 30 wt% iron, aluminum-nickel with 45 wt% nickel, and aluminum-copper with 40 wt% copper also fall well within the range of about 0.05 wt% to 45 wt% of the mixture. For example, the aluminum-iron additive constitutes 3.3 wt% of the mixture; the aluminum-nickel additive constitutes 1.1 wt% of the mixture; and the aluminum-copper additive constitutes 0.25 wt% of the mixture. A POSITA in April 2014 would have also recognized that other intermediate alloy compositions would have fallen within the teachings of Example 7 and other disclosures of Xiao resulting in Al-Fe, Al-Ni, and Al-Cu intermediate alloys constituting about 0.05 wt% to 45 wt% of the mixture. Accordingly, these claim elements are disclosed by Xiao.		
61. The magnesium composite as defined in claim 49, wherein said additive material includes nickel,	Xiao discloses a "magnesium alloy...and further adds elements of Fe, Cu, Ni, and Ag which can enhance the corrosion performance of the magnesium alloy..." Xiao at ¶ 0026, ll. 1–9. Xiao teaches the use of a variety of metals as additive materials. See, e.g., Xiao at ¶ 0026. For instance, Xiao claims that the novel magnesium alloy may "further compris[e] trace elements at the weight percentages as follows: Fe: 0.1 to 5%,		

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	Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%. . .”Id. at Claim 2. In addition, Example 7 of Xiao particularly discloses intermediate alloys Al-Fe, Al-Ni, Al-Ag, Al-Cu, Al-Zr, Al-Ti and Zinc as additive materials. Id. at ¶ 0060. A POSITA in April 2014 would have understood that all of these intermediate alloys contain metal, including nickel, among other metals. Thus, Xiao discloses a number of metal additives, including nickel, and hence fully discloses all of the limitations of these claim elements.		
said nickel constitutes about 0.05-35 wt % of said magnesium composite,	Claim 1 of Xiao discloses: a “magnesium alloy, comprising the components at the weight percentages as follows: Al: 13 to 25%, Zn: 2 to 15%, the remainder is Mg, and a sum of the weight percentages of the components is 100%.” Xiao at Claim 1. And Claim 2 discloses: a “magnesium alloy, according to Claim 1, further comprising the trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%; and a sum of the weight percentages of the components is 100%.” Id. at Claim 2. These metallic elements are found in the additive materials generally disclosed by Xiao (i.e., intermediate alloys: Al-Fe, Al-Ni, Al-Cu, Al-Ti) (Xiao at ¶ 0023) and particularly described in association with Example 7 of Xiao (Id. at ¶¶ 0057–0060) for which a POSITA would have calculated for Example 7 of Xiao the specific weight percentage (ranges) of each additive material or secondary metal. In particular, a POSITA would have determined that the additive materials aluminum-iron with 30 wt% iron, aluminum-nickel with 45 wt% nickel, and aluminum-copper with 40 wt% copper also fall well within the range of about 0.05 wt% to 45 wt% of the mixture. For example, the aluminum-iron additive constitutes 3.3 wt% of the mixture; the aluminum-nickel additive constitutes 1.1 wt% of the mixture; and the aluminum-copper additive constitutes 0.25 wt% of the mixture. A POSITA in April 2014 would have also recognized that other intermediate alloy compositions would have fallen within the teachings of Example 7 and other disclosures of Xiao resulting in Al-Fe, Al-Ni, and Al-Cu intermediate alloys constituting about 0.05		

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	wt% to 45 wt% of the mixture. Accordingly, these claim elements are disclosed by Xiao.		
said nickel forms galvanically-active in situ precipitate in said magnesium composite.	Xiao discloses a novel magnesium alloy with high aluminum and zinc content further adding elements Fe, Cu, Ni and Ag which can form intermetallics and enhance the corrosion performance of the magnesium alloy. Xiao at ¶ 0026. Xiao explains the corrosion mechanism within a magnesium alloy in terms of a cathode phase, which Xiao explains includes "the β (Mg17Al12) phase and eutectic phase on the grain boundary of the magnesium alloy," and "the magnesium matrix α phase which functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which [micro-batteries] greatly accelerate the corrosion decomposition of magnesium alloy." Id. These elements are among the claimed "secondary metals" disclosed by Xiao. Thus, all of the limitations of this claim element are disclosed by Xiao.		
62. The magnesium composite as defined in claim 61, wherein said nickel constitutes about 3-7 wt % of said magnesium composite.	***No infringement alleged. See Terves's Final Infringement Contentions at 18***		
63. The magnesium composite as defined in claim 61, wherein said nickel constitutes about 7-10 wt % of said magnesium composite.	***No infringement alleged. See Terves's Final Infringement Contentions at 18***		
64. The magnesium composite as defined in claim 49, wherein said	Xiao discloses a "magnesium alloy...and further adds elements of Fe, Cu, Ni, and Ag which can enhance the		

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additive material includes copper,	corrosion performance of the magnesium alloy...” Xiao at ¶ 0026, ll. 1–9. Xiao teaches the use of a variety of metals as additive materials. See, e.g., Xiao at ¶ 0026. For instance, Xiao claims that the novel magnesium alloy may “further compris[e] trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%. . .” Id. at Claim 2. In addition, Example 7 of Xiao particularly discloses intermediate alloys Al-Fe, Al-Ni, Al-Ag, Al-Cu, Al-Zr, Al-Ti and Zinc as additive materials. Id. at ¶ 0060. A POSITA in April 2014 would have understood that all of these intermediate alloys contain metal, including, in particular, copper, among other metals. Thus, Xiao discloses a number of metal additives, including copper, and hence fully discloses all of the limitations of this claim element.		
said copper constitutes about 0.05-35 wt % of said magnesium composite,	Claim 1 of Xiao discloses: a “magnesium alloy, comprising the components at the weight percentages as follows: Al: 13 to 25%, Zn: 2 to 15%, the remainder is Mg, and a sum of the weight percentages of the components is 100%.” Xiao at Claim 1. And Claim 2 discloses: a “magnesium alloy, according to Claim 1, further comprising the trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%; and a sum of the weight percentages of the components is 100%.” Id. at Claim 2. These metallic elements are found in the additive materials generally disclosed by Xiao (i.e., intermediate alloys: Al-Fe, Al-Ni, Al-Cu, Al-Ti) (Xiao at ¶ 0023) and particularly described in association with Example 7 of Xiao (Id. at ¶¶ 0057–0060) for which a POSITA would have calculated for Example 7 of Xiao the specific weight percentage (ranges) of each additive material or secondary metal. In particular, a POSITA would have determined that the additive materials aluminum-iron with 30 wt% iron, aluminum-nickel with 45 wt% nickel, and aluminum-copper with 40 wt% copper also fall well within the range of about 0.05 wt% to 45 wt% of the mixture. For example, the aluminum-iron additive constitutes 3.3 wt% of the mixture; the aluminum-nickel additive constitutes 1.1 wt% of the mixture; and the aluminum-copper		

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	additive constitutes 0.25 wt% of the mixture. A POSITA in April 2014 would have also recognized that other intermediate alloy compositions would have fallen within the teachings of Example 7 and other disclosures of Xiao resulting in Al-Fe, Al-Ni, and Al-Cu intermediate alloys constituting about 0.05 wt% to 45 wt% of the mixture. Accordingly, these claim elements are disclosed by Xiao.		
said copper forms the galvanically-active in situ precipitate in said magnesium composite.	Xiao discloses a novel magnesium alloy with high aluminum and zinc content further adding elements Fe, Cu, Ni and Ag which can form intermetallics and enhance the corrosion performance of the magnesium alloy. Xiao at ¶ 0026. Xiao explains the corrosion mechanism within a magnesium alloy in terms of a cathode phase, which Xiao explains includes "the β (Mg17Al12) phase and eutectic phase on the grain boundary of the magnesium alloy," and "the magnesium matrix α phase which functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which [micro-batteries] greatly accelerate the corrosion decomposition of magnesium alloy." Id. These elements are among the claimed "secondary metals" disclosed by Xiao. Thus, all of the limitations of this claim element are disclosed by Xiao.		
65. The magnesium composite as defined in claim 49, wherein said additive material includes cobalt, said cobalt constitutes about 0.05-35 wt. % of said magnesium composite, said cobalt forms the galvanically-active in situ precipitate in said magnesium composite.	***No infringement alleged for this claim. See Terves' Final Infringement Contentions at 18.***		

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66. The magnesium composite as defined in claim 49, wherein a dissolution rate of said magnesium composite is about 5-325 mg/cm^2/hr. in 3 wt % KCI water mixture at 90°C.	A POSITA in April 2014 would have recognized that Xiao disclosed a table of dissolution rates ("decomposition rates") because the units of measurement are the units used by POSITAs to measure dissolution rates. The disclosed table provides seven examples (excluding the comparative [prior art] example). Xiao at ¶ 0064. Xiao provides dissolution rates in g/cm2/hr, while the claims of the '653 Patent express dissolution rates in mg/cm2/hr. A POSITA would have known converting between g/cm2/hr to mg/cm2/hr, merely requires multiplication by 1,000. Thus, as each of Xiao's seven examples (excluding the comparative [prior art] example) has a dissolution rate within the claimed range of "about 5-325 mg/cm2/hr in 3 wt.% KCl water" at both 70°C or 93°C (with Example 7 being more than seven times that floor), a POSITA in April 2014 would have recognized that the dissolution rate of the examples in Xiao would necessarily have been well above the claimed floor of "about 5" mg/cm2/hr at the claimed 90°C.		
67. The magnesium composite as defined in claim 49, wherein a dissolution rate of said magnesium composite is at least 45 mg/cm^2/hr. in 3 wt % KCl water mixture at 90°C. and up to 325 mg/cm^2/hr. in 3 wt % KCl water mixture at 90°C.	A POSITA in April 2014 would have recognized that Xiao disclosed a table of dissolution rates ("decomposition rates") because the units of measurement are the units used by POSITAs to measure dissolution rates. The disclosed table provides seven examples (excluding the comparative [prior art] example). Xiao at ¶ 0064. Xiao provides dissolution rates in g/cm2/hr, while the claims of the '653 Patent express dissolution rates in mg/cm2/hr. A POSITA would have known converting between g/cm2/hr to mg/cm2/hr, merely requires multiplication by 1,000. Six of the seven examples (excluding the comparative [prior art] example) provided in Xiao therefore discloses a dissolution rate of "at least 45 mg/cm2/hr in 3 wt % KCl water" and "up to 325 mg/cm2/hr in 3 wt % KCl water" at 93°C. Given that the dissolution rates of Xiao slightly above		

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	(i.e., 3°C above) 90°C are almost all above the claimed floor of "at least 45 mg/cm2/hr". As such, a POSITA in April 2014 would have expected the dissolution rate of the examples in Xiao at 90°C to also be necessarily above the claimed floor of "at least 45 mg/cm2/hr." Thus, this element is disclosed by Xiao.		
68. The magnesium composite as defined in claim 49, wherein a dissolution rate of said magnesium composite is up to 1 mg/cm^2/hr. in 3 wt % KCl water mixture at 21°C.	***No infringement alleged for this claim. See Terves' Final Infringement Contentions at 19***		
69. The magnesium composite as defined in claim 49, wherein said additive material has a melting point temperature that is 100°C. greater than a melting temperature of said magnesium or magnesium alloy.	Xiao discloses a "magnesium alloy...and further adds elements of Fe, Cu, Ni, and Ag which can enhance the corrosion performance of the magnesium alloy..." Xiao at ¶ 0026, ll. 1–9. A POSITA in April 2014 would have understood "melting temperature" in this claim element to be a reference to the smelting temperature or temperature of the melt when the additive material is being added to the magnesium or magnesium alloy, not the "melting point temperature" as that measurement is used for the additive material. Xiao generally discloses "loading pure magnesium and pure aluminum into a smelting furnace and increasing the temperature to 700 to 730 °C, next loading pure zinc and an [sic] intermediate alloys . . . into a resulting magnesium-aluminum alloy melt after melting and increasing the temperature to 740 to 780°C . . . ." Xiao at ¶¶ 0021–0022; see also Id. at Claim 5 ("the melting temperature of the pure magnesium and pure aluminum is from 700 to 730 °C.")		

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	Examples 1–7 of Xiao teach a range of smelting temperatures for the magnesium-aluminum alloy from 700°C (Example 1) to 730°C (Examples 2, 5, and 7). Xiao ¶¶ 0034–0060. The additive materials noted above are one or more of the intermediate alloys: Al-Fe, Al-Ni, Al-Cu, Al-Ag, Al-Zr, Al-Ti. Id. at ¶ 0023. A POSITA using typical phase diagrams for each of these additive materials would be able to readily determine the melting point temperature. A POSITA in April 2014 would have recognized that Al-Fe had a variable melting point temperature ranging from 1538°C (pure iron) down to 652°C for a eutectic point near 99 wt% aluminum; Al-Ni had a variable melting point temperature that ranges from 1640°C down to 640°C (depending upon the alloy mixture); and Al-Cu had a variable melting point temperature ranging from 548°C up to 1084°C (depending upon the alloy mixture). Example 7 of Xiao specifically discloses a melting or smelting temperature of 730°C. Xiao at ¶ 0060. A POSITA could specifically analyze Example 7 of Xiao to determine (using particular intermediate alloy compositions) the melting point temperatures of the intermediate alloys added. Thus, in April 2014, a POSITA would have recognized from Example 7 of Xiao that at least an aluminum-nickel additive having 45 wt% nickel has a melting point temperature of 854°C which is 100°C greater than the melting or smelting temperatures of the magnesium aluminum alloy used in Example 7 (i.e., 730°C) and otherwise taught generally by Xiao (i.e., 700-730°C). A POSITA in April 2014 would have also recognized that other intermediate alloy compositions could have fallen within the teachings of Example 7 and other disclosures of Xiao and resulted in Al-Fe, Al-Ni, and Al-Cu intermediate alloys that would have had melting point temperatures that were 100°C. greater than the smelting temperatures of the magnesium alloy generally taught by Xiao (i.e., 700- 730°C). Thus, this claim element was disclosed by Xiao.		
70. The magnesium composite as defined in	Xiao discloses a “magnesium alloy...and further adds elements of Fe, Cu, Ni, and Ag which can enhance the		

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claim 49, wherein said magnesium composite is at least partially included in a down hole well component,	corrosion performance of the magnesium alloy...” Xiao at ¶ 0026, ll. 1–9. Xiao discloses that the cast magnesium alloy “can be used as a tripping ball material for a multi-stage sliding sleeve staged-fracturing technique.” Xiao at ¶ 0001. A POSITA would have understood that a tripping ball was a type of tool component in an oil well drilling operation. Thus, these claim elements were disclosed by Xiao.		
said down hole well component including one or more components selected from the group consisting of a sleeve, frac ball, hydraulic actuating tooling, tube, valve, valve component, or plug.	Xiao discloses that the cast magnesium alloy “can be used as a tripping ball material for a multi-stage sliding sleeve staged-fracturing technique.” Xiao at ¶ 0001. A POSITA would have understood that a tripping ball was a type of tool component in an oil well drilling operation.		
71. The magnesium composite as defined in claim 49, wherein at least a portion of said additive material remains unalloyed additive material in said magnesium composite.	***Infringement contention withdrawn pursuant to July 2, 2021 email from Matthew J. Cavanagh***		Xiao discloses that “[e]lements such as Fe, Cu, Ni, Ag, etc., in the micro-particles.” Id. at ¶ 0026. However, Xiao does not disclose whether any of the additive material remains “unalloyed”. Hassan explicitly discloses that magnesium composites containing additive materials, such as nickel may remain unreacted. In particular, Hassan discloses that the [s]evere reaction between magnesium melt and nickel particulates during DMD processing led to the reduction of the particulate size and formation of Mg2Ni intermetallics [13]. The results of quantitative determination of unreacted nickel (see Table I), microstructural characterization illustrating the presence of reaction products (see Fig. 1) and XRD results (see Table II) showing the presence of Mg2Ni supports the experimental observations.” Hassan at 2472. Thus, Hassan specifically provides experimental data showing—under similar conditions of magnesium composite fabrication as those in Xiao—that

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			some of the additives, particularly nickel, will remain unreacted and unalloyed. Given the motivation to combine Xiao with Hassan (discussed, supra), a POSITA in April 2014 would have combined these two references thereby providing further rationale that a POSITA in April 2014 would find Claim 12 of the '653 Patent obvious.
72. The magnesium composite as defined in claim 49, wherein said additive material is a metal or metal alloy.	***Infringement contention withdrawn pursuant to July 2, 2021 email from Matthew J. Cavanagh*** Xiao discloses a "magnesium alloy...and further adds elements of Fe, Cu, Ni, and Ag which can enhance the corrosion performance of the magnesium alloy..." Xiao at ¶ 0026, ll. 1–9. Xiao teaches the use of a variety of metals as additive materials. See, e.g., Xiao at ¶ 0026. For instance, Xiao claims that the magnesium alloy may "further compris[e] trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%. . ." Id. at Claim 2. In addition, Example 7 of Xiao particularly discloses intermediate alloys Al-Fe, Al-Ni, Al-Ag, Al-Cu, Al-Zr, Al-Ti and Zinc as additive materials. Id. at ¶ 0060. A POSITA in April 2014 would have understood that all of these additive materials contain metal(s). Accordingly, Example 7 of Xiao discloses this claim element in accordance with Patent Owner's definition of "additive material."		
73. A dissolvable magnesium composite for use in a ball or other tool component in a well drilling or completion operation,	Xiao discloses a "magnesium alloy...and further adds elements of Fe, Cu, Ni, and Ag which can enhance the corrosion performance of the magnesium alloy..." Xiao at ¶ 0026, ll. 1–9. Xiao discloses that the cast magnesium alloy "can be used as a tripping ball material for a multi-stage sliding sleeve staged-		

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	fracturing technique." ¶ 0001. A POSITA would have understood that a tripping ball was a type of tool component in an oil well drilling operation. Thus, these claim elements were disclosed by Xiao.		
said dissolvable magnesium composite includes in situ precipitation of galvanically-active intermetallic phases to enable controlled dissolution of said magnesium composite,	Xiao discloses a novel magnesium alloy with high aluminum and zinc content further adding elements Fe, Cu, Ni and Ag which can form intermetallics and enhance the corrosion performance of the magnesium alloy. Xiao explains the corrosion mechanism within a magnesium alloy in terms of a cathode phase, which Xiao explains includes "the β (Mg17Al12) phase and eutectic phase on the grain boundary of the magnesium alloy," and "the magnesium matrix α phase which functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which [micro-batteries] greatly accelerate the corrosion decomposition of magnesium alloy." Xiao at ¶ 0026. A POSITA in August 2014 would have understood this disclosure of "intermetallic composite micro-particles" to be a reference to intermetallic precipitate. A POSITA reading the Xiao reference in April 2014 would have recognized that the precipitation of galvanically-active intermetallic phases ("micro-batteries") are naturally and necessarily generated by the in situ reaction between magnesium and any and all of the disclosed metal additives forming in situ precipitate.		
said magnesium composite comprising a mixture of magnesium or a magnesium alloy and an additive material,	Xiao discloses "first loading pure magnesium and pure aluminum into a smelting furnace . . . next loading pure zinc and an [sic] intermediate alloys of trace element components into a resulting magnesium-aluminum alloy melt after melting." Xiao, at ¶ 0022. Xiao discloses that "Al-Fe ... Al-Ni ... Al-Cu ... Al- Ag ... Al-Zr ... and ... Al-Ti intermediate alloy[s], are heated to dry and then added to the magnesium-aluminum alloy melt." Id. at ¶ 0023. The addition of these intermediate alloys to the melted magnesium alloy necessarily results in a mixture of the additive material and magnesium alloy.		

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said additive material constituting about 0.05 wt % of said mixture,	Claim 1 of Xiao discloses: a "magnesium alloy, comprising the components at the weight percentages as follows: Al: 13 to 25%, Zn: 2 to 15%, the remainder is Mg, and a sum of the weight percentages of the components is 100%." Xiao at Claim 1. And Claim 2 discloses: a "magnesium alloy, according to Claim 1, further comprising the trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%; and a sum of the weight percentages of the components is 100%." Id. at Claim 2. These metallic elements are found in the additive materials generally disclosed by Xiao (i.e., intermediate alloys: Al-Fe, Al-Ni, Al-Cu, Al-Ti) (Xiao at ¶ 0023) and particularly described in association with Example 7 of Xiao (Id. at ¶¶ 0057–0060) for which a POSITA would calculate for Example 7 of Xiao the specific weight percentage (ranges) of each additive material or secondary metal. In particular, a POSITA would have determined that the additive materials aluminum-iron with 30 wt% iron, aluminum- nickel with 45 wt% nickel, and aluminum-copper with 40 wt% copper also fall well within the range of about 0.05 wt% to 45 wt% of the mixture. For example, the aluminum-iron additive constitutes 3.3 wt% of the mixture; the aluminum-nickel additive constitutes 1.1 wt% of the mixture; and the aluminum-copper additive constitutes 0.25 wt% of the mixture. Thus, a POSITA in April 2014 would have also recognized that other intermediate alloy compositions would have fallen within the teachings of Example 7 and other disclosures of Xiao resulting in Al-Fe, Al-Ni, and Al-Cu intermediate alloys constituting about 0.05 wt% to 45 wt% of the mixture. Accordingly, these claim elements are disclosed by Xiao.		
said additive material is a metal or metal alloy,	Xiao discloses a "magnesium alloy...and further adds elements of Fe, Cu, Ni, and Ag which can enhance the corrosion performance of the magnesium alloy..." Xiao at ¶ 0026, ll. 1–9. Xiao teaches the use of a variety of metals as additive materials. See, e.g., Xiao at ¶ 0026. For instance, Xiao claims		

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	that the magnesium alloy may "further compris[e] trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%. . ." Id. at Claim 2. In addition, Example 7 of Xiao particularly discloses intermediate alloys Al-Fe, Al-Ni, Al-Ag, Al-Cu, Al-Zr, Al-Ti and Zinc as additive materials. Id. at ¶ 0060. A POSITA in April 2014 would have understood that all of these additive materials contain metal(s). Accordingly, Example 7 of Xiao discloses this claim element in accordance with Patent Owner's definition of "additive material."		
said additive material includes one or more metals selected from the group consisting of copper, nickel, titanium, iron, silicon, and cobalt,	Xiao teaches the use of a variety of metals as additive materials. See, e.g., Xiao at ¶ 0026. For instance, Xiao claims that the novel magnesium alloy may "further compris[e] trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%. . ."Id. at Claim 2. In addition, Example 7 of Xiao particularly discloses intermediate alloys Al-Fe, Al-Ni, Al-Ag, Al-Cu, Al-Zr, Al-Ti and Zinc as additive materials. Id. at ¶ 0060. A POSITA in April 2014 would have understood that all of these intermediate alloys contain metal, including, in particular, copper, nickel, and iron, among other metals.Thus, Xiao discloses a number of metal additives, including copper, nickel, and iron and, hence fully discloses all of the limitations of these claim elements.		
said magnesium composite including in situ precipitation of galvanically-active intermetallic phases that include said additive material,	Xiao discloses a novel magnesium alloy with high aluminum and zinc content further adding elements Fe, Cu, Ni and Ag which can form intermetallics and enhance the corrosion performance of the magnesium alloy. Xiao at ¶ 0026. Xiao explains the corrosion mechanism within a magnesium alloy in terms of a cathode phase, which Xiao explains includes "the β (Mg17Al12) phase and eutectic phase on the grain boundary of the magnesium alloy," and "the magnesium matrix α phase which functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which [micro- batteries] greatly accelerate the corrosion decomposition of magnesium alloy." Id.		

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	A POSITA in August 2014 would have understood this disclosure of "intermetallic composite micro-particles" to be a reference to intermetallic precipitate. As noted above, at least Fe, Cu, and Ni are "additive materials." Consequently, the in-situ precipitation of galvanically- active intermetallic phases will include one or more of these additive materials. Thus, Xiao discloses all of these claim limitations.		
said additive material located in sufficient quantities in said galvanically-active intermetallic phases so as to obtain a composition and morphology of said galvanically-active intermetallic phases such that a galvanic corrosion rate along said galvanically-active intermetallic phases causes said magnesium composite to have a dissolution rate of at least at least 5 $mg/cm^2/hr.$ in 3 wt % KCl water mixture at 90°C.	A POSITA would understand that the galvanically-active intermetallic phases ("composite micro-particles") have a morphology that enhances the corrosion dissolution rate of the alloy due to a larger number of smaller particles throughout the microstructure. A POSITA would also understand the relationship between "composite micro-particles" and morphology of the galvanically-active intermetallic phases. Id. With respect to the "sufficient quantities" limitation, other claim limitations in Claims 49 and 73 define the weight percentage for the additive material as 0.05-45 wt% and about 0.05 wt%, respectively, which limitations are met by the teaching of Xiao with respect to four metals. In particular, Xiao discloses that "[e]lements such as Fe, Cu, Ni, Ag, etc., in the magnesium alloy can form a large number of intermetallic composite micro-particles, which can improve the corrosion performance of the magnesium alloy, thereby promoting the decomposition of the magnesium alloy." Id. ¶ 0026. And the magnesium alloy may "further compris[e] trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%;..." Id. at Claim 2. As such, Xiao discloses four metals (i.e., Fe, Cu, Ni, and Ti) included within the list of "additive material" set forth in Claim Element M, supra. The claimed weight % quantities of the "additive material" of Claim Element I, supra, also overlap with the weight % ranges of Xiao's "trace elements". As such, Claim Element P of claims 49 and 73--that the "additive materials" are located in "sufficient quantities"--is fully disclosed by Xiao's Claim 2 disclosure of "trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%..." Id. As such, Xiao's four metal "trace		

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	elements" are present in "sufficient quantities" to meet Claim Element P of claims 49 and 73. A POSITA in April 2014 would have recognized that Xiao disclosed a table of dissolution rates ("decomposition rates") because the units of measurement are the units used by POSITAs to measure dissolution rates. The disclosed table provides seven examples (excluding the comparative [prior art] example). Xiao at ¶ 0064. Xiao provides dissolution rates in $g/cm^2/hr$, while the claims of the '653 Patent express dissolution rates in $mg/cm^2/hr$. A POSITA would have known converting between $g/cm^2/hr$ to $mg/cm^2/hr$, merely requires multiplication by 1,000. Thus, as each of Xiao's seven examples (excluding the comparative [prior art] example) has a dissolution rate of at least three times the claimed "at least 5 $mg/cm^2/hr$ in 3 wt.% KCl water" at both 70°C or 93°C (with Example 7 being more than seven times that floor), a POSITA in April 2014 would have recognized that the dissolution rate of the examples in Xiao would necessarily have been well above the claimed floor of "at least of 5 $mg/cm^2/hr$" at the claimed 90°C.		
74. A dissolvable magnesium composite for use in a ball or other tool component in a well drilling or completion operation,		Xiao discloses a "magnesium alloy...and further adds elements of Fe, Cu, Ni, and Ag which can enhance the corrosion performance of the magnesium alloy..." Xiao at ¶ 0026, ll. 1–9. Xiao discloses that the cast magnesium alloy "can be used as a tripping ball material for a multi-stage sliding sleeve staged-fracturing technique." Xiao at ¶ 0001. A POSITA would have understood that a tripping ball was a type of tool component in an oil well drilling operation. Thus, these claim elements were disclosed by Xiao.	
said dissolvable magnesium composite includes in situ precipitation of galvanically-active intermetallic phases to		Xiao discloses a novel magnesium alloy with high aluminum and zinc content further adding elements Fe, Cu, Ni and Ag which can form intermetallics and enhance the corrosion performance of the magnesium alloy. Xiao explains the corrosion mechanism within a magnesium alloy in terms of a cathode phase, which Xiao explains includes "the β	

enable controlled dissolution of said magnesium composite,		(Mg17Al12) phase and eutectic phase on the grain boundary of the magnesium alloy," and "the magnesium matrix α phase which functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which [micro-batteries] greatly accelerate the corrosion decomposition of magnesium alloy." Xiao at ¶ 0026. A POSITA in August 2014 would have understood this disclosure of "intermetallic composite micro-particles" to be a reference to intermetallic precipitate. A POSITA reading the Xiao reference in April 2014 would have recognized that the precipitation of galvanically-active intermetallic phases ("micro-batteries") are naturally and necessarily generated by the in situ reaction between magnesium and any and all of the disclosed metal additives forming in situ precipitate. Thus, these claim elements were disclosed by Xiao.	
said magnesium composite comprising a mixture of magnesium or a magnesium alloy and an additive material,		Xiao discloses "first loading pure magnesium and pure aluminum into a smelting furnace . . . next loading pure zinc and an [sic] intermediate alloys of trace element components into a resulting magnesium-aluminum alloy melt after melting." Xiao, at ¶ 0022. Xiao discloses that "Al-Fe ... Al-Ni ... Al-Cu ... Al- Ag ... Al-Zr ... and ... Al-Ti intermediate alloy[s], are heated to dry and then added to the magnesium-aluminum alloy melt." Id. at ¶ 0023. The addition of these intermediate alloys to the melted magnesium alloy necessarily results in a mixture of the additive material and magnesium alloy.	
said additive material constituting at least 0.1 wt % of said mixture,	.	Claim 1 of Xiao discloses: a "magnesium alloy, comprising the components at the weight percentages as follows: Al: 13 to 25%, Zn: 2 to 15%, the remainder is Mg, and a sum of the weight percentages of the components is 100%." Xiao at Claim 1. And Claim 2 discloses: a "magnesium alloy, according to Claim 1, further comprising the trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%; and a sum of the weight percentages of the components is 100%." Id. at Claim 2.	

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		These metallic elements are found in the additive materials generally disclosed by Xiao (i.e., intermediate alloys: Al-Fe, Al-Ni, Al-Cu, Al-Ti) (Xiao at ¶ 0023) and particularly described in association with Example 7 of Xiao (Id. at ¶¶ 0057–0060) for which a POSITA would have calculated for Example 7 of Xiao the specific weight percentage (ranges) of each additive material or secondary metal. In particular, a POSITA would have determined that the additive materials aluminum-iron with 30 wt% iron, aluminum- nickel with 45 wt% nickel, and aluminum-copper with 40 wt% copper also fall well within the range of about 0.05 wt% to 45 wt% of the mixture. For example, the aluminum-iron additive constitutes 3.3 wt% of the mixture; the aluminum-nickel additive constitutes 1.1 wt% of the mixture; and the aluminum-copper additive constitutes 0.25 wt% of the mixture. Thus, a POSITA in April 2014 would have also recognized that other intermediate alloy compositions would have fallen within the teachings of Example 7 and other disclosures of Xiao resulting in Al-Fe, Al-Ni, and Al-Cu intermediate alloys constituting about 0.05 wt% to 45 wt% of the mixture. Accordingly, these claim elements are disclosed by Xiao	
said magnesium in said magnesium composite constituting at least 85 wt %,		Claim 1 of Xiao discloses a “magnesium alloy, comprising the components at the weight percentages as follows: Al: 13 to 25%, Zn: 2 to 15%, the remainder is Mg, and a sum of the weight percentages of the components is 100%.” Xiao (emphasis added). A POSITA would have understood that the range of non-magnesium elements in Claim 1 leaves 60-85 wt% for magnesium. Thus, Xiao discloses a range of magnesium up to 85 wt%, which touches the claimed range (i.e. at least 85wt% magnesium) set forth in this claim element. However, this leaves no room for any of the claimed additive materials. Xiao also discloses a prior art magnesium alloy represented by Mg-Al-Zn (with AZ91D magnesium alloy being the most widely used) wherein the “main components of this alloy and the respective weight percentages are as follows: Al 8.3 to 9.7, Zn 0.35 to 1.0, Mn 0.15 to 0.5, and the remainder [(i.e. 88.8 to 91.2 wt%)] is magnesium.” Id. at ¶ 0003. Xiao also uses an AZ91D as a comparative example alloy, with a	

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		composition of 9 wt% Al, 1 wt% Zn, 0.3 wt% Zr, and 0.1 wt% Mn, with the remainder (i.e. 89.6 wt%) being magnesium. Id. at ¶ 0032. Xiao teaches a primary difference between this prior art and its novel magnesium alloy lies in the addition of metallic elements like Iron, Copper, and/or Nickel into the alloy. Id. at ¶ 0026 ("[e]lements such as Fe, Cu, Ni, Ag, etc., in the magnesium alloy can form a large number of intermetallic composite micro-particles, which can improve the corrosion performance of the magnesium alloy, thereby promoting the decomposition of the magnesium alloy"). The dissolution data in Xiao (Xiao at ¶ 0061) teaches that the addition of Iron, Copper, and/or Nickel (alongside the Aluminum, Zinc, Zirconium, and Manganese of the prior art AZ91D example) caused a surprisingly large increase in dissolution rates. Thus, Xiao, as a whole, teaches magnesium compositions with magnesium content above 85wt% and "room" for the novel additive materials (i.e. "Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%" (Xiao at Claim 2)). Thus, Xiao fully discloses a range of magnesium of at least 85 wt %, touching and even overlapping the claim range.	
said additive material is a metal material selected from the group consisting of copper, nickel and cobalt,		Xiao teaches the use of a variety of metals as additive materials. See, e.g., Xiao at ¶ 0026. For instance, Xiao claims that the novel magnesium alloy may "further compris[e] trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%. . ."Id. at Claim 2. In addition, Example 7 of Xiao particularly discloses intermediate alloys Al-Fe, Al-Ni, Al-Ag, Al-Cu, Al-Zr, Al-Ti and Zinc as additive materials. Id. at ¶ 0060. A POSITA in April 2014 would have understood that all of these intermediate alloys contain metal, including, in particular, copper, nickel, and iron, among other metals. Thus, Xiao discloses a number of metal additives, including copper, nickel, and iron and, hence fully discloses all of the limitations of these claim elements.	
said magnesium composite including in situ precipitation of		Xiao discloses a novel magnesium alloy with high aluminum and zinc content further adding elements Fe, Cu, Ni and Ag which can form intermetallics and enhance the corrosion	

galvanically-active intermetallic phases that include said additive material,		performance of the magnesium alloy. Xiao at ¶ 0026. Xiao explains the corrosion mechanism within a magnesium alloy in terms of a cathode phase, which Xiao explains includes "the β (Mg17Al12) phase and eutectic phase on the grain boundary of the magnesium alloy," and "the magnesium matrix α phase which functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which [micro- batteries] greatly accelerate the corrosion decomposition of magnesium alloy." Id. A POSITA in August 2014 would have understood this disclosure of "intermetallic composite micro-particles" to be a reference to intermetallic precipitate. As noted above, at least Fe, Cu, and Ni are "additive materials." Consequently, the in-situ precipitation of galvanically- active intermetallic phases will include one or more of these additive materials.	
said magnesium composite has a dissolution rate of 84-325 mg/cm^2/hr. in 3 wt % KCl water mixture at 90°C.		As for the final limitation of Claim 74, it requires a dissolution rate of 84–325 mg/cm^2/hr. in 3 wt % KCl water mixture at 90°C, the novel examples explicitly analyzed in Xiao disclose dissolution rates only up to 74 mg/cm^2/hr in 3 wt.% KCl water at 93°C, shy of this claimed range. However, a POSITA in April 2014 would have understood Xiao to also teach dissolution rates above the floor of 84 mg/cm2/hr at 90°C claimed in Claim 74, because (1) the dissolution rates in the Xiao examples are very close to the claimed floor (e.g. Example 1 exhibited a rate of 74 mg/cm2/hr at 93°C, Example 6 a rate of 63 mg/cm2/hr at 90°C, and Example 7 a rate of 57 mg/cm2/hr at 93°C; and (2) a POSITA would have expected that other magnesium compositions having additive amounts in the ranges as disclosed by Xiao, but with higher amounts of copper, nickel, and/or iron than the amounts tested by Xiao's examples would have improved corrosion performance. In particular, even though they come close to the 84 mg/cm2/hr at 90°C, Examples 1, 6 and 7 of Xiao had less aggregate copper, nickel and iron than taught by Claim 2 of Xiao (i.e. 5 wt% for each of copper, nickel, and iron in a magnesium composite). Thus, the Examples in Xiao used lower amounts of these specific dissolution-enhancing additive elements. As such, a POSITA in April 2014 would have understood this	

		and recognized that Xiao teaches magnesium compositions having dissolution rates above the claimed floor of "at least 84 mg/cm^2/hr." Id. It was well-known prior to April 2014 that additions of copper, iron, nickel and cobalt cause a sharp linear increase in the corrosion rate of magnesium as evidenced by Shaw, "Corrosion Resistance of Magnesium Alloys" published in 2003 in the ASM Handbook, Vol. 13A (2003). As such, the recitation of the claimed dissolution rate of 84-325 mg/cm2/hr at 90°C was not a new property or use but rather a property that would be inherent in the compositions disclosed in Xiao, as confirmed by the extrinsic evidence of Shaw.	
75. The magnesium composite as defined in claim 74, wherein said magnesium alloy is an AZ91D magnesium alloy that includes aluminum and zinc.	***Infringement contention withdrawn pursuant to July 2, 2021 email from Matthew J. Cavanagh.*** ***No infringement alleged for this claim. See Terves' Final Infringement Contentions at 21***		
76. The magnesium composite as defined in claim 74, wherein said additive material includes nickel,	***No infringement alleged for this claim. See Terves' Final Infringement Contentions at 21.***		
a content of said nickel in said magnesium composite is at least 0.3 wt %.		Xiao teaches the use of a variety of metals as additive materials. See, e.g., ¶ 0026. For instance, Xiao claims that the novel magnesium alloy may "further compris[e] trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%. . ." Id. at Claim 2. In addition, Example 7 of Xiao particularly discloses intermediate alloys Al-Fe, Al-Ni, Al-Ag, Al-Cu, Al-Zr, Al-Ti and Zinc as additive materials. Id. at ¶ 0060. A POSITA in April 2014 would have understood that all of these intermediate alloys contain metal, including, in particular, copper, nickel, and iron, among other metals. Thus,	

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		Xiao discloses a number of metal additives, including copper, nickel, and iron and, hence fully discloses all of the limitations of these claim elements.	
77. The magnesium composite as defined in claim 74, wherein said additive material includes nickel,	***No infringement alleged for this claim. See Terves' Final Infringement Contentions at 21.***		
a content of said nickel in said magnesium composite is at least 7 wt %.			
78. The magnesium composite as defined in claim 74, wherein said additive material includes nickel,	***No infringement alleged for this claim. See Terves' Final Infringement Contentions at 21.***		
a content of said nickel in said magnesium composite is at least 10 wt %.			

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Appendix D - U.S. Patent No. 10,689,740 Anticipation and Obviousness Invalidity Claim Chart

The following prior art methods and/or compositions anticipate the indicated claims of the '740 Patent under 35 U.S.C. § 102, under the plain and ordinary meaning of the claims as properly construed.

In addition, the following prior art methods and/or compositions render obvious the indicated claims of the '740 Patent under 35 U.S.C. § 103, either alone or in combination with other prior art references (and/or in combination with the knowledge of a person of ordinary skill at the time of the invention), under the plain and ordinary meaning of the claims as properly construed. Evidence of the public availability of prior art methods and compositions to be used includes the following:

- Chinese Patent App. No. 201310284659.X (Xiao), filed July 8, 2013; CN 103343271 A published Nov. 10, 2013; CN 103343271 B published July 1, 2015 (hereinafter, "Xiao").
    - Xiao (Xiao) was filed on July 8, 2013 and published October 9, 2013. Xiao qualifies as a printed publication and prior art under 35 U.S.C. § 102(b)
- Hassan, S.F., Gupta, M., *Development of High Strength Magnesium Based Composites Using Elemental Nickel Particulates as Reinforcement*. Journal of Materials Science 37, 2467–2474 (2002) (hereinafter, "Hassan").

Prior art-based grounds of invalidity presently include the following:

- Ground I: Claims 2-11, 13, 14, 16-17, 19-34, 49, 50, and 94-99 anticipated by Xiao;
- Ground II: Claims 2-7, 9, 14, 19, 21-47, 51-69, and 76-103 are anticipated, or at least made obvious, by Xiao; and
- Ground III: Claims 19, 83-93, 102, and 103, are obvious over Xiao in combination with Hassan

All grounds should be considered in combination or the alternative.

Overview of Xiao

Xiao, entitled "Light and pressure-proof fast-decomposed cast magnesium alloy," discloses a "cast magnesium alloy, which can be used as a tripping ball material for a multi-stage sliding sleeve staged-fracturing technique." ¶ 0001, ECOMETAL-010548. Xiao explains "[i]n recent years, the United States has made breakthroughs in the technologies of shale gas exploration and development, and the output has grown rapidly." "After the completion of all rock fracturing, it is necessary to depressurize the well tubing to facilitate the later production of the oil and gas well. In the past, the conventional method is to use the low-layer pressure to push the ball back to the well opening, or use a drilling tool to drill the sliding sleeve ball seat and the tripping ball, so as to destroy them." ¶ 0002, ECOMETAL-010548.

Xiao identifies the need for "the development of a tripping ball that can withstand the high pressure of fracturing construction and the high temperature at the bottom of the well, and has the feature of self-decomposition in the fluid environment of a well, can effectively reduce the construction risk and improve the construction efficiency." *Id.*

Xiao sought to meet this need by proposing a "method for preparing a light and pressure-proof fast-decomposed cast magnesium alloy by means of optimizing the alloy composition design using a self-made flux containing a rare earth element and adopting a smelting casting method." *Id.* at ¶ 0004. Specifically, Xiao discloses a "magnesium alloy with a high aluminum content (13 to 25% by weight) and a high zinc content (2 to 10% by weight), and further adds elements of Fe, Cu, Ni and Ag which can enhance the corrosion performance of the magnesium alloy, and at the same time adds Zr, Ti element as grain refiners to improve the compressive strength of the formed material, in which the purpose of adding the high content of aluminum is to produce a large amount of cathode phase, the β ($Mg_{17}Al_{12}$) phase and eutectic phase on the grain boundary of the magnesium alloy, and the magnesium matrix α phase functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which [micro-batteries] greatly accelerate the corrosion decomposition of magnesium alloy." *Id.* at ¶ 0026.

An English-language abstract of Xiao was provided to the examiner. See Ex. 1004. Using MS Word, that English-language abstract was compared to the "Abstract of the Disclosures" section of the Certified translation (ECOMETAL-010544-61). The comparison (Ex. 1008) shows that the abstracts would have been considered practically identical by a POSITA. However, both Abstracts failed to disclose the important subject matter of the Xiao reference: they say nothing about Xiao's disclosures of galvanic-activity, corrosion or accelerating the dissolution. Rather, the Abstracts say that "the alloy decomposition performance exceeds that of a traditional cast magnesium alloy." This portion of the final sentence of the Xiao Abstract likely led the patent examiner to incorrectly believe that Xiao—like much of the magnesium alloy prior art (see, e.g., Ex. 1001, at 3:19-24) and JP'030 (considered the closest reference by the examiner)—disclosed nothing more than "magnesium alloys [that] either improve corrosion resistance or are corrosion resistant." Ex. 1003, at 606–07.

Overview of Hassan

Prior art Hassan (introduced above) recognized that "[m]agnesium based materials due to their inherently low density and ensuing potential to exhibit high specific mechanical properties are actively sought for weight-critical structural application." Abstract, ECOMETAL-010503. Hassan discloses the "synthesis of monolithic and nickel reinforced magnesium composites (Mg/Nip)," including "superheating the magnesium turning with reinforcement particulates (placed in multi-layer sandwich form) to 750°C" and stirring the "molten slurry." *Id.* at ECOMETAL-010504.

Hassan describes its study as using "magnesium turnings . . . as the base material and elemental nickel particulates of 99.9% purity (Johnson Matthey, MA, USA) with an average size of 29±19 μm were used as reinforcement phase." *Id*. Figure 1 of Hassan demonstrates "representative SEM micrographs showing distribution of nickel and its reaction product in: (a) Mg/7.3 Nip, (b) Mg/14.0Nip and (c) Mg/24.9Nip matrices:"

Hassan also discloses that the deposited magnesium ingots may then be subjected to secondary processing. For example, Hassan teaches that the nickel-reinforced magnesium ingots are

machined and hot extruded to obtain rods of 8 mm diameter. *Id*. Analysis of the composite of Hassan "showed the reduction in the size of elemental nickel particulates in the extruded composites" (see Table 1 of Hassan). In other words, the extrusion in Hassan resulted in a reduction of particulate size of the magnesium composite. Hassan was not considered by the patent examiner during the prosecution of the '653 Patent.

Motivation to Combine Xiao and Hassan

A POSITA in April 2014 would have been motivated to combine the disclosures of Xiao with the teachings of Hassan. First, Xiao and Hassan are both directed to improving the properties of magnesium based materials, especially those for use in devices or tools. Hassan, for instance, teaches that:

> increasing hostile service conditions that the modern engineering devices have to withstand have led the materials scientists across the globe to create new materials with enhanced properties when compared to the conventional materials. One way to improve the properties of conventional metallic materials is to reinforce them judiciously keeping the end application in mind. Among the reinforced metallic materials, magnesium based composites are becoming the strong candidates for lightweight structural application due to their superior specific mechanical properties.

ECOMETAL-010553. Hassan also recognizes that type of processing, type, size, and volume fraction of reinforcement are "common factors governing the end properties of a metal matrix composite[]." *Id.*

Xiao similarly teaches in the context of its smelt casted magnesium alloy, the use of reinforcing metals or metal alloys to enhance corrosion performance and/or improve the compressive strength of the formed magnesium material. *Id*. In particular, Xiao noted that existing magnesium alloys (such as AZ91D) had low compressive strength and slow decomposition rates, making them unsuitable as material for, for example, a tripping ball used in oil well drilling. *Id* at ¶ 0003. Xiao responded to those recognized problems in the art by "adjusting the chemical composition and preparation process" to prepare a light and pressure-proof cast magnesium alloy that adds elements which can enhance the corrosion performance of the magnesium alloy. *Id*. at ¶ 0004.

A POSITA would have been motivated to modify the disclosed magnesium alloys and magnesium-alloy-based tripping ball material taught in Xiao to further increase and/or control the rate of dissolution. More specifically, a POSITA would look to Hassan, which teaches pure magnesium reinforced with nickel particulates that exhibits improved physical and mechanical properties over magnesium alloy AZ91. Ex. 1007 at p. 2467, col. 2. Hassan also teaches that careful "selection of reinforcing phase remains one of the most critical factors in developing a composite material with superior properties when compared to its monolithic counterparts." *Id.* Additionally, Hassan notes that its magnesium composites possess improved thermal expansion and mechanical characteristics, which would be beneficial in oil field applications. *Id.* Accordingly, a POSITA in April 2014 would have recognized the benefits set forth in Hassan applied to the magnesium alloy used in the tools taught in Xiao. *Id.*

Hassan also teaches subjecting magnesium ingots to secondary processing. A POSITA in April 2014 would have been motivated to treat the magnesium alloys disclosed in Xiao using the

secondary processing techniques disclosed by Hassan such that the size of additive particulates and magnesium composite could be controlled and optimized.

Xiao already disclosed that controlling the particulate size of its magnesium alloy was desirable with argon treatment and a refining agent (rather than the deformation processing claimed in the '653 Patent). ¶¶ 0036 and 0044, ECOMETAL-010555-56. A POSITA in April 2014 would have had a reasonable expectation of successfully combining the magnesium alloy of Xiao with the secondary processing techniques of Hassan, which were conventionally techniques known for decades to optimize particulate size of metal alloys and improve metal properties. Moreover, such processing techniques have been known for decades to optimize particulate size of metal alloys. See, e.g., Ex. 1203, 1:20-23 ("Powder metal technology is well known to the persons skilled in the art and generally comprises the formation of metal powders which are compacted and then subjected to an elevated temperature so as to produce a sintered product.").

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Shorthand	Description of Prior Art and Other Documents Reviewed
'740 Patent	U.S. Patent No. 10,689,740 B2
Medlin Declaration	Declaration of Dana J. Medlin, Ph.D., P.E., FASM Under 37 C.F.R. § 1.68I in Support of Request for *Ex Parte* Reexamination of U.S. Patent No. 10,329,653
'740 Patent PH	Prosecution History for U.S. Patent No. 10,689,740 B2
Chinese-Language Xiao	Chinese Patent Publication No. CN103343271A (Xiao) (Chinese-language accompanied by an English language abstract)
Xiao	Chinese Pat. Pub. No. CN 103343271 (Xiao) (Certified English Language Translation)
Hassan	Development of High Strength Magnesium Based Composites Using Elemental Nickel Particulates as Reinforcement. Hassan, S.F., Gupta, M., *Journal of Materials Science* 37, 2467–2474 (2002).
1008	Abstract Comparison of the English-language abstract and "Abstract of the Disclosures" section of the Certified English-language translation of Chinese Pat. Pub. No. CN 103343271 (Xiao)
1009	US Provisional Patent Application 61982425
1201	Review of Recent Studies in Magnesium Matrix Composters, Yai Zhi Ye, Xing Yang, Liu, *Journal of Materials Science 39 (2004)*
1202	Fracture Behavior of Cryogenically solidified aluminum-alloy reinforced with Nano-ZrO2 Metal Matrix Composites (CNMMCs), Joel Hemanth. *Journal of Chemical Engineering and Materials Science Vol. 2(8), August 2011*

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1203	US Patent No. 5,476,632 (Shivanath, et al)
1204	Corrosion Resistance of Magnesium Alloys, Barbara A. Shaw, Pennsylvania State University. *ASM Handbook, Volume 13A Corrosion: Fundamentals, Testing, and Protection*
1205	Al-Fe Diagram: Charles H. Henager, Hydrogen Permeation Barrier Coatings, Materials for the Hydrogen Economy, Chapter 8, CRC Press 2007, Editors: R. H. Jones, G. J. Thomas, pp 181-190
1206	Al-Ni Diagram: Laszlo J. Kecskes et al., Army Research Laboratory ARL-TR-5507, April 2011, ACombustion Synthesis Reaction Behavior of Cold-Rolled Ni/Al and Ti/Al Multilayers. p. 5
1207	Al-Cu Diagram: https://sites.google.com/site/eampotentials/Home/AlCu downloaded June 20, 2020.
1208	Al-Ag Diagram: A. J. McAlister, Bull. Alloy Phase Diagrams, 8(6):526-533, 1987
1209	Cu-Ni Phase Diagram. *Teach Yourself Phase Diagrams and Phase Transformations*, Professor Mike Ashby, 5th Edition, March 2009 Cambridge
1210	Illustrated portion of Cu-Ni Chart Phase Diagram. *Materials Science and Engineering*, *6th Edition by Callister and Rethwisch, 2003*
1211	Ag-Cu Binary Phase Diagram. *ASM Metals Handbook, 8th Edition, Vol. 8, Metallography, Structures and Phase Diagrams, 1973*
1212	Mg-Pb Phase Diagram. *ASM Metals Handbook, 8th Edition, Vol. 8, Metallography, Structures and Phase Diagrams, 1973*
1213	Al-Mg Phase Diagram. *ASM Metals Handbook, 8th Edition, Vol. 8, Metallography, Structures and Phase Diagrams, 1973*

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1214	Mg-Ni Diagram. *ASM Metals Handbook, 8th Edition, Vol. 8, Metallography, Structures and Phase Diagrams, 1973*
1215	Galvanic Series table referred to by POSITAs
1216	Mass/Balance. Dana J. Medlin

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U.S. Patent No. 10,689,740 ('740 Patent) Anticipation and Obviousness Invalidity Claim Chart

'740 Patent Claims[1]	Anticipated by CN 103343271 A Xiao et al.	At Least Made Obvious By CN 103343271 A Xiao et al.	Obvious over CN 103343271 A Xiao et al. in view of Hassan, Development of High Strength Mag…
1. A dissolvable magnesium alloy in which additions of high electronegative intermetallic formers are selected from one or more elements with an electronegativity of greater than 1.75 and 0.2-5 wt. % of one or more elements with an electronegativity of 1.25 or less, a magnesium content in said dissolvable magnesium alloy is greater than 50 wt. %, said one or more elements with an electronegativity of greater than 1.75 form a precipitate, particle, and/or intermetallic phase in said dissolvable magnesium alloy, said one or more elements with an electronegativity of greater than 1.75 include one or more elements selected from the group of tin, nickel, iron, cobalt, silicon, nickel, chromium, copper, bismuth, lead, tin, antimony, indium, silver, aluminum, gold, platinum, cadmium, selenium, arsenic, boron, germanium, carbon, molybdenum, tungsten, manganese, zinc, rhenium and gallium, said one or more elements with	***No infringement alleged. See Terves's Final Infringement Contentions at 21***		

[1] Independent claims 1, 2, 19, and 94 are shaded for easier reference.

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an electronegativity of 1.25 or less are selected from the group of calcium, strontium, barium, potassium, neodymium, cerium, sodium, lithium, cesium, yttrium, lanthanum, samarium, europium, gadolinium, terbium, dysprosium, holmium and ytterbium, said dissolvable magnesium alloy has a dissolution rate of at least 5 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C.			
2. A dissolvable magnesium composite that at least partially forms a ball, a frac ball, a tube, a plug or other tool component that is to be used in a well drilling or completion operation,	Xiao discloses a "magnesium alloy...and further adds elements of Fe, Cu, Ni, and Ag which can enhance the corrosion performance of the magnesium alloy..." Xiao ¶ 0026. Xiao discloses a novel magnesium alloy with high aluminum and zinc content further adding elements Fe, Cu, Ni and Ag which can form intermetallics and enhance the corrosion performance of the magnesium alloy. Xiao explains the corrosion mechanism within a magnesium alloy in terms of a cathode phase, which Xiao explains includes "the β (Mg17Al12) phase and eutectic phase on the grain boundary of the magnesium alloy," and "the magnesium matrix α phase which functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which [micro-batteries] greatly accelerate the corrosion decomposition of magnesium alloy." Xiao ¶ 0026. Xiao discloses a novel magnesium alloy with high aluminum and zinc content further adding elements Fe, Cu, Ni and Ag which can form intermetallics and enhance the corrosion performance of the magnesium alloy. Xiao explains the corrosion mechanism within a magnesium alloy in terms of a cathode phase, which Xiao explains includes "the β (Mg17Al12) phase and eutectic phase on the grain boundary	A POSITA in August 2014 would have understood this disclosure as "magnesium composite that at least partially forms a ball, a frac ball, a tube, a plug or other tool component that is to be used in a well drilling or completion operation, …." Thus, this claim element was rendered obvious by Xiao.	

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	of the magnesium alloy," and "the magnesium matrix α phase which functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which [micro-batteries] greatly accelerate the corrosion decomposition of magnesium alloy." Xiao ¶ 0026. Thus, this claim element was anticipated by Xiao.		
said dissolvable dissolvable [sic] magnesium composite includes in situ precipitate,	Xiao discloses a "dissolvable dissolvable [sic] magnesium composite includes in situ precipitate …." Thus, this claim element was anticipated by Xiao.	A POSITA in August 2014 would have understood this disclosure as "dissolvable dissolvable [sic] magnesium composite includes in situ precipitate …." Thus, this claim element was rendered obvious by Xiao.	
said dissolvable magnesium composite comprising a mixture of magnesium or a magnesium alloy and an additive material,	Xiao discloses a "magnesium composite comprising a mixture of magnesium or a magnesium alloy and an additive material …." Thus, this claim element was anticipated by Xiao.	A POSITA in August 2014 would have understood this disclosure as "magnesium composite comprising a mixture of magnesium or a magnesium alloy and an additive material, …." Thus, this claim element was rendered obvious by Xiao.	
said magnesium composite includes greater than 50 wt. % magnesium, said in situ precipitate includes	Xiao discloses a "magnesium composite includes greater than 50 wt. % magnesium, said in situ precipitate …." Thus, this claim element was anticipated by Xiao.	A POSITA in August 2014 would have understood this disclosure as "magnesium composite includes greater than 50 wt. % magnesium, said in situ precipitate …." Thus, this claim element was rendered obvious by Xiao.	
said additive material, said additive material [sic] includes one or more metal materials selected from the group consisting of a) copper wherein said copper constitutes 0.1-35 wt. % of said dissolvable magnesium composite, b) wt. % nickel wherein said nickel constitutes 0.1-23.5 wt. % of said dissolvable magnesium composite, and c) cobalt wherein said cobalt constitutes 0.1-20 wt. % of said dissolvable magnesium composite,	Xiao discloses a "additive material, said additive material [sic] includes one or more metal materials selected from the group consisting of a) copper wherein said copper constitutes 0.1-35 wt. % of said dissolvable magnesium composite, b) wt. % nickel wherein said nickel constitutes 0.1-23.5 wt. % of said dissolvable magnesium composite, and c) cobalt wherein said cobalt constitutes 0.1-20 wt. % of said dissolvable magnesium composite…." Thus, this claim element was anticipated by Xiao.	Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean "over 50 wt. % magnesium and one or more metals selected from the group consisting of aluminum, boron, bismuth, zinc, zirconium, and manganese." It would have been obvious to a PHOSITA to include both Mg and Mn as both are subject to similar corrosion behavior. Based on the combination of "aluminum, boron, bismuth, zinc, zirconium, and manganese" it would have been obvious to a PHOSITA to include Co in the amounts referenced.	

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		Thus, this claim element was rendered obvious by Xiao.	
said dissolvable magnesium composite has a dissolution rate of at least 75 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C.	Xiao discloses a "decomposition performance in a high temperature potassium chloride solution (at a temperature of 70 °C or 93 °C in a potassium chloride aqueous solution with a mass fraction of 3%) significantly exceeds that of the existing ingot metallurgy magnesium alloy (such as the Mg-Al-Zn type AZ91D magnesium alloy)." Xiao ¶ 0028. A POSITA in August 2014 would have understood this disclosure to mean "a dissolution rate of at least 75 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C." Thus, this claim element was anticipated by Xiao.	Xiao discloses a "decomposition performance in a high temperature potassium chloride solution (at a temperature of 70 °C or 93 °C in a potassium chloride aqueous solution with a mass fraction of 3%) significantly exceeds that of the existing ingot metallurgy magnesium alloy (such as the Mg-Al-Zn type AZ91D magnesium alloy)." Xiao ¶ 0028. A POSITA in August 2014 would have understood this disclosure as a "magnesium composite has a dissolution rate of at least 75 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C." Thus, this claim element was rendered obvious by Xiao.	
3. The dissolvable magnesium composite as defined in claim 2, wherein said dissolvable magnesium composite has a dissolution rate of 75-325 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C.	Xiao discloses a "decomposition performance in a high temperature potassium chloride solution (at a temperature of 70 °C or 93 °C in a potassium chloride aqueous solution with a mass fraction of 3%) significantly exceeds that of the existing ingot metallurgy magnesium alloy (such as the Mg-Al-Zn type AZ91D magnesium alloy)." Xiao ¶ 0028. A POSITA in August 2014 would have understood this disclosure to mean "a dissolution rate of 75-325 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C." Thus, this claim element was anticipated by Xiao.	Xiao discloses a "decomposition performance in a high temperature potassium chloride solution (at a temperature of 70 °C or 93 °C in a potassium chloride aqueous solution with a mass fraction of 3%) significantly exceeds that of the existing ingot metallurgy magnesium alloy (such as the Mg-Al-Zn type AZ91D magnesium alloy)." Xiao ¶ 0028. A POSITA in August 2014 would have understood this disclosure as a "magnesium composite has a dissolution rate of at least 75 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C." Thus, this claim element was rendered obvious by Xiao.	
4. The dissolvable magnesium composite as defined in claim 2, wherein said dissolvable magnesium composite has a dissolution rate of 84-325 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C.	Xiao discloses a "decomposition performance in a high temperature potassium chloride solution (at a temperature of 70 °C or 93 °C in a potassium chloride aqueous solution with a mass fraction of 3%) significantly exceeds that of the existing ingot metallurgy magnesium alloy (such as the Mg-Al-Zn type AZ91D magnesium alloy)." Xiao ¶ 0028. A POSITA in August 2014 would have understood this disclosure to mean "a dissolution rate of 84-325 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C." Thus, this claim element was anticipated by Xiao.	Xiao discloses a "decomposition performance in a high temperature potassium chloride solution (at a temperature of 70 °C or 93 °C in a potassium chloride aqueous solution with a mass fraction of 3%) significantly exceeds that of the existing ingot metallurgy magnesium alloy (such as the Mg-Al-Zn type AZ91D magnesium alloy)." Xiao ¶ 0028. A POSITA in August 2014 would have understood this disclosure as a "magnesium composite has a dissolution rate of 84-325 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C." Thus, this claim element was rendered obvious by Xiao.	

5. The dissolvable magnesium composite as defined in claim 2, wherein said dissolvable magnesium composite has a dissolution rate of 100-325 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C.	Xiao discloses a "decomposition performance in a high temperature potassium chloride solution (at a temperature of 70 °C or 93 °C in a potassium chloride aqueous solution with a mass fraction of 3%) significantly exceeds that of the existing ingot metallurgy magnesium alloy (such as the Mg-Al-Zn type AZ91D magnesium alloy)." Xiao ¶ 0028. A POSITA in August 2014 would have understood this disclosure to mean "a dissolution rate of 100-325 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C." Thus, this claim element was anticipated by Xiao.	Xiao discloses a "decomposition performance in a high temperature potassium chloride solution (at a temperature of 70 °C or 93 °C in a potassium chloride aqueous solution with a mass fraction of 3%) significantly exceeds that of the existing ingot metallurgy magnesium alloy (such as the Mg-Al-Zn type AZ91D magnesium alloy)." Xiao ¶ 0028. A POSITA in August 2014 would have understood this disclosure to mean "a dissolution rate of 100-325 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C." Thus, this claim element was disclosed by Xiao.	
6. The dissolvable magnesium composite as defined in claim 2, wherein said dissolvable magnesium composite has a dissolution rate of 0.6-1 mg/cm2/hr. in 3 wt. % KCl water mixture at 21° C.	Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean "a dissolution rate of 0.6-1 mg/cm2/hr. in 3 wt. % KCl water mixture at 21° C." Further, Xiao discloses a "decomposition performance in a high temperature potassium chloride solution (at a temperature of 70 °C or 93 °C in a potassium chloride aqueous solution with a mass fraction of 3%) significantly exceeds that of the existing ingot metallurgy magnesium alloy (such as the Mg-Al-Zn type AZ91D magnesium alloy)." Xiao ¶ 0028. Thus, this claim element was anticipated by Xiao.	Xiao discloses a "decomposition performance in a high temperature potassium chloride solution (at a temperature of 70 °C or 93 °C in a potassium chloride aqueous solution with a mass fraction of 3%) significantly exceeds that of the existing ingot metallurgy magnesium alloy (such as the Mg-Al-Zn type AZ91D magnesium alloy)." Xiao ¶ 0028. A POSITA in August 2014 would have understood this disclosure to mean "a dissolution rate of 100-325 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C." Thus, this claim element was disclosed by Xiao.	
7. The dissolvable magnesium composite as defined in claim 2, wherein said dissolvable magnesium composite has a dissolution rate of 0.5-1 mg/cm2/hr. in 3 wt. % KCl water mixture at 20° C.	Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean "a dissolution rate of 0.5-1 mg/cm2/hr. in 3 wt. % KCl water mixture at 20° C" Further, Xiao discloses a "decomposition performance in a high temperature potassium chloride solution (at a temperature of 70 °C or 93 °C in a potassium chloride	Xiao discloses a "decomposition performance in a high temperature potassium chloride solution (at a temperature of 70 °C or 93 °C in a potassium chloride aqueous solution with a mass fraction of 3%) significantly exceeds that of the existing ingot metallurgy magnesium alloy (such as the Mg-Al-Zn type AZ91D magnesium alloy)." Xiao ¶ 0028. A POSITA in August 2014 would have understood this disclosure to mean "a dissolution rate of 0.5-1 mg/cm2/hr. in 3 wt. % KCl water mixture at 20° C." Thus, this claim element was disclosed by Xiao.	

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	aqueous solution with a mass fraction of 3%) significantly exceeds that of the existing ingot metallurgy magnesium alloy (such as the Mg-Al-Zn type AZ91D magnesium alloy).” Xiao ¶ 0028. Thus, this claim element was anticipated by Xiao.		
8. The dissolvable magnesium composite as defined in claim 2, wherein said magnesium alloy comprises greater than 50 wt. % magnesium and no more than 10 wt. % aluminum, and one or more metals selected from the group consisting of 0.5-10 wt. % aluminum, 0.1-2 wt. % zinc, 0.01-1 wt. % zirconium, and 0.15-2 wt. % manganese.	Xiao discloses a “light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg.” Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean a “magnesium alloy comprises greater than 50 wt. % magnesium and no more than 10 wt. % aluminum, and one or more metals selected from the group consisting of 0.5-10 wt. % aluminum, 0.1-2 wt. % zinc, 0.01-1 wt. % zirconium, and 0.15-2 wt. % manganese.” Thus, this claim element was anticipated by Xiao.		
9. The dissolvable magnesium composite as defined in claim 2, wherein said magnesium alloy comprises greater than 50 wt. % magnesium and no more than 10 wt. % aluminum, and one or more metals selected from the group consisting of 0.1-3 wt. % zinc, 0.05-1 wt. % zirconium, 0.05-0.25 wt. % manganese, 0.0002-0.04 wt. % boron, and 0.4-0.7 wt. % bismuth.	Xiao discloses a “light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg.” Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean a “magnesium alloy comprises greater than 50 wt. % magnesium and no more than 10 wt. % magnesium alloy comprises greater than 50 wt. % magnesium and no more than 10 wt. % aluminum, and one or more metals selected from the group consisting of 0.1-3 wt. % zinc, 0.05-1 wt. % zirconium, 0.05-0.25 wt. % manganese, 0.0002-0.04 wt. % boron, and 0.4-0.7 wt. % bismuth.” Thus, this claim element was anticipated by Xiao.	Xiao discloses a “light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg.” Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean “over 50 wt. % magnesium and one or more metals selected from the group consisting of aluminum, boron, bismuth, zinc, zirconium, and manganese.” It would have been obvious to a PHOSITA to include both Mg and Mn as both are subject to similar corrosion behavior. Based on the combination of “aluminum, boron, bismuth, zinc, zirconium, and manganese” it would have been obvious to a PHOSITA to include B and Bi in the amounts referenced. Thus, this claim element was rendered obvious by Xiao.	
10. The dissolvable magnesium composite as defined in claim 2, wherein	Xiao discloses a “light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of		

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said additive material includes nickel.	Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. Xiao discloses a "magnesium composite as defined in claim 2, wherein said additive material includes nickel." Thus, this claim element was anticipated by Xiao.		
11. The dissolvable magnesium composite as defined in claim 2, wherein said additive material includes nickel, said nickel constitutes 0.3-7 wt. % of said dissolvable magnesium composite.	Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. Xiao discloses a "material includes nickel, said nickel constitutes 0.3-7 wt. % of said dissolvable magnesium composite." Thus, this claim element was anticipated by Xiao.		
12. The dissolvable magnesium composite as defined in claim 2, wherein said additive material includes nickel, said nickel constitutes 7-10 wt. % of said dissolvable magnesium composite.	***No infringement alleged. See Terves's Final Infringement Contentions at 24***		
13. The dissolvable magnesium composite as defined in claim 2, wherein said additive material includes copper.	Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. Xiao discloses an "additive material [that] includes copper." Thus, this claim element was anticipated by Xiao		
14. The dissolvable magnesium composite as defined in claim 2, wherein said additive material	Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to	Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to	

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includes copper, said copper constitutes 0.5-15 wt. % of said dissolvable magnesium composite.	0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. Xiao discloses an "additive material [that] includes copper." Thus, this claim element was anticipated by Xiao.	0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean a "said copper constitutes 0.5-15 wt. % of said dissolvable magnesium composite" Thus, this claim element was made obvious by Xiao.	
15. The dissolvable magnesium composite as defined in claim 2, wherein said additive material includes copper, said copper constitutes 15-35 wt. % of said dissolvable magnesium composite.	***No infringement alleged. See Terves's Final Infringement Contentions at 24.***		
16. The dissolvable magnesium composite as defined in claim 2, wherein said magnesium content in said dissolvable magnesium composite is at least 75 wt. %.	Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. Xiao discloses an "magnesium content in said dissolvable magnesium composite is at least 75 wt. %." Thus, this claim element was anticipated by Xiao..		
17. The dissolvable magnesium composite as defined in claim 2, wherein said magnesium content in said dissolvable magnesium composite is at least 85 wt. %.	Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. Xiao discloses an "magnesium content in said dissolvable magnesium composite is at least 85 wt. %.." Thus, this claim element was anticipated by Xiao.		

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18. The dissolvable magnesium composite as defined in claim 2, wherein said additive material is a metal or metal alloy.	***Infringement contention withdrawn pursuant to July 2, 2021 email from Matthew J. Cavanagh.***		
19. A dissolvable magnesium cast composite comprising			
a mixture of magnesium or a magnesium alloy and an additive material, said additive material includes one or more metals selected from the group consisting of a) copper wherein said copper constitutes at least 0.01 wt. % of said dissolvable magnesium cast composite, b) nickel wherein said nickel constitutes at least 0.01 wt. % of said dissolvable magnesium cast composite, and c) cobalt wherein said cobalt constitutes at least 0.01 wt. % of said dissolvable magnesium cast composite,	Xiao discloses a "magnesium alloy...and further adds elements of Fe, Cu, Ni, and Ag which can enhance the corrosion performance of the magnesium alloy..." ¶ 0026, ll. 1-3. Xiao discloses a novel magnesium alloy with high aluminum and zinc content further adding elements Fe, Cu, Ni and Ag which can form intermetallics and enhance the corrosion performance of the magnesium alloy. Xiao explains the corrosion mechanism within a magnesium alloy in terms of a cathode phase, which Xiao explains includes "the β (Mg17Al12) phase and eutectic phase on the grain boundary of the magnesium alloy," and "the magnesium matrix α phase which functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which [micro-batteries] greatly accelerate the corrosion decomposition of magnesium alloy." ¶ 0026. Xiao discloses an "a mixture of magnesium or a magnesium alloy and an additive material, said additive material includes one or more metals selected from the group consisting of a) copper wherein said copper constitutes at least 0.01 wt. % of said dissolvable magnesium cast composite, b) nickel wherein said nickel constitutes at least 0.01 wt. % of said dissolvable magnesium cast composite, and c) cobalt wherein said cobalt constitutes at least 0.01 wt. % of said dissolvable magnesium cast composite, …" Thus, this claim element was anticipated by Xiao.	A POSITA in August 2014 would have understood this disclosure to mean a "a mixture of magnesium or a magnesium alloy and an additive material, said additive material includes one or more metals selected from the group consisting of a) copper wherein said copper constitutes at least 0.01 wt. % of said dissolvable magnesium cast composite, b) nickel wherein said nickel constitutes at least 0.01 wt. % of said dissolvable magnesium cast composite, and c) cobalt wherein said cobalt constitutes at least 0.01 wt. % of said dissolvable magnesium cast composite, …" Thus, this claim element was rendered obvious by Xiao.	
said magnesium composite includes in situ precipitate,	Xiao discloses a "composite includes in situ precipitate, …" Thus, this claim element was anticipated by Xiao.	A POSITA in August 2014 would have understood this disclosure to mean "composite includes in situ precipitate, …" Thus, this claim element was rendered obvious by Xiao.	

said in situ precipitate includes said additive material, a plurality of particles of said in situ precipitate having a size of no more than 50 µm,	Xiao discloses a "additive material, a plurality of particles of said in situ precipitate having a size of no more than 50 µm, …." Thus, this claim element was anticipated by Xiao.	A POSITA in August 2014 would have understood this disclosure to mean "additive material, a plurality of particles of said in situ precipitate having a size of no more than 50 µm, …." Thus, this claim element was rendered obvious by Xiao.	
said magnesium composite has a dissolution rate of at least 5 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C.	Xiao discloses a "magnesium as the basis of our study; by means of adjusting the chemical composition and preparation process and using an industrial production method, a light and pressure-proof fast-decomposed cast magnesium alloy is prepared, which is able to meet the requirements for the decomposition of a tripping ball used in the multi-stage sliding sleeve staged-fracturing technique." Xiao ¶ 0005. Xiao discloses a "a magnesium alloy with a high aluminum content (13 to 25% by weight) and a high zinc content (2 to 10% by weight), and further adds elements of Fe, Cu, Ni and Ag which can enhance the corrosion performance of the magnesium alloy, and at the same time adds Zr, Ti element as grain refiners to improve the compressive strength of the formed material, in which the purpose of adding the high content of aluminum content is to produce a large amount of cathode phase, the B (Mgi7Al12) phase and eutectic phase on the grain boundary of the magnesium alloy, and the magnesium matrix o phase functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which greatly accelerate the corrosion decomposition of magnesium alloy." Xiao ¶ 0026. Further, Xiao discloses a "decomposition performance in a high temperature potassium chloride solution (at a temperature of 70 °C or 93 °C in a potassium chloride aqueous solution with a mass fraction of 3%) significantly exceeds that of the existing ingot metallurgy magnesium alloy (such as the Mg-Al-Zn type AZ91D magnesium alloy)." Xiao ¶ 0028. Thus, this claim element was anticipated by Xiao.	Xiao discloses a "decomposition performance in a high temperature potassium chloride solution (at a temperature of 70 °C or 93 °C in a potassium chloride aqueous solution with a mass fraction of 3%) significantly exceeds that of the existing ingot metallurgy magnesium alloy (such as the Mg-Al-Zn type AZ91D magnesium alloy)." Xiao ¶ 0028. A POSITA in August 2014 would have understood this disclosure to mean "of at least 5 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C." Thus, this claim element was rendered obvious by Xiao.	As set forth in Ground I, supra, Xiao already discloses each and every element of the magnesium composition of Claim 1. Xiao does not disclose subjecting that magnesium composite to deformation processing. Hassan explicitly discloses deformation processing. In particular, Hassan discloses that the deposited magnesium ingots may then be subjected to secondary processing. For example, Hassan teaches that the nickel-reinforced magnesium ingots are machined and hot extruded to obtain rods of 8 mm diameter. Id. Analysis of the composite of Hassan "showed the reduction in the size of elemental nickel particulates in the extruded composites" (see Table 1 (from Hassan (above)). In other words, the extrusion in Hassan resulted in a reduction of grain size of the magnesium composite. A POSITA in April 2014 would have been motivated to combine the disclosure of Xiao with this disclosure of deformation processing in Hassan rendering Claim 7 obvious. Thus, this claim element was rendered obvious by Xiao in view of Hassan.
20. The dissolvable magnesium cast composite	Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following		

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as defined in claim 19, wherein said magnesium composite includes at least 85 wt. % magnesium.	components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. Xiao discloses a "magnesium composite includes at least 85 wt. % magnesium." Thus, this claim element was anticipated by Xiao.		
21. The dissolvable magnesium cast composite as defined in claim 19, wherein said magnesium composite has a dissolution rate of at least 40 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C.	Xiao discloses a "a magnesium alloy … is to produce a large amount of cathode phase, the B (Mgi7Al12) phase and eutectic phase on the grain boundary of the magnesium alloy, and the magnesium matrix o phase functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which greatly accelerate the corrosion decomposition of magnesium alloy." Xiao ¶ 0026. Further, Xiao discloses a "decomposition performance in a high temperature potassium chloride solution (at a temperature of 70 °C or 93 °C in a potassium chloride aqueous solution with a mass fraction of 3%) significantly exceeds that of the existing ingot metallurgy magnesium alloy (such as the Mg-Al-Zn type AZ91D magnesium alloy)." Xiao ¶ 0028. Thus, this claim element was anticipated by Xiao.	Xiao discloses a "a magnesium alloy … is to produce a large amount of cathode phase, the B (Mgi7Al12) phase and eutectic phase on the grain boundary of the magnesium alloy, and the magnesium matrix o phase functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which greatly accelerate the corrosion decomposition of magnesium alloy." Xiao ¶ 0026. Further, Xiao discloses a "decomposition performance in a high temperature potassium chloride solution (at a temperature of 70 °C or 93 °C in a potassium chloride aqueous solution with a mass fraction of 3%) significantly exceeds that of the existing ingot metallurgy magnesium alloy (such as the Mg-Al-Zn type AZ91D magnesium alloy)." Xiao ¶ 0028. A POSITA in August 2014 would have understood this disclosure to mean "dissolution rate of at least 40 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C." Thus, this claim element was rendered obvious by Xiao.	
22. The dissolvable magnesium cast composite as defined in claim 20, wherein said magnesium composite has a dissolution rate of at least 40 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C.	Xiao discloses "a magnesium alloy … is to produce a large amount of cathode phase, the B (Mgi7Al12) phase and eutectic phase on the grain boundary of the magnesium alloy, and the magnesium matrix o phase functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which greatly accelerate the corrosion decomposition of magnesium alloy." Xiao ¶ 0026. Further, Xiao discloses a "decomposition performance in a high temperature potassium chloride solution (at a temperature of 70 °C or 93 °C in a potassium chloride aqueous solution with a mass fraction of 3%) significantly	Xiao discloses "a magnesium alloy … is to produce a large amount of cathode phase, the B (Mgi7Al12) phase and eutectic phase on the grain boundary of the magnesium alloy, and the magnesium matrix o phase functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which greatly accelerate the corrosion decomposition of magnesium alloy." Xiao ¶ 0026. Further, Xiao discloses a "decomposition performance in a high temperature potassium chloride solution (at a temperature of 70 °C or 93 °C in a potassium chloride aqueous solution with a mass fraction of 3%) significantly	

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	exceeds that of the existing ingot metallurgy magnesium alloy (such as the Mg-Al-Zn type AZ91D magnesium alloy).” Xiao ¶ 0028. Thus, this claim element was anticipated by Xiao.	exceeds that of the existing ingot metallurgy magnesium alloy (such as the Mg-Al-Zn type AZ91D magnesium alloy).” Xiao ¶ 0028. A POSITA in August 2014 would have understood this disclosure to mean “magnesium composite has a dissolution rate of at least 40 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C.” Thus, this claim element was rendered obvious by Xiao.	
23. The dissolvable magnesium cast composite as defined in claim 19, wherein said magnesium composite includes no more than 10 wt. % aluminum.	Xiao discloses a “light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg.” Xiao ¶ 0026. Xiao Abstract. Xiao discloses “a magnesium alloy with a high aluminum content (13 to 25% by weight)” Xiao ¶ 0026. Xiao also discloses “trace element components are an Al-Fe intermediate alloy, an Al-Ni intermediate alloy, an Al-Cu intermediate alloy, an Al-Ag intermediate alloy, an Al-Zr intermediate alloy, and an Al-Ti intermediate alloy, ….” Xiao Claim 9. Thus, this claim element was anticipated by Xiao.	Xiao discloses a “light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg.” Xiao ¶ 0026. Xiao Abstract. Xiao discloses “a magnesium alloy with a high aluminum content (13 to 25% by weight)” Xiao ¶ 0026. Xiao also discloses “trace element components are an Al-Fe intermediate alloy, an Al-Ni intermediate alloy, an Al-Cu intermediate alloy, an Al-Ag intermediate alloy, an Al-Zr intermediate alloy, and an Al-Ti intermediate alloy, ….” Xiao Claim 9. Xiao discloses “a magnesium alloy with a high aluminum content (13 to 25% by weight) and” Xiao ¶ 0026. A POSITA in August 2014 would have understood this disclosure to mean “magnesium composite includes no more than 10 wt. % aluminum.” Thus, this claim element was rendered obvious by Xiao.	
24. The dissolvable magnesium cast composite as defined in claim 20, wherein said magnesium composite includes no more than 10 wt. % aluminum.	Xiao discloses a “light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg.” Xiao ¶ 0026. Xiao Abstract. Xiao discloses “a magnesium alloy with a high aluminum content (13 to 25% by weight)” Xiao ¶ 0026. Xiao also discloses “trace element components are an Al-Fe intermediate alloy, an Al-Ni intermediate alloy, an Al-Cu intermediate alloy, an Al-Ag intermediate alloy, an Al-Zr	Xiao discloses a “a magnesium alloy with a high aluminum content (13 to 25% by weight) and” Xiao ¶ 0026. A POSITA in August 2014 would have understood this disclosure to mean “magnesium composite includes no more than 10 wt. % aluminum.” Thus, this claim element was rendered obvious by Xiao.	

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	intermediate alloy, and an Al-Ti intermediate alloy, ….” Xiao Claim 9. Xiao discloses “a magnesium alloy with a high aluminum content (13 to 25% by weight)” Xiao ¶ 0026. Xiao discloses “trace element components are an Al-Fe intermediate alloy, an Al-Ni intermediate alloy, an Al-Cu intermediate alloy, an Al-Ag intermediate alloy, an Al-Zr intermediate alloy, and an Al-Ti intermediate alloy, ….” Xiao Claim 9. Thus, this claim element was anticipated by Xiao.		
25. The dissolvable magnesium cast composite as defined in claim 21, wherein said magnesium composite includes no more than 10 wt. % aluminum.	Xiao discloses “a magnesium alloy with a high aluminum content (13 to 25% by weight)” Xiao ¶ 0026. Xiao discloses “trace element components are an Al-Fe intermediate alloy, an Al-Ni intermediate alloy, an Al-Cu intermediate alloy, an Al-Ag intermediate alloy, an Al-Zr intermediate alloy, and an Al-Ti intermediate alloy, ….” Xiao Claim 9. Thus, this claim element was anticipated by Xiao.	Xiao discloses a “a magnesium alloy with a high aluminum content (13 to 25% by weight) and” Xiao ¶ 0026. A POSITA in August 2014 would have understood this disclosure to mean “magnesium composite includes no more than 10 wt. % aluminum.” Thus, this claim element was rendered obvious by Xiao.	
26. The dissolvable magnesium cast composite as defined in claim 22, wherein said magnesium composite includes no more than 10 wt. % aluminum.	Xiao discloses “a magnesium alloy with a high aluminum content (13 to 25% by weight)” Xiao ¶ 0026. Xiao discloses “trace element components are an Al-Fe intermediate alloy, an Al-Ni intermediate alloy, an Al-Cu intermediate alloy, an Al-Ag intermediate alloy, an Al-Zr intermediate alloy, and an Al-Ti intermediate alloy, ….” Xiao Claim 9. Thus, this claim element was anticipated by Xiao.	Xiao discloses a “a magnesium alloy with a high aluminum content (13 to 25% by weight) and” Xiao ¶ 0026. A POSITA in August 2014 would have understood this disclosure to mean “magnesium composite includes no more than 10 wt. % aluminum.” Thus, this claim element was rendered obvious by Xiao.	
27. The dissolvable magnesium cast composite as defined in claim 23, wherein said magnesium composite includes at least 50 wt. % magnesium.	Xiao discloses “[a] light and pressure-proof fast-decomposed cast magnesium alloy, comprising the components at the weight percentages as follows: Al: 13 to 25%, Zn: 2 to 15%, the remainder is Mg, and a sum of the weight percentages of the components is 100%.” Xiao Claim 1. Xiao also discloses a “light and pressure-proof fast-decomposed cast magnesium alloy according to claim 1, further comprising the trace elements at the weight	A POSITA in August 2014 would have understood this disclosure to mean “magnesium composite includes at least 50 wt. % magnesium.” Thus, this claim element was rendered obvious by Xiao.	

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	percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%; and a sum of the weight percentages of the components is 100%. Xiao Claim 2. Thus, this claim element was anticipated by Xiao.		
28. The dissolvable magnesium cast composite as defined in claim 25, wherein said magnesium composite includes at least 50 wt. % magnesium.	Xiao discloses "[a] light and pressure-proof fast-decomposed cast magnesium alloy, comprising the components at the weight percentages as follows: Al: 13 to 25%, Zn: 2 to 15%, the remainder is Mg, and a sum of the weight percentages of the components is 100%." Xiao Claim 1. Xiao also discloses a "light and pressure-proof fast-decomposed cast magnesium alloy according to claim 1, further comprising the trace elements at the weight percentages as follows: Fe: 0.1 to 5%, Cu: 0.05 to 5%, Ni: 0.05 to 5%, Zr: 0.05 to 0.5%, Ti: 0.05 to 0.5%; and a sum of the weight percentages of the components is 100%. Xiao Claim 2. Thus, this claim element was anticipated by Xiao.	A POSITA in August 2014 would have understood this disclosure to mean "magnesium composite includes at least 50 wt. % magnesium." Thus, this claim element was rendered obvious by Xiao.	
29. The dissolvable magnesium cast composite as defined in claim 19, wherein said dissolvable magnesium cast composite has a dissolution rate of 40-325 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C.	Xiao discloses "a magnesium alloy … is to produce a large amount of cathode phase, the B (Mgi7Al12) phase and eutectic phase on the grain boundary of the magnesium alloy, and the magnesium matrix o phase functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which greatly accelerate the corrosion decomposition of magnesium alloy." Xiao ¶ 0026. Further, Xiao discloses a "decomposition performance in a high temperature potassium chloride solution (at a temperature of 70 °C or 93 °C in a potassium chloride aqueous solution with a mass fraction of 3%) significantly exceeds that of the existing ingot metallurgy magnesium alloy (such as the Mg-Al-Zn type AZ91D magnesium alloy)." Xiao ¶ 0028. Thus, this claim element was anticipated by Xiao.	A POSITA in August 2014 would have understood this disclosure to mean "a dissolution rate of 40-325 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C." Thus, this claim element was rendered obvious by Xiao.	

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30. The dissolvable magnesium cast composite as defined in claim 20, wherein said dissolvable magnesium cast composite has a dissolution rate of 40-325 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C.	Xiao discloses "a magnesium alloy … is to produce a large amount of cathode phase, the B (Mgi7Al12) phase and eutectic phase on the grain boundary of the magnesium alloy, and the magnesium matrix o phase functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which greatly accelerate the corrosion decomposition of magnesium alloy." Xiao ¶ 0026. Further, Xiao discloses a "decomposition performance in a high temperature potassium chloride solution (at a temperature of 70 °C or 93 °C in a potassium chloride aqueous solution with a mass fraction of 3%) significantly exceeds that of the existing ingot metallurgy magnesium alloy (such as the Mg-Al-Zn type AZ91D magnesium alloy)." Xiao ¶ 0028. Thus, this claim element was anticipated by Xiao.	A POSITA in August 2014 would have understood this disclosure to mean "a dissolution rate of 40-325 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C." Thus, this claim element was rendered obvious by Xiao.	
31. The dissolvable magnesium cast composite as defined in claim 22, wherein said dissolvable magnesium cast composite has a dissolution rate of 40-325 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C.	Xiao discloses "a magnesium alloy … is to produce a large amount of cathode phase, the B (Mgi7Al12) phase and eutectic phase on the grain boundary of the magnesium alloy, and the magnesium matrix o phase functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which greatly accelerate the corrosion decomposition of magnesium alloy." Xiao ¶ 0026. Further, Xiao discloses a "decomposition performance in a high temperature potassium chloride solution (at a temperature of 70 °C or 93 °C in a potassium chloride aqueous solution with a mass fraction of 3%) significantly exceeds that of the existing ingot metallurgy magnesium alloy (such as the Mg-Al-Zn type AZ91D magnesium alloy)." Xiao ¶ 0028. Thus, this claim element was anticipated by Xiao.	A POSITA in August 2014 would have understood this disclosure to mean "a dissolution rate of 40-325 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C." Thus, this claim element was rendered obvious by Xiao.	
32. The dissolvable magnesium cast composite as defined in claim 23, wherein said dissolvable magnesium cast composite has a dissolution rate of 40-325 mg/cm2/hr. in 3 wt. %	Xiao discloses "a magnesium alloy … is to produce a large amount of cathode phase, the B (Mgi7Al12) phase and eutectic phase on the grain boundary of the magnesium alloy, and the magnesium matrix o phase functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which greatly accelerate the corrosion decomposition of magnesium alloy." Xiao ¶ 0026.	A POSITA in August 2014 would have understood this disclosure to mean "a dissolution rate of 40-325 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C." Thus, this claim element was rendered obvious by Xiao.	

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KCl water mixture at 90° C.	Further, Xiao discloses a "decomposition performance in a high temperature potassium chloride solution (at a temperature of 70 °C or 93 °C in a potassium chloride aqueous solution with a mass fraction of 3%) significantly exceeds that of the existing ingot metallurgy magnesium alloy (such as the Mg-Al-Zn type AZ91D magnesium alloy)." Xiao ¶ 0028. Thus, this claim element was anticipated by Xiao.		
33. The dissolvable magnesium cast composite as defined in claim 27, wherein said dissolvable magnesium cast composite has a dissolution rate of 40-325 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C.	Xiao discloses "a magnesium alloy … is to produce a large amount of cathode phase, the B (Mgi7Al12) phase and eutectic phase on the grain boundary of the magnesium alloy, and the magnesium matrix o phase functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which greatly accelerate the corrosion decomposition of magnesium alloy." Xiao ¶ 0026. Further, Xiao discloses a "decomposition performance in a high temperature potassium chloride solution (at a temperature of 70 °C or 93 °C in a potassium chloride aqueous solution with a mass fraction of 3%) significantly exceeds that of the existing ingot metallurgy magnesium alloy (such as the Mg-Al-Zn type AZ91D magnesium alloy)." Xiao ¶ 0028. Thus, this claim element was anticipated by Xiao.	A POSITA in August 2014 would have understood this disclosure to mean "a dissolution rate of 40-325 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C." Thus, this claim element was rendered obvious by Xiao.	
34. The dissolvable magnesium cast composite as defined in claim 28, wherein said dissolvable magnesium cast composite has a dissolution rate of 40-325 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C.	Xiao discloses "a magnesium alloy … is to produce a large amount of cathode phase, the B (Mgi7Al12) phase and eutectic phase on the grain boundary of the magnesium alloy, and the magnesium matrix o phase functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which greatly accelerate the corrosion decomposition of magnesium alloy." Xiao ¶ 0026. Further, Xiao discloses a "decomposition performance in a high temperature potassium chloride solution (at a temperature of 70 °C or 93 °C in a potassium chloride aqueous solution with a mass fraction of 3%) significantly exceeds that of the existing ingot metallurgy magnesium alloy (such as the Mg-Al-Zn type AZ91D magnesium alloy)." Xiao ¶ 0028. Thus, this claim element was anticipated by Xiao.	A POSITA in August 2014 would have understood this disclosure to mean "40-325 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C." Thus, this claim element was rendered obvious by Xiao.	

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35. The dissolvable magnesium cast composite as defined in claim 27, wherein said magnesium alloy includes over 50 wt. % magnesium and one or more metals selected from the group consisting of aluminum, boron, bismuth, zinc, zirconium, and manganese.		Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean "over 50 wt. % magnesium and one or more metals selected from the group consisting of aluminum, boron, bismuth, zinc, zirconium, and manganese." It would have been obvious to a PHOSITA to include both Mg and Mn as both are subject to similar corrosion behavior. Based on the combination of "aluminum, boron, bismuth, zinc, zirconium, and manganese" it would have been obvious to a PHOSITA to include boron and bismuth, Thus, this claim element was rendered obvious by Xiao.	
36. The dissolvable magnesium cast composite as defined in claim 28, wherein said magnesium alloy includes over 50 wt. % magnesium and one or more metals selected from the group consisting of aluminum, boron, bismuth, zinc, zirconium, and manganese.		Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean "over 50 wt. % magnesium and one or more metals selected from the group consisting of aluminum, boron, bismuth, zinc, zirconium, and manganese." It would have been obvious to a PHOSITA to include both Mg and Mn as both are subject to similar corrosion behavior. Based on the combination of "aluminum, boron, bismuth, zinc, zirconium, and manganese" it would have been obvious to a PHOSITA to include boron and bismuth, Thus, this claim element was rendered obvious by Xiao.	
37. The dissolvable magnesium cast composite as defined in claim 27, wherein said magnesium alloy includes over 50 wt. % magnesium and one or more metals selected from		Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract.	

the group consisting of aluminum in an amount of 0.5-10 wt. %, zinc in an amount of 0.1-6 wt. %, zirconium in an amount of 0.01-3 wt. %, manganese in an amount of 0.15-2 wt. %, boron in an amount of 0.0002-0.04 wt. %, and bismuth in an amount of 0.4-0.7 wt. %.		A POSITA in August 2014 would have understood this disclosure to mean "over 50 wt. % magnesium and one or more metals selected from the group consisting of aluminum in an amount of 0.5-10 wt. %, zinc in an amount of 0.1-6 wt. %, zirconium in an amount of 0.01-3 wt. %, manganese in an amount of 0.15-2 wt. %, boron in an amount of 0.0002-0.04 wt. %, and bismuth in an amount of 0.4-0.7 wt. %." It would have been obvious to a PHOSITA to include both Mg and Mn as both are subject to similar corrosion behavior. Based on the combination of "aluminum, boron, bismuth, zinc, zirconium, and manganese" it would have been obvious to a PHOSITA to include boron and bismuth in the indicated concentrations Thus, this claim element was rendered obvious by Xiao.	
38. The dissolvable magnesium cast composite as defined in claim 28, wherein said magnesium alloy includes over 50 wt. % magnesium and one or more metals selected from the group consisting of aluminum in an amount of 0.5-10 wt. %, zinc in an amount of 0.1-6 wt. %, zirconium in an amount of 0.01-3 wt. %, manganese in an amount of 0.15-2 wt. %, boron in an amount of 0.0002-0.04 wt. %, and bismuth in an amount of 0.4-0.7 wt. %.		Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean "over 50 wt. % magnesium and one or more metals selected from the group consisting of aluminum in an amount of 0.5-10 wt. %, zinc in an amount of 0.1-6 wt. %, zirconium in an amount of 0.01-3 wt. %, manganese in an amount of 0.15-2 wt. %, boron in an amount of 0.0002-0.04 wt. %, and bismuth in an amount of 0.4-0.7 wt. %." It would have been obvious to a PHOSITA to include both Mg and Mn as both are subject to similar corrosion behavior. Based on the combination of "aluminum, boron, bismuth, zinc, zirconium, and manganese" it would have been obvious to a PHOSITA to include boron and bismuth in the indicated concentrations Thus, this claim element was rendered obvious by Xiao.	
39. The dissolvable magnesium cast composite as defined in claim 27, wherein said magnesium alloy includes over 50 wt. % magnesium and one or more metals selected from the group consisting of aluminum in an amount of		Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean "over 50 wt. % magnesium and one or	

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0.5-10 wt. %, zinc in an amount of 0.1-3 wt. %, zirconium in an amount of 0.01-1 wt. %, manganese in an amount of 0.15-2 wt. %, boron in an amount of 0.0002-0.04 wt. %, and bismuth in amount of 0.4-0.7 wt. %.		more metals selected from the group consisting of aluminum in an amount of 0.5-10 wt. %, zinc in an amount of 0.1-6 wt. %, zirconium in an amount of 0.01-3 wt. %, manganese in an amount of 0.15-2 wt. %, boron in an amount of 0.0002-0.04 wt. %, and bismuth in an amount of 0.4-0.7 wt. %." It would have been obvious to a PHOSITA to include both Mg and Mn as both are subject to similar corrosion behavior. Based on the combination of "aluminum, boron, bismuth, zinc, zirconium, and manganese" it would have been obvious to a PHOSITA to include boron and bismuth in the indicated concentrations. Thus, this claim element was rendered obvious by Xiao.	
40. The dissolvable magnesium cast composite as defined in claim 28, wherein said magnesium alloy includes over 50 wt. % magnesium and one or more metals selected from the group consisting of aluminum in an amount of 0.5-10 wt. %, zinc in an amount of 0.1-3 wt. %, zirconium in an amount of 0.01-1 wt. %, manganese in an amount of 0.15-2 wt. %, boron in an amount of 0.0002-0.04 wt. %, and bismuth in amount of 0.4-0.7 wt. %.		Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean "over 50 wt. % magnesium and one or more metals selected from the group consisting of aluminum in an amount of 0.5-10 wt. %, zinc in an amount of 0.1-6 wt. %, zirconium in an amount of 0.01-3 wt. %, manganese in an amount of 0.15-2 wt. %, boron in an amount of 0.0002-0.04 wt. %, and bismuth in an amount of 0.4-0.7 wt. %." It would have been obvious to a PHOSITA to include both Mg and Mn as both are subject to similar corrosion behavior. Based on the combination of "aluminum, boron, bismuth, zinc, zirconium, and manganese" it would have been obvious to a PHOSITA to include boron and bismuth in the indicated concentrations Thus, this claim element was rendered obvious by Xiao.	
41. The dissolvable magnesium cast composite as defined in claim 20, wherein said magnesium alloy includes at least 85 wt. % magnesium and one or more metals selected from the group consisting of 0.5-10 wt. % aluminum, 0.05-6 wt. % zinc, 0.01-3		Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean "includes at least 85 wt. % magnesium and one or more metals selected from the group consisting of 0.5-10 wt. % aluminum, 0.05-6 wt. % zinc, 0.01-3 wt. %	

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wt. % zirconium, and 0.15-2 wt. % manganese.		zirconium, and 0.15-2 wt. % manganese." It would have been obvious to a PHOSITA to include both Mg and Mn as both are subject to similar corrosion behavior. Based on the combination of "aluminum, boron, bismuth, zinc, zirconium, and manganese" it would have been obvious to a PHOSITA to include boron and bismuth in the indicated concentrations Thus, this claim element was rendered obvious by Xiao.	
42. The dissolvable magnesium cast composite as defined in claim 22, wherein said magnesium alloy includes at least 85 wt. % magnesium and one or more metals selected from the group consisting of 0.5-10 wt. % aluminum, 0.05-6 wt. % zinc, 0.01-3 wt. % zirconium, and 0.15-2 wt. % manganese.		Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean "includes at least 85 wt. % magnesium and one or more metals selected from the group consisting of 0.5-10 wt. % aluminum, 0.05-6 wt. % zinc, 0.01-3 wt. % zirconium, and 0.15-2 wt. % manganese." It would have been obvious to a PHOSITA to include both Mg and Mn as both are subject to similar corrosion behavior. Thus, this claim element was rendered obvious by Xiao.	
43. The dissolvable magnesium cast composite as defined in claim 23, wherein said magnesium alloy includes at least 85 wt. % magnesium and one or more metals selected from the group consisting of 0.5-10 wt. % aluminum, 0.05-6 wt. % zinc, 0.01-3 wt. % zirconium, and 0.15-2 wt. % manganese.		Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean "includes at least 85 wt. % magnesium and one or more metals selected from the group consisting of 0.5-10 wt. % aluminum, 0.05-6 wt. % zinc, 0.01-3 wt. % zirconium, and 0.15-2 wt. % manganese." It would have been obvious to a PHOSITA to include both Mg and Mn as both are subject to similar corrosion behavior. Thus, this claim element was rendered obvious by Xiao.	
44. The dissolvable magnesium cast composite		Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following	

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as defined in claim 27, wherein said magnesium alloy comprises greater than 50 wt. % magnesium and one or more metals selected from the group consisting of 0.5-10 wt. % aluminum, 0.1-2 wt. % zinc, 0.01-1 wt. % zirconium, and 0.15-2 wt. % manganese.		components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean "greater than 50 wt. % magnesium and one or more metals selected from the group consisting of 0.5-10 wt. % aluminum, 0.1-2 wt. % zinc, 0.01-1 wt. % zirconium, and 0.15-2 wt. % manganese." It would have been obvious to a PHOSITA to include both Mg and Mn as both are subject to similar corrosion behavior. Thus, this claim element was rendered obvious by Xiao.	
45. The dissolvable magnesium cast composite as defined in claim 28, wherein said magnesium alloy comprises greater than 50 wt. % magnesium and one or more metals selected from the group consisting of 0.5-10 wt. % aluminum, 0.1-2 wt. % zinc, 0.01-1 wt. % zirconium, and 0.15-2 wt. % manganese.		Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean "greater than 50 wt. % magnesium and one or more metals selected from the group consisting of 0.5-10 wt. % aluminum, 0.1-2 wt. % zinc, 0.01-1 wt. % zirconium, and 0.15-2 wt. % manganese." It would have been obvious to a PHOSITA to include both Mg and Mn as both are subject to similar corrosion behavior. Thus, this claim element was rendered obvious by Xiao.	
46. The dissolvable magnesium cast composite as defined in claim 27, wherein said magnesium alloy comprises greater than 50 wt. % magnesium and one or more metals selected from the group consisting of 0.1-3 wt. % zinc, 0.05-1 wt. % zirconium, 0.05-0.25 wt. % manganese, 0.0002-0.04 wt. % boron, and 0.4-0.7 wt. % bismuth.		Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean "greater than 50 wt. % magnesium and one or more metals selected from the group consisting of 0.1-3 wt. % zinc, 0.05-1 wt. % zirconium, 0.05-0.25 wt. % manganese, 0.0002-0.04 wt. % boron, and 0.4-0.7 wt. % bismuth." It would have been obvious to a PHOSITA to include both Mg and Mn as both are subject to similar corrosion behavior. It would have been obvious to a PHOSITA to include both B	

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		and Bi to the alloy. Based on the combination of "aluminum, boron, bismuth, zinc, zirconium, and manganese" it would have been obvious to a PHOSITA to include boron and bismuth in the indicated concentrations. Thus, this claim element was rendered obvious by Xiao.	
47. The dissolvable magnesium cast composite as defined in claim 28, wherein said magnesium alloy comprises greater than 50 wt. % magnesium and one or more metals selected from the group consisting of 0.1-3 wt. % zinc, 0.05-1 wt. % zirconium, 0.05-0.25 wt. % manganese, 0.0002-0.04 wt. % boron, and 0.4-0.7 wt. % bismuth.		Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean "greater than 50 wt. % magnesium and one or more metals selected from the group consisting of 0.1-3 wt. % zinc, 0.05-1 wt. % zirconium, 0.05-0.25 wt. % manganese, 0.0002-0.04 wt. % boron, and 0.4-0.7 wt. % bismuth." It would have been obvious to a PHOSITA to include both Mg and Mn as both are subject to similar corrosion behavior. It would have been obvious to a PHOSITA to include both B and Bi to the alloy. Based on the combination of "aluminum, boron, bismuth, zinc, zirconium, and manganese" it would have been obvious to a PHOSITA to include boron and bismuth in the indicated concentrations. Thus, this claim element was rendered obvious by Xiao.	
48. The dissolvable magnesium cast composite as defined in claim 19, wherein said magnesium alloy comprises 60-95 wt. % magnesium, 0.5-10 wt. % aluminum, 0.05-6 wt. % zinc, and 0.15-2 wt. % manganese.	***No infringement alleged. See Terves's Final Infringement Contentions at 31.***		
49. The dissolvable magnesium cast composite as defined in claim 19, wherein said magnesium alloy includes 60-95 wt. %	Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract.		

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magnesium and 0.01-1 wt. % zirconium.	Thus, this claim element was anticipated by Xiao.		
50. The dissolvable magnesium cast composite as defined in claim 19, wherein said magnesium alloy includes 60-95 wt. % magnesium, 0.05-6 wt. % zinc, and 0.01-1 wt. % zirconium.	Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. Thus, this claim element was anticipated by Xiao.		
51. The dissolvable magnesium cast composite as defined in claim 19, wherein said magnesium alloy includes over 50 wt. % magnesium and one or more metals selected from the group consisting of 0.1-3 wt. % zinc, 0.01-1 wt. % zirconium, 0.05-1 wt. % manganese, 0.0002-0.04 wt. % boron, and 0.4-0.7 wt. % bismuth.		Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean "includes over 50 wt. % magnesium and one or more metals selected from the group consisting of 0.1-3 wt. % zinc, 0.01-1 wt. % zirconium, 0.05-1 wt. % manganese, 0.0002-0.04 wt. % boron, and 0.4-0.7 wt. % bismuth." It would have been obvious to a PHOSITA to include both Mg and Mn as both are subject to similar corrosion behavior. It would have been obvious to a PHOSITA to include both B and Bi to the alloy. Based on the combination of "aluminum, boron, bismuth, zinc, zirconium, and manganese" it would have been obvious to a PHOSITA to include boron and bismuth in the indicated concentrations. Thus, this claim element was rendered obvious by Xiao.	
52. The dissolvable magnesium cast composite as defined in claim 19, wherein said additive material includes nickel, said nickel constitutes 0.1-23.5 wt. % of said dissolvable magnesium cast composite.		Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean "additive material includes nickel, said nickel constitutes 0.1-23.5 wt. % of said dissolvable	

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		magnesium cast composite." It would have been obvious to a PHOSITA to include 0.1-23.5 wt. % Ni. Thus, this claim element was rendered obvious by Xiao.	
53. The dissolvable magnesium cast composite as defined in claim 20, wherein said additive material includes nickel, said nickel constitutes 0.1-23.5 wt. % of said dissolvable magnesium cast composite.		Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean "additive material includes nickel, said nickel constitutes 0.1-23.5 wt. % of said dissolvable magnesium cast composite." It would have been obvious to a PHOSITA to include 0.1-23.5 wt. % Ni. Thus, this claim element was rendered obvious by Xiao.	
54. The dissolvable magnesium cast composite as defined in claim 22, wherein said additive material includes nickel, said nickel constitutes 0.1-23.5 wt. % of said dissolvable magnesium cast composite.		Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean "additive material includes nickel, said nickel constitutes 0.1-23.5 wt. % of said dissolvable magnesium cast composite." It would have been obvious to a PHOSITA to include 0.1-23.5 wt. % Ni. Thus, this claim element was rendered obvious by Xiao.	
55. The dissolvable magnesium cast composite as defined in claim 23, wherein said additive material includes nickel, said nickel constitutes 0.1-23.5 wt. % of said dissolvable magnesium cast composite.		Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean "additive material includes nickel, said nickel constitutes 0.1-23.5 wt. % of said dissolvable	

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		magnesium cast composite." It would have been obvious to a PHOSITA to include 0.1-23.5 wt. % Ni. Thus, this claim element was rendered obvious by Xiao.	
56. The dissolvable magnesium cast composite as defined in claim 27, wherein said additive material includes nickel, said nickel constitutes 0.1-23.5 wt. % of said dissolvable magnesium cast composite.		Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean "additive material includes nickel, said nickel constitutes 0.1-23.5 wt. % of said dissolvable magnesium cast composite." It would have been obvious to a PHOSITA to include 0.1-23.5 wt. % Ni. Thus, this claim element was rendered obvious by Xiao.	
57. The dissolvable magnesium cast composite as defined in claim 28, wherein said wherein said additive material includes nickel, said nickel constitutes 0.1-23.5 wt. % of said dissolvable magnesium cast composite.		Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean "additive material includes nickel, said nickel constitutes 0.1-23.5 wt. % of said dissolvable magnesium cast composite." It would have been obvious to a PHOSITA to include 0.1-23.5 wt. % Ni. Thus, this claim element was rendered obvious by Xiao.	
58. The dissolvable magnesium cast composite as defined in claim 19, wherein said additive material includes copper, said copper constitutes 0.01-35 wt. % of said dissolvable magnesium cast composite.		Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean "includes copper, said copper constitutes 0.01-35 wt. % of said dissolvable magnesium cast composite."	

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		It would have been obvious to a PHOSITA to include 0.01-35 wt. % Cu. Thus, this claim element was rendered obvious by Xiao.	
59. The dissolvable magnesium cast composite as defined in claim 20, wherein said additive material includes copper, said copper constitutes 0.01-35 wt. % of said dissolvable magnesium cast composite.		Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean "includes copper, said copper constitutes 0.01-35 wt. % of said dissolvable magnesium cast composite." It would have been obvious to a PHOSITA to include 0.01-35 wt. % Cu. Thus, this claim element was rendered obvious by Xiao.	
60. The dissolvable magnesium cast composite as defined in claim 22, wherein said additive material includes copper, said copper constitutes 0.01-35 wt. % of said dissolvable magnesium cast composite.		Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean "includes copper, said copper constitutes 0.01-35 wt. % of said dissolvable magnesium cast composite." It would have been obvious to a PHOSITA to include 0.01-35 wt. % Cu. Thus, this claim element was rendered obvious by Xiao.	
61. The dissolvable magnesium cast composite as defined in claim 23, wherein said additive material includes copper, said copper constitutes 0.01-35 wt. % of said dissolvable magnesium cast composite.		Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean "includes copper, said copper constitutes 0.01-35 wt. % of said dissolvable magnesium cast composite."	

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		It would have been obvious to a PHOSITA to include 0.01-35 wt. % Cu. Thus, this claim element was rendered obvious by Xiao.	
62. The dissolvable magnesium cast composite as defined in claim 17, wherein said additive material includes copper, said copper constitutes 0.01-35 wt. % of said dissolvable magnesium cast composite.		Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean "includes copper, said copper constitutes 0.01-35 wt. % of said dissolvable magnesium cast composite." It would have been obvious to a PHOSITA to include 0.01-35 wt. % Cu. Thus, this claim element was rendered obvious by Xiao.	
63. The dissolvable magnesium cast composite as defined in claim 28, wherein said additive material includes copper, said copper constitutes 0.01-35 wt. % of said dissolvable magnesium cast composite.		Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean "includes copper, said copper constitutes 0.01-35 wt. % of said dissolvable magnesium cast composite." It would have been obvious to a PHOSITA to include 0.01-35 wt. % Cu. Thus, this claim element was rendered obvious by Xiao.	
64. The dissolvable magnesium cast composite as defined in claim 19, wherein said additive material includes copper, said copper constitutes 0.5-15 wt. % of said dissolvable magnesium cast composite.		Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean "includes copper, said copper constitutes 0.01-35 wt. % of said dissolvable magnesium cast composite." It would have been obvious to a PHOSITA to include 0.5-15 wt. % Cu.	

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		Thus, this claim element was rendered obvious by Xiao.	
65. The dissolvable magnesium cast composite as defined in claim 20, wherein said additive material includes copper, said copper constitutes 0.5-15 wt. % of said dissolvable magnesium cast composite.		Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean "includes copper, said copper constitutes 0.01-35 wt. % of said dissolvable magnesium cast composite." It would have been obvious to a PHOSITA to include 0.5-15 wt. % Cu. Thus, this claim element was rendered obvious by Xiao.	
66. The dissolvable magnesium cast composite as defined in claim 22, wherein said additive material includes copper, said copper constitutes 0.5-15 wt. % of said dissolvable magnesium cast composite.		Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean "includes copper, said copper constitutes 0.01-35 wt. % of said dissolvable magnesium cast composite." It would have been obvious to a PHOSITA to include 0.5-15 wt. % Cu. Thus, this claim element was rendered obvious by Xiao.	
67. The dissolvable magnesium cast composite as defined in claim 23, wherein said additive material includes copper, said copper constitutes 0.5-15 wt. % of said dissolvable magnesium cast composite.		Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean "includes copper, said copper constitutes 0.01-35 wt. % of said dissolvable magnesium cast composite." It would have been obvious to a PHOSITA to include 0.5-15 wt. % Cu.	

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		Thus, this claim element was rendered obvious by Xiao.	
68. The dissolvable magnesium cast composite as defined in claim 27, wherein said additive material includes copper, said copper constitutes 0.5-15 wt. % of said dissolvable magnesium cast composite.		Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean "includes copper, said copper constitutes 0.01-35 wt. % of said dissolvable magnesium cast composite." It would have been obvious to a PHOSITA to include 0.5-15 wt. % Cu. Thus, this claim element was rendered obvious by Xiao.	
69. The dissolvable magnesium cast composite as defined in claim 28, wherein said additive material includes copper, said copper constitutes 0.5-15 wt. % of said dissolvable magnesium cast composite.		Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean "includes copper, said copper constitutes 0.01-35 wt. % of said dissolvable magnesium cast composite." It would have been obvious to a PHOSITA to include 0.5-15 wt. % Cu. Thus, this claim element was rendered obvious by Xiao.	
70. The dissolvable magnesium cast composite as defined in claim 19, wherein said additive material includes cobalt, said cobalt constitutes 0.1-20 wt. % of said magnesium composite.	***No infringement alleged. See Terves's Final Infringement Contentions at 34 – 35.***		
71. The dissolvable magnesium cast composite as defined in claim 20,	***No infringement alleged. See Terves's Final Infringement Contentions at 34 – 35.***		

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wherein said wherein said additive material includes cobalt, said cobalt constitutes 0.1-20 wt. % of said magnesium composite.			
72. The dissolvable magnesium cast composite as defined in claim 22, wherein said wherein said additive material includes cobalt, said cobalt constitutes 0.1-20 wt. % of said magnesium composite.	***No infringement alleged. See Terves's Final Infringement Contentions at 34 – 35.***		
73. The dissolvable magnesium cast composite as defined in claim 23, wherein said wherein said additive material includes cobalt, said cobalt constitutes 0.1-20 wt. % of said magnesium composite.	***No infringement alleged. See Terves's Final Infringement Contentions at 34 – 35.***		
74. The dissolvable magnesium cast composite as defined in claim 27, wherein said wherein said additive material includes cobalt, said cobalt constitutes 0.1-20 wt. % of said magnesium composite.	***No infringement alleged. See Terves's Final Infringement Contentions at 34 – 35.***		
75. The dissolvable magnesium cast composite as defined in claim 28, wherein said wherein said additive material includes cobalt, said cobalt constitutes 0.1-20 wt. % of said magnesium composite.	***No infringement alleged. See Terves's Final Infringement Contentions at 34 – 35.***		
76. The dissolvable magnesium cast composite		Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following	

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as defined in claim 19, wherein said additive material includes one or more metal materials selected from the group consisting of 0.1-35 wt. % copper, 0.1-24.5 wt. % nickel and 0.1-20 wt. % cobalt.		components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean "additive material includes one or more metal materials selected from the group consisting of 0.1-35 wt. % copper, 0.1-24.5 wt. % nickel and 0.1-20 wt. % cobalt." It would have been obvious to a PHOSITA to include Cu, Ni, and Co in the indicated concentrations. Thus, this claim element was rendered obvious by Xiao.	
77. The dissolvable magnesium cast composite as defined in claim 29, wherein said additive material includes one or more metal materials selected from the group consisting of 0.1-35 wt. % copper, 0.1-24.5 wt. % nickel and 0.1-20 wt. % cobalt.		Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean "additive material includes one or more metal materials selected from the group consisting of 0.1-35 wt. % copper, 0.1-24.5 wt. % nickel and 0.1-20 wt. % cobalt." It would have been obvious to a PHOSITA to include Cu, Ni, and Co in the indicated concentrations. Thus, this claim element was rendered obvious by Xiao.	
78. The dissolvable magnesium cast composite as defined in claim 22, wherein said additive material includes one or more metal materials selected from the group consisting of 0.1-35 wt. % copper, 0.1-24.5 wt. % nickel and 0.1-20 wt. % cobalt.		Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean "additive material includes one or more metal materials selected from the group consisting of 0.1-35 wt. % copper, 0.1-24.5 wt. % nickel and 0.1-20 wt. % cobalt." It would have been obvious to a PHOSITA to include Cu, Ni, and Co in the indicated concentrations. Thus, this claim element was rendered obvious by Xiao.	

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79. The dissolvable magnesium cast composite as defined in claim 23, wherein said additive material includes one or more metal materials selected from the group consisting of 0.1-35 wt. % copper, 0.1-24.5 wt. % nickel and 0.1-20 wt. % cobalt.		Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean "additive material includes one or more metal materials selected from the group consisting of 0.1-35 wt. % copper, 0.1-24.5 wt. % nickel and 0.1-20 wt. % cobalt." It would have been obvious to a PHOSITA to include Cu, Ni, and Co in the indicated concentrations. Thus, this claim element was rendered obvious by Xiao.	
80. The dissolvable magnesium cast composite as defined in claim 27, wherein said additive material includes one or more metal materials selected from the group consisting of 0.1-35 wt. % copper, 0.1-24.5 wt. % nickel and 0.1-20 wt. % cobalt.		Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean "additive material includes one or more metal materials selected from the group consisting of 0.1-35 wt. % copper, 0.1-24.5 wt. % nickel and 0.1-20 wt. % cobalt." It would have been obvious to a PHOSITA to include Cu, Ni, and Co in the indicated concentrations. Thus, this claim element was rendered obvious by Xiao.	
81. The dissolvable magnesium cast composite as defined in claim 28, wherein said additive material includes one or more metal materials selected from the group consisting of 0.1-35 wt. % copper, 0.1-24.5 wt. % nickel and 0.1-20 wt. % cobalt.		Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean "additive material includes one or more metal materials selected from the group consisting of 0.1-35 wt. % copper, 0.1-24.5 wt. % nickel and 0.1-20 wt. % cobalt." It would have been obvious to a PHOSITA to include Cu, Ni, and Co in the indicated concentrations. Thus, this claim element was rendered obvious by Xiao.	

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82. The dissolvable magnesium cast composite as defined in claim 19, wherein said dissolvable magnesium cast composite has one or more properties selected from the group consisting of a) a tensile strength of at least 14 ksi, b) a shear strength of at least 11 ksi, and c) an elongation of at least 3%.		Xiao discloses "a magnesium alloy with a high aluminum content (13 to 25% by weight) and a high zinc content (2 to 10% by weight), and further adds elements of Fe, Cu, Ni and Ag which can enhance the corrosion performance of the magnesium alloy, and at the same time adds Zr, Ti element as grain refiners to improve the compressive strength of the formed material, … The purpose of adding a high content of zinc to the magnesium alloy is to increase the strength of the magnesium alloy, … The addition of the trace elements Zr and Ti can refine the magnesium alloy crystals, thereby increasing the compressive strength of the alloy. The room temperature tensile strength op of the light and pressure-proof fast-decomposed cast magnesium alloy prepared by the invention is 130 to 180 MPa higher than that of the existing AZ91D magnesium alloy, …." Xiao at ¶ 0026. A POSITA in August 2014 would have understood this disclosure to mean "has one or more properties selected from the group consisting of a) a tensile strength of at least 14 ksi, b) a shear strength of at least 11 ksi, and c) an elongation of at least 3%." Thus, this claim element was rendered obvious by Xiao.	As set forth in Ground I, supra, Xiao already discloses each and every element of the magnesium composition of Claim 1. Xiao does not disclose subjecting that magnesium composite to deformation processing. Hassan explicitly discloses deformation processing. In particular, Hassan discloses that the deposited magnesium ingots may then be subjected to secondary processing. For example, Hassan teaches that the nickel-reinforced magnesium ingots are machined and hot extruded to obtain rods of 8 mm diameter. Id. Analysis of the composite of Hassan "showed the reduction in the size of elemental nickel particulates in the extruded composites" (see Table 1 (from Hassan (above)). In other words, the extrusion in Hassan resulted in a reduction of grain size of the magnesium composite. A POSITA in April 2014 would have been motivated to combine the disclosure of Xiao with this disclosure of deformation processing in Hassan rendering Claim 7 obvious. Accordingly, Claim 7 should be found obvious over Xiao in view of Hassan.
83. The dissolvable magnesium cast composite as defined in claim 20, wherein said dissolvable magnesium cast composite has one or more properties selected from the group consisting of a) a tensile strength of at least 14 ksi, b) a shear strength of at least 11 ksi, and c) an elongation of at least 3%.		Xiao discloses "a magnesium alloy with a high aluminum content (13 to 25% by weight) and a high zinc content (2 to 10% by weight), and further adds elements of Fe, Cu, Ni and Ag which can enhance the corrosion performance of the magnesium alloy, and at the same time adds Zr, Ti element as grain refiners to improve the compressive strength of the formed material, … The purpose of adding a high content of zinc to the magnesium alloy is to increase the strength of the magnesium alloy, … The addition of the trace elements Zr and Ti can refine the magnesium alloy crystals, thereby increasing the compressive strength of the alloy. The room temperature tensile strength op of the light and pressure-proof fast-decomposed cast magnesium alloy prepared by the invention is 130 to 180 MPa higher than that of the existing AZ91D magnesium alloy, …." Xiao at ¶ 0026. A POSITA in August 2014 would have understood this disclosure to mean "has one or more properties selected from the group consisting of a) a tensile strength of at least 14 ksi, b) a shear strength of at least 11 ksi, and c) an elongation of at least 3%."	As set forth in Ground I, supra, Xiao already discloses each and every element of the magnesium composition of Claim 1. Xiao does not disclose subjecting that magnesium composite to deformation processing. Hassan explicitly discloses deformation processing. In particular, Hassan discloses that the deposited magnesium ingots may then be subjected to secondary processing. For example, Hassan teaches that the nickel-reinforced magnesium ingots are machined and hot extruded to obtain rods of 8 mm diameter. Id. Analysis of the composite of Hassan "showed the reduction in the size of elemental nickel particulates in the extruded composites" (see Table 1 (from Hassan (above)). In other words, the extrusion in Hassan resulted in a reduction of grain size of the magnesium composite. A POSITA in April 2014 would have been motivated to combine the disclosure of Xiao with this disclosure of deformation processing in Hassan rendering Claim 7 obvious.

		Thus, this claim element was rendered obvious by Xiao.	Thus, this claim element was rendered obvious by Xiao in view of Hassan
84. The dissolvable magnesium cast composite as defined in claim 22, wherein said dissolvable magnesium cast composite has one or more properties selected from the group consisting of a) a tensile strength of at least 14 ksi, b) a shear strength of at least 11 ksi, and c) an elongation of at least 3%.		Xiao discloses "a magnesium alloy with a high aluminum content (13 to 25% by weight) and a high zinc content (2 to 10% by weight), and further adds elements of Fe, Cu, Ni and Ag which can enhance the corrosion performance of the magnesium alloy, and at the same time adds Zr, Ti element as grain refiners to improve the compressive strength of the formed material, … The purpose of adding a high content of zinc to the magnesium alloy is to increase the strength of the magnesium alloy, … The addition of the trace elements Zr and Ti can refine the magnesium alloy crystals, thereby increasing the compressive strength of the alloy. The room temperature tensile strength op of the light and pressure-proof fast-decomposed cast magnesium alloy prepared by the invention is 130 to 180 MPa higher than that of the existing AZ91D magnesium alloy, …." Xiao at ¶ 0026. A POSITA in August 2014 would have understood this disclosure to mean "has one or more properties selected from the group consisting of a) a tensile strength of at least 14 ksi, b) a shear strength of at least 11 ksi, and c) an elongation of at least 3%." Thus, this claim element was rendered obvious by Xiao.	As set forth in Ground I, supra, Xiao already discloses each and every element of the magnesium composition of Claim 1. Xiao does not disclose subjecting that magnesium composite to deformation processing. Hassan explicitly discloses deformation processing. In particular, Hassan discloses that the deposited magnesium ingots may then be subjected to secondary processing. For example, Hassan teaches that the nickel-reinforced magnesium ingots are machined and hot extruded to obtain rods of 8 mm diameter. Id. Analysis of the composite of Hassan "showed the reduction in the size of elemental nickel particulates in the extruded composites" (see Table 1 (from Hassan (above)). In other words, the extrusion in Hassan resulted in a reduction of grain size of the magnesium composite. A POSITA in April 2014 would have been motivated to combine the disclosure of Xiao with this disclosure of deformation processing in Hassan rendering Claim 7 obvious. Accordingly, this claim is obvious over Xiao in view of Hassan.
85. The dissolvable magnesium cast composite as defined in claim 25, wherein said dissolvable magnesium cast composite has one or more properties selected from the group consisting of a) a tensile strength of at least 14 ksi, b) a shear strength of at least 11 ksi, and c) an elongation of at least 3%.		Xiao discloses "a magnesium alloy with a high aluminum content (13 to 25% by weight) and a high zinc content (2 to 10% by weight), and further adds elements of Fe, Cu, Ni and Ag which can enhance the corrosion performance of the magnesium alloy, and at the same time adds Zr, Ti element as grain refiners to improve the compressive strength of the formed material, … The purpose of adding a high content of zinc to the magnesium alloy is to increase the strength of the magnesium alloy, … The addition of the trace elements Zr and Ti can refine the magnesium alloy crystals, thereby increasing the compressive strength of the alloy. The room temperature tensile strength op of the light and pressure-proof fast-decomposed cast magnesium alloy prepared by the invention is 130 to 180 MPa higher than that of the existing AZ91D magnesium alloy, …." Xiao at ¶ 0026. A POSITA in August 2014 would have understood this disclosure to mean "has one or more properties selected from	As set forth in Ground I, supra, Xiao already discloses each and every element of the magnesium composition of Claim 1. Xiao does not disclose subjecting that magnesium composite to deformation processing. Hassan explicitly discloses deformation processing. In particular, Hassan discloses that the deposited magnesium ingots may then be subjected to secondary processing. For example, Hassan teaches that the nickel-reinforced magnesium ingots are machined and hot extruded to obtain rods of 8 mm diameter. Id. Analysis of the composite of Hassan "showed the reduction in the size of elemental nickel particulates in the extruded composites" (see Table 1 (from Hassan (above)). In other words, the extrusion in Hassan resulted in a reduction of grain size of the magnesium composite. A POSITA in April 2014 would have been motivated to combine the disclosure of Xiao with this disclosure of

		the group consisting of a) a tensile strength of at least 14 ksi, b) a shear strength of at least 11 ksi, and c) an elongation of at least 3%." Thus, this claim element was rendered obvious by Xiao.	deformation processing in Hassan rendering Claim 7 obvious. Accordingly, Claim 7 should be found obvious over Xiao in view of Hassan.
86. The dissolvable magnesium cast composite as defined in claim 27, wherein said dissolvable magnesium cast composite has one or more properties selected from the group consisting of a) a tensile strength of at least 14 ksi, b) a shear strength of at least 11 ksi, and c) an elongation of at least 3%.		Xiao discloses "a magnesium alloy with a high aluminum content (13 to 25% by weight) and a high zinc content (2 to 10% by weight), and further adds elements of Fe, Cu, Ni and Ag which can enhance the corrosion performance of the magnesium alloy, and at the same time adds Zr, Ti element as grain refiners to improve the compressive strength of the formed material, … The purpose of adding a high content of zinc to the magnesium alloy is to increase the strength of the magnesium alloy, … The addition of the trace elements Zr and Ti can refine the magnesium alloy crystals, thereby increasing the compressive strength of the alloy. The room temperature tensile strength op of the light and pressure-proof fast-decomposed cast magnesium alloy prepared by the invention is 130 to 180 MPa higher than that of the existing AZ91D magnesium alloy, …." Xiao at ¶ 0026. A POSITA in August 2014 would have understood this disclosure to mean "has one or more properties selected from the group consisting of a) a tensile strength of at least 14 ksi, b) a shear strength of at least 11 ksi, and c) an elongation of at least 3%." Thus, this claim element was rendered obvious by Xiao.	As set forth in Ground I, supra, Xiao already discloses each and every element of the magnesium composition of Claim 1. Xiao does not disclose subjecting that magnesium composite to deformation processing. Hassan explicitly discloses deformation processing. In particular, Hassan discloses that the deposited magnesium ingots may then be subjected to secondary processing. For example, Hassan teaches that the nickel-reinforced magnesium ingots are machined and hot extruded to obtain rods of 8 mm diameter. Id. Analysis of the composite of Hassan "showed the reduction in the size of elemental nickel particulates in the extruded composites" (see Table 1 (from Hassan (above)). In other words, the extrusion in Hassan resulted in a reduction of grain size of the magnesium composite. A POSITA in April 2014 would have been motivated to combine the disclosure of Xiao with this disclosure of deformation processing in Hassan rendering Claim 7 obvious. Accordingly, Claim 7 should be found obvious over Xiao in view of Hassan.
87. The dissolvable magnesium cast composite as defined in claim 28, wherein said dissolvable magnesium cast composite has one or more properties selected from the group consisting of a) a tensile strength of at least 14 ksi, b) a shear strength of at least 11 ksi, and c) an elongation of at least 3%.		Xiao discloses "a magnesium alloy with a high aluminum content (13 to 25% by weight) and a high zinc content (2 to 10% by weight), and further adds elements of Fe, Cu, Ni and Ag which can enhance the corrosion performance of the magnesium alloy, and at the same time adds Zr, Ti element as grain refiners to improve the compressive strength of the formed material, … The purpose of adding a high content of zinc to the magnesium alloy is to increase the strength of the magnesium alloy, … The addition of the trace elements Zr and Ti can refine the magnesium alloy crystals, thereby increasing the compressive strength of the alloy. The room temperature tensile strength op of the light and pressure-proof fast-decomposed cast magnesium alloy prepared by the invention is 130 to 180 MPa higher than that of the existing AZ91D magnesium alloy, …." Xiao at ¶ 0026.	As set forth in Ground I, supra, Xiao already discloses each and every element of the magnesium composition of Claim 1. Xiao does not disclose subjecting that magnesium composite to deformation processing. Hassan explicitly discloses deformation processing. In particular, Hassan discloses that the deposited magnesium ingots may then be subjected to secondary processing. For example, Hassan teaches that the nickel-reinforced magnesium ingots are machined and hot extruded to obtain rods of 8 mm diameter. Id. Analysis of the composite of Hassan "showed the reduction in the size of elemental nickel particulates in the extruded composites" (see Table 1 (from Hassan (above)). In other words, the extrusion in Hassan resulted in a reduction of grain size of the magnesium composite.

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		A POSITA in August 2014 would have understood this disclosure to mean "has one or more properties selected from the group consisting of a) a tensile strength of at least 14 ksi, b) a shear strength of at least 11 ksi, and c) an elongation of at least 3%." Thus, this claim element was rendered obvious by Xiao.	A POSITA in April 2014 would have been motivated to combine the disclosure of Xiao with this disclosure of deformation processing in Hassan rendering Claim 7 obvious. Accordingly, Claim 7 should be found obvious over Xiao in view of Hassan.
88. The dissolvable magnesium cast composite as defined in claim 19, wherein said dissolvable magnesium cast composite has one or more properties selected from the group consisting of a) a tensile strength of 14-50 ksi, b) a shear strength of 11-25 ksi, and c) an elongation of at least 3%.		Xiao discloses "a magnesium alloy with a high aluminum content (13 to 25% by weight) and a high zinc content (2 to 10% by weight), and further adds elements of Fe, Cu, Ni and Ag which can enhance the corrosion performance of the magnesium alloy, and at the same time adds Zr, Ti element as grain refiners to improve the compressive strength of the formed material, … The purpose of adding a high content of zinc to the magnesium alloy is to increase the strength of the magnesium alloy, … The addition of the trace elements Zr and Ti can refine the magnesium alloy crystals, thereby increasing the compressive strength of the alloy. The room temperature tensile strength op of the light and pressure-proof fast-decomposed cast magnesium alloy prepared by the invention is 130 to 180 MPa higher than that of the existing AZ91D magnesium alloy, …." Xiao at ¶ 0026. A POSITA in August 2014 would have understood this disclosure to mean "has one or more properties selected from the group consisting of a) a tensile strength of 14-50 ksi, b) a shear strength of 11-25 ksi, and c) an elongation of at least 3%." Thus, this claim element was rendered obvious by Xiao.	As set forth in Ground I, supra, Xiao already discloses each and every element of the magnesium composition of Claim 1. Xiao does not disclose subjecting that magnesium composite to deformation processing. Hassan explicitly discloses deformation processing. In particular, Hassan discloses that the deposited magnesium ingots may then be subjected to secondary processing. For example, Hassan teaches that the nickel-reinforced magnesium ingots are machined and hot extruded to obtain rods of 8 mm diameter. Id. Analysis of the composite of Hassan "showed the reduction in the size of elemental nickel particulates in the extruded composites" (see Table 1 (from Hassan (above)). In other words, the extrusion in Hassan resulted in a reduction of grain size of the magnesium composite. A POSITA in April 2014 would have been motivated to combine the disclosure of Xiao with this disclosure of deformation processing in Hassan rendering Claim 7 obvious. Accordingly, Claim 7 should be found obvious over Xiao in view of Hassan.
89. The dissolvable magnesium cast composite as defined in claim 20, wherein said dissolvable magnesium cast composite has one or more properties selected from the group consisting of a) a tensile strength of 14-50 ksi, b) a shear strength of 11-25 ksi, and c) an elongation of at least 3%.		Xiao discloses "a magnesium alloy with a high aluminum content (13 to 25% by weight) and a high zinc content (2 to 10% by weight), and further adds elements of Fe, Cu, Ni and Ag which can enhance the corrosion performance of the magnesium alloy, and at the same time adds Zr, Ti element as grain refiners to improve the compressive strength of the formed material, … The purpose of adding a high content of zinc to the magnesium alloy is to increase the strength of the magnesium alloy, … The addition of the trace elements Zr and Ti can refine the magnesium alloy crystals, thereby increasing the compressive strength of the alloy. The room temperature tensile strength op of the light and pressure-proof fast-decomposed cast magnesium alloy prepared by the	As set forth in Ground I, supra, Xiao already discloses each and every element of the magnesium composition of Claim 1. Xiao does not disclose subjecting that magnesium composite to deformation processing. Hassan explicitly discloses deformation processing. In particular, Hassan discloses that the deposited magnesium ingots may then be subjected to secondary processing. For example, Hassan teaches that the nickel-reinforced magnesium ingots are machined and hot extruded to obtain rods of 8 mm diameter. Id. Analysis of the composite of Hassan "showed the reduction in the size of elemental nickel particulates in the extruded composites" (see Table 1 (from Hassan (above)). In other words, the extrusion in Hassan

		invention is 130 to 180 MPa higher than that of the existing AZ91D magnesium alloy, ….” Xiao at ¶ 0026. A POSITA in August 2014 would have understood this disclosure to mean “has one or more properties selected from the group consisting of a) a tensile strength of 14-50 ksi, b) a shear strength of 11-25 ksi, and c) an elongation of at least 3%.” Thus, this claim element was rendered obvious by Xiao.	resulted in a reduction of grain size of the magnesium composite. A POSITA in April 2014 would have been motivated to combine the disclosure of Xiao with this disclosure of deformation processing in Hassan rendering Claim 7 obvious. Accordingly, Claim 7 should be found obvious over Xiao in view of Hassan.
90. The dissolvable magnesium cast composite as defined in claim 22, wherein said dissolvable magnesium cast composite has one or more properties selected from the group consisting of a) a tensile strength of 14-50 ksi, b) a shear strength of 11-25 ksi, and c) an elongation of at least 3%.		Xiao discloses “a magnesium alloy with a high aluminum content (13 to 25% by weight) and a high zinc content (2 to 10% by weight), and further adds elements of Fe, Cu, Ni and Ag which can enhance the corrosion performance of the magnesium alloy, and at the same time adds Zr, Ti element as grain refiners to improve the compressive strength of the formed material, … The purpose of adding a high content of zinc to the magnesium alloy is to increase the strength of the magnesium alloy, … The addition of the trace elements Zr and Ti can refine the magnesium alloy crystals, thereby increasing the compressive strength of the alloy. The room temperature tensile strength op of the light and pressure-proof fast-decomposed cast magnesium alloy prepared by the invention is 130 to 180 MPa higher than that of the existing AZ91D magnesium alloy, ….” Xiao at ¶ 0026. A POSITA in August 2014 would have understood this disclosure to mean “has one or more properties selected from the group consisting of a) a tensile strength of 14-50 ksi, b) a shear strength of 11-25 ksi, and c) an elongation of at least 3%.” Thus, this claim element was rendered obvious by Xiao.	As set forth in Ground I, supra, Xiao already discloses each and every element of the magnesium composition of Claim 1. Xiao does not disclose subjecting that magnesium composite to deformation processing. Hassan explicitly discloses deformation processing. In particular, Hassan discloses that the deposited magnesium ingots may then be subjected to secondary processing. For example, Hassan teaches that the nickel-reinforced magnesium ingots are machined and hot extruded to obtain rods of 8 mm diameter. Id. Analysis of the composite of Hassan “showed the reduction in the size of elemental nickel particulates in the extruded composites” (see Table 1 (from Hassan (above)). In other words, the extrusion in Hassan resulted in a reduction of grain size of the magnesium composite. A POSITA in April 2014 would have been motivated to combine the disclosure of Xiao with this disclosure of deformation processing in Hassan rendering Claim 7 obvious. Accordingly, Claim 7 should be found obvious over Xiao in view of Hassan.
91. The dissolvable magnesium cast composite as defined in claim 23, wherein said dissolvable magnesium cast composite has one or more properties selected from the group consisting of a) a tensile strength of 14-50 ksi, b) a shear strength of 11-25 ksi,		Xiao discloses “a magnesium alloy with a high aluminum content (13 to 25% by weight) and a high zinc content (2 to 10% by weight), and further adds elements of Fe, Cu, Ni and Ag which can enhance the corrosion performance of the magnesium alloy, and at the same time adds Zr, Ti element as grain refiners to improve the compressive strength of the formed material, … The purpose of adding a high content of zinc to the magnesium alloy is to increase the strength of the magnesium alloy, … The addition of the trace elements Zr and Ti can refine the magnesium alloy crystals, thereby increasing the compressive strength of the alloy. The room	As set forth in Ground I, supra, Xiao already discloses each and every element of the magnesium composition of Claim 1. Xiao does not disclose subjecting that magnesium composite to deformation processing. Hassan explicitly discloses deformation processing. In particular, Hassan discloses that the deposited magnesium ingots may then be subjected to secondary processing. For example, Hassan teaches that the nickel-reinforced magnesium ingots are machined and hot extruded to obtain rods of 8 mm diameter. Id. Analysis of the composite of Hassan “showed the reduction in the size of elemental nickel

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and c) an elongation of at least 3%.		temperature tensile strength op of the light and pressure-proof fast-decomposed cast magnesium alloy prepared by the invention is 130 to 180 MPa higher than that of the existing AZ91D magnesium alloy, ….” Xiao at ¶ 0026. A POSITA in August 2014 would have understood this disclosure to mean “has one or more properties selected from the group consisting of a) a tensile strength of 14-50 ksi, b) a shear strength of 11-25 ksi, and c) an elongation of at least 3%.” Thus, this claim element was rendered obvious by Xiao.	particulates in the extruded composites” (see Table 1 (from Hassan (above)). In other words, the extrusion in Hassan resulted in a reduction of grain size of the magnesium composite. A POSITA in April 2014 would have been motivated to combine the disclosure of Xiao with this disclosure of deformation processing in Hassan rendering Claim 7 obvious. Accordingly, Claim 7 should be found obvious over Xiao in view of Hassan.
92. The dissolvable magnesium cast composite as defined in claim 27, wherein said dissolvable magnesium cast composite has one or more properties selected from the group consisting of a) a tensile strength of 14-50 ksi, b) a shear strength of 11-25 ksi, and c) an elongation of at least 3%.		Xiao discloses “a magnesium alloy with a high aluminum content (13 to 25% by weight) and a high zinc content (2 to 10% by weight), and further adds elements of Fe, Cu, Ni and Ag which can enhance the corrosion performance of the magnesium alloy, and at the same time adds Zr, Ti element as grain refiners to improve the compressive strength of the formed material, … The purpose of adding a high content of zinc to the magnesium alloy is to increase the strength of the magnesium alloy, … The addition of the trace elements Zr and Ti can refine the magnesium alloy crystals, thereby increasing the compressive strength of the alloy. The room temperature tensile strength op of the light and pressure-proof fast-decomposed cast magnesium alloy prepared by the invention is 130 to 180 MPa higher than that of the existing AZ91D magnesium alloy, ….” Xiao at ¶ 0026. A POSITA in August 2014 would have understood this disclosure to mean “has one or more properties selected from the group consisting of a) a tensile strength of 14-50 ksi, b) a shear strength of 11-25 ksi, and c) an elongation of at least 3%.” Thus, this claim element was rendered obvious by Xiao.	As set forth in Ground I, supra, Xiao already discloses each and every element of the magnesium composition of Claim 1. Xiao does not disclose subjecting that magnesium composite to deformation processing. Hassan explicitly discloses deformation processing. In particular, Hassan discloses that the deposited magnesium ingots may then be subjected to secondary processing. For example, Hassan teaches that the nickel-reinforced magnesium ingots are machined and hot extruded to obtain rods of 8 mm diameter. Id. Analysis of the composite of Hassan “showed the reduction in the size of elemental nickel particulates in the extruded composites” (see Table 1 (from Hassan (above)). In other words, the extrusion in Hassan resulted in a reduction of grain size of the magnesium composite. A POSITA in April 2014 would have been motivated to combine the disclosure of Xiao with this disclosure of deformation processing in Hassan rendering Claim 7 obvious. Accordingly, Claim 7 should be found obvious over Xiao in view of Hassan.
93. The dissolvable magnesium cast composite as defined in claim 28, wherein said dissolvable magnesium cast composite has one or more properties selected from the group consisting of a) a tensile strength of 14-50 ksi, b) a		Xiao discloses “a magnesium alloy with a high aluminum content (13 to 25% by weight) and a high zinc content (2 to 10% by weight), and further adds elements of Fe, Cu, Ni and Ag which can enhance the corrosion performance of the magnesium alloy, and at the same time adds Zr, Ti element as grain refiners to improve the compressive strength of the formed material, … The purpose of adding a high content of zinc to the magnesium alloy is to increase the strength of the magnesium alloy, … The addition of the trace elements Zr	As set forth in Ground I, supra, Xiao already discloses each and every element of the magnesium composition of Claim 1. Xiao does not disclose subjecting that magnesium composite to deformation processing. Hassan explicitly discloses deformation processing. In particular, Hassan discloses that the deposited magnesium ingots may then be subjected to secondary processing. For example, Hassan teaches that the nickel-reinforced magnesium ingots are machined and hot extruded to obtain

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shear strength of 11-25 ksi, and c) an elongation of at least 3%.		and Ti can refine the magnesium alloy crystals, thereby increasing the compressive strength of the alloy. The room temperature tensile strength op of the light and pressure-proof fast-decomposed cast magnesium alloy prepared by the invention is 130 to 180 MPa higher than that of the existing AZ91D magnesium alloy, ….” Xiao at ¶ 0026. A POSITA in August 2014 would have understood this disclosure to mean “has one or more properties selected from the group consisting of a) a tensile strength of 14-50 ksi, b) a shear strength of 11-25 ksi, and c) an elongation of at least 3%.” Thus, this claim element was rendered obvious by Xiao.	rods of 8 mm diameter. Id. Analysis of the composite of Hassan “showed the reduction in the size of elemental nickel particulates in the extruded composites” (see Table 1 (from Hassan (above)). In other words, the extrusion in Hassan resulted in a reduction of grain size of the magnesium composite. A POSITA in April 2014 would have been motivated to combine the disclosure of Xiao with this disclosure of deformation processing in Hassan rendering Claim 7 obvious. Accordingly, Claim 7 should be found obvious over Xiao in view of Hassan.
94. A dissolvable magnesium cast composite comprising			
a mixture of magnesium or a magnesium alloy and an additive material,	Xiao discloses a “magnesium alloy...and further adds elements of Fe, Cu, Ni, and Ag which can enhance the corrosion performance of the magnesium alloy...” ¶ 0026, ll. 1-3. Thus, this claim element was anticipated by Xiao.		
said additive material includes a) nickel wherein said nickel constitutes 0.01-5 wt. % of said dissolvable magnesium cast composite or b) nickel wherein said nickel constitutes 0.1-23.5 wt. % of said dissolvable magnesium cast composite,		Xiao discloses a “Example 1 The composition of the alloy and the respective percentages by weight are as follows: 13% Al-2% Zn-0.1% Fe-5% Ni-2.5% Ag-0.5% Ti-0.5% Zr, and the remainder is Mg.” Xiao ¶¶ 0033-0035. Xiao discloses a “Example 2 The composition of the alloy and the respective percentages by weight are as follows: 20% Al-10% Zn-5% Fe-2.5% Ni-2.5% Cu-5% Ag-0.25% Ti-0.25% Zr, and the remainder is Mg.” Xiao ¶¶ 0037-0039. Xiao discloses a “Example 3 The composition of the alloy and the respective percentages by weight are as follows: 20% Al-10% Zn-5% Fe-2.5% Ni-2.5% Cu-5% Ag-0.25% Ti-0.25% Zr, and the remainder is Mg.” Xiao ¶¶ 0041-0043. Xiao discloses a “Example 4 The composition of the alloy and the respective percentages by weight are as follows: 18% Al-8% Zn-2.5% Fe-2.0% Ni-5% Cu-1% Ag-0.3% Ti-0.15% Zr, and the remainder is Mg.” Xiao ¶¶ 0045-0047.	

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		A POSITA in August 2014 would have understood this disclosure to mean "additive material includes a) nickel wherein said nickel constitutes 0.01-5 wt. % of said dissolvable magnesium cast composite or b) nickel wherein said nickel constitutes 0.1-23.5 wt. % of said dissolvable magnesium cast composite." Thus, this claim element was rendered obvious by Xiao.	
said dissolvable magnesium cast composite includes in situ precipitate,	Xiao discloses a "purpose of adding the high content of aluminum content is to produce a large amount of cathode phase, the B ($Mg_{17}Al_{12}$) phase and eutectic phase …." Xiao ¶ 0026. Thus, this claim element was anticipated by Xiao.		
said in situ precipitate includes said additive material,	Xiao discloses a "purpose of adding the high content of aluminum content is to produce a large amount of cathode phase, the B ($Mg_{17}Al_{12}$) phase and eutectic phase …." Xiao ¶ 0026. Thus, this claim element was anticipated by Xiao.		
said dissolvable magnesium cast composite has a dissolution rate of at least 75 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C.	Xiao discloses "a magnesium alloy … is to produce a large amount of cathode phase, the B (Mgi7Al12) phase and eutectic phase on the grain boundary of the magnesium alloy, and the magnesium matrix o phase functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which greatly accelerate the corrosion decomposition of magnesium alloy." Xiao ¶ 0026. Further, Xiao discloses a "decomposition performance in a high temperature potassium chloride solution (at a temperature of 70 °C or 93 °C in a potassium chloride aqueous solution with a mass fraction of 3%) significantly exceeds that of the existing ingot metallurgy magnesium alloy (such as the Mg-Al-Zn type AZ91D magnesium alloy)." Xiao ¶ 0028. Thus, this claim element was anticipated by Xiao.		
95. The dissolvable magnesium cast composite as defined in claim 94, wherein said dissolvable magnesium cast composite	Xiao discloses a "Example 1 The composition of the alloy and the respective percentages by weight are as follows: 13% Al-2% Zn-0.1% Fe-5% Ni-2.5% Ag-0.5% Ti-0.5% Zr, and the remainder is Mg." Xiao ¶¶ 0033-0035.	Xiao discloses a "Example 1 The composition of the alloy and the respective percentages by weight are as follows: 13% Al-2% Zn-0.1% Fe-5% Ni-2.5% Ag-0.5% Ti-0.5% Zr, and the remainder is Mg." Xiao ¶¶ 0033-0035.	

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includes no more than 10 wt. % aluminum.	Xiao discloses a "Example 2 The composition of the alloy and the respective percentages by weight are as follows: 20% Al-10% Zn-5% Fe-2.5% Ni-2.5% Cu-5% Ag-0.25% Ti-0.25% Zr, and the remainder is Mg." Xiao ¶¶ 0037-0039. Xiao discloses a "Example 3 The composition of the alloy and the respective percentages by weight are as follows: 20% Al-10% Zn-5% Fe-2.5% Ni-2.5% Cu-5% Ag-0.25% Ti-0.25% Zr, and the remainder is Mg." Xiao ¶¶ 0041-0043. Xiao discloses a "Example 4 The composition of the alloy and the respective percentages by weight are as follows: 18% Al-8% Zn-2.5% Fe-2.0% Ni-5% Cu-1% Ag-0.3% Ti-0.15% Zr, and the remainder is Mg." Xiao ¶¶ 0045-0047. A POSITA in August 2014 would have understood this disclosure to mean "additive material includes a) nickel wherein said nickel constitutes 0.01-5 wt. % of said dissolvable magnesium cast composite or b) nickel wherein said nickel constitutes 0.1-23.5 wt. % of said dissolvable magnesium cast composite." Thus, this claim element was anticipated by Xiao.	Xiao discloses a "Example 2 The composition of the alloy and the respective percentages by weight are as follows: 20% Al-10% Zn-5% Fe-2.5% Ni-2.5% Cu-5% Ag-0.25% Ti-0.25% Zr, and the remainder is Mg." Xiao ¶¶ 0037-0039. Xiao discloses a "Example 3 The composition of the alloy and the respective percentages by weight are as follows: 20% Al-10% Zn-5% Fe-2.5% Ni-2.5% Cu-5% Ag-0.25% Ti-0.25% Zr, and the remainder is Mg." Xiao ¶¶ 0041-0043. Xiao discloses a "Example 4 The composition of the alloy and the respective percentages by weight are as follows: 18% Al-8% Zn-2.5% Fe-2.0% Ni-5% Cu-1% Ag-0.3% Ti-0.15% Zr, and the remainder is Mg." Xiao ¶¶ 0045-0047. A POSITA in August 2014 would have understood this disclosure to mean "additive material includes a) nickel wherein said nickel constitutes 0.01-5 wt. % of said dissolvable magnesium cast composite or b) nickel wherein said nickel constitutes 0.1-23.5 wt. % of said dissolvable magnesium cast composite." Thus, this claim element was rendered obvious by Xiao.	
96. The dissolvable magnesium cast composite as defined in claim 94, wherein said dissolvable magnesium composite cast includes at least 85 wt. % magnesium.	Xiao discloses a "Example 1 The composition of the alloy and the respective percentages by weight are as follows: 13% Al-2% Zn-0.1% Fe-5% Ni-2.5% Ag-0.5% Ti-0.5% Zr, and the remainder is Mg." Xiao ¶¶ 0033-0035. Xiao discloses a "Example 2 The composition of the alloy and the respective percentages by weight are as follows: 20% Al-10% Zn-5% Fe-2.5% Ni-2.5% Cu-5% Ag-0.25% Ti-0.25% Zr, and the remainder is Mg." Xiao ¶¶ 0037-0039. Xiao discloses a "Example 3 The composition of the alloy and the respective percentages by weight are as follows: 20% Al-10% Zn-5% Fe-2.5% Ni-2.5% Cu-5% Ag-0.25% Ti-0.25% Zr, and the remainder is Mg." Xiao ¶¶ 0041-0043. Xiao discloses a "Example 4 The composition of the alloy and the respective percentages by weight are as follows: 18% Al-8% Zn-2.5% Fe-2.0% Ni-5% Cu-1% Ag-0.3% Ti-0.15% Zr, and the remainder is Mg." Xiao ¶¶ 0045-0047. A POSITA in August 2014 would have understood this disclosure to mean "additive material includes a) nickel	Xiao discloses a "Example 1 The composition of the alloy and the respective percentages by weight are as follows: 13% Al-2% Zn-0.1% Fe-5% Ni-2.5% Ag-0.5% Ti-0.5% Zr, and the remainder is Mg." Xiao ¶¶ 0033-0035. Xiao discloses a "Example 2 The composition of the alloy and the respective percentages by weight are as follows: 20% Al-10% Zn-5% Fe-2.5% Ni-2.5% Cu-5% Ag-0.25% Ti-0.25% Zr, and the remainder is Mg." Xiao ¶¶ 0037-0039. Xiao discloses a "Example 3 The composition of the alloy and the respective percentages by weight are as follows: 20% Al-10% Zn-5% Fe-2.5% Ni-2.5% Cu-5% Ag-0.25% Ti-0.25% Zr, and the remainder is Mg." Xiao ¶¶ 0041-0043. Xiao discloses a "Example 4 The composition of the alloy and the respective percentages by weight are as follows: 18% Al-8% Zn-2.5% Fe-2.0% Ni-5% Cu-1% Ag-0.3% Ti-0.15% Zr, and the remainder is Mg." Xiao ¶¶ 0045-0047. A POSITA in August 2014 would have understood this disclosure to mean "additive material includes a) nickel	

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	wherein said nickel constitutes 0.01-5 wt. % of said dissolvable magnesium cast composite or b) nickel wherein said nickel constitutes 0.1-23.5 wt. % of said dissolvable magnesium cast composite." Thus, this claim element was anticipated by Xiao.	wherein said nickel constitutes 0.01-5 wt. % of said dissolvable magnesium cast composite or b) nickel wherein said nickel constitutes 0.1-23.5 wt. % of said dissolvable magnesium cast composite." Thus, this claim element was rendered obvious by Xiao.	
97. The dissolvable magnesium cast composite as defined in claim 95, wherein said dissolvable magnesium cast composite includes at least 85 wt. % magnesium.	Xiao discloses a "Example 1 The composition of the alloy and the respective percentages by weight are as follows: 13% Al-2% Zn-0.1% Fe-5% Ni-2.5% Ag-0.5% Ti-0.5% Zr, and the remainder is Mg." Xiao ¶¶ 0033-0035. Xiao discloses a "Example 2 The composition of the alloy and the respective percentages by weight are as follows: 20% Al-10% Zn-5% Fe-2.5% Ni-2.5% Cu-5% Ag-0.25% Ti-0.25% Zr, and the remainder is Mg." Xiao ¶¶ 0037-0039. Xiao discloses a "Example 3 The composition of the alloy and the respective percentages by weight are as follows: 20% Al-10% Zn-5% Fe-2.5% Ni-2.5% Cu-5% Ag-0.25% Ti-0.25% Zr, and the remainder is Mg." Xiao ¶¶ 0041-0043. Xiao discloses a "Example 4 The composition of the alloy and the respective percentages by weight are as follows: 18% Al-8% Zn-2.5% Fe-2.0% Ni-5% Cu-1% Ag-0.3% Ti-0.15% Zr, and the remainder is Mg." Xiao ¶¶ 0045-0047. A POSITA in August 2014 would have understood this disclosure to mean "additive material includes a) nickel wherein said nickel constitutes 0.01-5 wt. % of said dissolvable magnesium cast composite or b) nickel wherein said nickel constitutes 0.1-23.5 wt. % of said dissolvable magnesium cast composite." Thus, this claim element was anticipated by Xiao.	Xiao discloses a "Example 1 The composition of the alloy and the respective percentages by weight are as follows: 13% Al-2% Zn-0.1% Fe-5% Ni-2.5% Ag-0.5% Ti-0.5% Zr, and the remainder is Mg." Xiao ¶¶ 0033-0035. Xiao discloses a "Example 2 The composition of the alloy and the respective percentages by weight are as follows: 20% Al-10% Zn-5% Fe-2.5% Ni-2.5% Cu-5% Ag-0.25% Ti-0.25% Zr, and the remainder is Mg." Xiao ¶¶ 0037-0039. Xiao discloses a "Example 3 The composition of the alloy and the respective percentages by weight are as follows: 20% Al-10% Zn-5% Fe-2.5% Ni-2.5% Cu-5% Ag-0.25% Ti-0.25% Zr, and the remainder is Mg." Xiao ¶¶ 0041-0043. Xiao discloses a "Example 4 The composition of the alloy and the respective percentages by weight are as follows: 18% Al-8% Zn-2.5% Fe-2.0% Ni-5% Cu-1% Ag-0.3% Ti-0.15% Zr, and the remainder is Mg." Xiao ¶¶ 0045-0047. A POSITA in August 2014 would have understood this disclosure to mean "additive material includes a) nickel wherein said nickel constitutes 0.01-5 wt. % of said dissolvable magnesium cast composite or b) nickel wherein said nickel constitutes 0.1-23.5 wt. % of said dissolvable magnesium cast composite." Thus, this claim element was rendered obvious by Xiao.	
98. The dissolvable magnesium cast composite as defined in claim 94, wherein said dissolvable magnesium cast composite has a dissolution rate of 75-325 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C.	Xiao discloses "a magnesium alloy … is to produce a large amount of cathode phase, the B (Mgi7Al12) phase and eutectic phase on the grain boundary of the magnesium alloy, and the magnesium matrix o phase functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which greatly accelerate the corrosion decomposition of magnesium alloy." Xiao ¶ 0026.	Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. Further, Xiao discloses a "decomposition performance in a high temperature potassium chloride solution (at a temperature of 70 °C or 93 °C in a potassium chloride	

	Further, Xiao discloses a "decomposition performance in a high temperature potassium chloride solution (at a temperature of 70 °C or 93 °C in a potassium chloride aqueous solution with a mass fraction of 3%) significantly exceeds that of the existing ingot metallurgy magnesium alloy (such as the Mg-Al-Zn type AZ91D magnesium alloy)." Xiao ¶ 0028. Thus, this claim element was anticipated by Xiao.	aqueous solution with a mass fraction of 3%) significantly exceeds that of the existing ingot metallurgy magnesium alloy (such as the Mg-Al-Zn type AZ91D magnesium alloy)." Xiao ¶ 0028. A POSITA in August 2014 would have understood this disclosure to mean "dissolvable magnesium cast composite has a dissolution rate of 75-325 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C." Thus, this claim element was rendered obvious by Xiao.	
99. The dissolvable magnesium cast composite as defined in claim 97, wherein said dissolvable magnesium cast composite has a dissolution rate of 75-325 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C.	Xiao discloses "a magnesium alloy … is to produce a large amount of cathode phase, the B (Mgi7Al12) phase and eutectic phase on the grain boundary of the magnesium alloy, and the magnesium matrix o phase functions as an anode phase, so that the matrix and the grain boundary of the magnesium alloy form a large amount of micro-batteries, which greatly accelerate the corrosion decomposition of magnesium alloy." Xiao ¶ 0026. Further, Xiao discloses a "decomposition performance in a high temperature potassium chloride solution (at a temperature of 70 °C or 93 °C in a potassium chloride aqueous solution with a mass fraction of 3%) significantly exceeds that of the existing ingot metallurgy magnesium alloy (such as the Mg-Al-Zn type AZ91D magnesium alloy)." Xiao ¶ 0028. Thus, this claim element was anticipated by Xiao.	Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. Further, Xiao discloses a "decomposition performance in a high temperature potassium chloride solution (at a temperature of 70 °C or 93 °C in a potassium chloride aqueous solution with a mass fraction of 3%) significantly exceeds that of the existing ingot metallurgy magnesium alloy (such as the Mg-Al-Zn type AZ91D magnesium alloy)." Xiao ¶ 0028. A POSITA in August 2014 would have understood this disclosure to mean "dissolvable magnesium cast composite has a dissolution rate of 75-325 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C." Thus, this claim element was rendered obvious by Xiao.	
100. The dissolvable magnesium cast composite as defined in claim 94, wherein said nickel constitutes 0.1-23.5 wt. % of said dissolvable magnesium cast composite.		Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean "nickel constitutes 0.1-23.5 wt. % of said dissolvable magnesium cast composite." It would have been obvious to a PHOSITA to include 0.1-23.5 wt. % Ni. Thus, this claim element was rendered obvious by Xiao.	

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101. The dissolvable magnesium cast composite as defined in claim 99, wherein said nickel constitutes 0.1-23.5 wt. % of said dissolvable magnesium cast composite.		Xiao discloses a "light and pressure-proof fast-decomposed cast magnesium alloy is composed of the following components: 13 to 25% of Al, 2 to 15% of Zn, 0.1 to 5% of Fe, 0.05 to 5% of Cu, 0.05 to 5% of Ni, 0 to 5% of Ag, 0.05 to 0.5% of Zr, 0.05 to 0.5% of Ti, and the remainder is Mg." Xiao ¶ 0026. Xiao Abstract. A POSITA in August 2014 would have understood this disclosure to mean "nickel constitutes 0.1-23.5 wt. % of said dissolvable magnesium cast composite." It would have been obvious to a PHOSITA to include 0.1-23.5 wt. % Ni. Thus, this claim element was rendered obvious by Xiao.	
102. The dissolvable magnesium cast composite as defined in claim 94, wherein said dissolvable magnesium cast composite has one or more properties selected from the group consisting of a) a tensile strength of at least 14 ksi, b) a shear strength of at least 11 ksi, and c) an elongation of at least 3%.		Xiao discloses "a magnesium alloy with a high aluminum content (13 to 25% by weight) and a high zinc content (2 to 10% by weight), and further adds elements of Fe, Cu, Ni and Ag which can enhance the corrosion performance of the magnesium alloy, and at the same time adds Zr, Ti element as grain refiners to improve the compressive strength of the formed material, … The purpose of adding a high content of zinc to the magnesium alloy is to increase the strength of the magnesium alloy, … The addition of the trace elements Zr and Ti can refine the magnesium alloy crystals, thereby increasing the compressive strength of the alloy. The room temperature tensile strength op of the light and pressure-proof fast-decomposed cast magnesium alloy prepared by the invention is 130 to 180 MPa higher than that of the existing AZ91D magnesium alloy, …." Xiao at ¶ 0026. A POSITA in August 2014 would have understood this disclosure to mean "has one or more properties selected from the group consisting of a) a tensile strength of at least 14 ksi, b) a shear strength of at least 11 ksi, and c) an elongation of at least 3%." Thus, this claim element was rendered obvious by Xiao.	As set forth in Ground I, supra, Xiao already discloses each and every element of the magnesium composition of Claim 1. Xiao does not disclose subjecting that magnesium composite to deformation processing. Hassan explicitly discloses deformation processing. In particular, Hassan discloses that the deposited magnesium ingots may then be subjected to secondary processing. For example, Hassan teaches that the nickel-reinforced magnesium ingots are machined and hot extruded to obtain rods of 8 mm diameter. Id. Analysis of the composite of Hassan "showed the reduction in the size of elemental nickel particulates in the extruded composites" (see Table 1 (from Hassan (above)). In other words, the extrusion in Hassan resulted in a reduction of grain size of the magnesium composite. A POSITA in April 2014 would have been motivated to combine the disclosure of Xiao with this disclosure of deformation processing in Hassan rendering Claim 7 obvious. Accordingly, Claim 7 should be found obvious over Xiao in view of Hassan.
103. The dissolvable magnesium cast composite as defined in claim 101, wherein said dissolvable magnesium cast composite has one or more properties selected from the group		Xiao discloses "a magnesium alloy with a high aluminum content (13 to 25% by weight) and a high zinc content (2 to 10% by weight), and further adds elements of Fe, Cu, Ni and Ag which can enhance the corrosion performance of the magnesium alloy, and at the same time adds Zr, Ti element as grain refiners to improve the compressive strength of the formed material, … The purpose of adding a high content of	As set forth in Ground I, supra, Xiao already discloses each and every element of the magnesium composition of Claim 1. Xiao does not disclose subjecting that magnesium composite to deformation processing. Hassan explicitly discloses deformation processing. In particular, Hassan discloses that the deposited magnesium ingots may then be subjected to secondary processing. For

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consisting of a) a tensile strength of at least 14 ksi, b) a shear strength of at least 11 ksi, and c) an elongation of at least 3%.		zinc to the magnesium alloy is to increase the strength of the magnesium alloy, … The addition of the trace elements Zr and Ti can refine the magnesium alloy crystals, thereby increasing the compressive strength of the alloy. The room temperature tensile strength op of the light and pressure-proof fast-decomposed cast magnesium alloy prepared by the invention is 130 to 180 MPa higher than that of the existing AZ91D magnesium alloy, ….” Xiao at ¶ 0026. A POSITA in August 2014 would have understood this disclosure to mean “has one or more properties selected from the group consisting of a) a tensile strength of at least 14 ksi, b) a shear strength of at least 11 ksi, and c) an elongation of at least 3%.” Thus, this claim element was rendered obvious by Xiao.	example, Hassan teaches that the nickel-reinforced magnesium ingots are machined and hot extruded to obtain rods of 8 mm diameter. Id. Analysis of the composite of Hassan “showed the reduction in the size of elemental nickel particulates in the extruded composites” (see Table 1 (from Hassan (above)). In other words, the extrusion in Hassan resulted in a reduction of grain size of the magnesium composite. A POSITA in April 2014 would have been motivated to combine the disclosure of Xiao with this disclosure of deformation processing in Hassan rendering Claim 7 obvious. Accordingly, Claim 7 should be found obvious over Xiao in view of Hassan.

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Appendix E

U.S. Patent No. 10,329,653 ('653 Patent) Non-Infringement Claim Chart

'653 Patent Claims[1]	**Limitations of '653 Patent Claims not found in Purported Infringing Materials**
1. A magnesium composite	
that includes in situ precipitation of galvanically-active intermetallic phases to enable controlled dissolution of said magnesium composite,	The Purported Infringing Materials do not include in situ precipitation of galvanically-active intermetallic phases to enable controlled dissolution of said magnesium composite.
said magnesium composite comprising a mixture of magnesium or a magnesium alloy and an additive material,	
said additive material having a greater melting point temperature than a solidus temperature of said magnesium,	
said additive material constituting about 0.05 wt %-45 wt % of said mixture,	
said additive material forming precipitant in said magnesium composite,	The Purported Infringing Materials do not include an additive material forming precipitant in said magnesium composite.

[1] Independent claims 1, 12, 25, 29, 33, 37, 41, 45, 49, 73, and 74 are shaded for easier reference.

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said additive material includes one or more metals selected from the group consisting of copper, nickel, iron, and cobalt,	
said magnesium composite has a dissolution rate of at least 5 mg/cm^2/hr. in 3 wt % KCI water mixture at 90°C.	The Purported Infringing Materials do not have a dissolution rate of at least 5 mg/cm^2/hr in 3 wt. % KCI water mixture at 90 °C.
2. The magnesium composite as defined in claim 1, wherein said magnesium alloy includes over 50 wt % magnesium and one or more metals selected from the group consisting of aluminum, boron, bismuth, zinc, zirconium, and manganese.	The Purported Infringing Materials do not include both the limitations as defined in claim 1 and a magnesium alloy of the Infringing Materials includes over 50 wt. % magnesium and one or more metals selected from the group listed.
3. The magnesium composite as defined in claim 1, wherein said magnesium alloy includes over 50 wt % magnesium and one or more metals selected from the group consisting of aluminum	The Purported Infringing Materials do not include both the limitations as defined in claim 1 and over 50 wt. % magnesium and one or more metals selected from the group listed.

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in an amount of about 0.5-10 wt %, zinc in amount of about 0.1-3 wt %, zirconium in an amount of about 0.01-1 wt %, manganese in an amount of about 0.15-2 wt %, boron in amount of about 0.0002-0.04 wt %, and bismuth in amount of about 0.4-0.7 wt %.	
4. The magnesium composite as defined in claim 1, wherein said additive material includes nickel,	
said nickel constitutes about 0.05-35 wt % of said magnesium composite,	
said nickel forms galvanically-active in situ precipitate in said magnesium composite.	The Purported Infringing Materials do not include both the limitations as defined in claim 1 and wherein said nickel constitutes about 0.05-35 wt. % of said magnesium composite and said nickel forms galvanically-active in situ precipitate in said magnesium composite.
5. The magnesium composite as defined in claim 1, wherein said additive material includes copper,	The Purported Infringing Materials do not include both the limitations as defined in claim 1.
said copper constitutes about 0.05-35 wt % of	

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said magnesium composite,	
said copper forms galvanically-active in situ precipitate in said magnesium composite.	The Purported Infringing Materials do not include both the limitations as defined in claim 1 and copper, wherein said copper constitutes about 0.05-35 wt. % of said magnesium composite and said copper forms galvanically-active in situ precipitate in said magnesium composite.
6. The magnesium composite as defined in claim 1, wherein said additive material includes cobalt, said cobalt constitutes about 0.05-35 wt. % of said magnesium composite, said cobalt forms galvanically-active in situ precipitate in said magnesium composite.	***No infringement alleged. See Terves's Final Infringement Contentions at 4-5.***
7. The magnesium composite as defined in claim 1, where said magnesium composite is subjected to a deformation processing to reduce grain size of said magnesium composite, increase tensile yield strength of said magnesium composite, increase elongation of said magnesium composite,	The Purported Infringing Materials do not include both the limitations as defined in claim 1 and are not subjected to a deformation processing to reduce grain size of said magnesium composite, increase tensile yield strength of said magnesium composite, increase elongation of said magnesium composite, or combinations thereof.

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or combinations thereof.	
8. The magnesium composite as defined in claim 1, wherein said magnesium composite is subjected to a surface treatment to improve a surface hardness of said magnesium composite,	***Infringement contention withdrawn pursuant to July 2, 2021 email from Matthew J. Cavanagh.***
said surface treatment including peening, heat treatment, aluminizing, or combinations thereof.	
9. The magnesium composite as defined in claim 1, wherein a dissolution rate of said magnesium composite is about 5-325 $mg/cm^2/hr$. in 3 wt % KCl water mixture at 90°C.	The Purported Infringing Materials do not include both the limitations as defined in claim 1 and have a dissolution rate of about 5-325 $mg/cm^2/hr$ in 3 wt. % KCl water mixture at 90 °C.
10. The magnesium composite as defined in claim 1, wherein a dissolution rate of said magnesium composite is controlled by an amount and size of said in situ formed	The Purported Infringing Materials do not include both the limitations as defined in claim 1 and have a dissolution rate controlled by an amount and size of said in situ formed galvanically-active particles whereby smaller average sized particles of said in situ formed galvanically-active particles, a greater weight percent of said in situ formed galvanically-active particles in said magnesium composite, or combinations thereof increases said dissolution rate of said magnesium composite.

galvanically-active particles whereby smaller average sized particles of said in situ formed galvanically-active particles, a greater weight percent of said in situ formed galvanically-active particles in said magnesium composite, or combinations thereof increases said dissolution rate of said magnesium composite.	
11. The magnesium composite as defined in claim 1, wherein said additive material is a metal or metal alloy.	***Infringement contention withdrawn pursuant to July 2, 2021 email from Matthew J. Cavanagh***.
12. A magnesium composite that includes in situ precipitation of galvanically-active intermetallic phases to enable controlled dissolution of said magnesium composite comprising a mixture of a magnesium or a magnesium alloy and an additive material,	The Purported Infringing Materials do not include *in situ* precipitation of galvanically-active intermetallic phases to enable controlled dissolution of said magnesium composite.
said additive material having a greater melting point temperature than a	The Purported Infringing Materials do not include a mixture of a magnesium or a magnesium alloy and an additive material, said additive material having the described aspects.

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solidus temperature of said magnesium,	
said composite including greater than 50 wt % magnesium,	
said additive material constituting about 0.05-45 wt % of said magnesium composite,	
said additive material having a melting point temperature that is 100°C. greater than a melting temperature of said magnesium or magnesium alloy,	
said additive material including one or more metals selected from the group consisting of copper, nickel, cobalt, titanium, and iron,	
at least a portion of said additive material remaining unalloyed additive material,	
said magnesium composite including in situ precipitation of galvanically-active intermetallic phases that includes said unalloyed additive material,	The Purported Infringing Materials do not include *in situ* precipitation of galvanically-active intermetallic phases that includes said unalloyed additive material.
said magnesium composite has a dissolution rate of at	The Purported Infringing Materials do not include a dissolution rate of at least 5 mg/cm^2/hr. in 3 wt. % KCl water mixture at 90° C.

least 5 mg/cm^2/hr. in 3 wt % KCl water mixture at 90°C.	
13. The magnesium composite as defined in claim 12, wherein said additive material is added to said magnesium or magnesium alloy while said magnesium or magnesium alloy is at a temperature that is above said solidus temperature of said magnesium and a temperature that is less than a melting point of said additive material to form said mixture.	The Purported Infringing Materials do not include both the limitations as defined in claim 12 including wherein said additive material is added to said magnesium or magnesium alloy while said magnesium or magnesium alloy is at a temperature that is above said solidus temperature of said magnesium and a temperature that is less than a melting point of said additive material to form said mixture.
14. The magnesium composite as defined in claim 13, wherein said magnesium alloy includes over 50 wt % magnesium and one or more metals selected from the group consisting of aluminum in an amount of about 0.5-10 wt %, zinc in amount of about 0.1-3 wt %, zirconium in an amount of about 0.01-1 wt %, manganese in an amount of about 0.15-2	The Purported Infringing Materials do not include both the limitations as defined in claim 13, wherein said magnesium alloy includes over 50 wt % magnesium and one or more metals selected from the group consisting of aluminum in an amount of about 0.5-10 wt %, zinc in amount of about 0.1-3 wt %, zirconium in an amount of about 0.01-1 wt %, manganese in an amount of about 0.15-2 wt %, boron in amount of about 0.0002-0.04 wt %, and bismuth in an amount of about 0.4-0.7 wt %.

wt %, boron in amount of about 0.0002-0.04 wt %, and bismuth in an amount of about 0.4-0.7 wt %.	
15. The magnesium composite as defined in claim 14, wherein said additive material includes nickel,	The Purported Infringing Materials do not include both the limitations as defined in claim 14, wherein said nickel constitutes about 0.05-35 wt. % of said magnesium composite and said nickel forms galvanically-active in situ precipitate in said magnesium composite.
said nickel constitutes about 0.05-35 wt % of said magnesium composite,	
said nickel forms galvanically-active in situ precipitate in said magnesium composite.	
16. The magnesium composite as defined in claim 15, wherein said additive material includes nickel,	***No infringement alleged for this claim. See Terves' Final Infringement Contentions at 7.***
said nickel constitutes about 3-7 wt % of said magnesium composite.	
17. The magnesium composite as defined in claim 15, wherein said	***No infringement alleged for this claim. See Terves' Final Infringement Contentions at 7.***

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additive material includes nickel,	
said nickel constitutes about 7-10 wt % of said magnesium composite.	
18. The magnesium composite as defined in claim 15, wherein a dissolution rate of said magnesium composite is at least 45 mg/cm2/hr. in 3 wt % KCl water mixture at 90°C. and up to 325 mg/cm^2/hr. in 3 wt % KCl water mixture at 90°C.	The Purported Infringing Materials do not include both the limitations as defined in claim 15 and a dissolution rate of at least 45 mg/cm^2/hr in 3 wt. % KCl water mixture at 90 °C. and up to 325 mg/cm^2/hr in 3 wt. % KCl water mixture at 90 °C.
19. The magnesium composite as defined in claim 12, wherein said magnesium alloy includes over 50 wt % magnesium and one or more metals selected from the group consisting of aluminum in an amount of about 0.5-10 wt %, zinc in amount of about 0.1-6 wt %, zirconium in an amount of about 0.01-3 wt %, manganese in an amount of about 0.15-2 wt %, boron in amount of about 0.0002-0.04 wt %, and bismuth in an	The Purported Infringing Materials do not include both the limitations as defined in claim 12 and include over 50 wt. % magnesium and one or more metals selected from the group listed.

amount of about 0.4-0.7 wt %.	
20. The magnesium composite as defined in claim 12, said additive material includes nickel,	The Purported Infringing Materials do not include both the limitations as defined in claim 12 and include nickel, wherein said nickel constitutes about 0.05-35 wt. % of said magnesium composite and said nickel forms galvanically-active in situ precipitate in said magnesium composite.
said nickel constitutes about 0.05-35 wt % of said magnesium composite,	
said nickel forms galvanically-active in situ precipitate in said magnesium composite.	
21. The magnesium composite as defined in claim 20, wherein said additive material includes nickel,	***No infringement alleged for this claim. See Terves' Final Infringement Contentions at 8.***
said nickel constitutes about 3-7 wt % of said magnesium composite.	
22. The magnesium composite as defined in claim 20, wherein said additive material includes nickel,	***No infringement alleged for this claim. See Terves' Final Infringement Contentions at 8.***
said nickel constitutes about 7-10 wt % of said magnesium composite.	

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23. The magnesium composite as defined in claim 12, wherein a dissolution rate of said magnesium composite is at least 45 $mg/cm^2/hr$. in 3 wt % KCl water mixture at 90°C. and up to 325 $mg/cm^2/hr$. in 3 wt % KCl water mixture at 90°C.	The Purported Infringing Materials do not include both the limitations as defined in claim 12 and have a dissolution rate of at least 45 $mg/cm^2/hr$ in 3 wt. % KCl water mixture at 90 °C. and up to 325 $mg/cm^2/hr$ in 3 wt. % KCl water mixture at 90 °C.
24. The magnesium composite as defined in claim 12, wherein said additive material is a metal or metal alloy.	***Infringement contention withdrawn pursuant to July 2, 2021 email from Matthew J. Cavanagh.***
25. A dissolvable magnesium alloy composite for use in a ball or other tool component in a well drilling or completion operation,	
said dissolvable magnesium alloy composite comprising at least 85 wt % magnesium;	
one or more metals selected from the group consisting of 0.5-10 wt % aluminum, 0.05-6 wt % zinc, 0.01-3 wt %	The Purported Infringing Materials do not form a galvanically-active intermetallic particle that promotes corrosion of said dissolvable magnesium alloy composite.

zirconium, and 0.15-2 wt % manganese; and about 0.05-45 wt % of a secondary metal to form a galvanically-active intermetallic particle that promotes corrosion of said dissolvable magnesium alloy composite,	
said secondary metal including one or more metals selected from the group consisting of copper, nickel, cobalt, titanium and iron,	
said magnesium alloy composite has a dissolution rate of at least 5 mg/cm^2/hr. in 3 wt % KCI water mixture at 90°C.	The Purported Infringing Materials do not have a dissolution rate of at least 5 mg/cm^2/hr in 3 wt. % KCI water mixture at 90° C.
26. The dissolvable magnesium alloy composite as defined in claim 25, wherein a dissolution rate of said magnesium alloy composite is 100-325 mg/cm^2/hr. in 3 wt % KCl water mixture at 90°C.	The Purported Infringing Materials do not include both the limitations as defined in claim 25 and have a dissolution rate of 100-325 mg/cm^2/hr in 3 wt. % KCl water mixture at 90 °C.
27. The dissolvable magnesium composite as defined in claim 25,	The Purported Infringing Materials do not include both the limitations as defined in claim 25 and include nickel, wherein said

wherein said secondary metal includes nickel,	nickel forms galvanically-active in situ precipitate in said magnesium composite.
said nickel forms galvanically-active in situ precipitate in said magnesium composite.	
28. The dissolvable magnesium alloy composite as defined in claim 25, wherein said additive material is a metal or metal alloy.	***Infringement contention withdrawn pursuant to July 2, 2021 email from Matthew J. Cavanagh.***
29. A dissolvable magnesium alloy composite for use in a ball or other tool component in a well drilling or completion operation,	
said dissolvable magnesium alloy composite comprising 60-95 wt % magnesium; 0.01-1 wt % zirconium; and about 0.05-45 wt % of a secondary metal	The Purported Infringing Materials AJM006, AJM1010, AJM012, AJM016, AJM017 do not contain Zr. *See* Swanger Report at MEDLIN-000492.
to form a galvanically-active intermetallic particle that promotes corrosion of said dissolvable magnesium alloy composite,	The Purported Infringing Materials do not form a galvanically-active intermetallic particle that promotes corrosion of said dissolvable magnesium alloy composite

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said secondary metal including one or more metals selected from the group consisting of copper, nickel, cobalt, titanium and iron,	
said magnesium alloy composite has a dissolution rate of at least 5 mg/cm^2/hr. in 3 wt % KCl water mixture at 90°C.	The Purported Infringing Materials do not have a dissolution rate of at least 5 mg/cm^2/hr. in 3 wt % KCl water mixture at 90°C..
30. The dissolvable magnesium alloy composite as defined in claim 29, wherein a dissolution rate of said magnesium alloy composite is 5-325 mg/cm^2/hr. in 3 wt % KCl water mixture at 90°C.	The Purported Infringing Materials do not include both the limitations as defined in claim 29 and have a dissolution rate of 5-325 mg/cm^2/hr. in 3 wt. % KCl water mixture at 90 °C.
31. The dissolvable magnesium composite as defined in claim 29, wherein said secondary metal includes nickel,	The Purported Infringing Materials do not include both the limitations as defined in claim 29 and include nickel, wherein said nickel forms galvanically-active in situ precipitate in said magnesium composite.
said nickel forms galvanically-active in situ precipitate in said magnesium composite.	

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32. The dissolvable magnesium alloy composite as defined in claim 29, wherein said additive material is a metal or metal alloy.	***Infringement contention withdrawn pursuant to July 2, 2021 email from Matthew J. Cavanagh.***
33. A dissolvable magnesium alloy composite for use in a ball or other tool component in a well drilling or completion operation,	
said dissolvable magnesium alloy composite comprising 60-95 wt. % magnesium; 0.5-10 wt. % aluminum; 0.05-6 wt. % zinc; 0.15-2 wt. % manganese; and about 0.05-45 wt. % of a secondary metal to form a galvanically-active intermetallic particle that promotes corrosion of said dissolvable magnesium alloy composite,	The Purported Infringing Materials do not form a galvanically-active intermetallic particle that promotes corrosion of said dissolvable magnesium alloy composite.
said secondary metal including one or more metals selected from the group consisting of copper, nickel, cobalt, titanium and iron,	
said magnesium alloy composite has a dissolution rate of at least 5 mg/cm2/hr. in 3	The Purported Infringing Materials do not have a dissolution rate of at least 5 $mg/cm^2/hr.$ in 3 wt. % KCl water mixture at 90 °C.

wt. % KCl water mixture at 90° C.	
34. The dissolvable magnesium alloy composite as defined in claim 33, wherein a dissolution rate of said magnesium alloy composite is 5-325 mg/cm′/hr. in 3 wt. % KCl water mixture at 90° C.	The Purported Infringing Materials do not include both the limitations as defined in claim 33 and have a dissolution rate of 5-325 mg/cm^2/hr. in 3 wt. % KCl water mixture at 90 °C.
35. The dissolvable magnesium composite as defined in claim 33, wherein said secondary metal includes nickel, said nickel forms galvanically-active in situ precipitate in said magnesium composite.	The Purported Infringing Materials do not include both the limitations as defined in claim 33 and include nickel, wherein said nickel forms galvanically-active in situ precipitate in said magnesium composite.
36. The dissolvable magnesium alloy composite as defined in claim 33, wherein said additive material is a metal or metal alloy.	***Infringement contention withdrawn pursuant to July 2, 2021 email from Matthew J. Cavanagh.***
37. A dissolvable magnesium alloy composite for use in a ball or other tool component in a well drilling or completion	

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operation, said dissolvable magnesium alloy composite comprising	
60-95 wt. % magnesium; 0.05-6 wt. % zinc; 0.01-1 wt. % zirconium; and about 0.05-45 wt. % of a secondary metal to form a galvanically-active intermetallic particle that promotes corrosion of said dissolvable magnesium alloy composite,	The Purported Infringing Materials do not form a galvanically-active intermetallic particle that promotes corrosion of said dissolvable magnesium alloy composite, said secondary metal including one or more metals selected from the group listed.
said secondary metal including one or more metals selected from the group consisting of copper, nickel, cobalt, titanium and iron,	
said magnesium alloy composite has a dissolution rate of at least 5 mg/cm^2/hr. in 3 wt. % KCl water mixture at 90° C.	The Purported Infringing Materials do not have a dissolution rate of at least 5 mg/cm^2/hr. in 3 wt. % KCl water mixture at 90 °C.
38. The dissolvable magnesium alloy composite as defined in claim 37, wherein a dissolution rate of said magnesium alloy composite is 5-325 mg/cm^2/hr. in 3 wt. % KCl water mixture at 90° C.	The Purported Infringing Materials do not include both the limitations as defined in claim 37 and have a dissolution rate of 5-325 mg/cm^2/hr. in 3 wt. % KCl water mixture at 90° C.

39. The dissolvable magnesium composite as defined in claim 37, wherein said secondary metal includes nickel, said nickel forms galvanically-active in situ precipitate in said magnesium composite.	The Purported Infringing Materials do not include both the limitations as defined in claim 37 and include nickel, wherein said nickel forms galvanically-active in situ precipitate in said magnesium composite..
40. The dissolvable magnesium alloy composite as defined in claim 37, wherein said additive material is a metal or metal alloy.	***Infringement contention withdrawn pursuant to July 2, 2021 email from Matthew J. Cavanagh.***
41. A dissolvable magnesium alloy composite for use in a ball or other tool component in a well drilling or completion operation, said dissolvable magnesium alloy composite comprising	
over 50 wt. % magnesium; one or more metals selected from the group consisting of 0.5-10 wt. % aluminum, 0.1-2 wt. % zinc, 0.01-1 wt. % zirconium, and 0.15-2 wt. % manganese; and about 0.05-45 wt. % of a secondary metal to form a galvanically-active intermetallic particle that promotes corrosion of said	The Purported Infringing Materials do not comprise about 0.05-45 wt. % of a secondary metal to form a galvanically-active intermetallic particle that promotes corrosion of said dissolvable magnesium alloy composite, said secondary metal including one or more metals selected from the group listed.

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dissolvable magnesium alloy composite,	
said secondary metal including one or more metals selected from the group consisting of copper, nickel and cobalt,	
said magnesium alloy composite has a dissolution rate of at least 5 mg/cm^2/hr. in 3 wt. % KCl water mixture at 90° C.	The Purported Infringing Materials do not have a dissolution rate of at least 5 mg/cm^2/hr. in 3 wt. % KCl water mixture at 90° C.
42. The dissolvable magnesium alloy composite as defined in claim 41, wherein a dissolution rate of said magnesium alloy composite is 5-325 mg/cm^2/hr. in 3 wt. % KCl water mixture at 90° C.	The Purported Infringing Materials do not include both the limitations as defined in claim 41 and have a dissolution rate of 5-325 mg/cm^2/hr. in 3 wt. % KCl water mixture at 90° C.
43. The dissolvable magnesium composite as defined in claim 41, wherein said secondary metal includes nickel, said nickel forms galvanically-active in situ precipitate in said magnesium composite.	The Purported Infringing Materials do not include both the limitations as defined in claim 41 and include nickel, wherein said nickel forms galvanically-active in situ precipitate in said magnesium composite.
44. The dissolvable magnesium alloy composite as defined in claim 41, wherein said additive material is a metal or metal alloy.	***Infringement contention withdrawn pursuant to July 2, 2021 email from Matthew J. Cavanagh.***

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45. A dissolvable magnesium alloy composite for use in a ball or other tool component in a well drilling or completion operation, said dissolvable magnesium alloy composite comprising	
over 50 wt. % magnesium; one or more metals selected from the group consisting of 0.1-3 wt. % zinc, 0.01-1 wt. % zirconium, 0.05-1 wt. % manganese, 0.0002-0.04 wt. % boron, and 0.4-0.7 wt. % bismuth; and about 0.05-45 wt. % of a secondary metal to form a galvanically-active intermetallic particle that promotes corrosion of said dissolvable magnesium alloy composite,	The Purported Infringing Materials do not comprise about 0.05-45 wt. % of a secondary metal to form a galvanically-active intermetallic particle that promotes corrosion of said dissolvable magnesium alloy composite, said secondary metal including one or more metals selected from the group listed.
said secondary metal including one or more metals selected from the group consisting of copper, nickel, and cobalt,	
said magnesium alloy composite has a dissolution rate of at least 5 mg/cm^2/hr. in 3 wt. % KCl water mixture at 90° C.	The Purported Infringing Materials do not have a dissolution rate of at least 5 mg/cm^2/hr. in 3 wt. % KCl water mixture at 90° C.
46. The dissolvable magnesium alloy composite as defined in claim 45, wherein a	The Purported Infringing Materials do not include both the limitations as defined in claim 45 and have a dissolution rate of 5-325 mg/cm^2/hr. in 3 wt. % KCl water mixture at 90 °C.

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dissolution rate of said magnesium alloy composite is 5-325 $mg/cm^2/hr.$ in 3 wt. % KCl water mixture at 90° C.	
47. The dissolvable magnesium composite as defined in claim 45, wherein said secondary metal includes nickel, said nickel forms galvanically-active in situ precipitate in said magnesium composite.	The Purported Infringing Materials do not include both the limitations as defined in claim 45 and wherein said secondary metal includes nickel, said nickel forms galvanically-active in situ precipitate in said magnesium composite.
48. The dissolvable magnesium alloy composite as defined in claim 45, wherein said additive material is a metal or metal alloy.	***Infringement contention withdrawn pursuant to July 2, 2021 email from Matthew J. Cavanagh.***
49. A magnesium composite that includes in situ precipitation of galvanically-active intermetallic phases to enable controlled dissolution of said magnesium composite, said magnesium composite comprising	
a mixture of magnesium or a magnesium alloy and an additive material, said additive material constituting about 0.05-45 wt. % of said mixture, said additive material includes one or	The Purported Infringing Materials do not comprise a mixture of magnesium or a magnesium alloy and an additive material, said additive material having the described aspects.

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more metals selected from the group consisting of copper, nickel, titanium, iron, and cobalt,	
said magnesium composite including in situ precipitation of galvanically-active intermetallic phases that include said additive material,	The Purported Infringing Materials do not include *in situ* precipitation of galvanically-active intermetallic phases to enable controlled dissolution of said magnesium composite.
said additive material located in sufficient quantities in said galvanically-active intermetallic phases so as to obtain a composition and morphology of said galvanically-active intermetallic phases such that a galvanic corrosion rate along said galvanically-active intermetallic phases causes said magnesium composite to have a dissolution rate of at least at least 5 $mg/cm^2/hr.$ in 3 wt. % KCl water mixture at 90° C.	The Purported Infringing Materials do not include in situ precipitation of galvanically-active intermetallic phases that include said additive material, said additive material having the described aspects.
50. The magnesium composite as defined in claim 49, wherein said additive material includes one or more metals selected from the group consisting of copper, nickel, and cobalt.	The Purported Infringing Materials do not include both the limitations as defined in claim 49 and the one or more metals selected from the group listed.

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51. The magnesium composite as defined in claim 49, wherein said additive material includes particles having an average particle diameter size of about 0.1-500 microns.	***Infringement contention withdrawn pursuant to July 2, 2021 email from Matthew J. Cavanagh.***
52. The magnesium composite as defined in claim 49, wherein said magnesium alloy includes over 50 wt. % magnesium, and one or more metals selected from the group consisting of aluminum, boron, bismuth, zinc, zirconium, and manganese.	The Purported Infringing Materials do not include both the limitations as defined in claim 49 and include over 50 wt. % magnesium, and one or more metals selected from the group listed.
53. The magnesium composite as defined in claim 49, wherein said magnesium alloy includes over 50 wt. % magnesium, and one or more metals selected from the group consisting of aluminum in an amount of about 0.5-10 wt. %, zinc in an amount of about 0.1-6 wt. %, zirconium in an amount of about 0.01-3 wt. %, manganese in an amount of about 0.15-2 wt. %, boron in an amount of about 0.0002-0.04 wt. %, and bismuth in amount of about 0.4-0.7 wt. %.	The Purported Infringing Materials do not include both the limitations as defined in claim 49 and include over 50 wt. % magnesium, and one or more metals selected from the group listed.

54. The magnesium composite as defined in claim 49, wherein said magnesium alloy includes over 50 wt. % magnesium, and one or more metals selected from the group consisting of aluminum in an amount of about 0.5-10 wt. %, zinc in an amount of about 0.1-3 wt. %, zirconium in an amount of about 0.01-1 wt. %, manganese in an amount of about 0.15-2 wt. %, boron in an amount of about 0.0002-0.04 wt. %, and bismuth in an amount of about 0.4-0.7 wt. %.	The Purported Infringing Materials do not include both the limitations as defined in claim 49 and include over 50 wt. % magnesium, and one or more metals selected from the group listed.
55. The magnesium composite as defined in claim 49, wherein said magnesium alloy includes at least 85 wt. % magnesium, and one or more metals selected from the group consisting of 0.5-10 wt. % aluminum, 0.05-6 wt. % zinc, 0.01-3 wt. % zirconium, and 0.15-2 wt. % manganese.	The Purported Infringing Materials do not include both the limitations as defined in claim 49 and over 50 wt. % magnesium, and one or more metals selected from the group listed.
56. The magnesium composite as defined in claim 49, wherein said magnesium alloy includes 60-95 wt. % magnesium and 0.01-1 wt. % zirconium.	The Purported Infringing Materials do not include both the limitations as defined in claim 49 and 60-95 wt. % magnesium and 0.01-1 wt. % zirconium. The Purported Infringing Materials AJM006, AJM1010, AJM012, AJM016, AJM017 do not contain Zr. *See* Swanger Report at MEDLIN-000492.

57. The magnesium composite as defined in claim 56, wherein said magnesium alloy further includes 0.05-6 wt. % zinc.	The Purported Infringing Materials do not include both the limitations as defined in claim 56 and 0.05-6 wt. % zinc. The Purported Infringing Materials AJM006, AJM1010, AJM012, AJM016, AJM017 do not contain Zr. *See* Swanger Report at MEDLIN-000492.
58. The magnesium composite as defined in claim 49, wherein said magnesium alloy includes 60-95 wt. % magnesium, 0.5-10 wt. % aluminum, 0.05-6 wt. % zinc, and 0.15-2 wt. % manganese.	The Purported Infringing Materials do not include both the limitations as defined in claim 49 and 60-95 wt. % magnesium, 0.5-10 wt. % aluminum, 0.05-6 wt. % zinc, and 0.15-2 wt. % manganese.
59. The magnesium composite as defined in claim 49, wherein said magnesium alloy includes over 50 wt. % magnesium and one or more metals selected from the group consisting of 0.5-10 wt. % aluminum, 0.1-2 wt. % zinc, 0.01-1 wt. % zirconium, and 0.15-2 wt. % manganese.	The Purported Infringing Materials do not include both the limitations as defined in claim 49 and over 50 wt. % magnesium and one or more metals selected from the group listed.
60. The magnesium composite as defined in claim 49, wherein said magnesium alloy includes over 50 wt. % magnesium, and one or more metals selected from the group consisting of 0.1-3 wt. % zinc, 0.01-1 wt. %	The Purported Infringing Materials do not include both the limitations as defined in claim 49 and over 50 wt. % magnesium, and one or more metals selected from the group listed.

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zirconium, 0.05-1 wt. % manganese, 0.0002-0.04 wt. % boron, and 0.4-0.7 wt. % bismuth.	
61. The magnesium composite as defined in claim 49, wherein said additive material includes nickel, said nickel constitutes about 0.05-35 wt. % of said magnesium composite, said nickel forms galvanically-active in situ precipitate in said magnesium composite.	The Purported Infringing Materials do not include both the limitations as defined in claim 49 and wherein said nickel constitutes about 0.05-35 wt. % of said magnesium composite and said nickel forms galvanically-active in situ precipitate in said magnesium composite.
62. The magnesium composite as defined in claim 61, wherein said nickel constitutes about 3-7 wt. % of said magnesium composite.	***No infringement alleged. See Terves's Final Infringement Contentions at 18***
63. The magnesium composite as defined in claim 61, wherein said nickel constitutes about 7-10 wt. % of said magnesium composite.	***No infringement alleged. See Terves's Final Infringement Contentions at 18***
64. The magnesium composite as defined in claim 49, wherein said additive material includes copper, said copper constitutes about 0.05-35 wt. % of said magnesium composite, said copper forms the galvanically-active in situ precipitate	The Purported Infringing Materials do not include both the limitations as defined in claim 49 and copper, wherein said copper constitutes about 0.05-35 wt. % of said magnesium composite and said copper forms the galvanically-active in situ precipitate in said magnesium composite.

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in said magnesium composite.	
65. The magnesium composite as defined in claim 49, wherein said additive material includes cobalt, said cobalt constitutes about 0.05-35 wt. % of said magnesium composite, said cobalt forms the galvanically-active in situ precipitate in said magnesium composite.	***No infringement alleged for this claim. See Terves' Final Infringement Contentions at 18.***
66. The magnesium composite as defined in claim 49, wherein a dissolution rate of said magnesium composite is about 5-325 $mg/cm^2/hr.$ in 3 wt. % KCI water mixture at 90° C.	The Purported Infringing Materials do not include both the limitations as defined in claim 49 and have a dissolution rate of about 5-325 $mg/cm^2/hr.$ in 3 wt. % KCI water mixture at 90 °C.
67. The magnesium composite as defined in claim 49, wherein a dissolution rate of said magnesium composite is at least 45 $mg/cm^2/hr.$ in 3 wt. % KCl water mixture at 90° C. and up to 325 $mg/cm^2/hr.$ in 3 wt. % KCl water mixture at 90° C.	The Purported Infringing Materials do not include both the limitations as defined in claim 49 and have a dissolution rate of at least 45 $mg/cm^2/hr.$ in 3 wt. % KCl water mixture at 90 °C and up to 325 $mg/cm^2/hr.$ in 3 wt. % KCl water mixture at 90 °C.
68. The magnesium composite as defined in claim 49, wherein a dissolution rate of said	***No infringement alleged for this claim. See Terves' Final Infringement Contentions at 19.***

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magnesium composite is up to 1 mg/cm^2/hr. in 3 wt. % KCl water mixture at 21° C.	
69. The magnesium composite as defined in claim 49, wherein said additive material has a melting point temperature that is 100° C. greater than a melting temperature of said magnesium or magnesium alloy.	The Purported Infringing Materials do not include both the limitations as defined in claim 49 and have a melting point temperature that is 100 °C greater than a melting temperature of said magnesium or magnesium alloy.
70. The magnesium composite as defined in claim 49, wherein said magnesium composite is at least partially included in a down hole well component, said down hole well component including one or more components selected from the group consisting of a sleeve, frac ball, hydraulic actuating tooling, tube, valve, valve component, or plug.	The Purported Infringing Materials do not include both the limitations as defined in claim 49 and at least partially included in a down hole well component, said down hole well component including one or more components selected from the group listed.
71. The magnesium composite as defined in claim 49, wherein at least a portion of said additive material remains unalloyed additive material in said magnesium composite.	***Infringement contention withdrawn pursuant to July 2, 2021 email from Matthew J. Cavanagh.***

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72. The magnesium composite as defined in claim 49, wherein said additive material is a metal or metal alloy.	***Infringement contention withdrawn pursuant to July 2, 2021 email from Matthew J. Cavanagh.***
73. A dissolvable magnesium composite for use in a ball or other tool component in a well drilling or completion operation, said dissolvable magnesium composite includes in situ precipitation of galvanically-active intermetallic phases to enable controlled dissolution of said magnesium composite, said magnesium composite comprising a mixture of magnesium or a magnesium alloy and an additive material, said additive material constituting about 0.05 wt. % of said mixture, said additive material is a metal or metal alloy, said additive material includes one or more metals selected from the group consisting of copper, nickel, titanium, iron, silicon, and cobalt, said magnesium composite including in situ precipitation of galvanically-active intermetallic phases that include said additive material, said	The Purported Infringing Materials do not include *in situ* precipitation of galvanically-active intermetallic phases to enable controlled dissolution of said magnesium composite.

additive material located in sufficient quantities in said galvanically-active intermetallic phases so as to obtain a composition and morphology of said galvanically-active intermetallic phases such that a galvanic corrosion rate along said galvanically-active intermetallic phases causes said magnesium composite to have a dissolution rate of at least at least 5 $mg/cm^2/hr.$ in 3 wt. % KCl water mixture at 90° C.	
74. A dissolvable magnesium composite for use in a ball or other tool component in a well drilling or completion operation, said dissolvable magnesium composite includes in situ precipitation of galvanically-active intermetallic phases to enable controlled dissolution of said magnesium composite, said magnesium composite comprising	The Purported Infringing Materials do not include *in situ* precipitation of galvanically-active intermetallic phases to enable controlled dissolution of said magnesium composite.
a mixture of magnesium or a magnesium alloy and an additive material,	

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said additive material constituting at least 0.1 wt. % of said mixture,	
said magnesium in said magnesium composite constituting at least 85 wt. %,	
said additive material is a metal material selected from the group consisting of copper, nickel and cobalt,	
said magnesium composite including in situ precipitation of galvanically-active intermetallic phases that include said additive material,	
said magnesium composite has a dissolution rate of 84-325 mg/cm^2/hr. in 3 wt. % KCl water mixture at 90° C.	The Purported Infringing Materials do not have a dissolution rate of 84-325 mg/cm^2/hr. in 3 wt. % KCl water mixture at 90° C.
75. The magnesium composite as defined in claim 74, wherein said magnesium alloy is an AZ91D magnesium alloy that includes aluminum and zinc.	***Infringement contention withdrawn pursuant to July 2, 2021 email from Matthew J. Cavanagh.*** ***No infringement alleged for this claim. See Terves' Final Infringement Contentions at 21.***
76. The magnesium composite as defined in claim 74, wherein said additive material includes nickel, a content of said nickel in said magnesium composite is at least 0.3 wt. %.	***No infringement alleged for this claim. See Terves' Final Infringement Contentions at 21.***

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77. The magnesium composite as defined in claim 74, wherein said additive material includes nickel, a content of said nickel in said magnesium composite is at least 7 wt. %.	***No infringement alleged for this claim. See Terves' Final Infringement Contentions at 21.***
78. The magnesium composite as defined in claim 74, wherein said additive material includes nickel, a content of said nickel in said magnesium composite is at least 10 wt. %.	***No infringement alleged for this claim. See Terves' Final Infringement Contentions at 21.***

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Appendix F

U.S. Patent No. 10,689,740 ('740 Patent) Non-Infringement Claim Chart

'740 Patent Claims[1]	**Limitations of '740 Patent Claims not found in Purported Infringing Materials .**
1. A dissolvable magnesium alloy in which additions of high electronegative intermetallic formers are selected from one or more elements with an electronegativity of greater than 1.75 and 0.2-5 wt. % of one or more elements with an electronegativity of 1.25 or less, a magnesium content in said dissolvable magnesium alloy is greater than 50 wt. %, said one or more elements with an electronegativity of greater than 1.75 form a precipitate, particle, and/or intermetallic phase in said dissolvable magnesium alloy, said one or more elements with an electronegativity of greater than 1.75 include one or more elements selected from the group of tin, nickel, iron, cobalt, silicon, nickel, chromium, copper, bismuth, lead, tin, antimony, indium, silver, aluminum, gold,	***No infringement alleged. See Terves's Final Infringement Contentions at 21.***

[1] Independent claims 1, 2, 19, and 94 are shaded for easier reference.

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platinum, cadmium, selenium, arsenic, boron, germanium, carbon, molybdenum, tungsten, manganese, zinc, rhenium and gallium, said one or more elements with an electronegativity of 1.25 or less are selected from the group of calcium, strontium, barium, potassium, neodymium, cerium, sodium, lithium, cesium, yttrium, lanthanum, samarium, europium, gadolinium, terbium, dysprosium, holmium and ytterbium, said dissolvable magnesium alloy has a dissolution rate of at least 5 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C.	
2. A dissolvable magnesium composite that at least partially forms a ball, a frac ball, a tube, a plug or other tool component that is to be used in a well drilling or completion operation,	The Purported Infringing Materials do not form a ball, a frac ball, a tube, a plug or other tool component that is to be used in a well drilling or completion operation.
said dissolvable dissolvable [sic] magnesium composite includes in situ precipitate,	The Purported Infringing Materials do not have in situ precipitate.
said dissolvable magnesium composite comprising a mixture of magnesium or a	The Purported Infringing Materials do not have in situ precipitate.

magnesium alloy and an additive material,	
said magnesium composite includes greater than 50 wt. % magnesium, said in situ precipitate includes	
said additive material, said additive material [sic] includes one or more metal materials selected from the group consisting of a) copper wherein said copper constitutes 0.1-35 wt. % of said dissolvable magnesium composite, b) wt. % nickel wherein said nickel constitutes 0.1-23.5 wt. % of said dissolvable magnesium composite, and c) cobalt wherein said cobalt constitutes 0.1-20 wt. % of said dissolvable magnesium composite,	
said dissolvable magnesium composite has a dissolution rate of at least 75 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C.	The Purported Infringing Materials do not have a dissolution rate of at least 75 mg/cm.sup.2/hr. in 3 wt. % KCl water mixture at 90.degree. C.
3. The dissolvable magnesium composite as defined in claim 2, wherein said dissolvable magnesium composite has a dissolution rate of 75-325 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C.	The Purported Infringing Materials do not include both the limitations as defined in claim 2 and have a dissolution rate between 75-325 mg/cm.sup.2/hr. in 3 wt. % KCl water mixture at 90.degree. C.

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4. The dissolvable magnesium composite as defined in claim 2, wherein said dissolvable magnesium composite has a dissolution rate of 84-325 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C.	The Purported Infringing Materials do not include both the limitations as defined in claim 2 and have a dissolution rate between 84-325 mg/cm.sup.2/hr. in 3 wt. % KCl water mixture at 90.degree. C.
5. The dissolvable magnesium composite as defined in claim 2, wherein said dissolvable magnesium composite has a dissolution rate of 100-325 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C.	The Purported Infringing Materials do not include both the limitations as defined in claim 2 and have a dissolution rate between 100-325 mg/cm.sup.2/hr. in 3 wt. % KCl water mixture at 90.degree. C.
6. The dissolvable magnesium composite as defined in claim 2, wherein said dissolvable magnesium composite has a dissolution rate of 0.6-1 mg/cm2/hr. in 3 wt. % KCl water mixture at 21° C.	The Purported Infringing Materials do not include both the limitations as defined in claim 2 and have a dissolution rate of 0.6-1 mg/cm.sup.2/hr. in 3 wt. % KCl water mixture at 21.degree. C
7. The dissolvable magnesium composite as defined in claim 2, wherein said dissolvable magnesium composite has a dissolution rate of 0.5-1 mg/cm2/hr. in 3 wt. % KCl water mixture at 20° C.	The Purported Infringing Materials do not include both the limitations as defined in claim 2 and have a dissolution rate of 0.5-1 mg/cm.sup.2/hr. in 3 wt. % KCl water mixture at 20.degree. C.

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8. The dissolvable magnesium composite as defined in claim 2, wherein said magnesium alloy comprises greater than 50 wt. % magnesium and no more than 10 wt. % aluminum, and one or more metals selected from the group consisting of 0.5-10 wt. % aluminum, 0.1-2 wt. % zinc, 0.01-1 wt. % zirconium, and 0.15-2 wt. % manganese.	The Purported Infringing Materials do not include both the limitations as defined in claim 2 and composed of greater than 50 wt. % magnesium and no more than 10 wt. % aluminum, and one or more metals selected from the group consisting of 0.5-10 wt. % aluminum, 0.1-2 wt. % zinc, 0.01-1 wt. % zirconium, and 0.15-2 wt. % manganese.
9. The dissolvable magnesium composite as defined in claim 2, wherein said magnesium alloy comprises greater than 50 wt. % magnesium and no more than 10 wt. % aluminum, and one or more metals selected from the group consisting of 0.1-3 wt. % zinc, 0.05-1 wt. % zirconium, 0.05-0.25 wt. % manganese, 0.0002-0.04 wt. % boron, and 0.4-0.7 wt. % bismuth.	The Purported Infringing Materials do not include both the limitations as defined in claim 2 and composed of greater than 50 wt. % magnesium and no more than 10 wt. % aluminum, and one or more metals selected from the group consisting of 0.1-3 wt. % zinc, 0.05-1 wt. % zirconium, 0.05-0.25 wt. % manganese, 0.0002-0.04 wt. % boron, and 0.4-0.7 wt. % bismuth.
10. The dissolvable magnesium composite as defined in claim 2, wherein said additive material includes nickel.	The Purported Infringing Materials do not include both the limitations as defined in claim 2 and include nickel as an additive material.
11. The dissolvable magnesium composite as defined in claim 2,	The Purported Infringing Materials do not include both the limitations as defined in claim 2 and include nickel as an additive

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wherein said additive material includes nickel, said nickel constitutes 0.3-7 wt. % of said dissolvable magnesium composite.	material constituting between 0.3-7 wt. % of the purported Infringing Material.
12. The dissolvable magnesium composite as defined in claim 2, wherein said additive material includes nickel, said nickel constitutes 7-10 wt. % of said dissolvable magnesium composite.	***No infringement alleged. See Terves's Final Infringement Contentions at 24.***
13. The dissolvable magnesium composite as defined in claim 2, wherein said additive material includes copper.	The Purported Infringing Materials do not include both the limitations as defined in claim 2 and include copper as an additive material.
14. The dissolvable magnesium composite as defined in claim 2, wherein said additive material includes copper, said copper constitutes 0.5-15 wt. % of said dissolvable magnesium composite.	The Purported Infringing Materials do not include both the limitations as defined in claim 2 and include copper as an additive material constituting between 0.5-15 wt. % of the purported Infringing Material.
15. The dissolvable magnesium composite as defined in claim 2, wherein said additive material includes copper, said copper constitutes 15-35 wt. % of said dissolvable magnesium composite.	***No infringement alleged. See Terves's Final Infringement Contentions at 24.***

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16. The dissolvable magnesium composite as defined in claim 2, wherein said magnesium content in said dissolvable magnesium composite is at least 75 wt. %.	The Purported Infringing Materials do not include both the limitations as defined in claim 2 and include magnesium constituting at least 75 wt. % of the purported Infringing Material.
17. The dissolvable magnesium composite as defined in claim 2, wherein said magnesium content in said dissolvable magnesium composite is at least 85 wt. %.	The Purported Infringing Materials do not include both the limitations as defined in claim 2 and include magnesium constituting at least 85 wt. % of the purported Infringing Material.
18. The dissolvable magnesium composite as defined in claim 2, wherein said additive material is a metal or metal alloy.	***Infringement contention withdrawn pursuant to July 2, 2021 email from Matthew J. Cavanagh.***
19. A dissolvable magnesium cast composite comprising	
a mixture of magnesium or a magnesium alloy and an additive material, said additive material includes one or more metals selected from the group consisting of a) copper wherein said copper constitutes at least 0.01 wt. % of said dissolvable magnesium cast composite, b) nickel wherein said nickel constitutes at least 0.01 wt. % of said dissolvable magnesium cast composite, and c)	

cobalt wherein said cobalt constitutes at least 0.01 wt. % of said dissolvable magnesium cast composite,	
said magnesium composite includes in situ precipitate,	The Purported Infringing Materials do not include *in situ* precipitate.
said in situ precipitate includes said additive material, a plurality of particles of said in situ precipitate having a size of no more than 50 μm,	
said magnesium composite has a dissolution rate of at least 5 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C.	The Purported Infringing Materials do not have a dissolution rate of at least 5 mg/cm^2/hr. in 3 wt. % KCl water mixture at 90 °C.
20. The dissolvable magnesium cast composite as defined in claim 19, wherein said magnesium composite includes at least 85 wt. % magnesium.	The Purported Infringing Materials do not include both the limitations as defined in claim 19 and include at least 85 wt. % magnesium.
21. The dissolvable magnesium cast composite as defined in claim 19, wherein said magnesium composite has a dissolution rate of at least 40 mg/cm.sup.2/hr. in 3 wt. % KCl water mixture at 90.degree. C.	The Purported Infringing Materials do not include both the limitations as defined in claim 19 and have a dissolution rate of at least 40 mg/cm.sup.2/hr. in 3 wt. % KCl water mixture at 90.degree. C.
22. The dissolvable magnesium cast composite as defined in	The Purported Infringing Materials do not include both the limitations as defined in claim 20 and have a dissolution rate of at

claim 20, wherein said magnesium composite has a dissolution rate of at least 40 mg/cm.sup.2/hr. in 3 wt. % KCl water mixture at 90.degree. C.	least 40 mg/cm.sup.2/hr. in 3 wt. % KCl water mixture at 90.degree. C.
23. The dissolvable magnesium cast composite as defined in claim 19, wherein said magnesium composite includes no more than 10 wt. % aluminum.	The Purported Infringing Materials do not include both the limitations as defined in claim 19 and include no more than 10 wt. % aluminum.
24. The dissolvable magnesium cast composite as defined in claim 20, wherein said magnesium composite includes no more than 10 wt. % aluminum.	The Purported Infringing Materials do not include both the limitations as defined in claim 20 and include no more than 10 wt. % aluminum.
25. The dissolvable magnesium cast composite as defined in claim 21, wherein said magnesium composite includes no more than 10 wt. % aluminum.	The Purported Infringing Materials do not include both the limitations as defined in claim 21 and include aluminum constituting no more than 10 wt. % of the purported Infringing Material.
26. The dissolvable magnesium cast composite as defined in claim 22, wherein said magnesium composite includes no more than 10 wt. % aluminum.	The Purported Infringing Materials do not include both the limitations as defined in claim 22 and include aluminum constituting no more than 10 wt. % of the purported Infringing Material.
27. The dissolvable magnesium cast composite as defined in claim 23, wherein said	The Purported Infringing Materials do not include both the limitations as defined in claim 23 and include at least 50 wt. % magnesium.

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magnesium composite includes at least 50 wt. % magnesium.	
28. The dissolvable magnesium cast composite as defined in claim 25, wherein said magnesium composite includes at least 50 wt. % magnesium.	The Purported Infringing Materials do not include both the limitations as defined in claim 25 and include magnesium constituting at least 50 wt. % of the purported Infringing Material.
29. The dissolvable magnesium cast composite as defined in claim 19, wherein said dissolvable magnesium cast composite has a dissolution rate of 40-325 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C.	The Purported Infringing Materials do not include both the limitations as defined in claim 19 and have a dissolution rate between 40-325 mg/cm.sup.2/hr. in 3 wt. % KCl water mixture at 90.degree. C.
30. The dissolvable magnesium cast composite as defined in claim 20, wherein said dissolvable magnesium cast composite has a dissolution rate of 40-325 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C.	The Purported Infringing Materials do not include both the limitations as defined in claim 20 and have a dissolution rate between 40-325 mg/cm.sup.2/hr. in 3 wt. % KCl water mixture at 90.degree. C.
31. The dissolvable magnesium cast composite as defined in claim 22, wherein said dissolvable magnesium cast composite has a dissolution rate of 40-325 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C.	The Purported Infringing Materials do not include both the limitations as defined in claim 22 and have a dissolution rate between 40-325 mg/cm.sup.2/hr. in 3 wt. % KCl water mixture at 90.degree. C.

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32. The dissolvable magnesium cast composite as defined in claim 23, wherein said dissolvable magnesium cast composite has a dissolution rate of 40-325 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C.	The Purported Infringing Materials do not include both the limitations as defined in claim 23 and have a dissolution rate between 40-325 mg/cm.sup.2/hr. in 3 wt. % KCl water mixture at 90.degree. C.
33. The dissolvable magnesium cast composite as defined in claim 27, wherein said dissolvable magnesium cast composite has a dissolution rate of 40-325 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C.	The Purported Infringing Materials do not include both the limitations as defined in claim 27 have a dissolution rate between 40-325 mg/cm.sup.2/hr. in 3 wt. % KCl water mixture at 90.degree C.
34. The dissolvable magnesium cast composite as defined in claim 28, wherein said dissolvable magnesium cast composite has a dissolution rate of 40-325 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C.	The Purported Infringing Materials do not include both the limitations as defined in claim 28 and have a dissolution rate between 40-325 mg/cm.sup.2/hr. in 3 wt. % KCl water mixture at 90.degree. C.
35. The dissolvable magnesium cast composite as defined in claim 27, wherein said magnesium alloy includes over 50 wt. % magnesium and one or more metals selected from the group consisting of aluminum, boron, bismuth, zinc,	The Purported Infringing Materials do not include both the limitations as defined in claim 27 and have a magnesium alloy which includes over 50 wt. % magnesium and one or more metals selected from the group consisting of aluminum, zinc, zirconium, and manganese.

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zirconium, and manganese.	
36. The dissolvable magnesium cast composite as defined in claim 28, wherein said magnesium alloy includes over 50 wt. % magnesium and one or more metals selected from the group consisting of aluminum, boron, bismuth, zinc, zirconium, and manganese.	The Purported Infringing Materials do not include both the limitations as defined in claim 28 and include magnesium constituting over 50 wt. % of the Infringing Material and one or more metals selected from the group consisting of aluminum, boron, bismuth, zinc, zirconium, and manganese.
37. The dissolvable magnesium cast composite as defined in claim 27, wherein said magnesium alloy includes over 50 wt. % magnesium and one or more metals selected from the group consisting of aluminum in an amount of 0.5-10 wt. %, zinc in an amount of 0.1-6 wt. %, zirconium in an amount of 0.01-3 wt. %, manganese in an amount of 0.15-2 wt. %, boron in an amount of 0.0002-0.04 wt. %, and bismuth in an amount of 0.4-0.7 wt. %.	The Purported Infringing Materials do not include both the limitations as defined in claim 27 and include magnesium constituting over 50 wt. % of the Infringing Material and one or more metals selected from the group consisting of aluminum in an amount of 0.5-10 wt. %, zinc in an amount of 0.1-6 wt. %, zirconium in an amount of 0.01-3 wt. %, manganese in an amount of 0.15-2 wt. %, boron in an amount of 0.0002-0.04 wt. %, and bismuth in an amount of 0.4-0.7 wt. %.
38. The dissolvable magnesium cast composite as defined in claim 28, wherein said magnesium alloy	The Purported Infringing Materials do not include both the limitations as defined in claim 28 and include magnesium constituting over 50 wt. % of the purported Infringing Material and one or more metals selected from the group consisting of aluminum in an amount of 0.5-10 wt. %, zinc in an amount of 0.1-6 wt. %,

includes over 50 wt. % magnesium and one or more metals selected from the group consisting of aluminum in an amount of 0.5-10 wt. %, zinc in an amount of 0.1-6 wt. %, zirconium in an amount of 0.01-3 wt. %, manganese in an amount of 0.15-2 wt. %, boron in an amount of 0.0002-0.04 wt. %, and bismuth in an amount of 0.4-0.7 wt. %.	zirconium in an amount of 0.01-3 wt. %, manganese in an amount of 0.15-2 wt. %, boron in an amount of 0.0002-0.04 wt. %, and bismuth in an amount of 0.4-0.7 wt. %.
39. The dissolvable magnesium cast composite as defined in claim 27, wherein said magnesium alloy includes over 50 wt. % magnesium and one or more metals selected from the group consisting of aluminum in an amount of 0.5-10 wt. %, zinc in an amount of 0.1-3 wt. %, zirconium in an amount of 0.01-1 wt. %, manganese in an amount of 0.15-2 wt. %, boron in an amount of 0.0002-0.04 wt. %, and bismuth in amount of 0.4-0.7 wt. %.	The Purported Infringing Materials do not include both the limitations as defined in claim 27 and include magnesium constituting over 50 wt. % of the Infringing Material and one or more metals selected from the group consisting of aluminum in an amount of 0.5-10 wt. %, zinc in an amount of 0.1-3 wt. %, zirconium in an amount of 0.01-1 wt. %, manganese in an amount of 0.15-2 wt. %, boron in an amount of 0.0002-0.04 wt. %, and bismuth in amount of 0.4-0.7 wt. %.
40. The dissolvable magnesium cast composite as defined in claim 28, wherein said magnesium alloy includes over 50 wt. %	The Purported Infringing Materials do not include both the limitations as defined in claim 28 and include magnesium constituting over 50 wt. % of the Infringing Material and one or more metals selected from the group consisting of aluminum in an amount of 0.5-10 wt. %, zinc in an amount of 0.1-3 wt. %, zirconium in an amount of 0.01-1 wt. %, manganese in an amount of 0.15-2 wt. %,

magnesium and one or more metals selected from the group consisting of aluminum in an amount of 0.5-10 wt. %, zinc in an amount of 0.1-3 wt. %, zirconium in an amount of 0.01-1 wt. %, manganese in an amount of 0.15-2 wt. %, boron in an amount of 0.0002-0.04 wt. %, and bismuth in amount of 0.4-0.7 wt. %.	boron in an amount of 0.0002-0.04 wt. %, and bismuth in amount of 0.4-0.7 wt. %.
41. The dissolvable magnesium cast composite as defined in claim 20, wherein said magnesium alloy includes at least 85 wt. % magnesium and one or more metals selected from the group consisting of 0.5-10 wt. % aluminum, 0.05-6 wt. % zinc, 0.01-3 wt. % zirconium, and 0.15-2 wt. % manganese.	The Purported Infringing Materials do not include both the limitations as defined in claim 20 and include magnesium constituting at least 85 wt. % of the Infringing Material and one or more metals selected from the group consisting of 0.5-10 wt. % aluminum, 0.05-6 wt. % zinc, 0.01-3 wt. % zirconium, and 0.15-2 wt. % manganese.
42. The dissolvable magnesium cast composite as defined in claim 22, wherein said magnesium alloy includes at least 85 wt. % magnesium and one or more metals selected from the group consisting of 0.5-10 wt. % aluminum, 0.05-6 wt. % zinc, 0.01-3 wt. % zirconium, and 0.15-2 wt. % manganese.	The Purported Infringing Materials do not include both the limitations as defined in claim 22 and include magnesium constituting at least 85 wt. % of the Infringing Material and one or more metals selected from the group consisting of 0.5-10 wt. % aluminum, 0.05-6 wt. % zinc, 0.01-3 wt. % zirconium, and 0.15-2 wt. % manganese.

43. The dissolvable magnesium cast composite as defined in claim 23, wherein said magnesium alloy includes at least 85 wt. % magnesium and one or more metals selected from the group consisting of 0.5-10 wt. % aluminum, 0.05-6 wt. % zinc, 0.01-3 wt. % zirconium, and 0.15-2 wt. % manganese.	The Purported Infringing Materials do not include both the limitations as defined in claim 23 and include magnesium constituting at least 85 wt. % of the Infringing Material and one or more metals selected from the group consisting of 0.5-10 wt. % aluminum, 0.05-6 wt. % zinc, 0.01-3 wt. % zirconium, and 0.15-2 wt. % manganese.
44. The dissolvable magnesium cast composite as defined in claim 27, wherein said magnesium alloy comprises greater than 50 wt. % magnesium and one or more metals selected from the group consisting of 0.5-10 wt. % aluminum, 0.1-2 wt. % zinc, 0.01-1 wt. % zirconium, and 0.15-2 wt. % manganese.	The Purported Infringing Materials do not include both the limitations as defined in claim 27 and include magnesium constituting greater than 50 wt. % of the Infringing Material and one or more metals selected from the group consisting of 0.5-10 wt. % aluminum, 0.1-2 wt. % zinc, 0.01-1 wt. % zirconium, and 0.15-2 wt. % manganese.
45. The dissolvable magnesium cast composite as defined in claim 28, wherein said magnesium alloy comprises greater than 50 wt. % magnesium and one or more metals selected from the group consisting of 0.5-10 wt. % aluminum, 0.1-2 wt. % zinc, 0.01-1 wt. % zirconium, and 0.15-2 wt. % manganese.	The Purported Infringing Materials do not include both the limitations as defined in claim 28 and include magnesium constituting greater than 50 wt. % of the Infringing Material and one or more metals selected from the group consisting of 0.5-10 wt. % aluminum, 0.1-2 wt. % zinc, 0.01-1 wt. % zirconium, and 0.15-2 wt. % manganese.

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46. The dissolvable magnesium cast composite as defined in claim 27, wherein said magnesium alloy comprises greater than 50 wt. % magnesium and one or more metals selected from the group consisting of 0.1-3 wt. % zinc, 0.05-1 wt. % zirconium, 0.05-0.25 wt. % manganese, 0.0002-0.04 wt. % boron, and 0.4-0.7 wt. % bismuth.	The Purported Infringing Materials do not include both the limitations as defined in claim 27 and include magnesium constituting greater than 50 wt. % of the Infringing Material and one or more metals selected from the group consisting of 0.1-3 wt. % zinc, 0.05-1 wt. % zirconium, 0.05-0.25 wt. % manganese, 0.0002-0.04 wt. % boron, and 0.4-0.7 wt. % bismuth.
47. The dissolvable magnesium cast composite as defined in claim 28, wherein said magnesium alloy comprises greater than 50 wt. % magnesium and one or more metals selected from the group consisting of 0.1-3 wt. % zinc, 0.05-1 wt. % zirconium, 0.05-0.25 wt. % manganese, 0.0002-0.04 wt. % boron, and 0.4-0.7 wt. % bismuth.	The Purported Infringing Materials do not include both the limitations as defined in claim 28 and include magnesium constituting greater than 50 wt. % of the Infringing Material and one or more metals selected from the group consisting of 0.1-3 wt. % zinc, 0.05-1 wt. % zirconium, 0.05-0.25 wt. % manganese, 0.0002-0.04 wt. % boron, and 0.4-0.7 wt. % bismuth.
48. The dissolvable magnesium cast composite as defined in claim 19, wherein said magnesium alloy comprises 60-95 wt. % magnesium, 0.5-10 wt. % aluminum, 0.05-6 wt. % zinc, and 0.15-2 wt. % manganese.	***No infringement alleged. See Terves's Final Infringement Contentions at 31.***

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49. The dissolvable magnesium cast composite as defined in claim 19, wherein said magnesium alloy includes 60-95 wt. % magnesium and 0.01-1 wt. % zirconium.	The Purported Infringing Materials do not include both the limitations as defined in claim 19 and include magnesium constituting 60-95 wt. % and zirconium constituting 0.01-1 wt. % of the purported Infringing Material.
50. The dissolvable magnesium cast composite as defined in claim 19, wherein said magnesium alloy includes 60-95 wt. % magnesium, 0.05-6 wt. % zinc, and 0.01-1 wt. % zirconium.	The Purported Infringing Materials do not include both the limitations as defined in claim 19 and include magnesium constituting 60-95 wt. %, zinc constituting 0.05-6 wt. %, and zirconium constituting 0.01-1 wt. % of the purported Infringing Material.
51. The dissolvable magnesium cast composite as defined in claim 19, wherein said magnesium alloy includes over 50 wt. % magnesium and one or more metals selected from the group consisting of 0.1-3 wt. % zinc, 0.01-1 wt. % zirconium, 0.05-1 wt. % manganese, 0.0002-0.04 wt. % boron, and 0.4-0.7 wt. % bismuth.	The Purported Infringing Materials do not include both the limitations as defined in claim 19 and include one or more metals selected from the group consisting of 0.1-3 wt. % zinc, 0.01-1 wt. % zirconium, 0.05-1 wt. % manganese, 0.0002-0.04 wt. % boron, and 0.4-0.7 wt. % bismuth.
52. The dissolvable magnesium cast composite as defined in claim 19, wherein said additive material includes nickel, said nickel constitutes 0.1-23.5 wt. % of said dissolvable magnesium cast composite.	The Purported Infringing Materials do not include both the limitations as defined in claim 19 and contain nickel, wherein said nickel constitutes 0.1-23.5 wt. % of said dissolvable magnesium cast composite.

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53. The dissolvable magnesium cast composite as defined in claim 20, wherein said additive material includes nickel, said nickel constitutes 0.1-23.5 wt. % of said dissolvable magnesium cast composite.	The Purported Infringing Materials do not include both the limitations as defined in claim 20 and contain nickel, wherein said nickel constitutes 0.1-23.5 wt. % of said dissolvable magnesium cast composite.
54. The dissolvable magnesium cast composite as defined in claim 22, wherein said additive material includes nickel, said nickel constitutes 0.1-23.5 wt. % of said dissolvable magnesium cast composite.	The Purported Infringing Materials do not include both the limitations as defined in claim 22 and include nickel constituting between 0.1-23.5 wt. % of the purported Infringing Material.
55. The dissolvable magnesium cast composite as defined in claim 23, wherein said additive material includes nickel, said nickel constitutes 0.1-23.5 wt. % of said dissolvable magnesium cast composite.	The Purported Infringing Materials do not include both the limitations as defined in claim 23 and contain nickel, wherein said nickel constitutes 0.1-23.5 wt. % of said dissolvable magnesium cast composite.
56. The dissolvable magnesium cast composite as defined in claim 27, wherein said additive material includes nickel, said nickel constitutes 0.1-23.5 wt. % of said dissolvable magnesium cast composite.	The Purported Infringing Materials do not include both the limitations as defined in claim 27 and include nickel constituting between 0.1-23.5 wt. % of the purported Infringing Material.

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57. The dissolvable magnesium cast composite as defined in claim 28, wherein said wherein said additive material includes nickel, said nickel constitutes 0.1-23.5 wt. % of said dissolvable magnesium cast composite.	The Purported Infringing Materials do not include both the limitations as defined in claim 28 and include nickel constituting between 0.1-23.5 wt. % of the purported Infringing Material.
58. The dissolvable magnesium cast composite as defined in claim 19, wherein said additive material includes copper, said copper constitutes 0.01-35 wt. % of said dissolvable magnesium cast composite.	The Purported Infringing Materials do not include both the limitations as defined in claim 19 and include copper constituting between 0.01-35 wt. % of the purported Infringing Material.
59. The dissolvable magnesium cast composite as defined in claim 20, wherein said additive material includes copper, said copper constitutes 0.01-35 wt. % of said dissolvable magnesium cast composite.	The Purported Infringing Materials do not include both the limitations as defined in claim 20 and include copper constituting between 0.01-35 wt. % of the purported Infringing Material.
60. The dissolvable magnesium cast composite as defined in claim 22, wherein said additive material includes copper, said copper constitutes 0.01-35 wt. % of said dissolvable magnesium cast composite.	The Purported Infringing Materials do not include both the limitations as defined in claim 22 and include copper constituting 0.01-35 wt. % of the purported Infringing Material.

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61. The dissolvable magnesium cast composite as defined in claim 23, wherein said additive material includes copper, said copper constitutes 0.01-35 wt. % of said dissolvable magnesium cast composite.	The Purported Infringing Materials do not include both the limitations as defined in claim 23 and include copper constituting 0.01-35 wt. % of the purported Infringing Material.
62. The dissolvable magnesium cast composite as defined in claim 17, wherein said additive material includes copper, said copper constitutes 0.01-35 wt. % of said dissolvable magnesium cast composite.	The Purported Infringing Materials do not include both the limitations as defined in claim 17 and include copper constituting 0.01-35 wt. % of the purported Infringing Material.
63. The dissolvable magnesium cast composite as defined in claim 28, wherein said additive material includes copper, said copper constitutes 0.01-35 wt. % of said dissolvable magnesium cast composite.	The Purported Infringing Materials do not include both the limitations as defined in claim 28 and include copper constituting 0.01-35 wt. % of the purported Infringing Material.
64. The dissolvable magnesium cast composite as defined in claim 19, wherein said additive material includes copper, said copper constitutes 0.5-15 wt. % of said dissolvable magnesium cast composite.	The Purported Infringing Materials do not include both the limitations as defined in claim 19 and include copper constituting 0.5-15 wt. % of the purported Infringing Material.
65. The dissolvable magnesium cast composite as defined in	The Purported Infringing Materials do not include both the limitations as defined in claim 20 and include copper constituting at least 0.5-15 wt. % of the Infringing Materials.

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claim 20, wherein said additive material includes copper, said copper constitutes 0.5-15 wt. % of said dissolvable magnesium cast composite.	
66. The dissolvable magnesium cast composite as defined in claim 22, wherein said additive material includes copper, said copper constitutes 0.5-15 wt. % of said dissolvable magnesium cast composite.	The Purported Infringing Materials do not include both the limitations as defined in claim 22 and include copper constituting 0.5-15 wt. % of the Infringing Materials.
67. The dissolvable magnesium cast composite as defined in claim 23, wherein said additive material includes copper, said copper constitutes 0.5-15 wt. % of said dissolvable magnesium cast composite.	The Purported Infringing Materials do not include both the limitations as defined in claim 23 and include copper constituting between 0.5-15 wt. % of the purported Infringing Material.
68. The dissolvable magnesium cast composite as defined in claim 27, wherein said additive material includes copper, said copper constitutes 0.5-15 wt. % of said dissolvable magnesium cast composite.	The Purported Infringing Materials do not include both the limitations as defined in claim 27 and include copper constituting between 0.5-15 wt. % of the purported Infringing Material.
69. The dissolvable magnesium cast composite as defined in claim 28, wherein said	The Purported Infringing Materials do not include both the limitations as defined in claim 28 and include copper constituting between 0.5-15 wt. % of the purported Infringing Material.

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additive material includes copper, said copper constitutes 0.5-15 wt. % of said dissolvable magnesium cast composite.	
70. The dissolvable magnesium cast composite as defined in claim 19, wherein said additive material includes cobalt, said cobalt constitutes 0.1-20 wt. % of said magnesium composite.	***No infringement alleged. See Terves's Final Infringement Contentions at 34-35***
71. The dissolvable magnesium cast composite as defined in claim 20, wherein said wherein said additive material includes cobalt, said cobalt constitutes 0.1-20 wt. % of said magnesium composite.	***No infringement alleged. See Terves's Final Infringement Contentions at 34-35***
72. The dissolvable magnesium cast composite as defined in claim 22, wherein said wherein said additive material includes cobalt, said cobalt constitutes 0.1-20 wt. % of said magnesium composite.	***No infringement alleged. See Terves's Final Infringement Contentions at 34-35***
73. The dissolvable magnesium cast composite as defined in claim 23, wherein said wherein said additive material includes cobalt, said cobalt	***No infringement alleged. See Terves's Final Infringement Contentions at 34-35***

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constitutes 0.1-20 wt. % of said magnesium composite.	
74. The dissolvable magnesium cast composite as defined in claim 27, wherein said wherein said additive material includes cobalt, said cobalt constitutes 0.1-20 wt. % of said magnesium composite.	***No infringement alleged. See Terves's Final Infringement Contentions at 34-35***
75. The dissolvable magnesium cast composite as defined in claim 28, wherein said wherein said additive material includes cobalt, said cobalt constitutes 0.1-20 wt. % of said magnesium composite.	***No infringement alleged. See Terves's Final Infringement Contentions at 34-35***
76. The dissolvable magnesium cast composite as defined in claim 19, wherein said additive material includes one or more metal materials selected from the group consisting of 0.1-35 wt. % copper, 0.1-24.5 wt. % nickel and 0.1-20 wt. % cobalt.	The Purported Infringing Materials do not include both the limitations as defined in claim 19 and include one or more metal materials selected from the group consisting of 0.1-35 wt. % copper, 01.-24.5 wt. % nickel and 0.1-20 wt. % cobalt.
77. The dissolvable magnesium cast composite as defined in claim 29, wherein said additive material includes one or more metal materials	The Purported Infringing Materials do not include both the limitations as defined in claim 29 and include one or more metal materials selected from the group consisting of 0.1-35 wt. % copper, 0.1-24.5 wt. % nickel and 0.1-20 wt. % cobalt.

selected from the group consisting of 0.1-35 wt. % copper, 0.1-24.5 wt. % nickel and 0.1-20 wt. % cobalt.	
78. The dissolvable magnesium cast composite as defined in claim 22, wherein said additive material includes one or more metal materials selected from the group consisting of 0.1-35 wt. % copper, 0.1-24.5 wt. % nickel and 0.1-20 wt. % cobalt.	The Purported Infringing Materials do not include both the limitations as defined in claim 22 and include one or more metal materials selected from the group consisting of 0.1-35 wt. % copper, 0.1-24.5 wt. % nickel and 0.1-20 wt. % cobalt.
79. The dissolvable magnesium cast composite as defined in claim 23, wherein said additive material includes one or more metal materials selected from the group consisting of 0.1-35 wt. % copper, 0.1-24.5 wt. % nickel and 0.1-20 wt. % cobalt.	The Purported Infringing Materials do not include both the limitations as defined in claim 23 and include one or more metal materials selected from the group consisting of 0.1-35 wt. % copper, 01.-24.5 wt. % nickel and 0.1-20 wt. % cobalt.
80. The dissolvable magnesium cast composite as defined in claim 27, wherein said additive material includes one or more metal materials selected from the group consisting of 0.1-35 wt. % copper, 0.1-24.5 wt. % nickel and 0.1-20 wt. % cobalt.	The Purported Infringing Materials do not include both the limitations as defined in claim 27 and include one or more metal materials selected from the group consisting of 0.1-35 wt. % copper, 01.-24.5 wt. % nickel and 0.1-20 wt. % cobalt.

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81. The dissolvable magnesium cast composite as defined in claim 28, wherein said additive material includes one or more metal materials selected from the group consisting of 0.1-35 wt. % copper, 0.1-24.5 wt. % nickel and 0.1-20 wt. % cobalt.	The Purported Infringing Materials do not include both the limitations as defined in claim 28 and include one or more metal materials selected from the group consisting of 0.1-35 wt. % copper, 0.1-24.5 wt. % nickel and 0.1-20 wt. % cobalt.
82. The dissolvable magnesium cast composite as defined in claim 19, wherein said dissolvable magnesium cast composite has one or more properties selected from the group consisting of a) a tensile strength of at least 14 ksi, b) a shear strength of at least 11 ksi, and c) an elongation of at least 3%.	The Purported Infringing Materials do not include both the limitations as defined in claim 19 and have one or more properties selected from the group consisting of a) a tensile strength of at least 14 ksi, b) a shear strength of at least 11 ksi, and c) an elongation of at least 3%.
83. The dissolvable magnesium cast composite as defined in claim 20, wherein said dissolvable magnesium cast composite has one or more properties selected from the group consisting of a) a tensile strength of at least 14 ksi, b) a shear strength of at least 11 ksi, and c) an elongation of at least 3%.	The Purported Infringing Materials do not include both the limitations as defined in claim 20 and have one or more properties selected from the group consisting of a) a tensile strength of at least 14 ksi, b) a shear strength of at least 11 ksi, and c) an elongation of at least 3%.

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84. The dissolvable magnesium cast composite as defined in claim 22, wherein said dissolvable magnesium cast composite has one or more properties selected from the group consisting of a) a tensile strength of at least 14 ksi, b) a shear strength of at least 11 ksi, and c) an elongation of at least 3%.	The Purported Infringing Materials do not include both the limitations as defined in claim 22 and have one or more properties selected from the group consisting of a) a tensile strength of at least 14 ksi, b) a shear strength of at least 11 ksi, and c) an elongation of at least 3%.
85. The dissolvable magnesium cast composite as defined in claim 25, wherein said dissolvable magnesium cast composite has one or more properties selected from the group consisting of a) a tensile strength of at least 14 ksi, b) a shear strength of at least 11 ksi, and c) an elongation of at least 3%.	The Purported Infringing Materials do not include both the limitations as defined in claim 25 and have one or more properties selected from the group consisting of a) a tensile strength of at least 14 ksi, b) a shear strength of at least 11 ksi, and c) an elongation of at least 3%.
86. The dissolvable magnesium cast composite as defined in claim 27, wherein said dissolvable magnesium cast composite has one or more properties selected from the group consisting of a) a tensile strength of at least 14 ksi, b) a shear strength of at least 11 ksi, and c) an	The Purported Infringing Materials do not include both the limitations as defined in claim 27 and have one or more properties selected from the group consisting of a) a tensile strength of at least 14 ksi, b) a shear strength of at least 11 ksi, and c) an elongation of at least 3%.

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elongation of at least 3%.	
87. The dissolvable magnesium cast composite as defined in claim 28, wherein said dissolvable magnesium cast composite has one or more properties selected from the group consisting of a) a tensile strength of at least 14 ksi, b) a shear strength of at least 11 ksi, and c) an elongation of at least 3%.	The Purported Infringing Materials do not include both the limitations as defined in claim 28 and have one or more properties selected from the group consisting of a) a tensile strength of at least 14 ksi, b) a shear strength of at least 11 ksi, and c) an elongation of at least 3%.
88. The dissolvable magnesium cast composite as defined in claim 19, wherein said dissolvable magnesium cast composite has one or more properties selected from the group consisting of a) a tensile strength of 14-50 ksi, b) a shear strength of 11-25 ksi, and c) an elongation of at least 3%.	The Purported Infringing Materials do not include both the limitations as defined in claim 19 and have one or more properties selected from the group consisting of a) a tensile strength of 14-50 ksi, b) a shear strength of 11-25 ksi, and c) an elongation of at least 3%.
89. The dissolvable magnesium cast composite as defined in claim 20, wherein said dissolvable magnesium cast composite has one or more properties selected from the group consisting of a) a tensile strength of 14-50 ksi, b) a shear strength of 11-25 ksi,	The Purported Infringing Materials do not include both the limitations as defined in claim 20 and said dissolvable magnesium cast composites have one or more properties selected from the group consisting of a) a tensile strength of 14-50 ksi, b) a shear strength of 11-25 ksi, and c) an elongation of at least 3%.

and c) an elongation of at least 3%.	
90. The dissolvable magnesium cast composite as defined in claim 22, wherein said dissolvable magnesium cast composite has one or more properties selected from the group consisting of a) a tensile strength of 14-50 ksi, b) a shear strength of 11-25 ksi, and c) an elongation of at least 3%.	The Purported Infringing Materials do not include both the limitations as defined in claim 22 and have one or more properties selected from the group consisting of a) a tensile strength of 14-50 ksi, b) a shear strength of 11-25 ksi, and c) an elongation of at least 3%.
91. The dissolvable magnesium cast composite as defined in claim 23, wherein said dissolvable magnesium cast composite has one or more properties selected from the group consisting of a) a tensile strength of 14-50 ksi, b) a shear strength of 11-25 ksi, and c) an elongation of at least 3%.	The Purported Infringing Materials do not include both the limitations as defined in claim 23 and have one or more properties selected from the group consisting of a) a tensile strength of 14-50 ksi, b) a shear strength of 11-25 ksi, and c) an elongation of at least 3%.
92. The dissolvable magnesium cast composite as defined in claim 27, wherein said dissolvable magnesium cast composite has one or more properties selected from the group consisting of a) a tensile strength of 14-50 ksi, b) a shear strength of 11-25 ksi,	The Purported Infringing Materials do not include both the limitations as defined in claim 27 and have one or more properties selected from the group consisting of a) a tensile strength of 14-50 ksi, b) a shear strength of 11-25 ksi, and c) an elongation of at least 3%.

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and c) an elongation of at least 3%.	
93. The dissolvable magnesium cast composite as defined in claim 28, wherein said dissolvable magnesium cast composite has one or more properties selected from the group consisting of a) a tensile strength of 14-50 ksi, b) a shear strength of 11-25 ksi, and c) an elongation of at least 3%.	The Purported Infringing Materials do not include both the limitations as defined in claim 28 and have one or more properties selected from the group consisting of a) a tensile strength of 14-50 ksi, b) a shear strength of 11-25 ksi, and c) an elongation of at least 3%.
94. A dissolvable magnesium cast composite comprising	
a mixture of magnesium or a magnesium alloy and an additive material,	
said additive material includes a) nickel wherein said nickel constitutes 0.01-5 wt. % of said dissolvable magnesium cast composite or b) nickel wherein said nickel constitutes 0.1-23.5 wt. % of said dissolvable magnesium cast composite,	
said dissolvable magnesium cast composite includes in situ precipitate,	The Purported Infringing Materials do not include in situ precipitate.
said in situ precipitate includes said additive material,	
said dissolvable magnesium cast	The Purported Infringing Materials do not have a dissolution rate of at least 75 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C.

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composite has a dissolution rate of at least 75 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C.	
95. The dissolvable magnesium cast composite as defined in claim 94, wherein said dissolvable magnesium cast composite includes no more than 10 wt. % aluminum.	The Purported Infringing Materials do not include both the limitations as defined in claim 94 and include aluminum constituting no more than 10 wt. % of the purported Infringing Material.
96. The dissolvable magnesium cast composite as defined in claim 94, wherein said dissolvable magnesium composite cast includes at least 85 wt. % magnesium.	The Purported Infringing Materials do not include both the limitations as defined in claim 94 and include magnesium constituting at least 85 wt. % of the purported Infringing Material.
97. The dissolvable magnesium cast composite as defined in claim 95, wherein said dissolvable magnesium cast composite includes at least 85 wt. % magnesium.	The Purported Infringing Materials do not include both the limitations as defined in claim 95 and include magnesium constituting at least 85 wt. % of the purported Infringing Material.
98. The dissolvable magnesium cast composite as defined in claim 94, wherein said dissolvable magnesium cast composite has a dissolution rate of 75-325 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C.	The Purported Infringing Materials do not include both the limitations as defined in claim 94 and have a dissolution rate between 75-325 mg/cm.sup.2/hr. in 3 wt. % KCl water mixture at 90.degree. C.

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99. The dissolvable magnesium cast composite as defined in claim 97, wherein said dissolvable magnesium cast composite has a dissolution rate of 75-325 mg/cm2/hr. in 3 wt. % KCl water mixture at 90° C.	The Purported Infringing Materials do not include both the limitations as defined in claim 97 and have a dissolution rate between 75-325 wt. % KCl water mixture at 90.degree. C.
100. The dissolvable magnesium cast composite as defined in claim 94, wherein said nickel constitutes 0.1-23.5 wt. % of said dissolvable magnesium cast composite.	The Purported Infringing Materials do not include both the limitations as defined in claim 94 and include nickel constituting between 0.1-23.5 wt. % of the purported Infringing Material.
101. The dissolvable magnesium cast composite as defined in claim 99, wherein said nickel constitutes 0.1-23.5 wt. % of said dissolvable magnesium cast composite.	The Purported Infringing Materials do not include both the limitations as defined in claim 99 and include nickel constituting between 0.1-23.5 wt. % of the purported Infringing Material.
102. The dissolvable magnesium cast composite as defined in claim 94, wherein said dissolvable magnesium cast composite has one or more properties selected from the group consisting of a) a tensile strength of at least 14 ksi, b) a shear strength of at least 11 ksi, and c) an elongation of at least 3%.	The Purported Infringing Materials do not include both the limitations as defined in claim 94 and have one or more properties selected from the group consisting of a) a tensile strength of at least 14 ksi, b) a shear strength of at least 11 ksi, and c) an elongation of at least 3%.

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103. The dissolvable magnesium cast composite as defined in claim 101, wherein said dissolvable magnesium cast composite has one or more properties selected from the group consisting of a) a tensile strength of at least 14 ksi, b) a shear strength of at least 11 ksi, and c) an elongation of at least 3%.	The Purported Infringing Materials do not include both the limitations as defined in claim 101 and have one or more properties selected from the group consisting of a) a tensile strength of at least 14 ksi, b) a shear strength of at least 11 ksi, and c) an elongation of at least 3%.

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