

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Chongqing Yanmei Technology Co., LTD

Petitioner

v.

TERVES, LLC

Patent Owner

Case No. Unassigned

Patent No. 10,689,740

Issued: June 23, 2020

Application No.: 16/158,915

Filed: Oct. 12, 2018

Title: GALVANICALLY-ACTIVE IN SITU FORMED PARTICLES FOR
CONTROLLED RATE DISSOLVING TOOLS

**PETITION FOR *INTER PARTES* REVIEW OF U.S. PATENT NO.
10,689,740 (CLAIMS 1 to 81)**

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PETITIONER'S EXHIBIT LIST

Exhibit	Short name	Description
EX1001	'740 patent	U.S. Patent 10,689,740 B2
EX1002	'653 patent	U.S. Patent 10,329,653 B2
EX1003	'653 reexamination certificate	U.S. Patent 10,329,653 C1 (REEXAMINATION CERTIFICATE)
EX1004		Claim listing of claims 1-81 of the '740 patent
EX1005	Doud '838	Doud '838 is the US Publication No. US 2015/0299838 A1. Doud '838 is the publication of US Application No. 14/689,295. The present '740 patent is a continuation-in-part of US Application No. 15/641,439 upon which the '653 patent was granted, and which in turn is a divisional of US Application No. 14/689,295.
EX1006	Xiao '271	Xiao '271 is Chinese Publication No. CN 103343271 A to Xiao et al. The supplied English Language translation will be referred to and Petition submits that this translation is accurate and certified. Further Xiao '271 was cited in Ex Parte Reexamination Request for No. 90/014,795 (Reexamination of 10,329,653). Further the USPTO reexamination examiner referred to Xiao as

		the closest prior art in the Notice of Intent to Issue a Reexamination Certificate of 3/28/2022 in the ‘795 Reexamination.
EX1007	Xu ‘185	Xu ‘185 is the US Publication No. US 2013/0299185 A1.
EX1008	‘795 reexamination request	Reexamination No. 90/014,795. Request for reexamination of 10,329,653 B2 (7/6/21).
EX1009	‘795 notice	Notice of Intent to Issue a Reexam Certificate (3/28/22)
EX1010		<i>Docket Report for Magnesium Machine LLC v. Terves LLC</i> , No. 5:21-cv-01115 (W.D. Oklahoma)
EX1011		<i>Partial Docket report for Terves LLC v. Yueyang Aerospace New Materials Co. Ltd.</i> , 1:19-cv-01611-DCN (N.D. Ohio)
EX1012		<i>Docket Report for Terves LLC v. Yueyang Aerospace New Materials Co. Ltd.</i> No. 22-1855 (Fed. Cir.)
EX1013		Magnesium Machine LLC v. Terves LLC., <i>Complaint for Declaratory Judgement and Non-Infringement</i> filed 11/23/21
EX1014		Terves LLC vs. Yueyang Aerospace New Materials Co., Ltd., et al., <i>Memorandum in Support of Defendant’s Motion for Summary Judgment</i> , filed 11/18/2021.

EX1015		Notice of Allowance and <i>Examiner's Reasons for Allowance</i> dated 4/02/2020 in Application 16/158,915 which issued as the '740 patent.
EX1016	Nava Declaration	Declaration under 37 CFR 1.68 of Dr. Juan C. Nava, Ph.D.
EX1017		<i>Curriculum vitae</i> of Dr. Juan C. Nava

I. STANDING AND PROCEDURAL STATEMENTS

Chongqing Yanmei Technology Co., LTD certifies: (1) that the ‘740 patent is available for IPR; and (2) Petitioner is not barred or estopped from requesting IPR of any ‘740 patent claim on the grounds identified herein. This Petition is filed in accordance with 37 CFR 42.106(a). The petitioner is submitting a Power of Attorney and an Exhibit List pursuant to sections 41.10(b) and 42.63(e), and all required fees pursuant to 37 CFR 42.15(a), concurrently with this Petition. If any additional fees are due at any time during this proceeding, the Office is authorized to charge such fees to Deposit Account No. DA 506203.

II. MANDATORY NOTICES & PROCEDURAL STATEMENTS

A. Real Party-in-Interest, 37 CFR 42.8(b)(1)

The real party-in-interest is Chongqing Yanmei Technology Co., LTD which is owned by Mr. Huang Guangsheng, largest shareholder and legal representative. Chongqing Yanmei Technology Co., LTD is located at No. 1 Building, Guojichuangkegang, No. 130, Xiazhongdukou, Shapingba District Chongqing, China.

B. Related Matters, 37 CFR 42.8(b)(2)

The Petitioner identifies the following judicial or administrative matters that could affect, or could be affected by, a decision in this proceeding.

U.S. Patent	Proceeding
10,329,653 B2	Reexamination No. 90/014,795
10,329,653 B2	IPR2020-01620 (not instituted)
10,329,653 B2	<i>Terves LLC v. Yueyang Aerospace New Materials Co. Ltd.</i> , 1:19-cv-01611-DCN (ND Ohio)
10,329,653 B2	<i>Magnesium Machine LLC v. Terves LLC</i> , Case 5:21-cv-01115 (W.D. Oklahoma).
10,689,740 B2	<i>Magnesium Machine LLC v. Terves LLC</i> , Case 5:21-cv-01115 (W.D. Oklahoma)
10,689,740 B2	<i>Terves LLC v. Yueyang Aerospace New Materials Co. Ltd.</i> , 1:19-cv-01611-DCN (N.D. Ohio)
10,689,740 B2	<i>Terves LLC v. Yueyang Aerospace New Materials Co. Ltd.</i> , 2022-1855 (Fed.

	Cir.)
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C. Lead and Backup Counsel and Service Information, 37 CFR 42.8(b)(3) and (b)(4)

Petitioner provides the following designation of counsel for which a power of attorney is being filed contemporaneously. 37 CFR 42.10(b).

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III. STATEMENT OF THE PRECISE RELIEF REQUESTED AND THE REASONS THEREFORE, 37 CFR 42.22(A)

Petitioner requests the institution of IPR and cancellation of claims 1-81 of the ‘740 patent, for the reasons stated herein.

IV. BACKGROUND

A. Technical Background

The '740 patent is directed to a magnesium-based alloy which is castable, moldable, and/or extrudable. The alloy contains additives additional metal components which may form *in situ* particles in the alloy melt or upon cooling the alloy melt. See '740 Abstract. The magnesium-based alloy of the '740 patent results in an alloy that is useful to make, *inter alia*, dissolvable tool parts to be used downhole in a well drilling or completion application. See '740 col. 1 lines 35-59.

B. The '740 Patent

The '740 patent is part of a family of applications. The '740 patent issued on US Application No. 16/158,915 filed 10/12/2018, which is a Continuation-in-part of Application No. 15/641,439 filed on 7/5/2017, now U.S. Patent No. 10,329,653 B2, which is a divisional of application No. 14/689,295 filed 4/17/2015, now U.S. Patent No. 9,903,010 B2, which claimed priority to provisional Application No. 61/981,425 filed on 4/18/2014.

The U.S. Patent 10,329,653 was reexamined in Reexamination No. 90/014,795 which was filed on 7/6/2021 and in which a reexamination certificate was issued as on 5/10/2022 generating certificate No. US 10,329,653 C1.

V. IDENTIFICATION OF THE CHALLENGE

The petitioner requests that the Board institute IPR of claims 1-81 of the ‘740 patent and find those claims unpatentable. There is a reasonable likelihood that the Petitioner will prevail with respect to at least one challenged claim. 35 USC 314(a).

The Petitioner’s challenge is based on the following references:

Exhibit	Short name	Description
EX1005	Doud ‘838	Doud ‘838 is the US Publication No. US 2015/0299838 A1. Doud ‘838 is the publication of US Application No. 14/689,295. The present ‘740 patent is a continuation-in-part of US Application No. 15/641,439 which in turn is a divisional of US Application No. 14/689,295.
EX1006	Xiao ‘271	Xiao ‘271 is Chinese Publication No. CN 103343271 A to Xiao et al. The supplied English Language translation will be referred to and Petition submits that this translation is accurate and certified. Further Xiao ‘271 was cited in Ex Parte Reexamination Request for No. 90/014,795 (Reexamination of 10,329,653).
EX1007	Xu ‘185	Xu ‘185 is the US Publication No. US 2013/0299185 A1.

Ground	Sec. 102/103	Claim(s)	Prior art
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I	102	1-81	Doud ‘838 (EX1005)
II	103	1-81	Xu ‘185 (EX1007)
III	102 or 103	1	Xiao ‘271 (EX1006) or Xiao ‘271 in view of Xu ‘185 (EX1007)
IV	103	2-7, 10, 11, 13, 14, 16, 18, 19, 21, 29, 49- 52, 58, 64, 76, and 77	Xiao ‘271 (EX1006) in view of Xu ‘185 (EX1007)

A. Claim Construction

In an IPR, claims are interpreted under the *Phillips* standard. 37 CFR 42.100(b); *Phillips v AWH Corp.*, 415 F3d 1303 (Fed. Cir. 2005) (*en banc*). Under this standard, claim terms are given their plain meaning as understood by a person of ordinary skill in the art. *Phillips*, 415 F3d 1312-13.

1. Claim 1

a) “... intermetallic formers...”

The petitioner finds that this term is used only once elsewhere in the ‘740 disclosure. See ‘740 disclosure col. 24 line 4. The petitioner submits that this term “former” should be construed as a noun and that it refers to additives which *are capable of forming* intermetallic but that the formation of intermetallic is not

required by the addition. See EX1016 Nava Declaration ¶ 21. A latter passage of claim 1 recites “...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...” The petitioner therefore submits that the actual formation of intermetallic in the covered dissolvable magnesium alloy with an intermetallic former is not required by the claim.

b) “...*high electronegative intermetallic formers are selected from one or more elements with an electronegativity greater than 1.75 and 0.2-5 wt% of one or more elements with an electronegativity of 1.25 or less...*”

The petitioner submits that this claim limitation requires only one element with an electronegativity greater than 1.75; or less than 1.25, but does not require both. This claim term is open to two alternative interpretations. In the first interpretation this limitation the high electronegative intermetallic formers are selected from a group that comprises one or more elements with an electronegativity greater than 1.75, and this group also comprises 0.2-5 wt. % of one or more elements with an electronegativity of 1.25 or less. Stated another way the group can be from one or more element with electronegativity greater than 1.75 or where the element is includes one or more element with an electronegativity of 1.25 or less, the weight percentage is limited to 0.2-5 wt%. In the second interpretation this limitation could

be understood is that the dissolvable magnesium alloy of claim 1 includes high electronegative intermetallic formers that are selected from one or more elements with an electronegativity greater than 1.75 and then the composition unconditionally includes 0.2-5 wt% of one or more elements with an electronegativity of 1.25 or less.

The petitioner submits that the claim limitation should be construed in the first manner such that the “... *selected from*...” applies to selecting from a group that comprises the one or more elements of electronegativities of greater than 1.75 and also included in the group is the 0.2-5 wt% of one or more elements with an electronegativity of 1.25 or less. Crucially, petitioner submits that this recited limitation can be met so long as there is at least one element with an electronegativity greater than 1.75 present as a high-electronegative intermetallic formers and that 0.2-5 wt% of one or more element with an electronegativity of 1.25 or less is not required to be present as these are part of the group of alternatives and therefore optional as long as another group alternative is met.

In construing the claim petition respectfully directs the Board’s attention to the following passages of the ‘740 disclosure. In the ‘740 patent, col. 6, lines 20-30, the disclosure explains that “In still yet another and/or alternative non-limiting aspect of the invention, there is provided a magnesium composite that is over 50

wt. % magnesium and about 0.5-49.5 wt% of additive (SM)¹ (e.g., aluminum... rare earth metals (e.g., yttrium, lanthanum, samarium, europium, gadolinium, terbium, dysprosium, holmium, ytterbium, etc.) and zirconium) (and all values and ranges therebetween) is added to the magnesium or magnesium alloy to form a galvanically-active intermetallic particle.” This disclosure explains that the magnesium composite includes over 50 wt% magnesium and that the “one or more additives” can be selected from any of the list including copper, nickel, iron, cobalt, etc. as well as rare earth metals, including “... yttrium, lanthanum, samarium, europium, gadolinium, terbium, dysprosium, holmium, ytterbium, etc.”. Next in the ‘740 patent, col. 24, lines 1-22, the disclosure explains “In still another and/or alternative non-limiting aspect of the invention, there is provided 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 magnesium alloy is greater than 50 wt%...”. A sensible understanding of this portion of the disclosure is that the intermetallic formers may comprise either (1) one or more elements with an electronegativity of greater than 1.75 or 0.2-5 wt% of one or (2) more elements with electronegativity of 1.25 or less, or (3) both. Again, in the

¹ (SM) is defined as “one or more additives” ‘740, col. 5, line 50-55.

‘740 patent at col. 26, line 63 discloses “... said additive forming metal composite particles or precipitant in said magnesium composite, said metal composite particles or precipitant forming said in situ precipitation of said galvanically-active intermetallic phases, said additive including one or more first additives having an electronegativity of 1.5 or greater. The dissolvable component can optionally further include one or more second additives having an electronegativity of 1.25 or less.” In this portion of the ‘740 patent the inclusion of additives having an electronegativity of 1.25 or less is specifically indicated as being optional.

Additionally, within claim 1 itself, there is an alternative group listing for the one or more elements with an electronegativity greater than 1.75, and this list of alternatives is recited as “selected from the group of tin...rhenium and gallium...”; and with respect to the alternatives for the one or more elements with an electronegativity of 1.25 or less this list of alternatives is recited as “selected from the group of calcium...holmium and gallium...”. In each of these lists of alternatives the drafted began the lists with “...*selected from*...” and then used the conjunctive “...*and*...” between the last two elements of the list to define the list of alternatives. The petitioner submits that the entire claim would have been drafted with similar drafting logic and that therefore the construction of the limitation “*selected from* one or more elements ... *and* 0.2-5% of one or more elements...” should be interpreted in a similar manner to the other lists of alternatives which have

been drafted in a similar fashion which do not require that both elements listed be present simply because the use of the conjunction “... *and*...” is recited between the elements.

Therefore, petitioner submits that submits that the claim limitation should be construed in the first manner such that the “... *selected from*...” allows the claim scope to include selecting from a group that comprises the one or more elements of electronegativities of greater than 1.75 and also included in the group is the 0.2-5 wt% of one or more elements with an electronegativity of 1.25 or less.

2. Claim 2

a) “... in situ precipitate...”

The use of the term “... in situ precipitate...” appears in the disclosure and refers to alloyed or unalloyed metal additive particles in the resulting composite. See e.g., ‘740 patent col. 7 lines 15-18. See also EX1016 Nava Declaration ¶ 22.

3. Claim 19

a) “... in situ precipitate...”

As above, the use of the term “... in situ precipitate...” appears in the disclosure and refers to alloyed or unalloyed metal additive particles in the resulting composite. See e.g., ‘740 patent col. 7 lines 15-18. See also EX1016 Nava Declaration ¶ 22.

b) *“... a plurality of particles of said in situ precipitate having a size of no more than 50µm...”*

The use of the term “a plurality of particles” in conjunction with the claim 19 transitional phrase “...comprising...” means that the claim is open to another particle or pluralities of particles having sizes that exceed 50 µm so long as there are at least two particles, thereby forming a plurality, of said in situ precipitate which have a size of no more than 50 µm.

4. Claim 62

a) *“The dissolvable magnesium cast composite as defined in claim 17...”*

Although claim 62 is recited in a listing of claims which are apparently dependent, either directly or indirectly on claim 19, claim 62 positively recites claim 17. Moreover, although claim 2 and 17 do not recite the term “magnesium cast composite” but instead “magnesium composite”, it can reasonably be construed that these refer to the same thing. Accordingly, claim 62 should be construed to further limit the dissolvable magnesium composite of claim 17.

5. Claims 76-81

a) “...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 petitioner submits that the use of the limitation “...said additive material includes one or more metal materials selected from the group consisting of...” means that only one metal of copper, nickel, or cobalt needs to be present within the recited range, but that the other metals besides the one which is present within the recited range do not need to be within the recited range. Claims 76-81 *should not be construed to limit all of* the ranges of copper, nickel and cobalt recited in claim 19 to the narrower ranges of claims 76-81 because the claims do not require the ranges for each enumerated metal if present. For example, the ranges of claim 76 could be satisfied by a dissolvable magnesium composite which includes copper at 1% by weight and cobalt at 22% by weight because although the cobalt falls outside of the cited range of 0.1-20 wt %, the copper at 1% provides copper in the range of 0.1-35 wt.% thereby meeting the limitation.

B. The Person of Ordinary Skill in the Art

The POSA relevant to the ‘740 patent would have at least a Ph.D. in chemistry, metallurgy, or material science or material engineering. Or alternatively the POSA

would have a Bachelor of Science or Master of Science degree in one of these disciplines plus experience involving the use and design of dissolvable metal alloys for use in creating tools and other downhole parts for well drilling or completion activities.

C. Priority Date

The '740 patent issued on US Application No. 16/158,915 filed 10/12/2018 which is a continuation-in-part of the application No. 15/641,439 which published as US 10,329,653 B2.

A claim in a continuation may only be afforded the benefit of the filing date of the parent application to the extent that the claim is fully supported in the manner required by 35 USC 112(a). To be entitled to the benefit of the filing date of an earlier-filed application, the later filed application must be an application for a patent for an invention which is disclosed in the prior application; the disclosure of the invention in the prior application and in the later-filed application must be sufficient to comply with the requirements of 35 USC 112(a) except for the best mode requirement. See *Transco Prods., Inc. v. Performance Contracting, Inc.*, 38 F.3d 551 (Fed. Cir. 1994). See also *Tronzo v. Biomet, Inc.*, 156 F.3d 1154, (Fed. Cir. 1998); *In re Scheiber*, 587 F.2d 59 (CCPA 1978). Furthermore, regarding ranges, a range is only supported to the extent the full scope of the range is covered in the disclosure for which support under 112(a) is sought. See *In re Wertheim*, 541 F.2d

257 (CCPA 1976). In *In re Wertheim*, the ranges described in the original specification included a range of “25%-60” and specific examples of “36%” and “50%”; a corresponding new claim limitation to “at least 35%” did not meet the description requirement because the phrase “at least” had no upper limit and caused the claim to read literally on embodiments outside the “25% to 60%” range.

Petitioner submits that claims 1-81 in the present ‘740 patent do not have full support and/or enablement in the manner required by 35 USC 112(a) in the disclosure of the ‘653 patent or any previous parent disclosure. Petitioner submits that the earliest effective filing date for these claims in the ‘740 patent is the 10/12/2018 filing date of the US Application No. 16/158,915.

1. Claim 1 has a priority date of 10/12/2018

Petitioner submits that the following limitations do not find support in the manner required by 35 USC 112(a) in the published disclosure of the ‘653 patent or any parent disclosure.

a) “... with an electronegativity with greater than 1.75...”

The petitioner submits that this limitation is not disclosed anywhere in the ‘653 patent in the manner required by 35 USC 112(a) and therefore is not entitled to the priority date of the ‘653 patent. Further, petitioner acknowledges that the ‘653 patent mentions copper, nickel, cobalt, iron, aluminum, boron, bismuth, zinc, zirconium, manganese, titanium, and silicon as options for additives. See ‘653 col.

8 lines 25-30, and claims 1 and 2. However, there is no definitive disclosure of the electronegative of 1.75 or greater and these listed elements do not inherently provide full written description support for the full scope of the range. Accordingly, the limitation is not supported in the manner required by 35 USC 112(a) in the disclosure of the '653 patent. See also EX1016 Nava Declaration ¶ 22-26, 81.

b) *“...and 0.2-5 wt % of one or more elements with an electronegativity of 1.25 or less...”*

The petitioner submits that this limitation is not disclosed anywhere in the '653 patent in the manner required by 35 USC 112(a) and therefore is not entitled to the priority date of the '653 patent. See also EX1016 Nava Declaration ¶ 22-26

c) *“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...”*

The petitioner submits that this limitation is not disclosed anywhere in the '653 patent in the manner required by 35 USC 112(a) and therefore is not entitled to

the priority date of the '653 patent. Further, petitioner acknowledges that the '653 patent mentions copper, nickel, cobalt, iron, aluminum, boron, bismuth, zinc, zirconium, manganese, titanium, and silicon as options for additives. See '653 col. 8 lines 25-30, and claims 1 and 2. However, there is no definitive disclosure of elements of “chromium,... lead, tin, antimony, indium, silver, ..., gold, platinum, cadmium, selenium, arsenic, ... germanium, carbon, molybdenum, tungsten ... rhenium, and gallium” and the disclosed elements of copper, nickel, cobalt, iron, aluminum, boron, bismuth, zinc, zirconium, manganese, titanium, and silicon do not inherently provide full written description support for the full list of elements recited in claim 1. Accordingly, the limitation is not supported in the manner required by 35 USC 112(a) in the disclosure of the '653 patent. Accordingly, the limitation is not supported in the manner required by 35 USC 112(a) in the disclosure of the '653 patent. See also EX1016 Nava Declaration ¶ 22-26, 81.

d) “... 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...”

The petitioner submits that this limitation is not disclosed anywhere in the '653 patent in the manner required by 35 USC 112(a) and therefore is not entitled to

the priority date of the '653 patent. See also EX1016 Nava Declaration ¶ 22-26, 81.

2. Claims 2-18 and 62 have a priority date of 10/12/2018

a) “A dissolvable magnesium composite... said dissolvable magnesium composite comprising a mixture of magnesium or a magnesium alloy and an additive material, said magnesium composite includes greater than 50 wt. % magnesium...said additive material includes one or more metals selected from ...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.”

Regarding this limitation, petitioner submits that the '653 patent separately provides written support for the cobalt wt. % range of 0.05-20% and additionally there is nominal support for the dissolution rate range of at least 5 mg/cm²/hr in 3 wt. % KCl water mixture at 90 °C. See '653 patent col. 5 lines 39-45 and claim 1. However, petitioner submits that there is no written description support for the embodiment where the cobalt wt. % is between 0.1-20% *and* the dissolution rate is *at least 75 mg/cm²/hr* in 3 wt. % KCl water mixture at 90 °C. Petitioner submits that

there are no specific working examples of that use cobalt modified magnesium alloy in the disclosure, or even what magnesium alloy may be used as a starting material. The portion over the disclosure in the '653 patent which discusses the magnesium alloy in conjunction with cobalt only provides that the magnesium is over 50 wt. % and further provides that the cobalt wt. % is 0.05-20%, but there is no discussion in this passage -- or any other found in the '653 patent -- describing how the inventors in the '653 patent had possession of the he embodiment where the cobalt wt. % is between 0.1-20% *and* the dissolution rate is *at least* 75 mg/cm²/hr in 3 wt. % KCl water mixture at 90 °C. The petitioner submits that this full limitation is not disclosed anywhere in the '653 patent in the manner required by 35 USC 112(a) and therefore is not entitled to the priority date of the '653 patent. See also EX1016 Nava Declaration ¶ 27-31, 81.

Moreover, assuming *arguendo* that the broad nominal ranges in recited in the claims of the '653 patent in conjunction with the broad nominal ranges for cobalt wt. % as secondary metal recited in the claims of the '653 patent provide written description support for the above identified limitation in claim 2 of the '740 patent, the Petition submits that the full scope is not enabled by the disclosure of the '653 patent. Under *In re Wands*, 858 F.2d 731, 737 (Fed. Cir. 1988), a claim is not enabled if there is *undue experimentation* as determined by the *Wands Factors* required to practice the full scope of the claim; where the *Wands* factors are (A) the breadth of

the claims, (B) the nature of the invention, (C) the state of the art, (D) the level of one of ordinary skill, (E) the level of predictability in the art, (F) the amount of direction provided by the inventor, (G) the existence of working examples, and (H) the quantity of experimentation needed to make or use the invention based on the content of the disclosure. Here, (A) claim 2 of the '740 has exceedingly broad scope because the composite alloy is limited only by having greater than 50 wt. % magnesium as well as one or more of the metals, which in the case of cobalt range from 0.05-20% by weight. The nature of the invention (B) is a sophisticated magnesium alloy composite material which is further defined in the claim by a property, the dissolution rate, of the composite alloy *at least* 75 mg/cm²/hr in 3 wt. % KCl water mixture at 90 °C. Further, although the state of the art is developed (C) and the level of one of skill in the art would likely include advanced education in a specific discipline such as material engineering or metallurgy (D), the level of predictability (E) in the art is low as evidenced by the vastly different dissolution rates achieved between the nickel and copper containing metal alloys. See '653 patent col. 14 line 10 – col. 15 line 38. Further, although the inventors in the '653 patent provide direction and specific working examples for the nickel and copper containing alloys which use an AZ91D magnesium alloy as a starting material, there is no direction or specific examples provided for the production of the cobalt containing alloy. Accordingly, the Petitioner submits that the quantity of

experimentation that would be needed for a POSA to practice the full scope of claim 2 to achieve all of the magnesium compounds having 0.05-20% by weight of cobalt and providing the dissolution rate of *at least 75 mg/cm²/hr* in 3 wt. % KCl water mixture at 90 °C requires an *undue amount* of experimentation. See also EX1016 Nava Declaration ¶ 32, 81.

Accordingly, the petitioner submits that the full scope of claim 2 is not enabled in the manner required by 35 USC 112(a) by the disclosure of the ‘653 patent and therefore is not entitled to the priority date of the ‘653 patent.

b) “... *said additive material 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.*”

Here, petitioner submits that there is no support for using *more than one* of the recited additive material of copper in 0.1-35 wt. %, nickel at 0.1-23.5 wt %, and

cobalt at 0.2-20 wt. %, each wt. % of said dissolvable magnesium composite. The petitioner submits that although each of the ranges of the of 0.1-35 wt. % for copper, or 0.1-23.5 wt. % for nickel, or 0.1-20 wt. % for cobalt may individually have support in the disclosure of the ‘653 patent, that this does not provide support in the manner required by 112(a) for using a combination of *more than one* at the claimed recited metals at the weight percentages. Furthermore, there is no support in the original disclosure for the use of more than one of the copper, nickel, and cobalt *together*, while also achieving the dissolution rate of at least 75 mg/cm²/hr in 3 wt. % KCl water mixture at 90 °C. See also EX1016 Nava Declaration ¶ 33-39, 81.

The petitioner submits that this limitation is not disclosed in the ‘653 patent in the manner required by 35 USC 112(a) and therefore is not entitled to the priority date of the ‘653 patent.

Claims 19-61 and 63-81 have a priority date of 10/12/2018

c) “... *said copper constitutes at least 0.01 wt. % of said dissolvable magnesium cast composite...*”

The petitioner submits that the open top end of the range for copper does not find written description support in the disclosure of the ‘653 patent. The ‘653 patent provides for various ranges of copper. In the ‘653 patent copper ranges of 0.05-35 wt %, 0.01-5 wt. %, about 0.5-15 wt. %, 15-35 wt.% and 0.01-20 wt % are disclosed. See ‘653 patent col. 5 lines 15-25. However, there is *no literal support* for any values

of copper over 35 wt. % in the disclosure of the ‘653 patent. Accordingly, under *In re Wertheim*, the petitioner submits that the scope of the range which does not find literal support in the ‘653 patent disclosure does not have support in the manner required by 35 USC 112(a) in the ‘653 patent disclosure and therefore is not entitled to the priority date of the ‘653 patent. See also EX1016 Nava Declaration ¶¶ 40-44, 81.

d) “... said nickel constitutes at least 0.01 wt % of said dissolvable magnesium cast composite...”

The petitioner submits that the open top end of the range for nickel does not find written description support in the disclosure of the ‘653 patent. The ‘653 patent provides for various ranges of nickel. In the ‘653 patent nickel ranges of 0.05-35 wt. %, 0.05-23.5 wt. %, 0.01-5 wt. %, 3-7 wt. %, 7-10 wt. %, and 10-24.5 wt % are disclosed. See ‘653 patent col. 4 lines 58-65. However, there is *no literal support* for any values of nickel over 35 wt. % in the disclosure of the ‘653 patent. Accordingly, under *In re Wertheim*, the petitioner submits that the scope of the range which does not find literal support in the ‘653 patent disclosure does not have support in the manner required by 35 USC 112(a) in the ‘653 patent disclosure and therefore is not entitled to the priority date of the ‘653 patent. See also EX1016 Nava Declaration ¶¶ 40-44, 81.

e) “... said cobalt constitutes at least 0.01 wt % of said dissolvable magnesium cast composite.

The petitioner submits that the open top end of the range for cobalt does not find written description support in the disclosure of the ‘653 patent. The ‘653 patent provides for various ranges of cobalt. In the ‘653 patent cobalt ranges of 0.05-20% by weight or cobalt as secondary metal (SM) in an amount of 0.5-35% by weight are disclosed. See ‘653 patent col. 5 lines 40-42, col. 6 lines 15-17, and col. 8 lines 27-28. However, there is *no literal support* for any values of cobalt over 35 wt. % in the disclosure of the ‘653 patent. Accordingly, under *In re Wertheim*, the petitioner submits that the scope of the range which does not find literal support in the ‘653 patent disclosure does not have support in the manner required by 35 USC 112(a) in the ‘653 patent disclosure and therefore is not entitled to the priority date of the ‘653 patent. See also EX1016 Nava Declaration ¶ 40-44, 81.

References in the Grounds

3. Doud ‘838 (Ex 1010)

Doud ‘838 is the publication of US Application No. 14/689,295. Doud ‘838 published on 10/22/2015 and qualifies under 35 USC 102 as 102(a)(1)-type art against claims of the present ‘740 patent based on the 2015 publication date of Doud ‘838 and the 10/12/2018 filing date of the ‘740 application.

The present ‘740 patent is a continuation-in-part of US Application No.

15/641,439 which in turn is a divisional of US Application No. 14/689,295. Although there are many differences in the '740 patent disclosure and claims which do not find written description support and/or enablement in the manner required by 35 USC 112(a) in the Doud '838 disclosure, there are also many sections of the disclosure of Doud '838 and the present application which are shared.

Doud '838 teaches several embodiments of a galvanically-active in situ formed particles for controlled rate of dissolving tools. See Id. Title. The alloy described in Doud '838 is castable, moldable, and/or extrudable. See Id. Abstract. The galvanically active particles are formed in situ. See Id. Abstract.

There is a nickel containing magnesium alloy embodiment of the of the alloy found in [0045] which uses an AZ91D magnesium alloy having 90 wt% Mg, 9 wt % Al, 1 wt % Zn, and which has 7 wt % Ni added as the additive to form the particles. See Id. [0045]. And additional ranges for nickel are between 0.01-24.5 wt %. See Id. [0012].

There is a second nickel containing magnesium alloy embodiment found in [0046] which uses an AZ91D magnesium alloy having 90 wt% Mg, 9 wt % Al, 1 wt % Mg, and which has 1% Ni added as the additive to form the particles. See Id [0046].

There is a copper containing magnesium alloy embodiment found in [0047] which uses an AZ91D magnesium alloy having 90 wt % Mg, 90 wt % Al, 1 wt %

Zn, and which has 10 wt % copper added as the additive to form the particles. See Id [0047]. And additional ranges for the copper are 0.5-35 wt %. See Id [0013].

There is a cobalt containing magnesium alloy embodiment disclosed at [0014], which provides a magnesium composite that is over 50 wt% magnesium and about 0.05-20% by weight cobalt added as the additive to form the particles. See Id [0014].

Further the embodiments disclose dissolutions rates in units of mg/cm²-hr in 3% KCl solution at 90C. See Id [0045]-[0047]. Values range from 40 mg/cm²-hr for aged 10% copper containing AZ91D magnesium alloy to 325 mg/cm²-hr for nickel containing AZ91D magnesium alloy. See Id [0045]-[0047].

4. Xiao ‘271 (EX1006)

Xiao ‘271 published as CN 10334271A on 10/9/2013. Xiao ‘271 qualifies under 35 USC 102 as 102(a)(1)-type prior art based on the 2013 publication date of the Xiao ‘271 reference and the 10/12/2018 filing date of the ‘740 patent. Moreover, to the extent that any claims of the ‘740 patent are considered to have support going back to an earlier application disclosure, the earliest possible filing date for the ‘740 application is the filing date of provisional application 61/981,425 which was filed on 4/18/2014. Even in light of this filing date, the Xiao ‘271 reference still presumptively qualifies as 102(a)(1)-type prior art.

Xiao ‘271, entitled “Light and pressure-proof fast-decomposing 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.” Xiao ‘271 [0001]. Xiao explains “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.” Id at [0002]. Xiao ‘271 proposes 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.”

Xiao ‘271 teaches a series of Magnesium-Aluminum Alloys with various amounts of additives which form intermetallic microparticles. See Xiao ‘271 [0026]. And see table at [0062] translated and reprinted below.

Alloy	Al	Zn	Fe	Ni	Cu	Ag	Ti	Zr	Mn	Mg
Contrast Example 1 (AZ91D)	9.00	1.00	0	0	0	0	0	0.01	0.03	balance
Embodiment 1	13	1.3	0.1	5	0	2.5	0.5	0.5	0	balance
Embodiment 2	15	5	0.5	0.1	0	0	0.1	0.1	0	balance
Embodiment 3	20	10	5	2.5	2.5	5	0.25	0.25	0	balance
Embodiment 4	18	8	2.5	2.0	5	1	0.3	0.15	0	balance
Embodiment 5	20	5	0.8	0.05	0.05	0	0.05	0.1	0	balance
Embodiment 6	15	6	1.5	0.2	1	2	0.15	0.1	0	balance
Embodiment 7	25	10	1	0.5	0.1	0	0.5	0.05	0	balance

The different embodiments in Xiao ‘271 provide for different dissolution rates which are measured in a 3% KCl solution at 70 C and 93C. A POSA would recognize that the measurement at 93C is very similar to the rate 90C recited in several of the claims of the ‘740 patent. Furthermore, the values in Xiao are given in g/cm²-hr which is converted to mg/cm²-hr by multiplying by a factor of 1,000. The Table in Xiao ‘271 [0064] is translated and reprinted below.

	Tensile strength at room temperature σ_b (MPa)	Decomposition rate in 3% KCl solution at 70°C (g.cm ⁻² .h ⁻¹)	Decomposition rate in 3% KCl solution at 93°C (g.cm ⁻² .h ⁻¹)
Contrast Example 1	232	0.00026	0.0005
Embodiment 1	360	0.035	0.074
Embodiment 2	385	0.015	0.045
Embodiment 3	410	0.013	0.036
Embodiment 4	375	0.034	0.058
Embodiment 5	392	0.025	0.048
Embodiment 6	365	0.021	0.063
Embodiment 7	387	0.036	0.057

5. **Xu ‘185 (EX1007)**

Xu ‘185 published as US 2013/0299185 A1 on 11/14/2013. Xu ‘185 qualifies under 35 USC 102 as 102(a)(1)-type prior art based on the 2013 publication date of the Xu ‘185 reference and the 10/12/2018 filing date of the ‘470 patent. Moreover, to the extent that any claims of the ‘740 patent are considered to have support going back to an earlier application disclosure, the earliest possible filing

date for the '740 application is the filing date of provisional application 61/981,425 which was filed on 4/18/2014. Even in light of this filing date, the Xu '185 reference still presumptively qualifies as 102(a)(1)-type prior art.

Xu '185 is directed to a frustoconical ("cone") member which includes a metal composite that has a cellular nanomatrix comprising a metallic nanomatrix material. See Xue '185 Abstract. The cone is used as a tool in a down hole construction of an oil or gas well. See Id. [0001]. The cone in Xu '185 is designed to dissolve. See Id. [0028]. In Xu '185 the metal composite may comprise Mg alloy, with aluminum present at about 1-5 wt%. See Id. [0032]. And rare earth metals are present at about 5 wt% or less, or 2 wt% or less. See Id. [0033]. Additional disintegration agents can include copper, cobalt, nickel, iron, tungsten, zinc, or combinations in amounts between 0.25 wt % to 15 wt%. See Id. [0035]. The composite is designed to disintegrate with downhole brine fluids such as a 1-25 wt. % KCl salt brine. See Id. at [0052]. Disintegration rates at between 1-10,000 mg/cm²-hr, 25-1000 mg/cm²-hr, or 50-500 mg/cm²-hr are contemplated. See Id. [0054]. And the composite material is designed to be used as a temporary material seal at up to about 800, 1000, or 1200 F where the seal disintegrates in response to contact with a downhole fluid or change in condition (e.g., pH, temperature, pressure, time, and the like). See Id. [0052].

VI. DETAILED EXPLANATION OF THE GROUNDS

A. Ground I: Claims 1-81 are anticipated under 35 USC 102(a)(1) by Doud '838 (EX1005)

“A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference.” *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987).

In order for a prior art document to describe a claimed invention under 35 USC 102, the prior art document need only describe and enable one skilled in the art to make a single species or embodiment of the claimed invention. However, to provide support for a claim under 35 USC 112(a) it is necessary that the specification describe and enable the entire scope of the claimed invention. See *Vas-Cath Inc. v. Manhukar*, 935 F.2d 1555, 1562 (Fed. Cir. 1991). The petitioner submits that a disclosure in a prior application can be used to find the claims of the child case unpatentable. In affirming a rejection over a disclosure to which a child application claims priority to, *In re Lukach*, 442 F.2d 967, 969 (CCPA 1971), the CCPA noted the following:

“Appellants have raised a further point. They content that “[t]here is an inconsistency constituting an inequity in rejecting the claims as fully met by the Hercules British patent under 35 USC 102,

while at the same time holding that appellants cannot obtain the benefit of the filing date of the U.S. counterpart.” What they are saying, in terms of the statute is that if “if the invention was described” in the British reference within the meaning of §102(b), there must have been a “description of the invention” in the corresponding grandparent application within the meaning of the first paragraph of §112. This argument appears to overlook the law that the description of a single embodiment of broadly claimed subject matter constitutes a description of the invention for anticipation purposes (see, e.g., *In re Ruscetta*, 255 F.2d 687, 45 CCPA 968 (1958)), whereas the same information in a specification might not alone be enough to provide a description of that invention for the purposes of adequate disclosure. See e.g., *In re Ahlbrecht*, *supra*. There are other apparent anomalies between the requirement for claim-anticipating disclosures and for claim-supporting disclosures. See, e.g., *In re Hafner*, 410 F.2d 1403, 56 CCPA 1424 (1969).”

A patent’s own disclosure can also be used to find a claim in a CIP application obvious. If the CIP’s claim extends even slightly past what a parent application disclosed more than a year earlier, the parent can be used as prior art against the CIP claim. See, e.g., *In re Chu*, 66 F.3d 292, 296–97 (Fed. Cir. 1995) (holding that even though Chu’s “application claims to be a CIP of the Doyle patent,” some claims were not supported by Doyle alone, so for those claims “the Doyle patent was properly relied on as prior art”).

In section (V)(C) in the present petition, it is established that the claims 1-81 recite limitations which do not have support in the manner required by 35 USC 112(a) in the disclosure of the ‘653 patent which the ‘740 patent is continuation-in-

part of. In essence since these limitations recited in claims 1-81 of the '740 are not disclosed in the '653 patent disclosure, the '740 patent cannot rely on the filing date of the '653 patent. However, Doud '838 which is the publication of a parent application of the '653 patent still discloses embodiments of inventions which fall within the scope of the claims of the '740 patent. Therefore, as in *Lukach*, the disclosure of Doud '838 which is a prior publication of the '653 patent constitutes anticipatory prior art against the claims of the '740 patent even though the same disclosure cannot provide adequate written description or enablement support of the same claims.

The petitioner submits that although claims 1-81 of the '740 patent are not supported in the manner required by 35 USC 112(a) in either the '653 patent or in the Doud '838 disclosure, claim 1-81 are, nevertheless, anticipated by the Doud '838 disclosure because the reference qualifies as prior art under 35 USC 102(a)(1) and because the Doud '838 discloses embodiments which fall within the scope of claims 1-81.

Therefore, petitioner requests that claims 1-81 be canceled as invalid because they are anticipated under 35 USC 102(a)(1) by Doud '838.

A mapping of each of the claim limitations to the disclosure of Doud '838 is provided in the form of a claim chart below. Additionally, petitioner submits the Nava Declaration concurring that Doud '838 discloses embodiments which fall

within the scope of claims 1-81 of the ‘740 patent. See also EX1016 Nava Declaration ¶ 45-49, 82.

US Patent Number 10,689,740 B2 claim listing (EX1004)		Doud ‘838 (EX1005)
Claim 1		
[1pre]		Doud ‘838 [0045], [0046], [0047] AZ91D magnesium alloys are disclosed which includes a dissolution rate, thereby being a dissolvable magnesium alloys.
[1a]		Doud ‘838 [0045], [0046] nickel is added. In [0012] the nickel additive forms an intermetallic, thereby being an intermetallic former. Doud ‘838 [0047] copper is added. In [0013] the copper additive is disclosed as forming an intermetallic, thereby being an intermetallic former. Because this limitation is in the form of an alternative “<i>selected from</i> one or more

	elements ... <i>and</i> one or more elements...” only one type of element above 1.75 electronegativity or below 1.25 needs to be disclosed in the prior art for the limitation to be met.
[1b]	Doud ‘838 [0045], [0046], [0047], magnesium content is 90%.
[1c]	Doud ‘838 [0045], [0046] nickel is added. In [0012] the nickel additive forms an intermetallic, thereby being an intermetallic phase. In Doud ‘838 [0047] copper is added. In [0013] the copper additive is disclosed as forming an intermetallic, thereby being an intermetallic phase.
[1d]	Doud ‘838 [0045] the dissolution rate is 110mg/cm²-hr in 3% KCL at 90C. In Doud ‘838 [0046] the dissolution rate is 325 mg/cm²-hr in a 3% KCl solution at 90C. In Doud ‘838 [0047] the dissolution rate is 50 mg/cm²-hr in a 3% KCl solution at

	90C.
Claim 2	
[2pre]	Doud '838 [0045], [0046], [0047]. AZ91D magnesium alloys with additives are disclosed which includes a dissolution rate, thereby being a dissolvable magnesium alloy and a cast composite.
[2a]	Doud '838 [0005], the dissolvable magnesium composite is directed to a ball or other tool component in a well drilling or completion operation.
[2b]	Doud '838 [0012]-[0014], the copper or nickel form an <i>in situ</i> precipitate and said <i>in situ</i> precipitate includes the additive metal.
[2c]	Doud '838 [0045], [0046] AZ91D magnesium alloys having an additive material of nickel are provided. Doud '838 [0047] Another AZ91D magnesium alloy and an additive material of copper is provided. Doud '838 [0014] and [0015] an additive of cobalt between 0.05-20% by weight is

	taught.
[2d]	In Doud '838 [0045], [0046],[0047] magnesium content is 90%.
[2e]	Doud '838 [0045], [0046], and [0053]. An AZ91 magnesium alloy and an additive material of nickel is provided at 7% by weight or 1% by weight. Therefore, the limitation of “at least 0.01wt%” is met. See also Doud '838 [0047] Another AZ91D magnesium alloy and an additive material of copper is provided at 10%. Therefore, the limitation of “at least 0.01 wt%” is met. Doud '838 [0014] and [0015] and additive of cobalt between 0.05-20% by weight is taught. Doud '838 [0019]-[0022] an additive of secondary metal between 0.05-35 wt% where secondary metal is cobalt.
[2f]	In Doud '838 [0045] the dissolution rate is 110mg/cm²-hr in 3% KCL at 90C. In Doud '838 [0046] the dissolution rate is 325 mg/cm²-hr in a 3% KCl solution at 90C.

Claim 3-5	
[3],[4],or [5]	In Doud '838 [0045] the dissolution rate is 110mg/cm²-hr in 3% KCL at 90C. In Doud '838 [0046] the dissolution rate is 325 mg/cm²-hr in a 3% KCl solution at 90C.
Claim 6	
[6]	Doud '838 [0047] the dissolution rate of 0.6 mg/cm²-hr in 3% KCl solution at 20C is disclosed.
Claim 7	
[7]	Doud '838 [0045] the dissolution rate of 0.8 mg/cm²-hr in 3% KCl solution at 20C is disclosed. See also Doud '838 [0046] the dissolution rate of 0.8 mg/cm²-hr in 3% KCl solution at 20C is disclosed. Doud '838 [0047] the dissolution rate of 0.5 mg/cm²-hr in 3% KCl solution at 20C is disclosed.
Claim 8-9	
[8], [9]	Doud '838 [0045], [0046], [0047] the

	magnesium content in the AZ91D magnesium alloy is 90 wt% and 9 wt% Al and zinc 1wt% are also present.
Claim 10-12	
[10], [11], [12]	Doud '838 [0045] and [0046] the addition of nickel at 7% is disclosed.
Claim 13-14	
[13], [14]	Doud '838 [0047] the addition of copper at 10% is disclosed.
Claim 15	
[15]	Doud '838 [0013] the addition of copper at 15-35 wt% is disclosed.
Claim 16-17	
[16], [17]	Doud '838 [0045], [0046],[0047] magnesium content is 90%.
Claim 18	
[18]	Doud '838 [0045]-[0047], at least copper and nickel additive metals are taught which are transition metals.
Claim 19	

[19pre]	Doud ‘838 [0045], [0046],[0047]. AZ91D magnesium alloys are disclosed which include a dissolution rate, thereby being a dissolvable magnesium alloy and a cast composite.
[19a]	Doud ‘838 [0045], [0046]. AZ91D magnesium alloys having an additive material of nickel are provided. Doud ‘838 [0047] Another AZ91D magnesium alloy and an additive material of copper is provided. Doud ‘838 [0014] and [0015] and additive of cobalt between 0.05-20% by weight is taught.
[19b]	Doud ‘838 [0045], [0046], and [0053]. An AZ91 magnesium alloy and an additive material of nickel is provided at 7% by weight or 1% by weight. Therefore, the limitation of “at least 0.01wt%” is met. Doud ‘838 [0047] Another AZ91D magnesium alloy and an additive material of copper is provided at 10%. Therefore, the limitation of “at least 0.01 wt%” is met.

	Doud '838 [0014] and [0015] and additive of cobalt between 0.05-20% by weight is taught. Doud '838 [0019]-[0022] an additive of secondary metal between 0.05-35 wt% where secondary metal is cobalt.
[19c]	See Doud '838 [0012]-[0014], the copper or nickel form an <i>in situ</i> precipitate and said <i>in situ</i> precipitate includes the additive metal.
[19d]	Doud '838 in [0006], the plurality of in situ particles have a particle size of 10-50 microns. Therefore, the limitation of having a size no more than 50 microns is met.
[19e]	Doud '838 [0045] the dissolution rate is 110mg/cm²-hr in 3% KCL at 90C. In Doud '838 [0046] the dissolution rate is 325 mg/cm²-hr in a 3% KCl solution at 90C. Doud '838 [0047] the dissolution rate is 50 mg/cm²-hr in a 3% KCl solution at 90C.

Claim 20	
[20]	Doud '838 [0045], [0046], [0047] magnesium content is 90%.
Claim 21-22	
[21-22]	Doud '838 [0045] the dissolution rate is 110mg/cm²-hr in 3% KCL at 90C. Doud '838 [0046] the dissolution rate is 325 mg/cm²-hr in a 3% KCl solution at 90C. Doud '838 [0047] the dissolution rate is 50 mg/cm²-hr in a 3% KCl solution at 90C.
Claim 23-26	
[23-26]	Doud '838 [0045], [0046], [0047] the aluminum content in the AZ91D magnesium alloy is 9 wt%.
Claims 27-28	
[27-28]	Doud '838 [0045], [0046], and [0047] the magnesium content in the AZ91D magnesium alloy is 90 wt%.

Claims 29-34	
[29-34]	Doud '838 [0045] the dissolution rate is 110mg/cm²-hr in 3% KCL at 90C. In Doud '838 [0046] the dissolution rate is 325 mg/cm²-hr in a 3% KCl solution at 90C. Doud '838 [0047] the dissolution rate is 50 mg/cm²-hr in a 3% KCl solution at 90C. Accordingly, the values fall within the claimed range and therefore the range is anticipated.
Claims 35 -47	
[35-36], [37-38], [39-40], [41-45], [46-47]	Doud '838 [0045], [0046], [0047] the magnesium content in the AZ91D magnesium alloy is 90 wt% and at least aluminum at 9 wt% and zinc 1wt% are also present.
Claim 48	

[48]	Doud '838 [0045], [0046],[0047] the magnesium content in the AZ91D magnesium alloy is 90 wt%. Further Doud '838 claim 11 discloses aluminum at 0.5-10 wt%, 0.1-3 wt% of zinc, and 0.15-2 wt% of manganese.
Claims 49-50	
[49], [50]	Doud '838 [0045], [0046],[0047] the magnesium content in the AZ91D magnesium alloy is 90 wt%. Further Doud '838 claim 11 discloses zinc 0.1-3wt% and zirconium in 0.01-1 wt%.
Claim 51	
[51]	Doud '838 [0045], [0046],[0047] the magnesium content in the AZ91D magnesium alloy is 90 wt%. Further Doud '838 claim 11 discloses zinc 0.1-3wt% and zirconium in 0.01-1 wt%, boron 0.0002-0.04wt%, and bismuth in 0.4-0.7 wt%.

Claims 52-57	
[52-57]	Doud '838 [0045] the magnesium content in the AZ91D magnesium alloy is 90 wt% and nickel at 7 wt%. Doud '838 [0046] the magnesium content in the AZ91D magnesium alloy is 90 wt% and nickel 1 wt%.
Claims 58- 63	
[58-63]	Doud '838 [0047] the magnesium content in the AZ91D magnesium alloy is 90 wt% and copper at 10 wt%.
Claims 64-69	
[64-69]	Doud '838 [0047] the magnesium content in the AZ91D magnesium alloy is 90 wt% and copper at 10 wt%.

Claims 70-75	
[70-75]	Doud ‘838 [0014] the magnesium content in the magnesium alloy is 90 wt% and cobalt at 0.05-20 wt%. Furthermore, the overlapping range for cobalt anticipates because it discloses the claimed range with <i>sufficient specificity</i>. See <i>ClearValue Inc. v. Pearl River Polymers Inc.</i>, 668 F.3d 1340 (Fed. Cir. 2012)
Claims 76-81	
[76-81]	Doud ‘838 [0045] the magnesium content in the AZ91D magnesium alloy is 90 wt% and nickel at 7 wt%. Doud ‘838 [0046] the magnesium content in the AZ91D magnesium alloy is 90 wt% and nickel 1 wt%. Doud ‘838 [0047] the magnesium content in the AZ91D magnesium alloy is 90 wt% and copper at 10 wt%.

B. Ground II: Claims 1-81 are obvious under 35 USC 103 over Xu ‘185 (EX1007)

Although Xu ‘185 does not anticipate because the claims of the ‘740 recite specific ranges which are *narrower or overlap with the range* in Xu ‘185, the operative question is thus "whether the improvement is more than the predictable use of prior art elements according to their established functions." See *KSR International Co. v. Teleflex Inc.*, 550 U.S. 398, 417 (2007). Petitioner submits that the above listed claims are obvious over Xu ‘185 on the grounds that Xu ‘185 teaches the overall invention and the claimed ranges overlap or fall within the Xu ‘185 ranges or simply represent *optimization within working conditions* disclosed in Xu ‘185 without any disclosed criticality.

When the disclosure of the prior art is not identical to the claim claims, in the case where the claimed range overlaps or lies within the range disclosed in the prior art prima facie obviousness exists. *See In re Wertheim*, 541 F.2d 257 (CCPA 1976). Additionally, differences in concentration or temperature will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such concentration or temperature is critical. “[W]here the general

conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable range by routine experimentation.” *See In re Aller*, 220 F.2d 454, 456 (CCPA 1955). Therefore, because certain claimed ranges in the ‘740 patent overlap or fall within the disclosed ranges of the Xu ‘185 reference, the limitations are *prima facie* obvious over the range disclosed in Xu ‘185. Further, petitioner submits that the specific values and ranges of the ‘740 patent may also be achieved simply by optimization of the prior art working conditions that the ranges and values claimed in the ‘740 patent are *prima facie* obvious.

Petitioner submits that a review of the prosecution history of the ‘740 patent indicates that there is no showing of criticality of the ranges and values made during examination of the ‘740 patent. See EX1015 pages 6 and 7. Nor is there any evidence of criticality of the values and ranges specified in the disclosure of the ‘740. Petitioner submits that it is not equitable for the ‘740 patent claims to cover practicing of the prior art disclosure Xu ‘185, albeit with specific narrower or overlapping products ranges of the prior art or optimized working conditions of broadly defined conditions disclosed in the prior art, without a showing of criticality of the claimed ranges in the ‘740.

Therefore, petitioner submits that claims 1-81 are obvious under 35 USC 103 over the Xu ‘185 reference for the reasons listed below in the claim chart. When relying on the above case law regarding overlapping ranges or optimization, such a

statement will be made. Additionally, petitioner submits the Nava Declaration concurring that Xu ‘185 discloses embodiments which fall within the scope of claims 1-81 of the ‘740 patent. See also EX1016 Nava Declaration ¶ 50-55, 83.

US Patent Number 10,689,740 B2 claim listing (EX1004)		Xu ‘185 (EX1007)
Claim 1		
[1pre]		Xu ‘185 [0031] discloses a magnesium alloy and [0028], and [0054] discloses the metal composite is dissolvable.
[1a]		Xu ‘185 [0033] discloses rare earth metals such as La, Ce, or Nd, and that they are present at 5% or 2% by weight or less. Furthermore, the overlapping range metal with electronegativity of 1.25 or less anticipates because it discloses the claimed range with <i>sufficient specificity</i> . See <i>ClearValue Inc. v. Pearl River Polymers Inc.</i> , 668 F.3d 1340 (Fed. Cir. 2012)

	Xu '185 [0037], Cu, Co, and Ni are disclosed. Furthermore, these elements (Fe, Cu, Ni, and Ag) are <i>intermetallic formers</i> simply because they are the same elements as those which are recited and therefore will have the same capabilities of forming an intermetallic. As discussed in section V(A)(1)(a) the term intermetallic former is not construed to require the formation of intermetallic.
[1b]	Xu '185 [0036], the metal matrix which may be magnesium, is present in an amount of 70-95 wt %.
[1c]	Xu '185 [0033] discloses rare earth metals such as La, Ce, or Nd, and that they are present at 5% or 2% by weight or less. Furthermore, the overlapping range metal with electronegativity of 1.25 or less anticipates because it discloses the claimed range with <i>sufficient specificity</i>. See <i>ClearValue Inc. v. Pearl River Polymers Inc.</i>, 668 F.3d 1340 (Fed. Cir.

	2012) Xu '185 [0037], Cu, Co, and Ni are disclosed.
[1d]	Xu '185 [0052], [0054] discloses the dissolution in KCl brines between 1-25 wt. % and at temperatures up to about 800, 1000, or 1200 F (427, 537, or 649C), and with dissolution rates of 50-500 mg/cm²-hr. Because the disclosed ranges overlap and/or embrace the range and/or values in the '740 patent <i>the POSA would consider them obvious as overlapping ranges or through routine optimization.</i>
Claim 2	
[2pre]	Xu '185 [0031] discloses a magnesium alloy and [0028], and [0054] discloses the metal composite is dissolvable.
[2a]	Xu '185 [0050] the metal composite is

	used to great a wellbore tool such as seal, cone, sleeve, bottom sub, and the like, and [0002] which are contemplated for use in drilling operations.
[2b]	Xu '185 [0038] the composite includes in situ precipitate particles.
[2c]	Xu '185 [0038] the composite includes additives such as Ni, Cu, Co.
[2d]	Xu '185 [0036], the metal matrix which may be magnesium, is present in an amount of 70-95 wt %.
[2e]	Xu '185 [0038], the precipitates include additives (Ni, Cu, Co) in an amount of 0.5-10 wt %.
[2f]	Xu '185 [0052], [0054] discloses the dissolution in KCl brines between 1-25 wt. % and at temperatures up to about 800, 1000, or 1200 F (427, 537, or 649C), and with dissolution rates of 50-500 mg/cm²-hr. Because the disclosed ranges overlap and/or embrace the range and/or values in the '740 patent <i>the POSA would consider them obvious as overlapping ranges or</i>

	<i>through routine optimization.</i>
Claim 3-7	
[3],[4],[5],[6],[7]	Xu '185 [0052], [0054] discloses the dissolution in KCl brines between 1-25 wt. % and at temperatures up to about 800, 1000, or 1200 F (427, 537, or 649C), and with dissolution rates of 50-500 mg/cm²-hr or 1-10,000 mg/cm²-hr. Because the disclosed ranges overlap and/or embrace the range and/or values in the '740 patent <i>the POSA would consider them obvious as overlapping ranges or through routine optimization.</i>
Claim 8-9	
[8], [9]	Xu '185 [0036], the metal matrix which may be magnesium, is present in an amount of 70-95 wt %. Xu '185 [0038] additives including Ni, Cu, Co, Zn, and Al may be present in a range of 0.5 wt% to 10 wt%. Therefore, a maximum of 10% additive where Al is present is contemplated. Because the disclosed ranges overlap and/or embrace the range and/or values in

	the '740 patent <i>the POSA would consider them obvious as overlapping ranges or through routine optimization.</i>
Claim 10	
[10]	Xu '185 [0038] additives including Ni, Cu, Co, Zn, and Al may be present in a range of 0.5 wt% to 10 wt%.
Claim 11-12	
[11],[12]	Xu '185 [0038] additives including Ni and may be present in a range of 0.5 wt% to 10 wt% Because the disclosed ranges overlap and/or embrace the range and/or values in the '740 patent <i>the POSA would consider them obvious as overlapping ranges or through routine optimization.</i>
Claim 13	
[13]	Xu '185 [0038] additives including Cu and may be present in a range of 0.5 wt% to 10 wt%.
Claim 14	

[14]	Xu '185 [0038] additives including Cu and may be present in a range of 0.5 wt% to 10 wt% Because the disclosed ranges overlap and/or embrace the range and/or values in the '740 patent <i>the POSA would consider them obvious as overlapping ranges or through routine optimization.</i>
Claim 15	
[15]	Xu '185 [0038] additives including Ni and may be present in a range of 0.5 wt% to 25 wt% Because the disclosed ranges overlap and/or embrace the range and/or values in the '740 patent <i>the POSA would consider them obvious as overlapping ranges or through routine optimization.</i>
Claim 16-17	
[16], [17]	Xu '185 [0036], the metal matrix which may be magnesium, is present in an amount of 70-95 wt %. Because the disclosed ranges overlap and/or embrace the range and/or values in the '740 patent <i>the POSA would consider</i>

	<i>them obvious as overlapping ranges or through routine optimization.</i>
Claim 18	
[18]	Xu '185 [0038] the additive is a metal.
Claim 19	
[19pre]	Xu '185 [0031] discloses a magnesium alloy and [0028], and [0054] discloses the metal composite is dissolvable, and [0059] a cast material is taught.
[19a]	Xu '185 [0031] discloses a magnesium alloy and [0038] additives of Cu, Co, and Ni are taught
[19b]	See Xu '185 [0038] additives of Cu, Co, and Ni are taught at ranges of 0.5-25 wt %, 0.5-20 wt %, or 0.5-10 wt%.
[19c]	See Xu '185 [0038], the particles form a precipitate in situ.
[19d]	See Xu '185 [0038], the particles of the nanostructured material 50 nm to 200 nm which is smaller than 50 μ m.
[19e]	Xu '185 [0052], [0054] discloses the dissolution in KCl brines between 1-25

	wt. % and at temperatures up to about 800, 1000, or 1200 F (427, 537, or 649C), and with dissolution rates of 50-500 mg/cm²-hr. Because the disclosed ranges overlap and/or embrace the range and/or values in the '740 patent <i>the POSA would consider them obvious as overlapping ranges or through routine optimization.</i>
Claim 20	
[20]	Xu '185 [0036], the metal matrix which may be magnesium, is present in an amount of 70-95 wt %. Because the disclosed ranges overlap and/or embrace the range and/or values in the '740 patent <i>the POSA would consider them obvious as overlapping ranges or through routine optimization.</i>
Claim 21-22	
[21-22]	Xu '185 [0052], [0054] discloses the dissolution in KCl brines between 1-25 wt. % and at temperatures up to about 800, 1000, or 1200 F (427, 537, or 649C), and with dissolution rates of 50-500

	mg/cm²-hr. Because the disclosed ranges overlap and/or embrace the range and/or values in the '740 patent <i>the POSA would consider them obvious as overlapping ranges or through routine optimization.</i>
Claim 23-26	
[23-26]	Xu '185 [0038] additives including Ni, Cu, Co, Zn, and Al may be present in a range of 0.5 wt% to 10 wt%. Therefore, a maximum of 10% additive where Al is present is contemplated.
Claims 27-28	
[27-28]	Xu '185 [0036], the metal matrix which may be magnesium, is present in an amount of 70-95 wt %.
Claims 29-34	
[29-34]	Xu '185 [0052], [0054] discloses the dissolution in KCl brines between 1-25 wt. % and at temperatures up to about 800, 1000, or 1200 F (427, 537, or 649C),

	and with dissolution rates of 1-10,000 mg/cm²-hr. Because the disclosed ranges overlap and/or embrace the range and/or values in the '740 patent <i>the POSA would consider them obvious as overlapping ranges or through routine optimization.</i>
Claims 35-36	
[35-36], [37-38], [39-40],[41-45],[46-47]	Xu '185 [0036], the metal matrix which may be magnesium, is present in an amount of 70-95 wt %. Xu '185 [0038] suggests Al in an amount of 0.5-10 wt.%. In instances where the disclosed ranges overlap and/or embrace the range and/or values in the '740 patent <i>the POSA would consider them obvious as overlapping ranges or through routine optimization.</i>
Claim 48	

[48]	Xu '185 [0036], the metal matrix which may be magnesium, is present in an amount of 70-95 wt %. Xu '185 [0038] suggests Al, Zn, and Mn in an amount of 0.5-10 wt.%. Because the disclosed ranges overlap and/or embrace the range and/or values in the '740 patent <i>the POSA would consider them obvious as overlapping ranges or through routine optimization.</i>
Claims 49	
[49]	Xu '185 [0036], the metal matrix which may be magnesium, is present in an amount of 70-95 wt %. Xu '185 [0047] and [0048] suggests Zr in an amount of 0.01-5 wt.%. Because the disclosed ranges overlap and/or embrace the range and/or values in the '740 patent <i>the POSA would consider them obvious as overlapping ranges or through routine optimization.</i>

Claim 50-51	
[50], [51]	Xu ‘185 [0036], the metal matrix which may be magnesium, is present in an amount of 70-95 wt %. Xu ‘185 [0038] suggests Zn in an amount of 0.5-10 wt.%. Xu ‘185 [0047] and [0048] suggests Zr in an amount of 0.01-5 wt.%. Because the disclosed ranges overlap and/or embrace the range in the ‘740 patent <i>the POSA would consider them obvious.</i>
Claims 52-81	
[52-57], [58-63], [64-69], [70-75], [76-81]	Xu ‘185 [0038] discloses Ni, Cu or Co in an amount of between 0.5-10 wt. %.

C. Ground III: Claims 1 is anticipated under 35 USC 102(a)(1) by Xiao ‘271 or obvious under 35 USC 103 by Xiao ‘271 in view of Xu ‘185

Petitioner submits that Xiao ‘271 anticipates claim 1 under 35 USC 102(a)(1)

because Xiao ‘271 teaches each and every limitation set forth in the claim.

Alternatively, although the additive elements having electronegativity less than 1.25 are not mentioned in Xiao ‘271, petitioner submits that this limitation is obvious under 35 USC 103 over Xiao ‘271 in view of Xu ‘185 for the reasons stated below. Additionally, petitioner submits the Nava Declaration concurring that Xiao ‘271, either alone or in combination, discloses embodiments which fall within the scope of claim 1 of the ‘740 patent. See also EX1016 Nava Declaration ¶¶ 56-66, 84-85.

US Patent Number 10,689,740 B2 Xiao ‘271 (EX1006) and optionally in claim listing (EX1004) view of Xu ‘185 (EX1007)	
Claim 1	
[1pre]	Xiao ‘271 [0026], [0062] discloses a dissolvable magnesium alloy.
[1a]	Xiao ‘271 discloses Fe, Cu, Ni, and Ag which are listed later in the claim as being from the list of one or more elements with electronegativity greater than 1.75. See Xiao ‘271 abstract.

	Because this limitation is in the form of an alternative “<i>selected from</i> one or more elements ... <i>and</i> one or more elements...” only one type of element above 1.75 electronegativity or below 1.25 needs to be disclosed in the prior art for the limitation to be met. Furthermore, these elements (Fe, Cu, Ni, and Ag) are <i>intermetallic formers</i> simply because they are the same elements as those which are recited and therefore will have the same capabilities of forming an intermetallic. As discussed in section V(A)(1)(a) the term intermetallic former is not construed to require the formation of intermetallic.
[1b]	Xiao ‘271 in [0062] provides for a magnesium content in the embodiments of “balance”. Because the other components in the embodiments 1-7 add up to less than 50% by weight, therefore the magnesium content in these examples is greater than 50% by weight.
[1c]	Xiao ‘271 discloses Fe, Cu, Ni, and Ag

	which are listed later in the claim as being from the list of one or more elements with electronegativity greater than 1.75. Because this limitation is in the form of an alternative “<i>selected from</i> one or more elements ... <i>and</i> one or more elements...” only one type of element above 1.75 electronegativity or below 1.25 needs to be disclosed in the prior art for the limitation to be met, and therefore the claim is anticipated by Xiao ‘271. Nevertheless, although Xiao ‘271 does not mention an element of electronegativity of 1.25 or less, Xu ‘185 [0033] provides for including a rare earth element of Yttrium (Y), cerium (Ce), or neodymium (Nd), in an amount of 2wt% or less. Xu ‘185 suggests that these additional rare earth additives in a dissolvable magnesium alloy result in “nanostructuring and precipitation hardening through the incorporation of particle precipitates as described herein.”
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	Accordingly, a person having ordinary skill in the art at the time the invention in claim 1 of '740 was effectively filed would have found it obvious, under <i>KSR</i>, to include one of Y, Ce, or Nd in the magnesium alloy of Xiao '271 in order to provide for the predictable result of additional nanostructuring and precipitation hardening through the incorporation of rare earth particle precipitates based on Y, Ce, and Nd as described in Xu '185. Moreover, because the range of 2 wt% or less of rare earth elements overlaps with the claimed range of 0.2-5 wt%, in the '740 patent <i>the POSA would consider them obvious as overlapping ranges or through routine optimization.</i>
[1d]	Xiao '271 [0064] provides that each of the seven examples has a dissolution rate of at least three times the claimed "at least 5/mg/cm²-hr." In these examples because the units are given as g/cm²-hr and the claimed units are in mg/cm²-hr, the prior art units merely need to be multiplied by

	a factor of 1,000 to convert grams to milligrams. Since the examples at 70C have a faster dissolution rate than the claimed rate and the dissolution rate increases as the temperature increase, a POSA would have recognized that the embodiments of Xiao ‘271 fall within the claimed range and therefore the limitation is met.
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D. Ground IV: Claims 2-7, 10, 11, 13, 14, 16, 18, 19, 21, 29, 49-52, 58, 64, 76, and 77 are obvious under 35 USC 103 over Xiao ‘271 in view of Xu ‘185

1. Regarding independent Claim 2 and dependent claims 3-7

Regarding independent claim 2 of the ‘740 patent, the cited Xiao ‘271 reference differs from the claim 2 limitation [2f] because the highest disclosed dissolution rate in Xiao ‘271 is 74 mg/cm²-hr in 3 wt. % KCL water mixture at 93C, shy of this claimed range of 75 mg/cm²-hr. Limitations [3]-[7] recite narrower ranges of the dissolution rate. Xu ‘185 is directed to a similar dissolvable magnesium alloy. Xu ‘185 discloses a wide range of achievable dissolutions rates from 50-500 mg/cm²-hr and that “[t]he disintegration rate is variable upon the

composition and processing conditions used to form the metal composite herein.” See Xu ‘185 [0054]. Further Xu ‘185 teaches that the “... microstructure of the metal composites herein is controllable by selection of powder metallurgical processing conditions and chemical materials used in the powders and coatings. Therefore, the disintegration rate is selectively tailorable as illustrated for metal composites of various compositions in FIG. 6, which shows a graph of mass loss versus time for various metal composites that include a cellular nanomatrix.” See Xu [0056]. Accordingly, a person having ordinary skill in the art at the time the invention was effectively filed would have found it obvious to vary the composition of additives in Xiao ‘271 as well as processing conditions as taught by Xu ‘185 in order to achieve the predictable result of a higher desired dissolution rate falling within the claimed range of above 75 mg/cm²-hr, 75-325 mg/cm²-hr, 84-325 mg/cm²-hr, 100-325 mg/cm²-hr, 0.6-1 mg/cm²-hr at 21C, or 0.5-1 mg/cm²-hr at 20C.

Further full discussion of the remaining limitations of claim 2 and dependent claims 3-7, 10, 13, 14, 16, and 18 and why they are disclosed or obvious over Xiao ‘271 and Xu ‘185 are provided below.

2. Regarding independent Claim 19

Regarding independent claim 19 of the ‘740 patent, the cited Xiao ‘271 reference differs from claim 19 limitation [19d] because while Xiao ‘271 discloses “microparticles” of additive in [0026], which are generally may have a size range of

100nm to 1000 μm , Xiao ‘271 does not disclose the plurality of particles of the in situ precipitate have a size of no more than 50 μm . Xu ‘185 is directed to a similar dissolvable magnesium alloy. In Xu ‘185 the additives precipitate particles are provided Xu ‘185 **222/226** in [0038] and which have a size of 50-200nm. See Xu ‘185 [0038]. Xu ‘185 teaches that the additive particles of this size provide for strengthening of the metal composite. See Id. [0038]. Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was effectively filed to provide for a plurality of additive precipitate particles in Xiao ‘271 which have a size of between 50-200 nm in order to achieve the predictable result of strengthening the metal composite of Xiao ‘271 as taught by Xu ‘185.

**3. Overlapping and narrower claimed ranges and optimization
in claims 2-7, 10, 11, 13, 14, 16, 18, 19, 21, 29, 49-52, 58, 64, 76, and
77**

Regarding claims 2-7, 10, 11, 13, 14, 16, 18, 19, 21, 29, 49-52, 58, 64, 76, and 77 petition submits that that Xiao ‘271 in view of Xu ‘185 teach as combined disclose the overall invention. When considering obviousness of a combination of known elements, the operative question is thus "whether the improvement is more than the predictable use of prior art elements according to their established functions." See *KSR International Co. v. Teleflex Inc.*, 550 U.S. 398, 417 (2007). As

discussed above under section (VI)(B), Ground II, under *In re Wertheim* and *In re Aller*, ranges in claims are obvious where the claimed range overlaps or falls within the prior art range or are simply the product of optimization within prior art working conditions without any disclosed criticality. Further as discussed above a review of the prosecution history and disclosure of the '740 patent does not establish any criticality of any of the claimed ranges. Therefore, petitioner submits that the above claims are obvious over Xiao '271 and Xu '185 where the claims recite a *specific range which overlaps or falls within the disclosure of the prior art* or where *the prior art teaches the general conditions and the specifically recited values and ranges in the claims are simply optimized values* without any disclosed criticality.

Therefore, petitioner submits that claims 2-7, 10, 11, 13, 14, 16, 18, 19, 21, 29, 49-52, 58, 64, 76, and 77 are obvious under 35 USC 103 over the Xiao '271 in view of Xu '185 for the reasons discussed above and listed below in the claim chart. When relying on the above case law regarding overlapping ranges or optimization, such a statement will be made. Additionally, petitioner submits the Nava Declaration concurring that Xiao '271 in combination with Xu '185 discloses embodiments which fall within the scope of claim 2-7, 10, 11, 13, 14, 16, 18, 19, 21, 29, 49-52, 58, 64, 76, and 77 of the '740 patent. See also EX1016 Nava Declaration ¶¶ 67-80, 86.

US Patent Number 10,689,740 B2 claim listing (EX1004)	Xiao ‘271 (EX1006) in view of Xu ‘185 (EX 1012)
Claim 2	
[2pre]	Xiao ‘271 abstract and see [0062], the composition is a dissolvable magnesium composite with dissolution rates given in [0062]. The material in ‘271 is a composite because it is formed of an alloy with intermetallic microparticles [0026].
[2a]	Xiao ‘271 Abstract the composite is used to form a tripping ball for a multi-stage sliding sleeve staged-fracturing technique.
[2b]	Xiao ‘271 [0026], the alloy forms “a large number of intermetallic chemical combination micro particles” which form as an in situ precipitate when the melt is cooled.
[2c]	Xiao ‘271 [0026], “The elements such as Fe, Cu, Ni, Ag owing to defining a large amount of intermetallic microparticle, can improve the corrosive nature of the

	magnesium alloy...”
[2d]	Xiao ‘271 in [0062] provides for a magnesium content in the embodiments of “balance”. Because the other components in the embodiments 1-7 add up to less than 50% by weight, therefore the magnesium content in these examples is greater than 50% by weight.
[2e]	Xiao ‘271 in [0062] Ni values are 5, 0.1, 2.5, 5, 0.05, 1, and 0.1 % by weight. Cu values are 2.5, 5, 0.05, 1, and 0.1 % by weight.
[2f]	As discussed above, although Xiao ‘271 does not disclose this limitation, it would have been obvious in view of Xu ‘185 to vary the composition of additives in Xiao ‘271 as well as processing conditions as taught by Xu ‘185 in order to achieve the predictable result of a higher desired dissolution rate falling within the claimed range of 75 mg/cm ² -hr.
Claim 3-7	
[3], [4], [5], [6], or [7]	As discussed above the limitation is met

	by Xiao ‘271 in view of Xu ‘185 by varying the composition of additives to provide a desired dissolution rate.
Claim 10-11	
[10], [11]	Xiao ‘271 [0062] examples of Ni at 2.5, 2, and 0.5 in wt. % are shown in Examples 3, 4, and 7.
Claim 13-14	
[13], [14]	Xiao ‘271 [0062] shows copper as an additive in amounts of 2.5, 5, and 1 wt. %.
Claim 16	
[16]	Xiao ‘271 [0062] Example 1 shows Mg with 77.1% by weight.
Claim 18	
[18]	Xiao ‘271 [0026], “The elements such as Fe, Cu, Ni, Ag owing to defining a large amount of intermetallic microparticle, can improve the corrosive nature of the magnesium alloy...”
Claim 19	

[19pre]	Xiao '271 Abstract, [0026], [0062] discloses a dissolvable magnesium alloy composite which is cast.
[19a]	Xiao '271 Abstract, [0026], [0062] discloses a dissolvable magnesium alloy which comprises a mixture of magnesium, and aluminum and an additive material of Fe, Cu, Ni, and Ag.
[19b]	Xiao '271 in [0062] Ni values are 5, 0.1, 2.5, 5, 0.05, 1, and 0.1 % by weight. Cu values are 2.5, 5, 0.05, 1, and 0.1 % by weight.
[19c]	Xiao '271 [0026], "The elements such as Fe, Cu, Ni, Ag owing to defining a large amount of intermetallic microparticle, can improve the corrosive nature of the magnesium alloy..."
[19d]	Although Xiao '271 does not disclose this limitation, it would have been obvious in view of Xu '185 to provide for a plurality of additive precipitate particles in Xiao '271 which have a size of between 50-200

	nm in order to achieve the predictable result of strengthening the metal composite of Xiao ‘271 as taught by Xu ‘185
[19e]	Xiao ‘271 [0064] provides that each of the seven examples has a dissolution rate of at least three times the claimed “at least 5/mg/cm ² -hr.” Since the examples at 70C have a faster dissolution rate than the claimed rate and the dissolution rate increases as the temperature increase, a POSA would have recognized that the embodiments of Xiao ‘271 fall within the claimed range and therefore the limitation is met.
Claim 21, 29	
[21], [29]	Xiao ‘271 [0064] provides that the embodiments 1, 2, 4, 5, 6, and 7 of Xiao ‘271 fall within the claimed range of 40-325 mg/cm ² -hr and therefore the limitation is met.
Claims 49-52	

[49],[50],[51],[52]	Xiao ‘271 [0062] provides for over 50 wt. % Mg, and between 0.05-.5 wt. % Zr, and Zn at 1.3, 5, 5, and 6 wt% in Examples 1, 2, 5, and 6.
Claims 58, 64, 76, 77	
[58], [64], [76], [77]	Xiao ‘271 in [0062] Cu values are 2.5, 5, 0.05, 1, and 0.1 % by weight.

VII. SECONDARY CONSIDERATIONS OF NON-OBVIOUSNESS

“[S]econdary considerations of non-obviousness” are among the “underlying factual inquiries” considered in the obviousness analysis. See *ZUP, LLC v. Nash Mfg., Inc.*, 896 F.3d 1365, 1371 (Fed. Cir. 2018). The petitioner is not aware of any such considerations pointing towards non-obviousness. In the event that the patent holder alleges any secondary considerations following institution, the Petitioner will respond in its Reply.

VIII. DISCRETION UNDER 35 USC 314(a) and 325(d)

A. The Board Should Not Exercise Its Discretion Under 35 USC 314(a) to Deny Institutions

For the reasons discussed above, petitioner submits that this petition meets the threshold that the petitioner will prevail with the respect to at least one of the claims in the petition. See 35 314(a).

Furthermore, petitioner is not aware of any prior IPR petitions challenging the ‘740 patent. Petitioner filed this IPR petition because the patent holder is involved with litigation of the ‘740 patent. The ‘740 patent is involved in *Terves LLC v. Yueyang Aerospace New Materials Co. Ltd.* and *Magnesium Machine LLC v. Terves*. Petitioner manufactures and markets a product or products in the field of the ‘740 patent and Petition has a reasonable apprehension that a suit could be brought by the patent holder requiring great litigation expense and inconvenience given that petitioner believes that the ‘740 patent is invalid. Consideration of the *Fintiv* factors strongly weights against exercising discretionary denial. See *Apple v. Fintiv, Inc.*, IPR2020-00019 (Paper 11) (PTAB Mar. 20, 2020).

***Fintiv* Factor 1: Whether the court granted a stay or evidence exists that one may be granted if the proceeding is instituted.** The factor is *in favor of institution*.

The litigation in case *Magnesium Machine LLC v. Terves LLC*, No 5:21-cv-

01115 (W.D. Oklahoma) has been filed. However, the court has granted a motion to dismiss for lack of personal jurisdiction over defendant *Terves*. A copy of the docket report for case No. 5:21-cv-01115 (W.D. Oklahoma) is supplied as EX1010.

The litigation in *Terves LLC v. Yueyang Aerospace New Materials Co. Ltd.*, 1:19-cv-01611-DCN (N.D. Ohio), has terminated with a final judgement. See EX1011. An appeal has been taken by the defendants in the case to the Federal Circuit in case No. 22-1855. See EX1012. Given that the trial level litigation in *Terves LLC v. Yueyang Aerospace New Materials Co. Ltd.*, has finished, the institution of the proceeding at the USPTO in this case would have limited effect on the progress of the litigation at the trial court level. Moreover, the appeal at the Federal circuit is still in its infancy. An opening brief and a response brief have been filed. But there have been no further developments.

***Fintiv* Factor 2: Proximity of the Court’s trial date to the Board’s projected statutory deadline for a final written decision.** This factor is *in favor of institution*.

Regarding *Terves v. Yueyang Aerospace New Materials Co. Ltd.*, the trial has completed and result in a final judgement. Although the parties have taken an appeal from the decision of the trial court, the Board’s projected statutory deadline will not have any effect on the trial in *Terves v. Yueyang Aerospace New Materials Co. Ltd.*,

***Fintiv* Factor 3: Investment in the parallel proceedings by the court and**

the parties. This factor weighs *in favor of institution*.

Regarding *Terves LLC v. Yueyang Aerospace New Materials Co. Ltd.*, the trial has already been conducted and a final order has been issued in the trial. Although the investment in the parallel proceedings is significant because there has been a final order in the case, the present IPR will have no effect on the trial that has already occurred, and if the appeal to the Federal Circuit results in a new trial being ordered, then the resulting decision of the IPR would be finalized before any new trial is to be held.

***Fintiv* Factor 4: Overlap between issues raised in the petition and the parallel proceeding.** This factor weights *in favor of institution*.

Regarding *Terves LLC v. Yueyang Aerospace New Materials Co. Ltd.*, the trial has already occurred and there is a final decision of infringement. However, in *Terves v. Yueyang* the parties litigated the validity of the ‘740 patent in view of Xiao ‘271 and Xiao ‘271 in view of Hassan. See EX1014. But the issue regarding the validity of the patent over the Doud ‘838, or Xu ‘185, or Xiao ‘271 in view of Xu ‘185 were not raised in the course of the litigation regarding the patent validity. See *Id.* EX1014.

Accordingly, petitioner acknowledges that there may be some overlap in issues with other proceedings because of the present arguments pertaining to Xaio

‘271. However, petitioner submits that the arguments based on Xiao ‘271 rest on novel legal theories and newly cited references. Furthermore, a substantial portion of the present petition rests on different issues entirely than were raised in *Terves v. Yueyang* or are being raised in *Magnesium Machine*.

***Fintiv* Factor 5: Whether the petitioner and the defendant in the parallel proceedings are the same party.** This factor weights *in favor of institution*.

The present petitioner is Chongqing Yanmei Technology Co. LTD. The present petitioner is not a party to the litigation of the *Magnesium Machine v. Terves LLC* or *Terves LLC v. Yueyang Aerospace New Materials Co. Ltd.* Since the petitioner in the present case is not the same party, the petitioner is not bound by the determination in either litigation if the court determines that the patent is not invalid over the cited reference and arguments made in each trial.

***Fintiv* Factor 6: Other circumstances that impact the Board’s discretion, including the merits.** This factor weighs *in favor of institution*.

The ‘740 patent is involved in at least two pending patent infringement actions. The cost and inconvenience of a patent litigation to defendants can be enormous. The present petitioner would be greatly relieved if the arguments and evidence currently presented in this petition were considered and a determination of the validity of the patent before the Board without the need to resort to U.S. District

Court.

For all of these reasons, the petitioner respectfully requests that the Board institute the IPR proceeding.

B. Consideration under 35 USC 325(d)

This petition does not present “the same or substantially the same prior art or arguments previously” presented to the Office. 35 USC 325(d). Although, the CIP parent ‘653 patent was subject to a reexamination 90/014,795 in which Xiao ‘271 was cited as a reference, the claims of the ‘740 have different limitations and are not the same as those considered in the ‘795 reexamination. Further, the present petition cites additional prior art and arguments were not considered in the ‘795 reexamination. In fact, the grounds based on the ‘740 patent as continuation-in-part of the ‘653 patent could not have been raised in the ‘795 reexamination of the ‘653 patent itself.

IX. Conclusion

There is a reasonable likelihood that the Challenged Claims are unpatentable based on the grounds presented in this petition. Petitioner respectfully requests that the Board institute IPR and cancel claims 1-81 in light of the above cited prior art.

Respectfully Submitted,

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Date: 01/24/2022

CERTIFICATE OF SERVICE

Under 37 CFR 42.6(E), the undersigned certifies that on January 24, 2023, a copy of the foregoing PETITION FOR *INTER PARTES REVIEW* OF US PATENT NO. 10,689,740, Petitioner's Power of Attorney, and all associated exhibits was served in their entirety on the following counsel of record for Patent Owner via Express Mail:

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CERTIFICATE OF COMPLIANCE WITH TYPE-VOLUME
REQUIREMENTS UNDER 37 CFR 42.24

Under 37 CFR 42.24(d), the undersigned certifies that the PETITION FOR *INTER PARTES REVIEW* OF US PATENT NO. 10,689,740 complies with the type-volume requirements of 37 CFR 42.24(a)(1)(i) because it contains 13,693 words, excluding the parts of the Petition exempted by 37 CFR 42.24(a).

This Petition also complies with the typeface requirements of 37 CFR 42.6(a)(2)(ii) and type-style requirements of 37 CFR 42.6(a)(2)(iii) and (iv).

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