

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ENERGYSOURCE MINERALS, LLC,
Petitioner,

v.

TERRALITHIUM LLC,
Patent Owner.

IPR2019-01603
Patent 9,644,126 B2

Before HUBERT C. LORIN, GRACE KARAFFA OBERMANN, and
CHRISTOPHER G. PAULRAJ, *Administrative Patent Judges*.

LORIN, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining No Challenged Claims Unpatentable
35 U.S.C. § 318(a)

I. INTRODUCTION

This is a Final Written Decision in an *inter partes* review challenging the patentability of claims 1–20 of U.S. Patent No. 9,644,126 B2 (Ex. 1001, “the ’126 patent”). We have jurisdiction under 35 U.S.C. § 6.

Petitioner has the burden of proving unpatentability of a claim by a preponderance of the evidence. 35 U.S.C. § 316(e). Having reviewed the arguments of the parties and the supporting evidence, we find that Petitioner has not demonstrated by a preponderance of the evidence that claims 1–20 are unpatentable.

A. Background

EnergySource Minerals, LLC (“Petitioner”) filed a Petition requesting *inter partes* review of claims 1–20 of the ’126 patent. Paper 1 (“Pet.”). TerraLithium LLC (“Patent Owner”) did not file a Preliminary Response to the Petition.

On March 17, 2020, we instituted an *inter partes* review, pursuant to 35 U.S.C. § 314(a). Specifically, we instituted an *inter partes* review of claims 1–20 on all asserted grounds of unpatentability. Paper 9 (“DI”).

After institution, Patent Owner filed a Patent Owner Response (Paper 14, “PO Resp.”); Petitioner filed a Reply (Paper 19, “Pet. Reply”); and Patent Owner filed a Sur-reply (Paper 23, “PO Sur-reply”).

On December 15, 2020, the parties presented arguments at oral hearing, the transcript of which is of record. Paper 30 (“Tr.”).

B. Related Proceedings

Petitioner indicates that it concurrently filed with the Petition in this case two other petitions for *inter partes* review of related U.S. Patent No. 9,650,555 and U.S. Patent No. 9,051,827. Pet. 1. These petitions correspond to IPR2019-01602 and IPR2019-01601, respectively.

According to Patent Owner:

On September 11, 2019, Petitioner filed *inter partes* reviews of related U.S. Patent No. 9,051,827 (IPR2019-01601) and U.S. Patent No. 9,650,555 (IPR2019-01602). On October 1, 2019, Petitioner filed *inter partes* reviews of related U.S. Patent No. 8,454,816 (IPR2019-01604), U.S. Patent No. 9,057,117 (IPR2019-01605), U.S. Patent No. 8,518,232 (IPR2019-01606), and U.S. Patent No. 9,238,851 (IPR2019-01607).

Paper 4, 1.

Trial has been instituted in IPR2019-01602. Institution was denied in IPR2019-01601; IPR2019-01604; IPR2019-01605; IPR2019-01606; and IPR2019-01607.

C. The '126 patent (Ex. 1001)

1. Disclosure

The '126 Patent “relates to treated brine compositions with reduced concentrations of silica, iron, and zinc” and “generally relates to treated brine compositions with reduced concentrations of silica, iron, and/or zinc that can also be used for recovery of other metals, including lithium, manganese, rubidium, cesium, and potassium.” Ex. 1001, code (54), 1:45–46, 1:50–54.

The '126 Patent describes treated geothermal brine compositions that contain “a treated geothermal brine having a concentration of silica ranging from 0 to 80 mg/kg and a concentration of iron ranging from 0 to 300 mg/kg.” Id. at 3:54–57. The '126 Patent discloses other embodiments in which “the treated geothermal brine composition has a concentration of zinc ranging from 0 to 300 mg/kg,” “the treated geothermal brine composition has a concentration of zinc less than about 100 mg/kg,” and “the treated geothermal brine composition has a concentration of zinc less than about 10 mg/kg, the concentration of silica less than about 10 mg/kg, and the

concentration of iron less than about 10 mg/kg.” Id. at 3:66–4:1, 4:4–6, 4:41–45. The ’126 Patent also describes the use of treated geothermal brines, such as for the extraction of minerals (e.g., lithium, manganese, potassium, rubidium, cesium, phosphates, zinc, lead, and other minerals and metals). Id. at 4:59–66, 16:46–50.

2. Claims

The ’126 patent has 20 claims, all of which Petitioner challenges.
Pet. 1.

Claims 1, 17, and 20 are the independent claims. Claims 2–16 depend from claim 1 and claims 18 and 19 depend from claim 17. All but claims 15, 16, 18, and 19 are directed to a “treated geothermal brine composition.” Claims 15 and 16, and 18 and 19 are directed to a “method of using” the composition of claims 1 and 17, respectively.

Independent claims 1, 17, and 20, reproduced below, are illustrative.

1. A treated geothermal brine composition, the composition comprising a treated geothermal brine having a concentration of zinc ranging from 0 to 300 mg/kg, a concentration of silica ranging from 0 to 80 mg/kg, and a concentration of iron ranging from 0 to 300 mg/kg, and comprising recoverable amounts of one or more metals selected from the group consisting of lithium, manganese, lead, rubidium, and cesium or mixtures thereof.

17. A treated geothermal brine composition, the composition comprising a treated geothermal brine having a concentration of zinc ranging from 0 to 100 mg/kg, a concentration of silica ranging from 0 to 30 mg/kg, and a concentration of iron ranging from 0 to 100 mg/kg, and said geothermal brine is a Salton Sea brine, and comprising recoverable amounts of one or more metals selected from the group consisting of lithium, manganese, lead, rubidium and cesium or mixtures thereof.

20. A treated geothermal brine composition, the composition comprising a treated geothermal brine having a concentration of

zinc less than 10 mg/kg, a concentration of silica less than 10 mg/kg, and a concentration of iron less than 10 mg/kg, and said geothermal brine is a Salton Sea brines, and comprising recoverable amounts of one or more metals selected from the group consisting of lithium, manganese, lead, rubidium and cesium or mixtures thereof.

Ex. 1001, 58:10–18, 60:4–12, 60:20–27. As can be seen, claims 15 and 17 include the limitation “and said geothermal brine is a Salton Sea brine” that claim 1 does not have. The independent claims recite different ranges for the concentrations of zinc, silica, and iron in the brine.

D. Asserted References

Petitioner relies on the following references:

Name	Reference	Ex. No.
Brown	U.S. Patent No. 5,358,700, issued Oct. 25, 1994	1005
Burrows	U.S. Patent Publication 2003/0026749 A1, published Feb. 6, 2003	1007
Christopher	D. H. Christopher, The Recovery and Separation of Mineral Values from Geothermal Brines, Bureau of Mines OFR 81-75 (Jun. 12, 1975)	1006
Maimoni	Arturo Maimoni, “A Cementation Process for Minerals Recovery from Salton Sea Geothermal Brines,” Lawrence Livermore Laboratory (Jan. 26, 1982)	1004
Wilkins	U.S. Patent No. 4,016,075, issued Apr. 5, 1977	1008

E. Grounds Asserted

Petitioner contends that claims 1–20 of the ’126 patent are unpatentable under the following grounds:

Claim(s) Challenged	35 U.S.C.	Reference(s)/Basis
1–20	§ 102	Christopher
1–20	§ 102 and/or § 103	Christopher
1–18	§ 103	Christopher, Brown, Burrows, Wilkins
1–20	§ 102	Maimoni
1–20	§ 102 and/or § 103	Maimoni
1–20	§ 103	Maimoni, Brown, Burrows, Wilkins, Christopher

Pet. 3–4.

Petitioner also relies on the Declaration of Darrell L. Gallup, Ph.D. (Ex. 1003; “Gallup Declaration”) as support for its patentability challenges.

Patent Owner relies on the Declaration of Stephen Harrison (Ex. 2002, “Harrison Declaration”) as support for its contentions in opposing the patentability challenges.

II. ANALYSIS

A. Level of Ordinary Skill in the Art

There is general agreement as to the level of ordinary skill in the art. *See* Pet. 4 (citing Ex. 1003, ¶ 22) and PO Resp. 3 (citing Ex. 2002, ¶¶ 1–18). Consistent therewith, we determine that one of ordinary skill in the art at the time of the invention would have had at least an undergraduate scientific or engineering degree in a relevant field (such as chemistry, chemical engineering or metallurgy) and at least five years’ experience in the hydrometallurgical industry.

B. Claim Construction

For petitions filed on or after November 13, 2018, “[claims] of a patent . . . shall be construed using the same claim construction standard that

would be used to construe the [claims] in a civil action under 35 U.S.C. § 282(b), including construing the [claims] in accordance with the ordinary and customary meaning of such claims as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent.” 37 C.F.R. § 42.100 (2019); *see also Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–14 (Fed. Cir. 2005) (en banc).

Petitioner proposes constructions for the claim terms “treated,” “geothermal brine,” and “treated geothermal brine” (Pet. 9–10); “Salton Sea brine” (*id.* at 10); and “concentration ranges including ‘0’ and ‘less than’” (*id.* at 11–12). Patent Owner responds to Petitioner’s proposed constructions and propose a construction for “parts per million” and “ppm”. PO Resp. 4–7. To the extent the meaning of any term requires discussion, we will provide it below in our analysis of the patentability challenges.

C. Anticipation – Christopher

Petitioner challenges claims 1–20 as anticipated under 35 U.S.C. § 102(b) by Christopher. Pet. 22–37.

1. Independent Claims 1, 17, and 20

a. “A treated geothermal brine composition . . . comprising a treated geothermal brine” (Claims 1, 17, and 20)

Petitioner argues that Christopher describes a “treated” geothermal brine because, inter alia, the silica concentration is reduced. Pet. 27–28 (citing inter alia Ex. 1006, 8–9). Table 1 of Christopher is reproduced below.

Table 1
Typical Composition of Sinclair No. 4 Brine

Element	ppm	Element	ppm	Element	ppm	Element	ppm
Ag	0.5	Ce	10	Mn	2000	Se	2.5
Al	0.6	Cu	0.5	Mo	10	Si	40
As	3.	F	10	Na	70,000	SO ₄	0.04
B	400	Fe	1200	Nb	0.1	Sr	600
Ba	200	Ga	0.5	NH ₄	650	Ta	6
Br	200	Ge	1.	Ni	0.5	Ti	2.5
Ca	35,000	I	0.5	P	0.5	V	0.3
Cd	0.9	K	19,000	Pb	100	Zn	500
Cl	190,000	Li	250	Rb	25	Zr	8
Cr	2	Mg	150	S	0.1		

Table 1 of Christopher showing analytical data for a typical composition of Sinclair No. 4 brine.

Ex. 1006, 8. Petitioner also relies on the statement located below, associated with Table 1, which reads: “[i]t will be noted that the silica content of the Sinclair No. 4 brine samples used averaged only 40 ppm, as contrasted to the normal value of 750 ppm obtained from fresh wellhead brine.” Pet. 27–28; Ex. 1006, 8.

Neither party disputes that Table 1 of Christopher describes an “aged” geothermal brine. PO Resp. 13–15 (citing Ex. 2002, ¶ 51, Ex. 2025, 217:2–6, Ex. 1006, 8–9). Pet. Reply 5 (“Christopher’s ‘aged’ brine”).

The question is whether Christopher’s “aged” brine is a “treated” brine as the claims call for. This requires us to construe the term “treated.”

In that regard, Petitioner proposes that the term “treated” be construed as defined in the ’126 patent. Pet. 9 (citing Ex. 1001, 8:8–14).

“[I]f the patentee has chosen to be his or her own lexicographer by clearly setting forth an explicit definition for a claim term,” then that definition of the term controls. *Johnson Worldwide Associates, Inc. v. Zebco Corp.*, 175 F.3d 985, 990 (Fed. Cir. 1999).

Here the ’126 patent provides an explicit definition for “treated”:

The term “treated” in reference to a brine (e.g., “treated brine” or “treated geothermal brine”) refers to brines that have been processed such that the concentration of at least one metal or elemental component has been reduced in the brine.

Ex. 1001, 8:8–14. We agree with Petitioner that this definition of “treated” controls.

Patent Owner proposes a more narrow meaning for “treated,” arguing that the ’126 patent describes a “treated” brine as having been flashed and then processed to remove iron. PO Resp. 4–6 (citing Ex. 2002, ¶ 35–39, Ex. 1001, 32:41–51).

The passage Patent Owner relies upon is an example treatment. PO Resp. 5–6 (discussing “Example 4”) (citing Ex. 1001, 32:41–54 (sic, 45:43–52, discussing “Example 4”). While the technique for producing “treated” geothermal brine per the example is consistent with the explicit definition for “treated,” it does not compel defining “treated” more narrowly. The definition for “treated” is already clear to one of ordinary skill in the art. Relying on said example would unnecessarily import a further limitation beyond what is required by the explicit definition set forth in the patent. This is improper. *Cf. E.I. du Pont de Nemours & Co. v. Phillips Petroleum Co.*, 849 F.2d 1430, 1433 (Fed. Cir. 1988) (“a limitation read into a claim from the specification wholly apart from any need to interpret what the patentee meant by particular words or phrases in the claim” is improper.)

We now turn to the question of whether the “treated” brine of the claims reads on Christopher’s “aged” brine within the meaning of the term “treated” as explicitly defined in the ’126 patent.

To meet the claims, the brine of Table 1 must “have been processed such that the concentration of at least one metal or elemental component has

been reduced in the brine.” Ex. 1001, 8:8–14. Since Christopher’s “aging” process reduces the silica concentration in the brine, and it is undisputed that silica is not a metal, Christopher’s “aging” process must reduce the concentration of at least one “elemental component” for the brine to meet the claims. PO Sur-reply 4; Ex. 1006, 8–9.

In that regard, Petitioner contends that Christopher’s “aging process resulted in a reduction in ‘at least one *elemental component*’ (*i.e., silica*).” Pet. Reply 5–6 (emphasis added). However, this is not buttressed with any evidence.

Petitioner has not presented any evidence showing Christopher’s “aging” process reduces “the concentration of at least one ... *elemental component*” to support its contention that Christopher’s brine of Table 1 is a “treated” brine as claimed.

Accordingly, on this record, Petitioner has not shown that the “treated” brine of the claims reads on Christopher’s “aged” brine by a preponderance of the evidence.

b. “said geothermal brine is a Salton Sea brine” (Claims 17 and 20)

We accept Petitioner’s contention, which is not opposed by Patent Owner and is supported adequately by objective evidence, that Christopher discloses brines obtained from wells in Imperial Valley, California, which are “Salton Sea” brines in accordance with the definition expressly provided for in the ’126 patent. Pet. 28 (citing Ex. 1003, ¶ 160–162), Ex. 1001, 8:5–7. *See generally* PO Resp. 6 and 10–24.

c. “having a concentration of zinc ranging from 0 to 300 mg/kg” (Claim 1); “having a concentration of zinc ranging from 0 to 100 mg/kg” (Claim 17); “having a concentration of zinc less than 10 mg/kg” (Claim 20).

Petitioner argues that “Christopher discloses treated geothermal brines having zinc concentrations of 0.004 g/L (3.4 mg/kg) in Table 3 and 5.0 ppm in Figure 20 [stream 3]. . . .,” which according to Petitioner are within the claimed ranges. Pet. 28, Ex. 1006, 12, 42. Table 3 and Fig. 20 are reproduced below.

<u>Table 3</u> Purification of Brine by Precipitation of Heavy Metal Hydroxides			
Element	Concentration		Washed and Dried Product Solid Wt, %
	Feed Brine g/l	Product Brine g/l	
Ba	0.223	0.207	0.002
Ca	34.6	36.6	12.4
Pb	0.139	<0.001	1.52
Li	0.255	0.261	0.06
Mg	0.150	0.0014	2.09
Mn	1.63	0.002	17.3
Fe	0.88	0.0053	11.0
Na	69	86	0.0088
Sr	0.710	0.719	0.009
K	19.1	18.7	0.007
Zn	0.497	0.004	6.03
SO ₄	0.042	<0.001	-
NH ₄	0.797	0.007	-

Table 3 of Christopher shows analytical data for feed and product brines and washed/dried solid product.

Ex. 1006, 12 (reproduced and annotated at Pet. 21).

Figure 20 of Christopher consists of a flowchart showing a process by which “Sinclair #4 Brine” feed passes through three precipitation units. After each unit, the flowchart states “Liquor” and a number is assigned to

each, from 2 to 4; the feed is assigned the number 1. At the bottom left of Figure 20 is this table:

LIQUOR	CONCENTRATION, PPM				
	Mn	Fe	Zn	Pb	Li
① FEED	2000	1810	805	120	
② IRON PRECIP. DISCH.	2000	20	780	110	
③ Mn PRECIP. DISCH.	<1.0	1.0	5.0	5.0	440
④ PRODUCT BRINE	<1.0	<1.0	<1.0	<1.0	4.6

Table in Figure 20 of Christopher showing analytical data for the feed and liquor brines.

Ex. 1006, 42 (reproduced and annotated at Pet. 23). It is this table in particular that Petitioner is referring to.

With respect to the concentration of zinc shown in Table 3, Petitioner contends that the reported 0.004 g/L equates to 3.4 mg/kg based on an alleged density of Salton Sea geothermal brines. *Id.*, fn. 3 (“mg/kg=(g/L*1000)/1.18kg/L due to the density of Salton Sea geothermal brines.”) (see also fn. 1).

Patent Owner argues that “a POSITA would need the density of the brine in order to make the conversion.” PO Resp. 16–17, citing Ex. 2002, ¶56; Ex. 2025, 335:24-336:2. Patent Owner takes issue with the density value in the footnote the Petitioner uses as the basis for converting 0.0004 g/L to 3.4 mg/kg. According to Patent Owner, said density “is unsupported by any reference or even by the testimony of Petitioner’s expert. (Ex. 2002, ¶57).” PO Resp. 17, referring to Pet. 28, fn. 3. According to Patent Owner, “[i]n his deposition, Dr. Gallup admitted that *he did not know the density* of a Sinclair No. 4 brine and based a value ‘close to 1.18’ on an assumption.” *Id.* (citing Ex. 2025, 337:5–9).

We agree with Patent Owner. To ascertain whether Table 3 describes zinc having a concentration in the range claimed, the 0.0004 g/L value must be converted to mg/kg and that entails knowing the density of the geothermal brine associated with Table 3. In that regard, “Christopher does not provide any density values that would allow a POSITA to make this calculation.” *Id.* The density value that Petitioner uses, i.e., 1.18kg/L, is unsupported by evidence.

Accordingly, the density of the geothermal brine associated with Table 3 is uncertain. Although it is possible that one of ordinary skill in the art might apply a density of 1.18kg/L, a case of inherency cannot resort to relying on possibilities and probabilities. *In re Olerich*, 666 F.2d 578, 581 (CCPA 1981).

For the foregoing reason, Table 3 insufficiently supports Petitioner’s contention that Christopher describes a brine having a concentration of zinc in the claimed range.

With respect to the concentration of zinc shown in Fig. 20, Patent Owner argues that it is unclear whether Christopher’s disclosure of “5 ppm” for zinc refers to ppm by volume or ppm by weight as the claims call for. PO Resp. 18–19. According to Patent Owner, “Dr. Gallup explained [that] ppm may be reported as ppm by weight or ppm by volume. (Ex. 2025, 119:16-25).” *Id.* at 18.

Because we are directed to no evidence contradicting it, we credit Dr. Gallup’s testimony that ppm can be reported by weight or by volume. Given this, one of ordinary skill in the art reading that iron is at a concentration of “5.0 ppm” for stream 3 in Figure 20 may understand it to refer to ppm by volume.

Accordingly, whether the “5.0 ppm” recited in Figure 20 refers to weight is uncertain. Although it is possible that one of ordinary skill in the art would understand it to mean ppm by weight, a case of inherency cannot resort to relying on possibilities and probabilities.

For the foregoing reason, Figure 20 insufficiently supports Petitioner’s contention that Christopher describes a brine having a concentration of iron in the claimed range.

We note that Patent Owner also appears to argue that Petitioner improperly combines Table 1 and Table 3. PO Resp. 17–18. However, Petitioner’s analysis does not rely on Table 1. Pet. 28.

Petitioner has not shown that Christopher describes a brine having zinc in a concentration in the claimed range by a preponderance of the evidence.

d. “a concentration of silica ranging from 0 to 80 mg/kg” (Claim 1); “a concentration of silica ranging from 0 to 30” (Claim 17); “a concentration of silica less than 10 mg/kg” (Claim 20)

Petitioner argues that Christopher describes a brine having a concentration of silica in the claimed range. Pet. 23–24, 27–30. Petitioner relies on Table 1, Table 3 and Figure 20 (all reproduced above). Pet. 23–24; Ex. 1006, 8, 12, 42.

With respect to Table 1, Petitioner contends that it shows silica at 40 ppm and that that is within the range claimed. Pet. 23, 27–28; Ex. 1006, 8.

Patent Owner argues that Table 1 reports the 40 ppm for “Si” but it is unclear that “Si” refers to “silica.” PO Resp. 13–15.

Petitioner argues that “Si” refers to silica because Christopher “reports silica (SiO₂), not once but twice” in the text immediately following Table 1. Pet. Reply 6; Ex. 1006, 8.

Patent Owner has the stronger argument.

It is true that “silica” is recited in the statement below Table 1. Pet. 23; PO Resp. 15. Ex. 1006, 8 (“silica content of the Sinclair No. 4 brine samples used averaged only 40 ppm”). But, as Patent Owner points out, “Dr. Gallup conceded [that] it is possible that Table 1 provides a silicon analysis and Christopher simply forgot to apply the conversion factor in his text below the table. (Ex. 2025, 183:1-19).” PO Resp. 15 (citing E. 2002, ¶ 53.

Petitioner responds by arguing, inter alia, that “Dr. Harrison was unable to challenge the reported 750 ppm silica value” in the statement below Table 1. Pet. Reply 6, citing Ex. 1011, 150:9–14. But that does not help narrow down what “Si” in Table 1 is referring to. Petitioner does not provide, for example, evidence that one of ordinary skill in the art reading Table 1 would have understood “Si” to mean silica.

Since Petitioner has not presented adequate evidence as to the understanding of one of ordinary skill in the art reading “Si” in Table 1, Table 1 insufficiently supports Petitioner’s contention that Christopher describes a brine having a concentration of silica in the claimed range.

With respect to Table 3 and Figure 20, Petitioner acknowledges that Table 3 and Figure 20 of Christopher have “no reported silica concentration.” Pet. 23–24; Ex. 1006, 42. Accordingly, Petitioner does not establish that the combined disclosures of Table 3 and Figure 20 indicate that Christopher expressly describes a brine having a concentration of silica in the claimed range.

Even though Table 3 and Figure 20 do not mention silica, Petitioner argues that Figure 20 shows Christopher’s process reducing the iron

concentration from 1810 ppm to 1.0 ppm or less and the silica concentration would necessarily reduce along with it. Pet. 28–30 (citing Ex. 1006, 42).

Petitioner relies on (a) statements and Examples 2, 7-9 from the '126 patent (Ex. 1001, 20:35–21:59, 42:31–50:51) and (b) ¶¶ 168–175 of Dr. Gallup's declaration (Ex. 1003) to show that Christopher's process necessarily reduces silica concentration as iron concentration reduces. Pet. 29–30.

Regarding (a), we agree with Patent Owner that, even if silica and iron co-precipitate there is no way to know whether the silica resulting therefrom would be at a concentration within the claimed range. PO Resp. 21 ("the process disclosed in the '126 patent . . . cannot support inherent anticipation of silica in the treated geothermal brine because *the starting level of silica in Christopher is unknown*. (Ex. 2002, ¶¶62-63). With greater starting silica content, a POSITA would expect greater silica content in the treated brine, which may or may not be within the claimed silica range.") As Patent Owner points out, "the concentration, pH, and reaction conditions will each contribute to the exact stoichiometry of silica and iron precipitation." *Id.* "[T]he silica content could actually increase as compared to the starting material." *Id.*

Accordingly, the statements and Examples from the '126 patent that Petitioner relies upon do not sufficiently support Petitioner's position that Christopher's process would necessarily reduce the concentration of silica in the brine to a level that is within the claimed range.

Regarding (b), Petitioner argues, inter alia, that by using Christopher's process, "iron precipitates quantitatively with silica, and a POSITA could tune the parameters of the process without undue experimentation to yield a treated geothermal brine free of silica, zinc and iron." Pet. 30. (citing Ex.

1003 ¶¶ 170–171). But the necessity to “tune” parameters in Christopher’s process to yield a brine free of silica undermines Petitioner’s argument that Christopher describes a process that necessarily yields silica at a concentration within the claimed range. Dr. Gallup supports the possibility rather than the inevitability that Christopher’s process yields a brine free of silica when he stated that “[i]n my opinion, a POSITA could easily tune the parameters of the process [of Christopher] to yield a treated geothermal brine free of silica, zinc and iron.” Ex. 1003, ¶ 171. PO Resp. 22. We understand from Dr. Gallup that a person of ordinary skill in the art “could [have] readily ‘tuned’” Christopher’s process to achieve a result as claimed, as Petitioner argues. Pet. Reply 7 (citing Ex. 1006, 8; Ex. 2025, 269:25–270:5). But that proves there is a difference between what Christopher describes and what is claimed, albeit the difference may be slight without the need for extensive tuning. Pet. Reply 9. “[D]ifferences between the prior art reference and a claimed invention, however slight, invoke the question of obviousness, not anticipation.” *Net MoneyIN, Inc. v. VeriSign, Inc.*, 545 F.3d 1359, 1371 (Fed. Cir. 2008).

Petitioner’s other arguments are similarly undermined. For example, Petitioner argues that according to Dr. Gallup there is a 1:1 correlation between silica and iron based on his experience. Pet. Reply 7–8. Yet the “exact molar correlation between silica and iron will vary based on temperature, pH, and agitation.” *Id.*

Accordingly, ¶¶ 150–157 of Dr. Gallup’s declaration also does not sufficiently support Petitioner’s position that Christopher’s process would necessarily reduce the concentration of silica in the brine.

Since Petitioner has not presented sufficient evidence showing Christopher’s process necessarily reduces the concentration of silica to

within the claimed range as it reduces the iron concentration from 1810 ppm to 1.0 ppm or less and since that is the basis for arguing that Table 3 and Figure 20 describe silica at a concentration within the claimed range, Table 3 and Figure 20 insufficiently support Petitioner's contention that Christopher describes a brine having a concentration of silica in the claimed range.

Finally, to the extent Petitioner looks to Table 1 to remedy Table 3 and Figure 20, it is unavailing. Pet. 23–24. As Patent Owner explains, “the iron content of the Feed Brine in Table 3 (746 ppm) is much lower than the brine in Table 1 (1200 ppm). [Ex. 2002, ¶ 58]. Other components in the Feed Brine are present in much greater concentrations than those indicated in Table 1. (*Id.*) ***They do not match up.***” PO Resp. 18. Ex. 1006, 8, 42. Patent Owner demonstrates this via a chart, reproduced in its Response, showing the brine of Table 1 and feed stream 1 of Figure 20 are different compositions. PO Resp. 19–20, citing Ex. 1006, 8, 42; Ex. 2002, ¶ 61 (in fn. 5).

Petitioner concedes as much. Pet. Reply 7 (“It is true that the brine concentrations ‘do not match up’ (POR, 18), nor would a POSITA expect the constituent concentrations of an averaged brine to ‘match’ the constituent concentrations of an actual geothermal brine sample. (EX 1011, 161:23–162:10).”).

Accordingly, we agree that “it is undisputable that the composition in Table 1 is a different composition from the Feed Brine in Table 3, and these streams are not combinable.” PO Resp. 18 (citing Ex. 2002, ¶ 58). One of ordinary skill in the art would have to resort to picking and choosing from disparate disclosures of brine compositions and even then it is not clear that one of ordinary skill in the art would necessarily reach a composition as claimed.

For the foregoing reasons, Petitioner has not shown that Christopher describes a brine having silica in a concentration in the claimed range by a preponderance of the evidence.

e. “a concentration of iron ranging from 0 to 300mg/kg” (Claims 1); “a concentration of iron ranging from 0 to 100mg/kg” (Claim 17); “a concentration of iron less than 10 mg/kg” (Claim 20)

Petitioner argues that “Christopher discloses treated geothermal brines having . . . iron concentrations of 0.0053 g/L (4.5 mg/kg) in Table 3 and/or 1.0 ppm in Figure 20”, which according to Petitioner are within the claimed ranges. Pet. 28; Ex. 1006, 12, 42.

Patent Owner’s arguments are the same as those raised in opposition to Petitioner’s argument that Table 3 and Figure 20 (stream 3) describe treated geothermal brines having zinc concentrations within the claimed ranges. PO Resp. 16–19.

For the reasons we have discussed in agreeing with Patent Owner with respect to the zinc limitation, we also agree with respect to the iron limitation. It is possible that one of ordinary skill in the art might apply a density of 1.18kg/L and, thereby, it is possible that the level of iron in the brine of Table 3 is 4.5 mg/kg as Petitioner argues. It is also possible that the “1.0 ppm” recited in Figure 20 refers to weight instead of volume. But a case of inherency cannot resort to relying on mere possibilities and probabilities. And so Petitioner has not shown that Christopher describes a brine necessarily having iron in the claimed concentration range by a preponderance of the evidence.

f. “and comprising recoverable amounts of one or more metals selected from the group consisting of lithium, manganese, lead, rubidium and cesium or mixtures thereof.” (Claims 1, 17, and 20)

We accept Petitioner’s contention, which is not opposed by Patent Owner and is supported adequately by objective evidence, that Christopher discloses brines with recoverable amounts of lithium. Pet. 26–27. *See generally* PO Resp. 10–23.

g. Conclusion

Because Petitioner has not shown that the “treated” brine of the claims reads on Christopher’s “aged” brine and not shown that Christopher describes a brine having zinc, silica, and iron in concentrations in the claimed ranges by a preponderance of the evidence, Petitioner has not shown that Christopher describes, expressly or inherently, the compositions of claims 1, 17, and 20.

2. Dependent Claims 2–16, 18, and 19

Having found that Petitioner does not prove by a preponderance of the evidence that independent claim 1, 17, and 20 are unpatentable based on anticipation by Christopher, we find that Petitioner has also failed to prove that any of the dependent claims are unpatentable on that same ground.

D. Anticipation/Obviousness – Christopher

This ground is lumped in with the anticipation ground. Pet. 27–30 (claim 1), 34–37 (claims 2–13, 17, and 20), and 39–40 (claims 16 and 19). We have already addressed the challenge to the patentability of the claims as being anticipated by Christopher, both expressly and inherently. As for the challenge based on obviousness, other than asserting it would have been obvious over Christopher, we are given little to go on. The insufficiency of the reasoning prevents us from doing a meaningful review. Consequently,

Petitioner does not prove by a preponderance of the evidence that independent claim 1, 17, and 20 are unpatentable based on obviousness over Christopher.

E. Obviousness – Christopher, Brown, Burrows, Wilkins

Petitioner challenges claims 1–20 as obvious under 35 U.S.C. § 103(a) over the combination of Christopher, Brown, Burrows, and/or Wilkins. Pet. 24, 31–43.

1. Independent Claims 1, 17, and 20

Petitioner does not explain how the combination of Christopher and Brown, Burrows, and/or Wilkins overcomes the deficiencies in Christopher identified earlier in addressing the anticipation ground; namely, that Christopher describes an “aged” brine rather than a “treated” brine and does not show a brine having zinc, silica, and iron in concentrations in the claimed ranges. *See generally* Pet. 24, 31–43

For that reason, Petitioner has not shown that the combination of Christopher and Brown, Burrows, and/or Wilkins renders obvious the composition of claims 1, 17, and 20 by a preponderance of the evidence.

That being said, the only aspects of claims 1, 17, and 20 that Petitioner discusses in the context of this obviousness ground are the silica limitations (claim 1, *see* Pet. 31–34; claims 17 and 20, *see* Pet. 38). Petitioner argues that a person of ordinary skill would have been motivated to combine Christopher with each of Brown, Burrows, and Wilkins, to “remove substantially all of silica”, “to further reduce the concentration of silica . . . to about 1 ppm,” and “to further reduce the concentration of silica . . . to about 10 ppm,” respectively. Pet. 31–32, 32, 33.

Petitioner’s case is deficient insofar as it fails to explain the differences between Christopher and the claims that necessitate reliance

upon Brown, Burrows, and Wilkins. Additionally, Petitioner provides no reasoning or explanation as to why one of ordinary skill in the art would have looked to Burrows and Wilkins to modify Christopher with an expectation of success. PO Resp. 38 and 40.

Patent Owner provides additional reasons that Petitioner's case for obviousness is deficient.

As for Burrows, Patent Owner argues that the brines of Christopher and Burrows are "completely different". PO Resp. 39. Patent Owner explains that Burrows' discloses a "raw brine with 8-12 ppm Si (17.25 to 25 ppm silica), compared to 750 ppm silica/silicon in Christopher. (Ex. 1007, ¶[0030], [0034] [see table, below "Raw Brine"]; Ex. 1006, ¶8)." *Id.* As the Patent Owner notes, "Burrows is dealing with a different brine having a much lower starting silica concentration." *Id.* Petitioner does not explain why one would have had an expectation of success in reaching a brine with silica in the claimed range given Christopher's starting brine has a much higher concentration of silica than the Burrow's process starts with. Pet. Reply 15–16. We agree with Patent Owner that "a POSITA would have no expectation of success because of the tremendously different silica levels between the two streams. (Ex. 2002, ¶99)." PO Resp. 39.

As for Wilkins, Patent Owner argues that it involves a process different than the one Christopher employs. Patent Owner explains that Wilkins involves adding ammonium hydroxide to a geothermal brine, while Christopher precipitates hydroxides from a brine using lime. PO Resp. 39–40 (citing Ex. 1008, Abstract, 1006, 10, 42). "Christopher does not use ammonium hydroxide, and Wilkins does not use lime. (Ex. 2002, ¶100)." *Id.* at 40. Patent Owner further explains that Wilkins "adds iron hydroxide to reduce the 'stickiness' of [a] sludge [formed by adding the ammonium

hydroxide to the brine], resulting in an increased iron content.” *Id.* (citing Ex. 1008, 5:49-55). As Patent Owner points out, “Wilkins describes the iron content as 1400 mg/L. (*Id.*, 4:37-42)” which is “well above the claimed range. (Ex. 2002 ¶101–102).” *Id.* at 40, 41. Petitioner does not explain why one of ordinary skill in the art would have been led to substitute Wilkins’ ammonium hydroxide for Christopher’s lime and thereby reach a brine with silica in the claimed range. Pet. Reply 15–16. And even if there was a reason for doing so, Petitioner does not then explain why one would have had an expectation of success in reaching a brine with iron in the claimed range when Wilkins describes the result of its process as obtaining an iron content well above the claimed range. *Id.* We agree with Patent Owner that “a POSITA would have no motivation to make such a combination and no expectation of success in doing so.” PO Resp. 40

Petitioner has not shown that the combination of Christopher and Burrows and/or Wilkins renders obvious the composition of claims 1, 17, and 20 by a preponderance of the evidence for these additional reasons.

Petitioner has not shown that the combination of Christopher and Brown renders obvious the composition of claims 1, 17, and 20 by a preponderance of the evidence for the earlier stated reason.

2. Dependent Claims 2–16, 18, and 19

Having found that Petitioner does not prove by a preponderance of the evidence that independent claims 1, 17, and 20 are unpatentable based on this obviousness ground, we find that Petitioner has also failed to prove that any of the dependent claims are unpatentable on that same ground.

F. Anticipation – Maimoni

Petitioner challenges claims 1–20 as anticipated under 35 U.S.C. § 102(b) by Maimoni. Pet. 38–51.

1. Independent Claims 1, 17, and 20

a. “A treated geothermal brine composition . . . comprising a treated geothermal brine” (Claims 1, 17, and 20)

We accept Petitioner’s contention, which is not opposed by Patent Owner and is supported adequately by objective evidence, that Maimoni discloses brine with reduced concentration of metals resulting from processing flashed geothermal brine from the Magmamax No. 1 well and that that is a “treated geothermal brine” as claimed. Pet. 43 (citing Ex. 1004, Title, 11–17). *See generally* PO Resp. 37–48.

b. “said geothermal brine is a Salton Sea brine” (Claims 7 and 20)

We accept Petitioner’s contention, which is not opposed by Patent Owner and is supported adequately by objective evidence, that Maimoni discloses brines obtained from wells at the Salton Sea and that they are a Salton Sea brine as required by claim 15. Pet. 43 (citing inter alia Ex. 1004, 7-8).

c. “having a concentration of zinc ranging from 0 to 300 mg/kg” (Claim 1); “having a concentration of zinc ranging from 0 to 100 mg/kg” (Claim 17); “having a concentration of zinc less than 10 mg/kg” (Claim 20)

Petitioner contends that Table 5 discloses a zinc concentration of 17 ppm in Stream No. 18. Pet. 41 (citing Ex. 1004, 17 (Table 5)). We accept Petitioner’s contention, which is not opposed by Patent Owner and is supported adequately by objective evidence, that Maimoni discloses a brine having zinc in a concentration within the claimed range.

d. “a concentration of silica ranging from 0 to 80 mg/kg” (Claim 1); “a concentration of silica ranging from 0 to 30 mg/kg” (Claim 17); “a concentration of silica less than 10 mg/kg” (Claim 20)

Petitioner argues that Table 5 and Figure 5 of Maimoni show silica “drop[ping] to about ‘22 ppm’ on Stream No. 11 leaving the iron thickener unit” which is within the claimed range. Pet. 43, Ex. 1004, 15-17: Table 5 and Figure 5, reproduced below.

Table 5. Process flow sheet for Magmamax No. 1 brine (Hazen Research, Inc.).

	Stream No.											
	1	2	3	4	5	6	7	8	9	10	11	12
SiO ₂	230 ppm total 187 ppm solid	1.6 lb/h 10.2 wt%	1.6 lb/h 60 wt%	43 ppm				43 ppm	0.16 lb/h solids		22 ppm	
Fe	255 ppm			255 ppm				255 ppm total	375 lb/h solids		26 ppm	
Zn	333 ppm			333 ppm				333 ppm			333 ppm	
Mn	775 ppm			775 ppm				775 ppm			775 ppm	
Pb	70 ppm			70 ppm				70 ppm	0.13 lb/h solids		56 ppm	
Li	182 ppm			182 ppm				182 ppm			182 ppm	
Inertia	22.1%			22.1%				22.1%			22.1%	
H ₂ O	77.7%			77.7%			7 lb/h	77.7%			77.1%	
Specific grey	1.135	1.20		1.135	1.22			1.14	1.32	1.9	1.13	1.22
Temp. °C	93	93	93	93	25	29	92	92	92	92	92	25
Temp. °F	200	200	200	200	77	85	198	198	198	198	198	77
Flow, gpm	15	0.025		15	0.025			15	0.03		15	0.088
Flow, gph	900	1.5		900	1.50			901	1.8		901	5.25
Flow, cfm	—	—				5.0	6.2					
Flow, lb/h	8523	15.0	2.67	8520	15.3			8528	20	6.8	8508	54
Specific heat Btu/lb °F	0.85	0.78	0.46	0.85	0.77			0.85		0.48	0.85	0.77
Heat Btu/h	1.45 × 10 ⁶	2340	2.46	1.45 × 10 ⁶	2471			144 × 10 ⁶		646	144 × 10 ⁶	10,656
Density	9.47 lb/gal	9.99 lb/gal	≈50 lb/ft ³	9.47 lb/gal	10.2 lb/gal			951 lb/gal	11.0 lb/gal	15.8 lb/gal	944 lb/gal	10.2 lb/gal
NH ₃	352 ppm			352 ppm				352 ppm			352 ppm	

Post-flash
Magmamax No. 1
brine input

SiO₂ thickener
underflow
at 11 wt% solids

SiO₂
filter cake

Brine feed
to iron reactor

40% w/y
Ca(OH)₂ slurry

Air sparge to iron reactor

Vent gas from
iron reactor

Iron slurry to
thickener

Iron thickener
underflow
at 20 wt% solids

Iron filter cake

Iron thickener
overflow

40% w/y
Ca(OH)₂ slurry

	Stream No.											
	13	14	15	16	17	18	19	20	21	22	23	24
SiO ₂												
Fe			26 ppm	0.21 lb/h		13 ppm			13 ppm			13 ppm
Zn			333 ppm	4.11 lb/h		17 ppm			17 ppm			17 ppm
Mn			775 ppm	10.06 lb/h		39 ppm			39 ppm			39 ppm
Pb			56 ppm	0.48 lb/h		6 ppm			6 ppm			6 ppm
Li			182 ppm			182 ppm			182 ppm	43 lb/h solids		18 ppm
Inertia			22.1%			22.1%			22.1%			22.1%
H ₂ O		20 lb/h	777%			77.8%			77.0%			77.0%
Specific grey			1.132	1.303	1.86	1.13	1.109	1.315	1.13	1.434	1.86	1.13
Temp. °C	29	90	90	90	90	90	25	25	90	90	90	90
Temp. °F	85	195	195	195	195	195	77	77	195	195	195	195
Flow, gpm			15	0.11		15	0.22	0.05	15.3	0.15	0.1	15
Flow, gph			904	6.8	1.6	902	13.6	2.8	918	9.2	5.8	912
Flow, cfm	12.4	16.0										
Flow, lb/h			8540	74	24.8	8515	126	31	8672	110	78	8594
Specific heat Btu/lb °F			0.85			0.85	0.78	0.67	0.85		0.48	0.85
Heat Btu/h			1.41 × 10 ⁶		2176	1.41 × 10 ⁶	7568	16,000	1.44 × 10 ⁶		7301	1.43 × 10 ⁶
Density			9.45 lb/gal	10.9 lb/gal	15.5 lb/gal	9.44 lb/gal	9.24 lb/gal	10.9 lb/gal	9.45 lb/gal	12.0 lb/gal	15.5 lb/gal	9.43 lb/gal
NH ₃		3.0 lb/h	352 ppm			35 ppm			35 ppm			35 ppm
Air sparge to manganese reactor Vent gases from manganese reactor Ind. ammonia Manganese slurry to thickener Manganese thickener underflow at 20 wt% solids Manganese filter cake Manganese thickener overflow NaAlO ₂ solution 30 wt% NaAlO ₂ AlCl ₃ solution 40 wt% AlCl ₃ Lithium aluminate slurry to thickener Lithium aluminate thickener underflow at 38 wt% solids Lithium aluminate centrifuge cake Lithium aluminate thickener overflow												

Table 5 of Maimoni shows a process flow sheet for various streams for Magmamax No. 1 brine..

Ex. 1004, 16–17 (reproduced at Pet. 45).

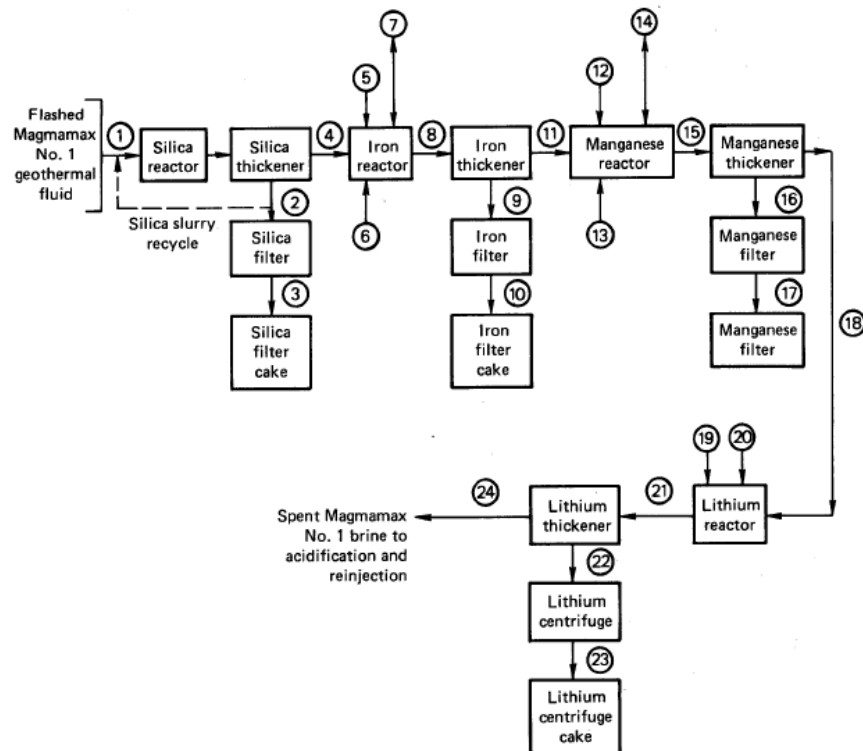


Figure 5. Process materials balance of Magmamax No. 1 brine (Hazen Research).

Fig. 5 of Maimoni shows a processing flow chart for Flashed Magmamax No. 1 brine.

Ex. 1004, 15 (reproduced at Pet. 44).

But the zinc concentration in Stream No. 11 is above the range specified in the claim. Pet. 43, Ex. 1004, 17 (Table 5). PO Resp. 41. Thus there is no single description in Maimoni of a brine having all the claimed components with concentrations as claimed. We agree with Patent Owner that Maimoni does not teach a stream with each of the claimed concentrations of silica, zinc, and iron. PO Resp. 41.

To compensate for the high zinc concentration in Stream No. 11, Petitioner directs our attention to Stream No. 18. Pet. 46 (reproducing an annotated version of Table 5 showing Stream Nos. 11 and 18 and how the concentration values for SiO₂, Fe, Zn, and Mn correspond). But the difficulty with relying on Stream No. 18 is that, as Patent Owner suggests, there is no value reported for the concentration of silica. PO Resp. 41, Ex. 1004, 17 (Table 5, Stream No. 18). Petitioner asserts that “Maimoni nonetheless discloses a treated geothermal brine having specific silica (22 ppm), zinc (17 ppm) and iron (13 ppm) concentrations that fall within the claimed ranges.” Pet. 46. But that is a characterization of Maimoni’s brine that can only come from picking and choosing from the disparate disclosures of the compositions for Stream Nos. 11 and 18.

We note that Petitioner states that Maimoni “inherently discloses a silica concentration of less than or equal to 22 ppm in Stream 18.” Pet. 42 (citing Ex. 1004, 14–15). This statement is not buttressed with any further analysis. While pages 14–15 of Maimoni indicate that removing silica from brine early in the process is advantageous (*see also* Pet. 43), it does so only generally and silica concentrations are nowhere mentioned.

Petitioner argues that silica coprecipitates with iron and it is perhaps this argument that Petitioner is relying upon to make a case for inherency based on Stream No. 18. But there is insufficient evidence to support it. Pet. 47.

According to Petitioner, “a POSITA would appreciate that the 22 ppm of silica in Stream 11 of Maimoni coprecipitates with the 26 ppm of iron based on the disclosed processing conditions, thereby further reducing the concentration of silica to well below the reported 22 ppm [in Stream No. 18].” Pet. 47 (citing Ex. 1003 ¶205). Petitioner explains that Maimoni maintains the pH of the brine with, for example, caustic soda so that “the iron precipitates quantitatively to yield a brine with low iron and silica concentrations (e.g., iron concentrations of 13 ppm in Streams 18, 21 and 24).” *Id.* (citing Ex. 1003 ¶¶ 202-206).

As we understand it, Petitioner is arguing that Maimoni’s process *necessarily* yields a concentration for silica in Stream No. 18 that is below that reported for Stream No. 11, i.e., 22 ppm. But it is based on properly maintaining the pH of the brine. As Patent Owner explains, Dr. Gallup confirms that “quantitative precipitation” of silica and iron is affected by several parameters. PO Resp. 42, relying on its arguments opposing the anticipation ground over Christopher relative the silica limitation, discussed above in section II.F.1.d.¹ “At least two of these parameters, pH and reactor stirring rate, are not reported in Table 5.” *Id.* Accordingly, we do not know from Maimoni what the impact of adjusting the pH will be on the silica

¹ We stated there, in part, that “Petitioner argues that according to Dr. Gallup there is a 1:1 correlation between silica and iron based on his experience. Pet. Reply 7–8. Yet the ‘exact molar correlation between silica and iron will vary based on temperature, pH, and agitation.’ *Id.*”

concentration of the brine of Stream No. 18. We agree with Patent Owner that “[t]here simply is insufficient evidence to conclude that Stream 18 must have the same or a lower amount of silica than stream 11. (Ex. 2002, ¶103-104).” *Id.*

Accordingly, there is insufficient evidence to support Petitioner’s position that Christopher’s process would necessarily reduce the concentration of silica in the brine of Stream No. 18 so that it has silica in a concentration within the claimed ranges.

Thus, Petitioner has not shown that Maimoni describes a brine having silica in a concentration in the claimed ranges for claims 1, 17, and 20 based on Stream No. 18 (Ex. 1004, 17 (Table 5)) by a preponderance of the evidence.

On the other hand, we are less persuaded by Patent Owner’s other argument that the “22 ppm” value for Stream No. 11 shown in Table 5 cannot be relied upon. According to Patent Owner, because:

- the streams shown in Table 5 refer to “***nominal*** flows and compositions.” PO Resp. 42 (citing Ex. 1004, 14);
- Maimoni states: “silica-separation step was not very effective, and silica was found to contaminate the products.” (Ex. 1004, 14).” *Id.*;
- the data recorded in Table 5 “appear to be calculated relative to the ***starting material*** concentrations rather than indicative of actual stream concentrations.” *Id.* at 43 (citing Ex. 1004, 14); and,
- “it is noteworthy that not a single component in Table 5 changes in concentration as the process progresses, despite components being fed to various process equipment.” *Id.* at 43–44.

To buttress that last reason Patent Owner provides annotated versions of Figure 5 singling out the Manganese Reactor (*id.* at 44) and Table 5 focusing

on the data for streams 11, 15, and 18 (*id.* at 45). Finally, Patent Owner lists what Patent Owner believes are “numerous other very clear errors with the data in Fig. 5.” *Id.* at 46–47.

Given all this, Patent Owner concludes that a person of ordinary skill in the art would not have reasonably understood or inferred that the “22 ppm” value shown in Table 5 “accurately reflects” a brine. *Id.* at 46 (citing Ex. 2002, ¶104-105).

We disagree. Maimoni expressly describes a silica concentration of “22 ppm” in Table 5. A person of ordinary skill in the art reading Table 5 would understand it to accurately report “22 ppm” for silica for brine based on a “pilot plant test.” Ex. 1004, 16. While the value may be “nominal” in the sense that it does not reflect the result that might be obtained if an actual pilot plant was used, the data is nevertheless actual data from a “pilot plant test[.]” *Id.*, Pet. Reply 18–19. The reasons Patent Owner gives speculate on the data that would be obtained were an actual pilot plant used to conduct the Hazen process. They do not, however, persuade us that Maimoni does not describe, as a matter of fact, the actual result of a pilot plant test. As such, the “22 ppm” value shown in Table 5 (for Stream No. 11) can be relied upon to establish anticipation.

Accordingly, Petitioner has shown that Maimoni describes a brine having silica in a concentration in the claimed range for claims 1 and 17 based on Stream No. 11 (Ex. 1004, 16 (Table 5)) by a preponderance of the evidence. However, the zinc concentration in Stream No. 11 (333 ppm) is above the range specified for zinc in claims 1 and 17.

Petitioner has not shown that Maimoni describes a brine having silica in a concentration in the claimed range for claim 20 (“a concentration of

silica less than 10 mg/kg”) based on Stream No. 11 (Ex. 1004, 16 (Table 5)) by a preponderance of the evidence.

e. “a concentration of iron ranging from 0 to 300mg/kg” (Claims 1); “a concentration of iron ranging from 0 to 100mg/kg” (Claim 17); “a concentration of iron less than 10 mg/kg” (Claim 20)

We accept Petitioner’s contention, which is not opposed by Patent Owner and is supported adequately by objective evidence, that Maimoni discloses a brine having iron at a concentration within the claimed range. Pet. 42 (citing Ex. 1004, 17, Table 5 (Stream No. 18)).

f. “and comprising recoverable amounts of one or more metals selected from the group consisting of lithium, manganese, lead, rubidium and cesium or mixtures thereof.” (Claims 1, 17, and 20)

We accept Petitioner’s contention, which is not opposed by Patent Owner and is supported adequately by objective evidence, that Maimoni discloses a brine with metals such as lithium in “recoverable amounts.” Pet. 42 (citing Ex. 1004, 17, Table 5 (Stream No. 18: 182 ppm for lithium)).

g. Conclusion

Because Petitioner has not shown that Maimoni describes a brine with each of the claimed concentrations of silica, zinc, and iron by a preponderance of the evidence, Petitioner has not shown that Maimoni describes, expressly or inherently, the composition of claims 1, 17, and 20.

2. Dependent Claims 2–16, 18, and 19

Having found that Petitioner does not prove by a preponderance of the evidence that independent claims 1, 17, and 20 are unpatentable based on anticipation by Maimoni, we find that Petitioner has also failed to prove that any of the dependent claims are unpatentable on that same ground.

G. Anticipation/Obviousness – Maimoni

This ground is lumped in with the anticipation ground. Pet. 43–47 (claim 1) and 51–52 (claims 2–13, 17, and 20). We have already addressed the challenge to the patentability of the claims as being anticipated by Maimoni, both expressly and inherently. As for the challenge based on obviousness, other than asserting the claims are “unpatentable over Maimoni (**Ground No. 5**)”, we are given little to go on. Pet. 40. The insufficiency of the reasoning prevents us from doing a meaningful review. *Id.* Consequently, Petitioner does not prove by a preponderance of the evidence that independent claim 1, 17, and 20 are unpatentable based on obviousness over Maimoni.

H. Obviousness – Maimoni, Brown, Burrows, Wilkins, Christopher

Petitioner challenges claims 1–20 as rendered obvious under 35 U.S.C. § 103(a) over Maimoni, Brown, Burrows, Wilkins, and/or Christopher. Pet. 47–51 (claim 1), 53–55 (claims 2–13, 17, 20), 55–56 (claims 14, 17, 20), and 58 (claims 16, 19).

1. Independent Claims 1, 17, and 20

Petitioner’s basic argument is that Brown, Burrows, Wilkins and/or Christopher would have led one of ordinary skill in the art to reduce the concentration of zinc, silica, and iron in the brine of Maimoni to within the claimed ranges in order to achieve “improved injectability, reduced scaling, and improved mineral extraction”. Pet. 50.

Brown is applied because it “discloses a treated Salton Sea brine containing residual amounts of silica of less than 10 ppm, and more preferably, between about 1 to about 10 ppm silica. EX 1005, 3:60-66.” Pet. 48.

We have already explained why we accept that Maimoni describes a Salton Sea brine and a brine with silica within the ranges of claim 1 and 17 (with respect to Stream No. 11 of Table 5). Ex. 1004, 8, 16. Accordingly, Maimoni already achieves the improvement that Petitioner argues one of ordinary skill would have been led to by reducing the silica concentration to the levels Brown discloses. Pet. 49 (“improve the injectivity of a treated geothermal brine composition”). Petitioner, however, does not explain how the combination of Maimoni and Brown overcomes the deficiency in Maimoni identified earlier in addressing the anticipation ground; namely, that Maimoni does not show a brine having all the components – zinc, silica, and iron – in concentrations within the claimed ranges.

Burrows and Wilkins are also applied for its disclosure of silica in a concentration within the claimed ranges. Pet. 48 (for Burrows: citing Ex. 1002, at 86; Ex 1007, Abstract, Figures 1-2, [0002], [0021], [0032], [0034], [0055]-[0068]; for Wilkins: citing Ex. 1008, Title and Figure 2). Since we have established that Maimoni describes a brine with silica within the claimed ranges, Maimoni already achieves the improvements that Petitioner argues one of ordinary skill would have obtained by reducing the silica concentration to the levels Burrows and Wilkins discloses. Pet. 50 (“improved injectability, reduced scaling, and improved mineral extraction”). Moreover, Petitioner does not explain how the combination of Maimoni and Burrows and/or Wilkins overcomes the deficiency in Maimoni identified earlier in addressing the anticipation ground; namely, that Maimoni does not show a brine having all the components – zinc, silica, and iron – in concentrations within the claimed ranges.

As an additional argument for why Petitioner’s case for obviousness over Maimoni and Burrows is deficient, Patent Owner argues that the brines

of Maimoni and Burrows are “different”. PO Resp. 61. Further, on that point, Patent Owner argues that Maimoni and Wilkins “involve two processes with completely different steps that cannot be combined.” *Id.* We addressed these arguments earlier with respect to the obviousness challenge involving Christopher, Brown, Burrows, and/or Wilkins and incorporate our discussion herein. *See supra.*

For the reasons discussed, Patent Owner’s additional arguments for why Petitioner’s case for obviousness over Maimoni and Burrows and/or Wilkins is deficient are persuasive.

As for Christopher, Petitioner does not explain how the combination of Maimoni and Christopher overcomes not only the deficiency in Maimoni identified earlier in addressing the anticipation ground; namely, that Maimoni does not show a brine having all the components – zinc, silica, and iron – in concentrations within the claimed ranges, but also Christopher, namely, that Christopher describes an “aged” brine rather than a “treated” brine and does not show a brine having zinc, silica, and iron in concentrations in the claimed ranges. We agree with Patent Owner that, for the same reasons that Christopher does not describe the claimed compositions, “Christopher fails to remedy the deficiencies of Maimoni.” PO Resp. 59.

Petitioner has not shown that the combination of Maimoni and Burrows, Wilkins, and/or Christopher renders obvious the composition of claims 1, 17, and 20 by a preponderance of the evidence for these additional reasons.

Petitioner has not shown that the combination of Maimoni and Brown renders obvious the composition of claims 1, 17, and 20 by a preponderance of the evidence for the earlier stated reason.

2. Dependent Claims 2–16, 18, and 19

Having found that Petitioner does not prove by a preponderance of the evidence that independent claim 1 or 15 are unpatentable based on this obviousness ground, we find that Petitioner has also failed to prove that any of the dependent claims are unpatentable on that same ground.

III. CONCLUSION

For the foregoing reasons, Petitioner has not proven by a preponderance of the evidence that any challenged claim of the '126 patent are unpatentable, as summarized in the following table:

Claims	35 U.S.C. §	Reference(s)/ Basis	Claims Shown Unpatentable	Claims Not Shown Unpatentable
1–20	102	Christopher		1–20
1–20	102/103	Christopher		1–20
1–20	102	Christopher, Brown, Burrows, Wilkins		1–20
1–20	102	Maimoni		1–20
1–20	102	Maimoni		1–20
1–20	103	Maimoni, Brown, Burrows, Wilkins, Christopher		1–20
Overall Outcome				1–20

IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that Petitioner has not shown by a preponderance of the evidence that claims 1–20 are unpatentable; and

FURTHER ORDERED that because this is a Final Written Decision, parties to this proceeding seeking judicial review of the Decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

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