

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ENERGYSOURCE MINERALS, LLC,
Petitioner

v.

TERRALITHIUM LLC,
Patent Owner

IPR2019-01605
Patent 9,057,117 B2

Before HUBERT C. LORIN, JO-ANNE M. KOKOSKI, and
CHRISTOPHER G. PAULRAJ, *Administrative Patent Judges*.

KOKOSKI, *Administrative Patent Judge*.

DECISION
Denying Institution of *Inter Partes* Review
35 U.S.C. § 314

I. INTRODUCTION

EnergySource Minerals, LLC (“Petitioner”) filed a Petition to institute an *inter partes* review of claims 12–15 and 21 (“the challenged claims”) of U.S. Patent No. 9,057,117 B2 (“the ’117 patent,” Ex. 1001). Paper 1 (“Pet.”). TerraLithium LLC (“Patent Owner”) did not file a Preliminary Response.

Institution of an *inter partes* review is authorized by statute when “the information presented in the petition . . . and any response . . . shows that there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition.” 35 U.S.C. § 314 (2018); *see* 37 C.F.R. § 42.4 (2019). For the reasons discussed below, we deny the Petition and do not institute an *inter partes* review.

A. *Related Proceedings*

Petitioner states that it “is concurrently filing IPR petitions on U.S. Patent Nos. 8,152,232 and 9,238,851, along with 8,454,816 which is the continuation parent patent of the ’117 patent.” Pet. 1. These proceedings correspond to IPR2019-01606, IPR2019-01607, and IPR2019-01604, respectively. Patent Owner also identifies three additional *inter partes* review proceedings filed by Petitioner, directed to related U.S. Patent Nos. 9,051,827 (IPR2019-01601), 9,650,555 (IPR2019-01602), and 9,644,126 (IPR219-01603).

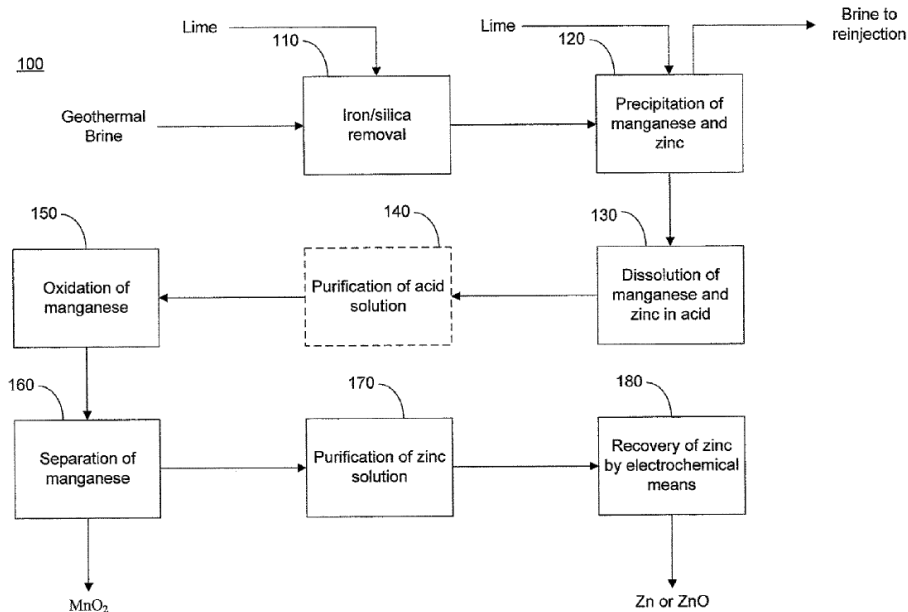
B. *The ’117 Patent*

The ’117 patent, titled “Selective Recovery of Manganese and Zinc from Geothermal Brines,” is directed to “methods for the selective removal and recovery of manganese and zinc [from] geothermal brines that include zinc and manganese, preferably without the simultaneous removal of other

ions from the brines.” Ex. 1001, code (54), 1:17–20. The ’117 patent explains that “geothermal brines provide a source of power due to the fact that hot geothermal pools are stored at high pressure underground,” and can produce flash-steam when released at atmospheric pressure that can be used to run a power plant. *Id.* at 1:23–27. Geothermal brines are also known to include various metals ions as well as a number of elements that can be recovered and used in secondary processes, particularly in the chemical, pharmaceutical, and electronics industries. *Id.* at 1:33–38. The presence of interfering ions such as silica increase the recovery costs, however, because additional steps are necessary to remove the interfering ions before the desired metals are recovered. *Id.* at 1:38–46.

According to the ’117 patent, conventional processing of ores and brines “can be used to recover a portion of the manganese and zinc present in geothermal brines,” but “there still exists a need to develop economic methods that are selective for the removal and recovery of manganese and zinc from the brines at high yield and high purity.” *Id.* at 1:54–59. The ’117 patent teaches that “‘brine’ or ‘brine solution’ refers to any aqueous solution that contains a substantial amount of dissolved metals, such as alkali and/or alkaline earth metal salt(s) in water, wherein the concentration of salts can vary from trace amounts up to the point of saturation.” *Id.* at 5:54–57. The ’117 patent states that such brines can be obtained from natural sources, such as geothermal brines, and from industrial sources, such as brines recovered from ore leaching or mineral dressing. *Id.* at 6:5–10.

Figure 1 of the ’117 patent, reproduced below, illustrates a process for the recovery of manganese and zinc from a geothermal brine according to one embodiment of the claimed invention:



Id. at 5:7–9. Manganese and zinc removal process 100, depicted in Figure 1, starts by removing silica and iron from the geothermal brine solution in iron/silica removal step 110. *Id.* at 6:12–14. In precipitation step 120, a base (such as calcium oxide or calcium hydroxide) “is added to the brine to adjust or maintain the pH of the brine at greater than or at least about 6.” *Id.* at 7:19–23. During this step, the brine solution is also exposed to an oxygen source (e.g., by sparging or bubbling air into the solution) to form manganese and zinc precipitates. *Id.* at 7:26–31. The solids in the mixture, which include at least manganese and zinc, are then separated from the mixture. *Id.* at 7:34–37. In step 130, the manganese and zinc solids are dissolved in an acid solution, which is then filtered to remove any remaining solids, and the solution may then be purified in optional purification step 140 to remove trace metals that may interfere with the subsequent separation of manganese and zinc. *Id.* at 7:44–46, 7:62–65.

“Manganese can then be isolated by electrolysis or, in step 150, by oxidation to produce manganese dioxide, or by precipitation as a carbonate by reaction with sodium carbonate.” *Id.* at 8:62–64. In step 160, precipitated manganese dioxide is separated from the zinc containing solution by filtration, centrifugation, or a like process. *Id.* at 9:4–7. The zinc containing solution may then be optionally purified in step 170 and supplied to an electrochemical cell for electrochemical recovery of zinc in step 180 by electrowinning. *Id.* at 9:36–39.

C. Challenged Claims

Petitioner challenges claims 12–15 and 21 of the ’117 patent. Pet. 3–4. Claims 12 and 21 are independent, and are reproduced below.

12. A method for recovering zinc and manganese from a brine, the method comprising the steps of:
providing a brine, said brine comprising manganese and zinc;
selectively removing silica and iron from the brine to produce a substantially silica free brine that includes manganese and zinc;
removing the zinc from the substantially silica free brine;
extracting the manganese from the substantially silica free brine;
oxidizing the manganese to produce a manganese dioxide precipitate; and
recovering the magnesium [sic] dioxide precipitate.

Ex. 1001, 20:9–21.

21. A method for recovering zinc and manganese from a brine, the method comprising the steps of:

providing a brine, said geothermal brine comprising manganese and zinc;

selectively removing silica and iron from the brine to produce a substantially silica free brine that includes manganese and zinc;

removing the zinc from the substantially silica free brine;

extracting manganese from the substantially silica free brine.

Id. at 20:61–21:3.

D. *The Prior Art*

Petitioner relies on the following prior art references.

Name	Reference	Ex. No.
Wilkins	U.S. Patent No. 4,016,075, issued Apr. 5, 1977	1008
Jost	U.S. Patent No. 4,405,463, issued Sept. 20, 1983	1007
Brown	U.S. Patent No. 5,358,700, issued Oct. 25, 1994	1010
Featherstone I	U.S. Patent No. 6,458,184 B2, issued Oct. 1, 2002	1011
Geisler	U.S. Patent No. 6,517,701 B1, issued Feb. 11, 2003	1009
Featherstone II	U.S. Patent App. Pub. No. 2003/0226761 A1, published Dec. 11, 2003	1012
Christopher	Christopher, The Recovery and Separation of Mineral Values from Geothermal Brines, Bureau of Mines OFR 81–75 (June 12, 1975)	1006
Maimoni	Maimoni, <i>A Cementation Process for Minerals Recovery from Salton Sea Geothermal Brines</i> , Lawrence Livermore Laboratory (Jan. 26, 1982)	1004

Name	Reference	Ex. No.
Bourcier	Bourcier et al., <i>Recovery of Minerals and Metals from Geothermal Fluids</i> , 2003 SME Annual Meeting (Feb. 24–26, 2003)	1005

E. Asserted Grounds

Petitioner challenges the patentability of claims 12–15 and 21 of the '117 patent on the following grounds:

Claims Challenged	35 U.S.C. §	Reference(s)/Basis
12–15, 21	102	Maimoni
12–15, 21	103	Maimoni, Applicant Admitted Prior Art (“AAPA”), Featherstone I, Featherstone II
12, 14, 15, 21	102	Bourcier
12, 14, 15, 21	103	Bourcier, AAPA, Featherstone I, Featherstone II
12–15, 21	102	Christopher
12–15, 21	103	Christopher, AAPA, Featherstone I, Featherstone II
12–15, 21	103	Maimoni, Bourcier, Christopher, Jost, Wilkins, Brown, Geisler, Featherstone I, Featherstone II

Petitioner relies on the Declaration of Darrell L. Gallup, Ph.D. (“the Gallup Declaration,” Ex. 1003) in support of its contentions.

II. ANALYSIS

A. Level of Ordinary Skill in the Art

Petitioner contends that a person having ordinary skill in the art (“POSITA”)

would have an undergraduate scientific or engineering degree in a relevant field (such as chemistry, chemical engineering or metallurgy), at least five years’ experience in aqueous solutions

that contains a substantial amount of dissolved metals, separation, extraction and filtration technologies, and/or related geothermal brine field and/or hydrometallurgy chemistries, or a graduate degree conferring similar experience, and an understanding of the relevant principles of chemistry and chemical engineering and hydrometallurgy technology.

Pet. 4 (citing Ex. 1003 ¶ 22). Petitioner also contends that “[t]he level of skill in the art is apparent from the cited art.” *Id.*

Petitioner’s proposed definition of a POSITA appears reasonable on the record before us, and we adopt that definition for our analysis in this Decision. Moreover, we see no reason why the level of ordinary skill in the art is not adequately reflected by the prior art of record. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001).

B. Claim Interpretation

We construe each claim “in accordance with the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent.” 37 C.F.R. § 42.100(b) (2019). Under this standard, claim terms are generally given their plain and ordinary meaning as would have been understood by a person of ordinary skill in the art at the time of the invention and in the context of the entire patent disclosure. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1313 (Fed. Cir. 2005) (en banc). Only those terms in controversy need to be construed, and only to the extent necessary to resolve the controversy. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999)).

Petitioner proposes constructions for the terms “brine,” “selectively removing silica and iron,” “substantially silica free brine,” “removing the

zinc,” and “extracting manganese,” as recited in claims 12 and 21, “oxidizing the manganese,” and “recovering the manganese dioxide precipitate” as recited in claim 12, and “providing iron (III)” as recited in claim 13. Pet. 7–24. Based on the record before us, for purposes of this Decision, we determine that no claim term requires explicit construction.

C. Anticipation by Maimoni

Petitioner contends that claims 12–15 and 21 are anticipated by Maimoni. Pet. 36–46. Petitioner relies on the Gallup Declaration in support of its contentions.

1. Overview of Maimoni

Maimoni examines “[t]he potential for minerals recovery from a 1000-Mwe combined geothermal power and minerals recovery plant in the Salton Sea.” Ex. 1004, 6.¹ Maimoni states that “[s]uch a power plant could recover 14–31% of the U.S. demand for manganese and substantial amounts of zinc and lead.” *Id.* According to Maimoni, the brines in the Salton Sea KGRA (Known Geothermal Resource Area) “are particularly interesting for combined energy and minerals recovery because of their high temperature, high salinity, and the fact that some processing would be required for brine reinjection regardless of mineral recovery.” *Id.*

Maimoni describes laboratory and pilot plant tests conducted by Hazen Research, Inc. (“Hazen”) in the Salton Sea. *Id.* Maimoni explains that Hazen’s laboratory studies “indicated that iron could be separated from manganese, zinc, and lead by precipitation of the” hydroxides using lime.

¹ Citations to Maimoni are to the page numbers added by Petitioner in the bottom-right corner of each page.

Id. at 14. According to Maimoni, “Hazen was able to obtain a hydrated magnetic iron oxide containing more than 68% iron and less than 0.1% manganese,” and “[t]he manganese precipitate contained 47.3% manganese, 18.2% zinc, and 2.6% lead with 0.6% lead contamination.” *Id.* Maimoni further states that Hazen’s “experiments also indicated that it would be advantageous to remove the silica present in the brine before precipitating the heavy metal hydroxides.” *Id.*

2. *Claims 12–15*

Petitioner contends that Maimoni discloses all of the elements of independent claim 12. Pet. 36–44. Petitioner concedes, however, that Maimoni does not teach “oxidizing the manganese to produce a manganese dioxide precipitate” or “recovering the manganese^[2] dioxide precipitate” as recited in claim 12. *Id.* at 42–44. To establish anticipation each and every element in a claim, arranged as recited in the claim, must be found in a single prior art reference. *Net MoneyIN, Inc. v. VeriSign, Inc.*, 545 F.3d 1359, 1369 (Fed. Cir. 2008); *Karsten Mfg. Corp. v. Cleveland Golf Co.*, 242 F.3d 1376, 1383 (Fed. Cir. 2001). Because Petitioner fails to allege that Maimoni discloses, expressly or inherently, “oxidizing the manganese to produce a manganese dioxide precipitate” or “recovering the manganese dioxide precipitate” as recited in claim 12, Petitioner has not established

² Claim 12 recites “recovering the *magnesium* dioxide” instead of “recovering the *manganese* dioxide.” Petitioner does not address this discrepancy. For purposes of this Decision, we analyze this limitation as presented by Petitioner, namely, that it recites “recovering the manganese dioxide.”

sufficiently that Maimoni discloses every limitation of independent claim 12, and claims 13–15 that depend directly therefrom.

Accordingly, we determine that Petitioner does not show a reasonable likelihood of prevailing on its assertion that Maimoni anticipates claims 12–15 of the ’117 patent.

3. *Claim 21*

Petitioner contends that Maimoni discloses all of the limitations of independent claim 21. Pet. 36–42. More particularly, Petitioner argues that Maimoni discloses each limitation as follows:

Preamble: “A method for recovering zinc and manganese from a brine, the method comprising the steps of:” (Pet. 36–37 (relying on Ex. 1004, 15–17));

Element 21.1: “providing a brine, said geothermal brine comprising manganese and zinc;” (Pet. 37 (relying on Ex. 1004, 16));

Element 21.2: “selectively removing silica and iron from the brine to produce a substantially silica free brine that includes manganese and zinc;” (Pet. 38–39 (relying on Ex. 1004, 14, 16; Ex. 1003 ¶¶ 284–285, 292–296));

Element 21.3: “removing zinc from the substantially silica free brine;” (Pet. 39–40 (relying on Ex. 1004, 16–17; Ex. 1003 ¶ 299));

Element 21.4: “extracting manganese from the substantially silica free brine. (Pet. 41 (relying on Ex. 1004, 16–17; Ex. 1003 ¶ 301).

Having reviewed Petitioner’s contentions regarding independent claim 21, as well as the cited portions of Maimoni and the Gallup Declaration, we determine that Petitioner has demonstrated a reasonable likelihood of establishing that independent claim 21 is anticipated by Maimoni.

D. Obviousness over Maimoni, AAPA, Featherstone I, and Featherstone II

Petitioner contends that the subject matter of claims 12–15 and 21 would have been unpatentable over Maimoni in view of AAPA and/or Featherstone I and/or Featherstone II. Pet. 36–46. Petitioner relies on the Gallup Declaration in support of its contentions. *Id.*

1. Overview of Featherstone I

Featherstone I is directed to the recovery of zinc from geothermal brines. Ex. 1011, 1:11:13. Featherstone I describes a process where “brine is passed over an ion exchange (IX) resin which binds zinc, wherein the resin has been pre-equilibrated with a solution containing a reducing agent.” *Id.* at 2:14–16. The loaded resin is then washed with a hot aqueous acidic salt wash, and eluted with an aqueous acidic solution containing a reducing agent. *Id.* at 2:17–19. Metals deleterious to downstream processes, such as iron, arsenic, and lead, are removed from the zinc-rich eluate by oxidation and solids removal. *Id.* at 2:19–21. Zinc is then extracted from the eluate using a solvent extraction (SX) process that utilizes a water immiscible cationic extractant (SX extractant). *Id.* at 2:22–24. The zinc-depleted aqueous phase is then removed, after which the zinc-loaded SX extractant is scrubbed with a dilute acidic solution, washed with reverse osmosis water, and stripped with a sulfuric acid solution. *Id.* at 2:24–27. Finally, the “sulfuric acid/zinc solution is separated from the stripped SX extractant and is used for electrowinning of zinc.” *Id.* at 2:27–29.

2. Overview of Featherstone II

Featherstone II is directed to a method of producing electrolytic manganese dioxide (EMD) from geothermal brines. Ex. 1012, code (57).

Featherstone II teaches that the process may be used to extract manganese from aqueous brine solutions that also may contain iron, or calcium and/or zinc in addition to iron. *Id.* ¶ 20. Featherstone II's process includes extracting manganese and iron from the brine solution by contacting the brine solution with a QL reagent that comprises a quaternary ammonium compound, a hydrogen ion exchange reagent, and an organic solvent, such that an organic phase containing manganese and iron and an aqueous phase are formed. *Id.* ¶ 22. Manganese and iron are then stripped from the organic phase by contacting the organic phase with acid such that the manganese and iron shift to the aqueous phase. *Id.* Iron is subsequently removed from the aqueous phase by oxidation, resulting in iron precipitates and a supernatant containing the manganese. *Id.* Finally, manganese is extracted by electrowinning the supernatant, such that electrolytic manganese dioxide deposits on the anode. *Id.*

3. *Claims 12–15*

Petitioner contends that Maimoni discloses all of the limitations of independent claim 12 except “oxidizing the manganese to produce a manganese dioxide precipitate” and “recovering the manganese dioxide precipitate.” Pet. 36–44.

Specifically, Petitioner contends that “[e]ven though *Maimoni* does not teach ‘oxidizing the manganese to produce a manganese dioxide precipitate’, it would have been obvious to combine *Maimoni* and *Featherstone II*.” Pet. 42 (citing Ex. 1003 ¶374). Petitioner contends that:

Featherstone II was admitted as prior art in the specification of the '117 patent, and discloses a “process for producing electrolytic manganese dioxide from geothermal brines.” Manganese and iron are extracted from the geothermal

brine solution using solvent extraction, and then stripped with an acid. The iron is then oxidized, and iron precipitates leaving a supernatant containing manganese. The supernatant containing manganese is then oxidized in an electrowinning cell such that electrolytic manganese dioxide is precipitated therefrom onto the anode of the electrolysis cell.

During electrowinning, manganese dioxide is deposited in the form of a dense precipitate layer at the anode. “The final manganese product is preferably comprised of at least 99% pure manganese dioxide.”

Id. at 42–43 (internal citations omitted).

With respect to “recovering the manganese dioxide precipitate,” Petitioner contends that the ’117 patent admits that “manganese dioxide precipitates can be separated and recovered by filtration and ‘**other known means**’,” and, therefore, “methods of recovery of solid manganese dioxide are prior art to the invention of the ’117 patent.” Pet. 43 (citing Ex. 1001, 9:1–3, 10:45–46, 12:41–44, 13:10–12). Petitioner further contends:

Even though *Maimoni* does not teach this step, *Featherstone II* clearly does.

Featherstone II discloses that “[f]ollowing the electrowinning step, the manganese dioxide product deposited on the anode is optionally finished to produce a commercial product. ... The manganese dioxide may then be removed using mechanical forces such as agitation, flexing, scraping, etc. Finally, the manganese dioxide may be ground, milled and neutralized using known methods.”

Pet. 44 (internal citations omitted).

Petitioner argues that “it was widely known during mineral recovery operations to remove zinc, extract manganese from the clarified brine and then further refine the extracted manganese to electrolytic manganese dioxide.” Pet. 35. According to Petitioner, the removal methods in

Maimoni “provide a clarified brine that is substantially free of silica and iron, which is suitable for use with the mineral extraction methods in” Maimoni (precipitation), Featherstone I (ion exchange and solvent extraction), and Featherstone II (solvent extraction). *Id.* at 35–36. Petitioner also argues that “[e]ach prior art reference is from the same field of endeavor as that of the ’117 patent, *i.e.*, the processing of geothermal brines for the production of power and/or the recovery of minerals,” and “relates to the fundamental object of the Challenged Claims, *i.e.*, to limit iron silicate scaling caused by the processing of geothermal brines and to remove the resulting precipitated iron-silica complexes, with the resulting clarified brine being processed for mineral recovery.” *Id.* at 24.

To support a showing of obviousness, there has to be articulated reasoning with rational underpinning to support a motivation to combine prior art teachings, and the analysis should be explicit. *KSR Int’l Co. v. Teleflex, Inc.*, 550 U.S. 398, 418 (2007) (citing *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006) (“[R]ejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with rational underpinning to support the legal conclusion of obviousness.”)). Petitioner, however, does not explain adequately why a person of ordinary skill in the art would have attempted to improve Maimoni by looking to Featherstone II (or any of the other cited references). The question of whether the prior art references are in the same field of endeavor is merely the jumping-off point in the determination of whether a claimed invention is obvious. *See K-Tec, Inc. v. Vita-Mix, Corp.*, 696 F.3d 1364, 1375 (Fed. Cir. 2012) (to qualify as prior art in an obviousness analysis, references must be analogous art—either in the same

field of endeavor, or reasonably pertinent to the problem with which the inventor is involved). Even assuming the references are analogous art, it is still necessary to show that it would have been obvious to a person having ordinary skill in the art to select and combine the teachings of those references.

Here, Petitioner merely contends that each element of claim 12 of the '117 patent was known in the prior art, but does not identify any particular motivation to combine those individual elements in the manner required by the claims. That is insufficient to establish that claim 12 would have been unpatentable under a theory of obviousness based on the asserted combination. *See Cheese Sys. Inc. v. Tetra Pak Cheese and Powder Sys., Inc.*, 725 F.3d 1341, 1352 (Fed. Cir. 2013) (“Obviousness cannot be based on the hindsight combination of components selectively culled from the prior art to fit the parameters of the patented invention.” (internal quotation marks omitted)). As explained in *KSR*, “a patent composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art.” *KSR*, 550 U.S. at 418.

Based on our review of the record, we find that there is insufficient explanation supported by record evidence as to why a person having ordinary skill in the art would have combined Maimoni, AAPA, Featherstone I, and Featherstone II as proposed by Petitioner. For example, Petitioner does not provide any reason why a person of ordinary skill in the art would have been motivated to “oxidiz[e] the manganese to produce a manganese dioxide precipitate” in Maimoni’s process based on the teachings of Featherstone II. Likewise, Petitioner does not provide any motivation to recover any manganese dioxide precipitate in Maimomi’s process based on

the statements in the '117 patent that such recovery was known in the prior art. Accordingly, we determine that the Petition does not establish a reasonable likelihood that Petitioner would prevail in showing that claim 12 would have been obvious over Maimoni in view of AAPA and/or Featherstone I and/or Featherstone II.

Claims 13–15 directly depend from claim 12. For the same reasons discussed above with respect to independent claim 12, Petitioner also has not established a reasonable likelihood that it would prevail in showing that dependent claims 13–15 would have been obvious over Maimoni in view of AAPA and/or Featherstone I and/or Featherstone II.

4. *Claim 21*

Petitioner contends that Maimoni discloses all of the limitations of independent claim 21. Pet. 36–42. While we are mindful that, although “novelty under 35 U.S.C. § 102 and nonobviousness under 35 U.S.C. § 103 are separate conditions for patentability,” “anticipation is the ‘epitome of obviousness.’” *Cohesive Techs., Inc. v. Waters Corp.*, 543 F.3d 1351, 1363 (Fed. Cir. 2008) (quoting *In re Kalm*, 378 F.2d 959, 962 (CCPA 1967)). Having already determined that Petitioner has established a reasonable likelihood of prevailing in showing that claim 21 is anticipated by Maimoni, we determine that Petitioner has established a reasonable likelihood of success in showing the obviousness of claim 21 over Maimoni.

E. *Anticipation by Bourcier*

Petitioner contends that claims 12, 14, 15 and 21 are anticipated by Bourcier. Pet. 47–52. Petitioner relies on the Gallup Declaration in support of its contentions. *Id.*

1. Overview of Bourcier

Bourcier “reports on previous and current research aimed at developing technologies for resource extraction from geothermal fluids, and provides a summary of the targeted mineral by-products, their potential value, and extraction methods being considered.” Ex. 1005, 4.³ Bourcier explains that heat extracted from geothermal fluids is used to generate power, and that “mineral extraction may allow further energy extraction that, without treatment, would be uneconomic due to scale formation.” *Id.* In particular, Bourcier teaches that “[s]ilica is an ubiquitous component of geothermal fluids and must be removed or reduced in concentration to allow other components to be removed” because it “tends to precipitate and form scales on various plant components or in reinjection wells,” and “will also tend to precipitate on mineral extraction processing equipment if not removed prior to mineral co-production.” *Id.* at 6.

Bourcier describes a process of mineral extraction from Salton Sea geothermal fluids used by CalEnergy Minerals (“CalEnergy”) to mine the fluids for their zinc content. *Id.* at 11–13. Specifically, the spent brine (downstream from the steam separation and energy extraction process) “is passed over an anionic ion exchange bed (IX) to extract the zinc present in the fluid primarily as anionic ZnCl_4^{2-} .” *Id.* at 11. The resin is eluted with an acidic solution that contains a reducing agent, zinc is “extracted from the eluate in a solvent extraction process (SX) utilizing a water immiscible cationic extractant,” and, after removal of the zinc-depleted aqueous phase,

³ Citations to Bourcier are to the page numbers added by Petitioner in the bottom right-hand corner.

the zinc-loaded SX extractant is stripped with a sulfuric acid solution. *Id.* at 11–12. “After separation of the SX extractant, the zinc sulfate solution undergoes electrowinning to produce metallic zinc.” *Id.* at 12. Bourcier notes that iron, arsenic, and lead are also extracted during the process, and are subsequently removed by oxidation followed by solids removal. *Id.* at 11.

Bourcier explains that “[s]ilica must be removed from the fluid for the zinc extraction process to be successful.” *Id.* at 12. Bourcier further explains that “CalEnergy has investigated methods for extracting manganese from their brines,” with the targeted by-product being electrolytic manganese dioxide. *Id.* at 13. Bourcier reports that “[p]reliminary work shows that a solvent extraction method utilizing diethylhexyl phosphoric acid and a quaternary amine shows good selectivity for manganese over other metals present in the brine.” *Id.*

2. *Claims 12, 14, and 15*

Petitioner contends that Bourcier discloses all of the limitations of independent claim 12. Pet. 47–51. In particular, Petitioner contends that Bourcier discloses “oxidizing the manganese to produce a manganese dioxide precipitate” and “recovering the manganese dioxide precipitate” because it discloses extracting manganese from the brine to produce electrolytic manganese dioxide for use in batteries. *Id.* at 50–51 (citing Ex. 1005, 11).

We disagree with Petitioner that Bourcier discloses either of these limitations. Bourcier states that “CalEnergy has investigated methods for extracting manganese from their brines,” and that “[t]he targeted by-product is electrolytic manganese dioxide for use in batteries.” Ex. 1005, 13.

Bourcier goes on to state that “[p]reliminary work shows that a solvent extraction method utilizing diethylhexyl phosphoric acid and a quaternary amine shows good selectivity for manganese over other metals in the brine,” but that “[m]ore work on manganese extraction is anticipated subsequent to successful full-scale zinc extraction.” *Id.* These statements in Bourcier establish that (1) methods for extracting manganese from brines have been investigated, (2) the extracted manganese is useful for use in batteries, and (3) more work is anticipated. Petitioner does not explain sufficiently why a person of ordinary skill would have understood these statements in Bourcier to be disclosing “oxidizing the manganese to produce a manganese dioxide precipitate” and “recovering the manganese dioxide precipitate” as required by claim 12.

Because Petitioner fails to demonstrate that Bourcier discloses, expressly or inherently, “oxidizing the manganese to produce a manganese dioxide precipitate” or “recovering the manganese dioxide precipitate” as recited in claim 12, Petitioner has not established sufficiently that Bourcier discloses every limitation of independent claim 12, and claims 14 and 15 that depend directly therefrom. Accordingly, we determine that Petitioner does not show a reasonable likelihood of prevailing on its assertion that Bourcier anticipates claims 12, 14, and 15 of the ’117 patent.

3. *Claim 21*

Petitioner contends that Bourcier discloses all of the limitations of independent claim 21. Pet. 47–50. More particularly, Petitioner argues that Bourcier discloses each limitation as follows:

Preamble: “A method for recovering zinc and manganese from a brine, the method comprising the steps of:” (Pet. 47 (relying on Ex. 1005, 3));

Element 21.1: “providing a brine, said geothermal brine comprising manganese and zinc;” (Pet. 47–48 (relying on Ex. 1005, 3, 11–13));

Element 21.2: “selectively removing silica and iron from the brine to produce a substantially silica free brine that includes manganese and zinc;” (Pet. 48 (relying on Ex. 1005, 8, 12; Ex. 1003 ¶ 308));

Element 21.3: “removing the zinc from the substantially silica free brine;” (Pet. 49 (relying on Ex. 1005, 4, 11–12; Ex. 1003 ¶ 311));

Element 21.4: “extracting manganese from the substantially silica free brine.” (Pet. 49–50 (relying on Ex. 1005, 13; Ex. 1003 ¶ 312)).

Having reviewed Petitioner’s contentions regarding independent claim 21, as well as the cited portions of Bourcier and the Gallup Declaration, we determine that Petitioner has demonstrated a reasonable likelihood of establishing that independent claim 21 is anticipated by Bourcier.

F. Obviousness over Bourcier, AAPA, Featherstone I, and Featherstone II

Petitioner contends that the subject matter of claims 12, 14, 15, and 21 would have been unpatentable over Bourcier in view of AAPA and/or Featherstone I and/or Featherstone II. Pet. 47–52. Petitioner relies on the Gallup Declaration in support of its contentions. *Id.*

1. Claims 12, 14, and 15

Petitioner contends that Bourcier discloses all of the limitations of independent claim 12, and argues that, to the extent that Bourcier does not

teach the “oxidizing the manganese to produce a manganese dioxide precipitate” and “recovering the manganese dioxide precipitate” limitations of claim 12, Featherstone II does. Pet. 47–51.

Specifically, Petitioner argues that

To the extent that *Bourcier* is interpreted to not teach “oxidizing the manganese to produce a manganese dioxide precipitate”, it would have been obvious to combine *Bourcier* and *Featherstone II*.

In addition to *Bourcier*’s disclosure that electrolytic manganese is the targeted by-product, *Featherstone II* clearly discloses oxidizing the manganese that has been extracted from a brine to produce manganese dioxide at the anode of an electrolysis cell.

Pet. 50 (internal citations omitted). With respect to “recovering the manganese dioxide precipitate,” Petitioner further argues that:

To the extent that *Bourcier* is interpreted to not teach this step, it would have been obvious to combine *Bourcier* and *Featherstone II*.

Featherstone II discloses that “[f]ollowing the electrowinning step, the manganese dioxide product deposited on the anode is optionally finished to produce a commercial product. ... The manganese dioxide may then be removed using mechanical forces such as agitation, flexing, scraping, etc. Finally, the manganese dioxide may be ground, milled and neutralized using known methods.”

A POSITA would readily appreciate that manganese dioxide of *Bourcier* could have been recovered like *Featherstone II*.

Id. at 50–51 (internal citations omitted).

For the reasons set forth above with respect to Petitioner’s contention that *Bourcier* anticipates claim 12, we disagree with Petitioner that *Bourcier* discloses either of these limitations. Furthermore, although *Featherstone II*

does describe a method of producing electrolytic manganese dioxide from geothermal brines (Ex. 1012, code (57), ¶ 22), Petitioner does not establish adequately why a person of ordinary skill would have looked to Featherstone II to improve Bourcier. In that regard, Petitioner argues that a POSITA “would readily appreciate” that the method described in Featherstone II could be used to recover Bourcier’s manganese dioxide, but does not explain why that would be the case. Pet. 51 (citing Ex. 1003 ¶¶ 374–375). Petitioner cites to the Gallup Declaration to support this contention, but neither of the cited paragraphs even mention combining Bourcier with Featherstone II. *See* Ex. 1003 ¶¶ 374 (stating that it would have been obvious to combine Maimoni and/or Christopher with Geisler and/or Featherstone II), 375 (stating that zinc and manganese could be removed from the brine in Maimoni, Brown, Jost, and/or Wilkins using the methods of Maimoni, Bourcier, Christopher, Featherstone I, Featherstone II, Brown, and/or Geisler, and that manganese dioxide precipitate can be produced and recovered using the method of Featherstone II and/or Geisler).

As was the case in the challenge based on Maimoni described above, Petitioner again merely contends that each element of claim 12 of the ’117 patent was known in the prior art. That is insufficient to establish that claim 12 would have been unpatentable under a theory of obviousness based on the asserted combination. *See KSR*, 550 U.S. at 418 (“[A] patent composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art.”); *Cheese Sys.*, 725 F.3d at 1352 (“Obviousness cannot be based on the hindsight combination of components selectively culled from the prior

art to fit the parameters of the patented invention.” (internal quotation marks omitted)).

For these reasons, we determine that Petitioner has not established sufficiently that the subject matter of claim 12, and claims 14 and 15 that depend directly therefrom, would have been unpatentable over Bourcier in view of AAPA and/or Featherstone I and/or Featherstone II.

2. *Claim 21*

Petitioner contends that Bourcier discloses all of the limitations of independent claim 21. Pet. 47–50. While we are mindful that, although “novelty under 35 U.S.C. § 102 and nonobviousness under 35 U.S.C. § 103 are separate conditions for patentability,” “anticipation is the ‘epitome of obviousness.’” *Cohesive Techs.*, 543 F.3d at 1363. Having already determined that Petitioner has established a reasonable likelihood of prevailing in showing that claim 21 is anticipated by Bourcier, we determine that Petitioner has established a reasonable likelihood of success in showing the obviousness of claim 21 over Bourcier.

G. *Anticipation by Christopher*

Petitioner contends that claims 12–15 and 21 are anticipated by Christopher. Pet. 52–60. Petitioner relies on the Gallup Declaration in support of its contentions. *Id.*

1. *Overview of Christopher*

Christopher describes a program of work sponsored by the United States Bureau of Mines and performed by Hazen “to determine methods of

recovery of mineral values from geothermal brines.” Ex. 1006, 7.⁴ Wellhead brine from “the Sinclair No. 4 well, Imperial Valley, California, was chosen for the study.” *Id.* Christopher states that “[t]he major heavy metal contaminants in Sinclair No. 4 brine are manganese, iron, zinc, and lead, which form insoluble hydroxides and precipitate from aqueous solutions . . . within the pH range 8.5–9.0.” *Id.* at 10 (internal citations omitted).

Christopher describes first selectively separating iron from the brine by precipitation of ferrous hydroxide, so that subsequent precipitation of manganese, lead, and zinc would provide a solid product that was low in iron and of greater commercial value. *Id.* at 16. The iron-free brine was then “agitated for three hours, with sufficient lime slurry added to establish and maintain a pH of 8.7,” after which analysis for manganese, zinc, lead, and iron was performed at intervals. *Id.* at 23.

2. *Claims 12–15*

Petitioner contends that Christopher discloses all of the elements of independent claim 12. Pet. 52–59. Petitioner concedes, however, that Christopher does not teach “oxidizing the manganese to produce a manganese dioxide precipitate” or “recovering the manganese dioxide precipitate” as recited in claim 12. *Id.* at 58–59. Because Petitioner fails to demonstrate that Christopher discloses, expressly or inherently, “oxidizing the manganese to produce a manganese dioxide precipitate” or “recovering the manganese dioxide precipitate” as recited in claim 12, Petitioner has not

⁴ Citations to Christopher are to the page numbers added by Petitioner in the bottom right-hand corner of the page.

established sufficiently that Christopher discloses every limitation of independent claim 12, and claims 13–15 that depend directly therefrom.

Accordingly, we determine that Petitioner does not show a reasonable likelihood of prevailing on its assertion that Christopher anticipates claims 12–15 of the '117 patent.

3. *Claim 21*

Petitioner contends that Christopher discloses all of the limitations of independent claim 21. Pet. 52–57. More particularly, Petitioner argues that Christopher discloses each limitation as follows:

Preamble: “A method for recovering zinc and manganese from a brine, the method comprising the steps of:” (Pet. 52–53 (relying on Ex. 1006, 6));

Element 21.1: “providing a brine, said geothermal brine comprising manganese and zinc;” (Pet. 53 (relying on Ex. 1006, 8, 12, 42));

Element 21.2: “selectively removing silica and iron from the brine to produce a substantially silica free brine that includes manganese and zinc;” (Pet. 53–55 (relying on Ex. 1006, 16–22, 42; Ex. 1003 ¶¶ 318, 326–329));

Element 21.3: “removing the zinc from the substantially silica free brine;” (Pet. 55–56 (relying on Ex. 1006, 6–26, 42; Ex. 1003 ¶ 331);

Element 21.4: “extracting manganese from the substantially silica free brine.” (Pet. 57 (relying on Ex. 1006, 6–26, 42; Ex. 1003 ¶ 335).

Having reviewed Petitioner’s contentions regarding independent claim 21, as well as the cited portions of Christopher and the Gallup Declaration, we determine that Petitioner has demonstrated a reasonable likelihood of establishing that independent claim 21 is anticipated by Christopher.

H. Obviousness over Christopher, AAPA, Featherstone I, and Featherstone II

Petitioner contends that the subject matter of claims 12–15 and 21 would have been unpatentable over Christopher in view of AAPA and/or Featherstone I and/or Featherstone II. Pet. 52–60. Petitioner relies on the Gallup Declaration in support of its contentions. *Id.*

1. Claims 12–15

Petitioner contends that Christopher discloses all of the limitations of independent claim 12 except “oxidizing the manganese to produce a manganese dioxide precipitate” and “recovering the manganese dioxide precipitate.” Pet. 52–59.

Specifically, Petitioner argues that “[e]ven though *Christopher* does not teach ‘oxidizing the manganese to produce a manganese dioxide precipitate’, it would have been obvious to combine *Christopher* and *Featherstone II*.” Pet. 58 (citing Ex. 1003 ¶¶ 374–375). Petitioner similarly argues that “[e]ven though *Christopher* does not teach” the step of “recovering the manganese dioxide precipitate,” “*Featherstone II* clearly does.” *Id.* at 59 (citing Ex. 1003 ¶ 347). Petitioner makes the same arguments and relies on the same disclosures in Featherstone II here as it does for these limitations in its challenge based on Maimoni. *Compare id.* at 58–59 *with id.* at 42–44. Thus, for the same reasons set forth above with respect to the challenge based on Maimoni (Section II.D.3, *supra*), we find that there is insufficient explanation supported by record evidence as to why a person having ordinary skill in the art would have combined Christopher, AAPA, Featherstone I, and Featherstone II as proposed by Petitioner. Accordingly, we determine that the Petition does not establish a reasonable

likelihood that Petitioner would prevail in showing that independent claim 12, and claims 13–15 that depend directly therefrom, would have been obvious over Christopher in view of AAPA and/or Featherstone I and/or Featherstone II.

2. *Claim 21*

Petitioner contends that Christopher discloses all of the limitations of independent claim 21. Pet. 52–57. While we are mindful that, although “novelty under 35 U.S.C. § 102 and nonobviousness under 35 U.S.C. § 103 are separate conditions for patentability,” “anticipation is the ‘epitome of obviousness.’” *Cohesive Techs.*, 543 F.3d at 1363. Having already determined that Petitioner has established a reasonable likelihood of prevailing in showing that claim 21 is anticipated by Christopher, we determine that Petitioner has established a reasonable likelihood of success in showing the obviousness of claim 21 over Christopher.

I. *Obviousness over Maimoni, Bourcier, Christopher, Jost, Wilkins, Brown, Geisler, Featherstone I, and Featherstone II*

Petitioner contends that claims 12–15 and 21 would have been obvious over Maimoni and/or Bourcier and/or Christopher in view of Jost and/or Wilkins and/or Brown, and in further view of Geisler and/or Featherstone I and/or Featherstone II. Pet. 61–75. Petitioner relies on the Gallup Declaration in support of its contentions. *Id.*

A petition for *inter partes* review must identify “with particularity, each claim challenged, the grounds on which the challenge to each claim is based, and the evidence that supports the grounds for the challenge to each claim.” 35 U.S.C. § 312(a)(3); *see also* 37 C.F.R. § 42.104(b) (specifying necessary elements of a petition). As the Federal Circuit has explained, “[i]n an IPR, the petitioner has the burden from the onset to show with

particularity why the patent it challenges is unpatentable.” *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016) (citing 35 U.S.C. § 312(a)(3)); *see also Intelligent Bio-Sys., Inc. v. Illumina Cambridge Ltd.*, 821 F.3d 1359, 1369 (Fed. Cir. 2016) (“It is of the utmost importance that petitioners in the IPR proceedings adhere to the requirement that the initial petition identify ‘with particularity’ the ‘evidence that supports the grounds for the challenge to each claim.’” (quoting 35 U.S.C. § 312(a)(3))). In that regard, the Consolidated Trial Practice Guide (Nov. 2019)⁵ advises that “parties should avoid submitting a repository of all the information that a judge could possibly consider, and instead focus on concise, well-organized, easy-to-follow arguments supported by readily identifiable evidence of record.” Consolidated Trial Practice Guide, 39.

The statutory requirement for particularity in a petition takes on heightened importance when considered in conjunction with the Board’s practice, in light of *SAS Inst. v. Iancu*, 138 S. Ct. 1348 (2018), to institute on all grounds asserted in a petition. *See Guidance of the Impact of SAS on AIA Trial Proceedings* (April 26, 2018) (explaining that “the PTAB will institute as to all claims or none” and “if the PTAB institutes a trial, the PTAB will institute on all challenges raised in the petition”). For example, where a petition contains voluminous or excessive grounds, Office guidance indicates “[t]he panel will evaluate the challenges and determine whether, in the interests of efficient administration of the Office and integrity of the patent system (*see* 35 U.S.C. § 316(b)), the entire petition should be denied

⁵ Available at:
<https://www.uspto.gov/sites/default/files/documents/tpgnov.pdf>

under 35 U.S.C. § 314(a).” *SAS Q&As*, Part D, Effect of *SAS* on future challenges that could be denied for statutory reasons (June 5, 2018).

Here, Petitioner’s assertion that claims 12–15 and 21 would have been obvious over Maimoni and/or Bourcier and/or Christopher in view of Jost and/or Wilkins and/or Brown, and in further view of Geisler and/or Featherstone I and/or Featherstone II suffers from a lack of particularity that results in voluminous and excessive grounds. Petitioner’s reliance on up to nine references connected by the conjunction “and/or” results in a multiplicity of grounds, none of which is presented with sufficient particularity. This “catch-all” ground attempts to require us to analyze whether each and every claim limitation is taught not only by each of Maimoni, Bourcier, and Christopher, but by each of these references in combination with each other or one or more of the other references asserted in the proceeding. In this way, Petitioner’s “catch-all” ground is not reasonably bounded in scope and is unduly burdensome for both the Board and Patent Owner to address.

Accordingly, we determine that the Petition fails to meet the particularity requirement of 35 U.S.C. § 312(a)(3) with regard to Petitioner’s assertion that claims 12–15 and 21 would have been obvious over Maimoni and/or Bourcier and/or Christopher in view of Jost and/or Wilkins and/or Brown, and in further view of Geisler and/or Featherstone I and/or Featherstone II, and we decline to institute an *inter partes* review on that ground.

III. CONCLUSION

“Office guidance issued on June 5, 2018 explains that the Board may consider the number of claims and grounds that meet the reasonable

likelihood standard when deciding whether to institute an *inter partes* review under 35 U.S.C. § 314(a).” *Chevron Oronite Co. LLC v. Infineum USA L.P.*, IPR2018-00923, Paper 9, 10–11 (PTAB Nov. 7, 2018) (citing *SAS Q&As*, part D) (informative). Petitioner establishes a reasonable likelihood of prevailing as to claim 21 on a small subset of what we have determined to be a voluminous and excessive number of asserted grounds, but does not demonstrate a reasonable likelihood of prevailing as to claims 12–15 on any of the asserted grounds.

Even when a petitioner demonstrates a reasonable likelihood of prevailing with respect to one or more claims, institution of review remains discretionary. *SAS*, 138 S. Ct. at 1355 (“§ 314(a) invests the Director with discretion on the question *whether* to institute review”); *Harmonic*, 815 F.3d at 1367 (“First of all, the PTO is permitted, but never compelled, to institute an IPR proceeding.” (citing 35 U.S.C. § 314(a))). On this record, instituting a trial with respect to the voluminous number of asserted grounds on all claims based on evidence and arguments directed to one challenged claim and six grounds is not an efficient use of the Board’s time and resources. Accordingly, we determine that, in the interests of efficient administration of the Office and integrity of the patent system and as a matter of procedural fairness to Patent Owner, the entire Petition should be denied, and we do not institute an *inter partes* review.

III. ORDER

In consideration of the foregoing, it is hereby
ORDERED that the Petition is *denied*.

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