

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

DECLARATION UNDER 37 CFR 1.68 OF DR. JUAN C. NAVA, PH.D.

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I, Juan C. Nava, declare as follows:

I. INTRODUCTION

1. I have been retained by Chongqing Yanmei Technology Co., LTD (“Petitioner”) as an independent expert consultant in this proceed before the United States Patent and Trademark Office. Although I am being compensated at my rate of \$180.00 per hour for the time I spend on this matter, no part of my compensation is dependent on the outcome of this proceeding, and I have no other interest in this proceeding.

2. I understand that this proceeding involves U.S. Patent No. 10,689,740 (“ the ‘740 patent”) (EX 1001), the application for which was filed on October 12, 2018 as U.S. Patent Application No. 16/158,915, 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 (“the ‘653 patent”) (EX 1002), 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.

3. I have been asked to consider whether the disclosure of the ‘653 patent provides disclosure supporting certain claim terms recited in claims of the ‘740 patent. Additionally, I have to consider whether certain references disclose or

suggest the features recited in claims 1-81 of the '740 patent. My opinions are set forth below.

II. QUALIFICATIONS

4. My curriculum vitae, which includes a detailed summary of my background and experience and a list of my publications and patents is attached is attached as EX 1017.

5. I have over 30 years of experience in the field metallurgy and corrosion of metals.

6. I obtained my B.S. in Chemical Engineering from Universidad Del Zulia, in Venezuela where my course work emphasized process design and research in corrosion electrochemistry. I obtained my M.S. in metallurgical engineering from the Ohio State University where my course work emphasized chemical metallurgy principals, and corrosion design. And I obtained my Ph.D. from the Ohio State University where my dissertation was directed to electrochemical studies of vanadium oxide-sodium sulfate melts.

7. I was employed for 25 years in industry as a subject matter expert on corrosion properties of metals and materials in industrial designs and processes.
8. I am a listed author on over a dozen published articles in the field of corrosion properties of metals and alloys and electrochemical reactions.
9. I am a joint inventor on two issued U.S. Patents.
10. I am inducted as a member into Alpha Sigma Mu, the International Professional Honor Society for Material Science and Engineering.
11. I am not an attorney and offer no legal opinions, but in the course of my work, I have had experience studying and analyzing patents and patent claims from the perspective of a person skilled in the art.

III. SUMMARY OF OPINIONS

12. All of the opinions contained in this Declaration are based on the documents I revised and my knowledge and professional judgement. In forming the opinions

expressed in this declaration, I have reviewed the ‘740 patent (EX 1001); the ‘653 patent (EX1002), the Doud ‘838 reference (EX1005), the Xiao ‘271 reference (EX1006), the Xu ‘185 reference (EX1007), and the Notice of Allowance and Examiner’s Reasons for Allowance (EX 1015) dated 4/02/2020 in Application 16/158,914 which issued as the ‘740 patent.

13. My opinions have been also guided by my appreciation of how a person of ordinary skill in the art would have understood the claims of the ‘740 patent at the time of the filing of the application, which is October 12, 2018.

14. In my opinion, and given the nature of the technology, a person with ordinary skill in the art in the field of the ‘740 patent would have 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.

15. Based on my experience, expertise and review of the documents, it is my opinion that the ‘653 patent disclosure does not provide adequate support for certain

claim limitations in claims 1-81 of the '740 patent.

16. Based on my experience, expertise and review of the documents, it is my opinion that the Doud '838 reference discloses embodiments which fall within the scope of claims 1-81 of the '740 patent.

17. Based on my experience, expertise and review of the documents, it is my opinion that Xu '185 discloses all of the claimed features claimed in claims 1-81 of the '740 patent. Moreover, where there are differences of concentration, temperature, or dissolution rate, these features are broadly disclosed in the Xu '185 reference. Further it is my opinion that these claimed features would be easily attainable by a person having ordinary skill through routine experimentation and optimization based on the guidance provided in Xu '185.

18. Based on my experience, expertise and review of the documents, it is my opinion that Xiao '271 discloses all of the claimed features of claim 1 either alone or in combination with Xu '185.

19. Based on my experience, expertise and review of the documents, it is my opinion that Xiao '271 in combination with the disclosure of Xu '185 discloses all

of the features of claims 2-7, 10, 11, 13, 14, 16, 18, 19, 21, 29, 49-52, 58, 64, 76, and 77. Furthermore, where there are differences of concentration, temperature, or dissolution rate, these features are broadly disclosed in the Xiao ‘271 or Xu ‘185 references. Further it is my opinion that these claimed features would be easily attainable by a person having ordinary skill through routine experimentation and optimization based on the guidance provided in Xiao ‘271 and/or Xu ‘185.

IV. OVERVIEW OF THE ‘740 PATENT (EX1001)

20. 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.

V. CLAIM CONSTRUCTION

A. Claim 1

21. The term “... intermetallic formers...” should be construed that the term “former” is a noun and that the recited claim term refers to additives which are capable of forming intermetallic but that the formation of intermetallic is not

required by the addition. My interpretation is based on the ‘740 patent disclosure as a whole and particularly in col. 24 line 4 as well as the plain text of claim 1 where a 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...”. Therefore, the additive which is the intermetallic former needs only to be capable of forming a precipitate, particle, and/or intermetallic phase in the dissolvable magnesium alloy, but the use of the term “and/or” with the other elements of the list means presence of intermetallics, per se, are not required in the claim.

B. Claims 2 and 19

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

VI. CLAIM FEATURES OF THE ‘740 DO NOT FIND DISCLOSURE IN THE ‘653 PATENT (EX1002)

23. Claim 1 recites the following features “... with an electronegativity with greater than 1.75...”; “...and 0.2-5 wt % of one or more elements with an electronegativity of 1.25 or less...”; “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...”; or “... 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...” See ‘740 claim 1.

24. I have carefully considered the disclosure of the ‘653 patent and there is no basis to conclude that these features were disclosed in the earlier ‘653 disclosure.

25. Moreover, although 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, 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.

26. Therefore, I conclude that the disclosure of the '653 patent does not disclose the above claimed features recited in claim 1 of the '740 patent.

27. Claim 2 recites the following features: "A dissolvable magnesium composite... said dissolvable magnesium composite comprising ...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."

28. I have carefully considered the disclosure of the '653 patent and there is no disclosure of the use of the cobalt embodiment being in the 0.1-20 wt. % range *as well as* providing for a dissolution rate of at least 75 mg/cm²-hr in 3 wt% KCl water mixture at 90C.

29. The '653 patent separately provides disclosure for the cobalt wt. % range of 0.05-20% and additionally nominally discloses the much broader 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, col. 21 lines 13-14 and claim 1.

30. However, in my opinion, these are separate disclosures and not connected such that a person of skill in the art would conclude that the cobalt wt. % between 0.1-20% *and* the dissolution rate is *at least* 75 mg/cm²/hr in 3 wt. % KCl water mixture at 90 °C has been disclosed in the '653 disclosure.

31. My opinion is reinforced by the lack of working examples that use cobalt within the claimed range of 0.1-20% and while also producing a dissolution rate of at least 75 mg/cm²-hr in 3 wt. % KCl water mixture at 90 °C.

32. Also since the '653 patent provides no guidance on how a high dissolution rate of 75 mg/cm²-hr in 3 wt. % KCl water mixture at 90 °C is achieved through the use of the additives, I do not think that a person having normal skill in the art would have been able to supplement the disclosure of the '653 patent through experimentation to discover the workable values for the cobalt content in claim 2 without engaging in inordinate amounts of experimentation, which would be tantamount to inventing the presently claimed magnesium alloy itself.

33. Claim 2 further recites "... 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.”

34. I have carefully reviewed the disclosure of the ‘653 patent and it does not provide any disclosure to support the magnesium composite having more than one metal material of copper, nickel, and cobalt within the claimed ranges for each and which produces a dissolution rate of 75 mg/cm²-hr in 3 wt. % KCl water mixture at 90 °C.

35. Although the disclosure discusses many times that more than one additive metal of copper, nickel, or cobalt can be used as the additive in the magnesium composite, the disclosure only provides for the dissolution rate of greater than 75 mg/cm²-hr in 3 wt. % KCl water mixture at 90 °C when nickel is used in Examples 1 and 3. ‘653 patent column 17 lines 30-60.

36. Furthermore, the use of copper results in a lower dissolution rate than 75

mg/cm^2-hr in 3 wt. % KCl water mixture at 90 °C in Example 5. '653 patent col. 18 lines 8-27.

37. Because the nickel produces a dissolution rate above the claimed dissolution rate and copper produces a dissolution rate below the claimed dissolution rate, in my opinion the reference does not provide clear suggestion as to what would happen *if the two additives were combined* because the inclusion of copper or cobalt could result in the lowering of the dissolution rate vis-à-vis the composite when only nickel is used.

38. Moreover, with the disclosure of the copper additive producing a dissolution rate below the $75 mg/cm^2-hr$ in 3 wt. % KCl water mixture at 90 °C, and no discussion of the impact that cobalt would have on the dissolution rate, the '653 reference cannot be considered to disclose an embodiment where the multiple additives are copper and cobalt being within the range of weight percentage values claimed, and which produces a dissolution rate of at least $75 mg/cm^2-hr$ in 3 wt. % KCl water mixture at 90 °C.

39. Therefore, it is my opinion that the '653 patent does not provide disclosure to support the use of more than one of the additives of copper, nickel, and cobalt and

which are each provided within their claimed concentration ranges to produces a dissolution rate of at least $75 \text{ mg/cm}^2\text{-hr}$ in 3 wt. % KCl water mixture at 90 °C.

40. In claim 19, the concentration weight percentages for copper, nickel, and cobalt are recited as being “at least 0.01 wt %...”

41. I have carefully reviewed the disclosure of the ‘653 patent. The upper range boundary disclosed for copper is 35 weight %. ‘653 patent col. 5 line 16. The upper range for nickel is 35 weight %. ‘653 patent col. 4 lines 58. And the upper range boundary for cobalt is 20 weight %. See ‘653 col. 5 line 41.

42. Further, the disclosure of the ‘653 patent discusses a more generic embodiment using secondary metal where the secondary metal may be copper, nickel, cobalt, titanium, silicon, or iron). See ‘653 patent col. 6 lines 15-20 and col. 8 lines 25-30. However, even here the secondary metal is disclosed as being below 35 weight %. See ‘653 patent col. 6 line 16.

43. The ‘653 patent does not disclose any values above 35 weight % for the copper, nickel, or cobalt.

44. So in my opinion, to the extent that claim 19 covers embodiments of a magnesium composite where the copper, nickel, or cobalt are present in amounts over 35 weight %, these embodiments are not disclosed in the disclosure of the '653 patent.

VII. DOUD '838 (EX1005) DISCLOSES ALL REQUIRED FEATURES OF CLAIMS 1-81 OF THE '740 PATENT

45. I have carefully reviewed the '740 patent including claims 1-81.

46. I have also carefully reviewed the disclosure of the Doud '838 reference.

47. Regarding Doud '838, [0005],[0006], [0012]-[0015], [0019]-[0022], [0045], [0046], and [0047] disclose a dissolvable magnesium alloy composite which includes additives of copper, nickel, or cobalt. The additives form particles or precipitates in situ. The composite is formed into a tool for well drilling. The dissolvable magnesium alloy composite provides 90% magnesium in the magnesium alloy. The concentration of copper is provided at 10 by weight, the concentration of nickel is provided at 1 or 7% by weight, and the cobalt is provided at 0.05-20% by weight. Further secondary metal is provided between 0.05-35 weight %, where

secondary metal may be copper, nickel or cobalt. Various dissolution rates up to 325 mg/cm²-hr are disclosed.

48. Regarding '740 patent claim 1, I read this claim as requiring only one additive metal either with an electronegativity over 1.75 or below 1.25. But I do not read '740 patent claim 1 as requiring an additive from each group of additives.

49. In my opinion, Doud '838 discloses embodiments which fall within the scope of claims 1-81 of the '740 patent.

VIII. XU '185 (EX1007) DISCLOSES ALL REQUIRED FEATURES OF '740 PATENT CLAIMS 1-81

50. As stated above, I have carefully reviewed the '740 patent including claims 1-81.

51. I have carefully reviewed the disclosure of the Xu '185 reference.

52. Regarding Xu '185, [0028], [0031], [0033], [0036]-[0038], [0050], [0052], [0054], teaches a dissolvable magnesium alloy composite which includes additives of copper, nickel, or cobalt. The composite is formed into a tool for well drilling.

The dissolvable magnesium alloy composite provides for 70-90% magnesium, and variety of dissolution rates from 50-500 mg/cm²-hr. The additives of copper, nickel, or cobalt are present in the composite in amounts of between 0.5-10 wt %.

53. In my opinion in Xu '185 the various concentration ranges for the additive and the range amount of magnesium in the composite would suggest to a person having ordinary skill in the art that these ranges are the identified workable ranges for using the invention. Although some experimentation may be needed to tailor a composite for a specific application, there would be no reason for a person having ordinary skill to expect one region of a range to be more or less important than any other portion of the disclosed range. A person having skill in the art would have understood that the full portion of the range is disclosed by the reference, and where optimization for a particular application is needed this experimentation would be routine and without significant effort.

54. Further, in my careful consideration of the '740 patent and the reasons for allowance of it, I have concluded that there is nothing special about the narrower claimed ranges, claimed ranges that only overlaps a portion of the disclosed range in Xu '185, or specific claimed concentration values or dissolution rate values versus what is disclosed in the Xu '185 reference.

55. In my opinion, Xu ‘185 discloses embodiments which fall within the scope of the ‘740 patent claims 1-81.

IX. Xiao ‘271 (EX1006), EITHER INDIVIDUALLY OR IN COMBINATION WITH OTHER REFERENCES, DISCLOSES ALL REQUIRED FEATURES OF ‘740 PATENT CLAIM 1

56. As stated above, I have carefully reviewed the ‘740 patent including claims 1-81.

57. I have carefully reviewed the disclosure of the Xiao ‘271 reference and the Xu ‘185 reference.

58. In my opinion the 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 [0004].

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.

59. In my opinion, Xiao '271 teaches Embodiment/Example 4 which is of particular importance regarding present claim 1. In Example 4 a magnesium alloy is produced with 18% Al, 8% Zn, 2.5% Fe, 2.0% Ni, 5% Cu, 1% Ag, 0.3% Ti, 0.15% Zr, and remainder Mg. Xiao '271 [0047]. Further the preparation is by smelting in a furnace at a temperature of 715 °C. The additives are added and the temperature is increased to 750 °C whereupon the temperature is then lowered to 730 °C, followed by a refining agent being used in a degassing treatment. Then the temperature is lowered to 710 °C. The sample is then allowed to stand before being cast under inert atmosphere and cooled.

60. In my opinion, the specific additives and treatments in Example 4 will produce a magnesium alloy composite having intermetallic formers of nickel, copper, iron, or silver having electronegativities greater than 1.75.

61. Furthermore, as discussed above, in my opinion the scope of claim 1 does not require that there be an additive from each group of additives, only from one group of additives.

62. Therefore, it is my opinion that Xiao '271 discloses all of the features of the

‘740 patent claim 1.

63. However, regarding the electronegativities below 1.25 recited in the ‘740 patent claim 1, I have also considered Xu ‘185.

64. In my opinion, Xu ‘185 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.”

65. Therefore in my opinion, a person having ordinary skill in the art at the time claim 1 of ‘740 was effectively filed would have found reason in Xu ‘185 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.

66. Therefore, in my opinion a combination of the disclosures of Xiao ‘271 and Xu ‘185 would disclose all of the recited limitations required by claim 1.

**X. XIAO ‘271 (EX1006) IN COMBINATION WITH XU ‘185 (EX1007)
DISCLOSES ALL REQUIRED CLAIM FEATURES OF ‘740 PATENT
CLAIMS 2-7, 10, 13, 14, 16, 18, 19, 21, 29, 49-52, 58, 64, 76, AND 77**

67. As stated above, I have carefully reviewed the ‘740 patent including claims 1-81.

68. I have carefully reviewed the disclosure of the Xiao ‘271 reference and the Xu ‘185 reference.

69. My opinion of what the Xiao ‘271 reference discloses is summarized above. In my opinion the present independent claim 2 differs from the disclosure of the Xiao ‘271 reference because the Xiao ‘271 reference does not disclose a dissolution rate that falls within the claimed range of the dissolution rate above 75 mg/cm²-hr of ‘740 patent claim 2.

70. However, it is also my opinion that 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 [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].

71. In my opinion the disclosure in Xu '185 is indicative of the level of knowledge and skill in the art. I believe that a person having ordinary skill would have recognized that the additive amounts in Xiao '271 could be further adjusted from the ranges and values disclosed in Xiao '271 in order to achieve a higher dissolution rate above 75 mg/cm²-hr. The person having ordinary skill would seek to provide such a higher dissolution rate based on the design needs of the application of the dissolvable tool being formed by the magnesium composite.

72. In my opinion the combination of the disclosure of the Xiao '271 reference and the Xu '185 reference discloses all of the required features of claim 2.

73. Regarding claims 3-7, in my opinion based on the disclosures of Xiao '271 and

Xu '185, further variation to the additives to provide a desired dissolution rate 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.

74. Regarding claims 10-11, 13-14, 16, and 18, in my opinion the further claim features recited in these claims are disclosed in Xiao '271, especially in [0026] and [0062].

75. Regarding claim 19 of the '740 patent, My opinion of what the Xiao '271 reference discloses is summarized above. In my opinion the cited Xiao '271 reference differs from claim 19 by not disclosing that the plurality of particles of the in situ precipitate have a size of no more than 50 μm. 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.

76. In my opinion, Xu '185 is directed to a similar dissolvable magnesium alloy to the alloy of Xiao '271 and of present claim 19. In Xu '185 the additives precipitate particles are provided in 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].

77. In my opinion, Xu '185 is indicative of the level of knowledge and skill in the art. I believe a person having ordinary skill in the art would have recognized providing 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.

78. In my opinion the combination of Xiao '271 and Xu '185 disclose all of the required features of claim 19.

79. In my opinion Xiao '271 further discloses all of the required features of claims 21, 29, 49-52, 58, 64, 76, and 77 in [0026], [0062], and [0064].

80. Further, in my careful consideration of the '740 patent and the reasons for allowance of it (EX1015), I have concluded that there is nothing special about the narrower claimed ranges, claimed ranges that only overlaps a portion of the disclosed ranges in Xiao '271 and/or in Xu '185, or specific claimed concentration values or dissolution rate values versus what is disclosed in Xiao '271 or Xu '185.

XI. CONCLUSION

81. In my opinion, claims 1-81 of the '740 patent do not find disclosure of all of the recited features in the the '653 patent.

82. In my opinion the cited references of Doud '838 discloses all of the required features of claims 1-81 of the '740 patent.

83. In my opinion the cited reference of Xu '185 discloses all of the required features of claims 1-81 of the '740 patent. Where the ranges of the claims of the '740 patent overlap with those disclosed in Xu '185, fall within the ranges of Xu '185, or a specific value is claimed that is covered in Xu '185, it is my opinion that there is nothing special about the claimed ranges or values which would set them apart from what is disclosed in Xu '185.

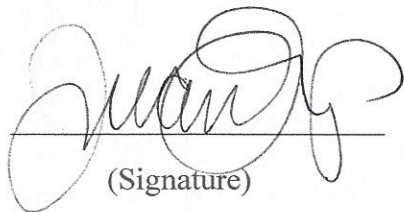
84. In my opinion Xiao '271 discloses all of the required features of the '740 patent claim 1.

85. Alternatively if '740 patent claim 1 requires an additive from each of the recited groups based on electronegativity, then my opinion is that the combination of disclosures between Xiao '271 and Xu '185 would disclose all of the required claim

features.

86. In my opinion Xiao '271 and Xu '185 disclose all of the required claim features of claims 2-7, 10, 11, 13, 14, 16, 18, 19, 21, 29, 49-52, 58, 64, 76, and 77. And Where the ranges of the claims of the '740 patent overlap with those disclosed in Xiao '271 or Xu '185, fall within the ranges of Xiao '271 Xu '185, or a specific value is claimed that is covered in Xiao '271 or Xu '185, it is my opinion that there is nothing special about the claimed ranges or values which would set them apart from what is disclosed in Xiao '271 or Xu '185.

87. I, **DR. JUAN C NAVA, PH.D.**, being warned that willful false statements and the like are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001, and that such willful false statements and the like may jeopardize the validity of the application or submission or any registration resulting therefrom, declares that all statements made of his/her own knowledge are true and all statements made on information and belief are believed to be true.


(Signature)

01/24/2023
Date