

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

CELANESE INTERNATIONAL CORPORATION,
Petitioner,

v.

DAICEL CORPORATION,
Patent Owner.

Case IPR2017-00166
Patent 9,006,483 B2

Before SHERIDAN K. SNEDDEN, ZHENYU YANG, and
TINA E. HULSE, *Administrative Patent Judges*.

SNEDDEN, *Administrative Patent Judge*.

FINAL WRITTEN DECISION
35 U.S.C. § 318(a); 37 C.F.R. § 42.73

ORDER ON MOTION TO AMEND
35 U.S.C. § 316(d) and 37 C.F.R. § 42.121

I. INTRODUCTION

This is a Final Written Decision in an *inter partes* review challenging the patentability of claims 1–3, 5, 6, 9–13, and 15 of U.S. Patent No. 9,006,483 B2 (Ex. 1001, “the ’483 Patent”). We have jurisdiction under 35 U.S.C. § 6.

In its non-contingent Motion to Amend, Patent Owner requests cancellation of claims 1–3, 5, 6, 9, 10, 12, 13, 15, and substitution of proposed claims 16–18. Patent Owner’s Motion to Amend is *granted* as to the cancellation of claims 1–3, 5, 6, 9, 10, 12, 13, 15, but *denied* as to substitute claims 16–18.

We conclude for the reasons that follow that Petitioner has shown by a preponderance of the evidence that claim 11 is unpatentable.

A. *Procedural History*

Celanese International Corporation (“Petitioner”) filed a Petition to institute an *inter partes* review of claims 1–3, 5, 6, 9–13, and 15 of the ’483 patent. Paper 1 (“Pet.”). Daicel Corporation (“Patent Owner”) filed a Patent Owner Preliminary Response. Paper 6. Based on these submissions, we instituted trial on the following grounds of unpatentability asserted by Petitioner:

Ground	Reference[s]	Basis	Challenged Claims
1	Aubigne ¹	§ 102	1–3, 5, 6, 9, 10, 12, 13, 15

¹ Ex. 1004, Simon D. Aubigne et al., U.S. Patent No. 5,416,237, issued May 16, 1995 (“Aubigne”).

Ground	Reference[s]	Basis	Challenged Claims
2	Aubigne and Watanabe ²	§ 103	1–3, 5, 6, 9, 10, 12, 13, 15
3	Miura ³	§ 102	1–3, 5, 6, 10, 11, 13

Decision to Institute (Paper 7, “Dec.”). Patent Owner filed a Request for Rehearing asking that we reconsider our decision to institute *inter partes* review on the ground that challenged claims 1–3, 5, 6, 10, 11, and 13 are anticipated by Miura. Paper 10. Petitioner filed a Response to Patent Owner’s Request for Rehearing. Paper 15. Based on these submissions, we denied Patent Owner’s Request for Rehearing. Paper 17.

After institution of trial, Patent Owner filed a Patent Owner Response (Paper 20, “PO Resp.”), to which Petitioner filed a corrected Reply to Patent Owner Response (Paper 34, “Reply”).

In addition, Patent Owner filed a non-contingent Motion to Amend, seeking to cancel claims 1–3, 5, 6, 9, 10, 12, and 15 and to replace claims 1, 6, and 12 with substitute claims 16–18. Paper 21 (“MTA”). Petitioner filed an Opposition to the Motion to Amend. Paper 29 (“Opp. MTA”). Patent Owner submitted a Reply in Support of its Motion to Amend (Paper 36, “PO Reply MTA”), and Petitioner filed a Sur-reply Supporting its Opposition (Paper 46, “Pet. Sur-reply MTA”).

Petitioner supports its challenge with the Declarations of James A. Hinnenkamp (Ex. 1002; Ex. 1054) and Yaw-Hwa Liu, Ph.D. (Ex. 1055).

² Ex. 1005, Hitoshi Watanabe et al., Japanese Patent No. 44895487, published June 23, 2010 (certified English translation) (“Watanabe”).

³ Ex. 1006, Hiroyuki Miura et al., U.S. Patent No. 7,884,241 B2, issued Feb. 8, 2011 (“Miura”).

Patent Owner relies on the Declarations of David E. Hendrix, P.E. (Ex. 2003) and Vijay S. Bhise, Eng. Sc. D. (Ex. 2006).

Petitioner filed a motion to exclude certain of Patent Owner's evidence. Paper 44. Patent Owner filed an opposition (Paper 50), and Petitioner filed a reply (Paper 52).

Oral argument was conducted on January 24, 2018. A transcript is entered as Paper 59 ("Tr.").

B. The '483 patent (Ex. 1001)

The '483 patent "relates to a process useful for producing high-quality acetic acid while inhibiting corrosion of an apparatus (e.g., a distillation column)." Ex. 1001, 1:5–7. Figure 1, shown below, provides a diagram of one disclosed embodiment for a production process of acetic acid disclosed in the '483 patent.

FIGURE 1

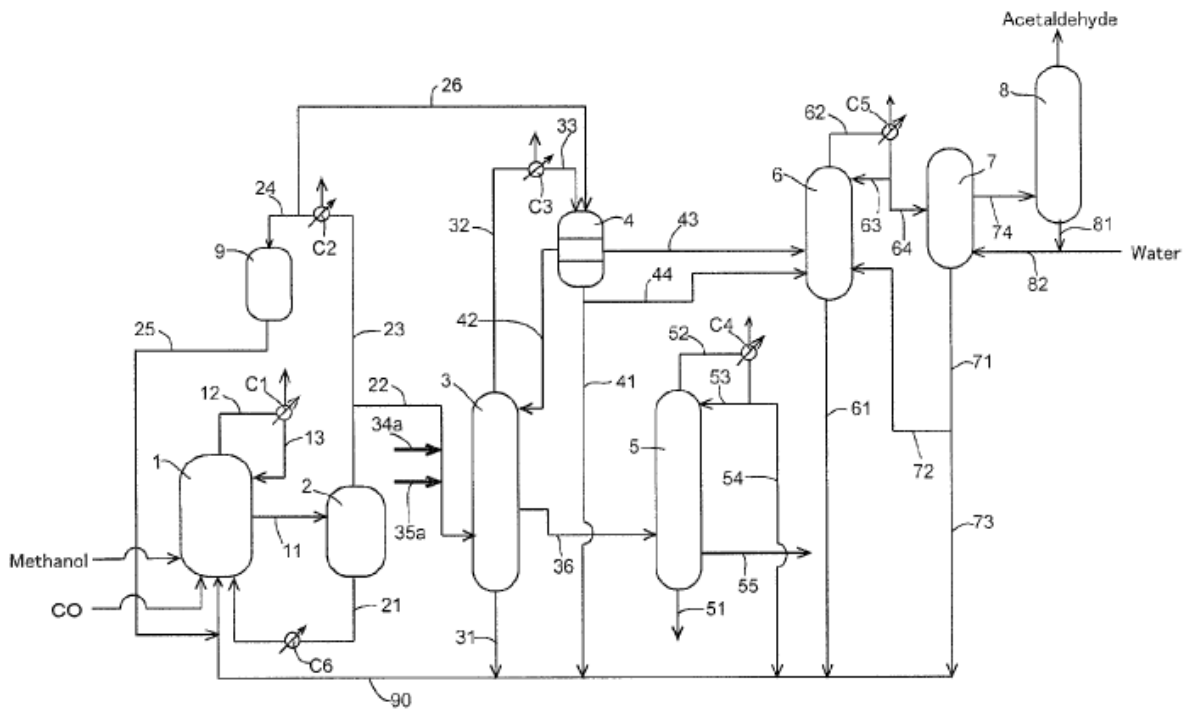


Figure 1 shows the following:

- i) reactor **1** for allowing methanol to continuously react with carbon monoxide in the presence of a catalyst or a catalyst system and water;
- ii) flash evaporator **2** for separating the reaction mixture into a volatile phase component and a low-volatile phase component;
- iii) first distillation column **3** for distilling the volatile phase component to form a first overhead from a top of the column, a bottom stream from a bottom thereof, and a side cut stream (crude acetic acid stream);
- iv) decanter **4** for cooling and condensing the first overhead in condenser **C3** and for separating the first overhead into an aqueous phase (upper phase or light phase) and an organic phase (lower phase or heavy phase);

v) second distillation column (dehydration column or purification column) **5** for distilling the side cut stream (crude acetic acid stream) from first distillation column **3** to form a second overhead from a top of the second distillation column, a bottom stream from a bottom thereof, and a side cut stream (purified acetic acid stream) from a side thereof; and

vi) an impurity-removing system (consisting of third distillation column **6**, water extraction column **7**, and fourth distillation column **8**) for removing an impurity from a condensate (an aqueous phase and an organic phase) in condenser **C4**. *Id.* at 7:42–66.

A reaction mixture is continuously fed from reactor **1** to flash evaporator **2** through feed line **11** for a flash distillation, and separated into a volatile phase component (a lower boiling point fraction mainly containing acetic acid as a product, methanol, methyl acetate, methyl iodide, water, propionic acid, acetaldehyde, and hydrogen iodide as a by-product) and a low-volatile phase component (a higher boiling point fraction mainly containing a metal catalyst component (high-boiling component) such as a rhodium catalyst and a lithium iodide). *Id.* at 8:51–63. The low-volatile phase component may be recycled to reactor **1** through recycle line **21**. *Id.* at 8:64–66.

The portion of the volatile phase component fed through feed line **22** is distilled in first distillation column **3** and separated into i) a first overhead (a first lower boiling point component containing methyl iodide, methyl acetate, acetaldehyde, water) withdrawn from the upper part of the column, ii) a bottom stream (a higher boiling point component containing water, acetic acid, catalyst, propionic acid, a C₆₋₁₂ alkyl iodide) withdrawn from the column bottom, and iii) a side cut stream (containing acetic acid) from the

side. *Id.* at 9:40–63.

The first overhead is introduced into condenser **C3** through introduction line **32** and cooled and condensed. *Id.* at 9:64–65. The resulting condensed component (a condensate containing methyl iodide, methyl acetate, acetic acid, and acetaldehyde) is fed to decanter **4** through introduction line **33**, and the resulting noncondensed component (a gas component mainly containing carbon monoxide, hydrogen, and others) is discharged as a vent gas. *Id.* at 9:66–10:4.

In order to inhibit the corrosion of distillation column **3** and improve the liquid-liquid separation of the condensate in decanter **4**, the volatile component fed to the distillation column **3** through the feed line **22** contains not more than 5% by weight of water and 0.5 to 9% by weight of methyl acetate, in terms of condensate or liquid. In the embodiment shown in Figure 1, water supply line **34a** and methyl acetate supply line **35a** are connected to feed line **22** for adjusting the water concentration and methyl acetate concentration in distillation column **3**. *Id.* at 10:5–15.

C. Illustrative Claims

Petitioner challenges claims 1–3, 5, 6, 9–13, and 15 of the '483 patent. Claims 1, 11, and 13 are illustrative of the challenged claims and are reproduced below:

1. A process for producing acetic acid, comprising:
 - distilling a mixture containing hydrogen iodide, water, methyl iodide, acetic acid, and methyl acetate to form an overhead containing a lower boiling point component, and
 - condensing the overhead to form separated liquid phases, wherein the mixture contains an effective amount of water in a concentration of not more than 5% by weight and methyl acetate in a concentration of 0.5 to 9% by weight, and is separated, in the distillation step, into the overhead containing

methyl iodide and a side cut stream or bottom stream containing acetic acid.

11. The process according to claim 1, wherein the mixture has a hydrogen iodide concentration of 100 to 10000 ppm, and is subjected to a distillation to form the side cut stream having a hydrogen iodide concentration of 1 to 350 ppm

13. A method for improving a liquid-liquid separation of a condensate while reducing a concentration of hydrogen iodide in an overhead and a side cut stream, comprising:

distilling a mixture containing hydrogen iodide, water, methyl iodide, acetic acid, and methyl acetate to form an overhead containing a lower boiling point component, and condensing the overhead to give a condensate containing separated liquid phases,

wherein the mixture contains an effective amount of water in a concentration of not more than 5% by weight and methyl acetate in a concentration of 0.5 to 9% by weight.

Claims 2, 3, 5, 6, and 9–12 depend directly from claim 1. Claim 15 depends directly from claim 13.

II. DISCUSSION

A. *Claim Interpretation*

We interpret claims using the “broadest reasonable construction in light of the specification of the patent in which [they] appear[.]” 37 C.F.R. § 42.100(b); *Cuozzo Speed Techs. LLC v. Lee*, 136 S. Ct. 2131, 2144–46 (2016). Only those terms that are in controversy need be construed, and only to the extent necessary to resolve the controversy. *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999).

The parties propose constructions for several claim terms. Pet. 13–16; PO Resp. 4–5. For purposes of this Decision, we find it necessary to address only the claim term “effective amount.”

1. An “*effective amount*” (Claims 1 and 13)

Independent claims 1 and 13 recite the phrase “an effective amount of water in a concentration of not more than 5% by weight and methyl acetate in a concentration of 0.5 to 9% by weight.”

As in our Decision to Institute, our analysis begins with the ’483 patent’s use of the term. Dec. 7–10. Although the ’483 patent does not explicitly define the term “effective amount,” it does use the term throughout the Specification, and it is used repeatedly to describe the invention. For example, the ’483 patent discloses that an object of the invention is to provide a process that “improve[s] liquid-liquid separation of a low-boiling stream (overhead) from a distillation column while inhibiting condensation of hydrogen iodide.” Ex. 1001, 4:32–37. The following excerpt from the ’483 patent is also instructive in this regard:

The inventors of the present invention made intensive studies to achieve the above objects and finally found that distillation of a mixture under feeding of a decreasing agent (an agent for decreasing hydrogen iodide) to a distillation column achieves the followings (1) and (2), wherein the decreasing agent contains an *effective amount* of water in a concentration of not more than 5% by weight and an *effective amount* of methyl acetate in a concentration of not more than 9% by weight: (1) a zone having a high water concentration is formed in the distillation column above a charging site (feed site or part) of a volatile component to the distillation column, and methyl acetate is allowed to effectively react with hydrogen iodide in the high-concentration zone to produce methyl iodide (a lower boiling point component) and acetic acid, where methyl iodide has a high miscibility with an organic phase, contrarily acetic acid has a

high miscibility with an aqueous phase and is largely different in boiling point from *methyl iodide* (*largely different in boiling point from water formed by a reaction of methanol with hydrogen iodide*); and (2) since a low-boiling stream (overhead) contains methyl acetate in a predetermined proportion, the low-boiling stream (overhead) from the distillation column is cooled and condensed *to clearly and efficiently separate the resulting condensate into an organic phase containing methyl iodide and an aqueous phase containing acetic acid*, and thus the liquid-liquid separation of the low-boiling stream (overhead) from the distillation column can significantly be improved.

Id. at 4:51–5:10 (emphasis added).

Thus, while the term “effective amount” is not expressly defined in the ’483 patent, it is clear, based on reading the ’483 patent in its entirety, that the term “effective amount” is used to describe a fundamental characteristic of the disclosed invention. That is, in order to perform the process according to the invention, water and methyl acetate must be present in amounts that would produce the desired effect of producing a liquid-liquid separation of a condensate while reducing the concentration of hydrogen iodide in a process for producing acetic acid. Accordingly, we conclude that the term “effective amount” requires the following two results to be achieved: (1) suppressed hydrogen iodide concentration and (2) sufficient liquid-liquid separation in an overhead condensate.

We note that Patent Owner’s construction of “effective amount” would require “improved liquid-liquid separation” as opposed to “sufficient liquid-liquid separation” in the overhead condensate. PO Resp. 4–5 (citing Ex. 2006 ¶¶ 29–30, 45–47). We decline to use “improved” in our claim construction, however, because the ’483 patent does not sufficiently compare different processes so as to give sufficient meaning to “improved.”

B. Grounds 1 and 2: Unpatentability of Claims 1–3, 5, 6, 9, 10, 12, 13, and 15 in view of Aubigne

Patent Owner does not address Petitioner’s Grounds 1 and 2 in its Response. PO Resp. 1 n.1 (“Patent Owner has elected not to address Grounds 1 and 2 in its Patent Owner Response.”). Furthermore, Petitioner’s Grounds 1 and 2 are moot in view of Patent Owner’s non-contingent Motion to Amend cancelling challenged claims 1–3, 5, 6, 9, 10, 12, 13, and 15.

C. Ground 3: Anticipation of Claim 11 over Miura

1. Summary of Petitioner’s Contentions

Petitioner asserts that claim 11 is anticipated by Miura.⁴ Pet. 43–58. In support of its assertion that Miura anticipates claim 11, Petitioner provides a detailed discussion and claim chart explaining how each claim limitation is disclosed in Miura. *Id.* at 43–52, 57–58. In particular, Petitioner contends that Miura discloses an acetic acid production process with the recited distillation mixture of hydrogen iodide, water, methyl iodide, acetic acid, and methyl acetate using amounts of water and methyl acetate falling within the claimed ranges. *Id.* at 45, 48 (citing Ex. 1006, 3:60–64, 5:50–55; Ex. 1002 ¶¶ 79–80).

Regarding the recited water concentration of not more than 5% by weight in independent claim 1, Petitioner contends that Miura discloses distillation of a mixture having a low water content of not more than 5% by weight water for the purposes of realizing effective removal of hydrogen

⁴ Claims 1–3, 5, 6, 10, and 13 are cancelled by Patent Owner, leaving claim 11 as the only remaining claim in the ’483 patent challenged by Petitioner. We therefore consider Petitioner’s Ground 3 to the extent it applies to claim 11 (which directly depends from claim 1). As noted by Petitioner, however, the limitations of claim 11 are not relied upon to distinguish the claims from the cited prior art. Reply 8.

iodide, preventing condensation of hydrogen iodide, and inhibiting corrosion. *Id.* at 44–45 (citing Ex. 1006, 3:21–24, 3:37–49).

Regarding the recited methyl acetate concentration of 0.5 to 9% by weight in independent claim 1, Petitioner contends that Miura recites that “[t]he concentration of the carboxylic acid ester may be about 0.1 to 20% by weight, preferably 0.5 to 15% by weight, and more preferably about 0.5 to 6% by weight (e.g., about 2 to 6% by weight)” for the reaction mixture (or liquid reaction composition). Reply 9 (citing Ex. 1006, 5:51–55).

Additionally, Petitioner contends that Miura repeatedly discloses methyl acetate as the carboxylic acid ester in the process. *Id.* (citing Ex. 1006, 6:23–25 (disclosing “an ester of the carboxylic acid with the alcohol (e.g., methyl acetate)”).

Regarding the requirement that the distillation mixture contain hydrogen iodide at a concentration of 100 to 10000 ppm in claim 11, Petitioner directs our attention to the following disclosure in Miura:

[S]ince hydrogen iodide can be efficiently removed or distilled off in the present invention, the concentration of hydrogen iodide (on the basis of weight) in the mixture is not particularly limited to a specific one, and for example, may be selected from the range of about 1 to 3000 ppm, and may be usually about 10 to 2000 ppm, preferably about 20 to 1500 ppm, and more preferably about 30 to 1200 ppm (e.g., about 50 to 1000 ppm).

Ex. 1006, 7:6–13; Pet. 57–58.

Regarding the requirement that the mixture is distilled to form a side cut stream having a hydrogen iodide concentration of 1 to 350 ppm in claim 11, Petitioner directs our attention to the following disclosure in Miura:

Such a process can greatly reduce the concentration of hydrogen iodide in the bottom solution or the side stream solution (e.g., acetic acid stream). The concentration of hydrogen

iodide in the bottom solution or the side stream solution (e.g., purified acetic acid) may be usually not more than 50 ppm (e.g., about 1 ppb to 10 ppm), not more than 10 ppm (about 0.001 to 1 ppm)”

Ex. 1006, 9:14–21; Pet. 57–58.

2. *Summary of Patent Owner’s Contentions*

Patent Owner contends that Petitioner fails to prove that Miura discloses the recited effective amount of water and methyl acetate for a distillation mixture. PO Resp. 8–10. In particular, Patent Owner argues that “[a] review of the entire Miura disclosure reveals the cited col. 5, lines 50–55 of Miura is referring to the mixture in the carbonylation reactor, and not the distillation column (see from 5:1 to 6:29).” *Id.* at 8 (citing Ex. 2006 ¶¶ 55–56). To further support this position, Patent Owner contends that

Miura describes MeI (alkyl iodide) concentration in the “liquid reaction composition” (see 5:42) of 1–25 wt% at 5:46–50. In contrast, 34 wt% of MeI concentration is described in Comparative Example 1 and Example 1 of Miura. The [person of ordinary skill in the art] reading such disclosure would readily understand that Comparative Example 1 and Example 1 of Miura are not referring to MeI concentrations in the “liquid reaction composition.” Ex. 2006, ¶ 56.

PO Resp. 8–9.

Regarding the recited methyl acetate concentration of 0.5 to 9% by weight in independent claim 1, Patent Owner contends that “the [person of ordinary skill in the art] in reviewing the Miura generic disclosure would not understand that this reference is disclosing all elements of the ‘483 Patent Claims as arranged in the claims.” PO Resp. 13 (citing Ex. 2006 ¶¶ 62–64). In particular, Patent Owner contends that “Petitioner fails to show Miura disclosed the claimed methyl acetate concentration range for distillation in a

distillation column.” *Id.* at 11. Patent Owner further characterizes Miura as follows:

Regarding the asserted disclosure of MA concentration, starting at 5:1, Miura is teaching the reaction mixture in the carbonylation reactor (see, e.g., 5:2 describing “carbonylation reactor”; 5:32 describing “carbonylation catalyst”; 5:67 describing “a reactor”; 6:1 and 6:19-20 describing “carbonylation reaction”), and not any equipment downstream like a distillation column. Ex. 2006, ¶¶ 55, 63 (see also ¶¶ 56-62, 64-65).

Id. at 16.

Patent Owner acknowledges that Miura discloses the ranges for a “carboxylic acid ester” falling within the claimed range of 0.5 to 9% by weight (e.g., “about 2 to 6% by weight”), but argues that “[t]here is no working example in the Miura reference disclosing the claimed range.” *Id.* at 14–15 (citing Ex. 1006, 5:50–55). Moreover, Patent Owner characterizes Miura as follows:

Miura discloses an embodiment (e.g., whether Example 1 or Comparative Example 1) where the methyl acetate concentration data point is 9.8 wt%. First, this is outside of the claimed range of 0.5 to 9 wt% of methyl acetate. Second, Petitioner’s reliance on 5:50-55 (see Petition, p. 48, claim chart for “and methyl acetate in a concentration of 0.5 to 9% by weight”) is not in the same form and order as in claim 1 of the ‘483 Patent.

Id. at 11; *see also id.* at 18 (“Petitioner has not stated what is actually described in Miura for a reaction mixture in a distillation column, other than the disclosed Comparative Example 1 and Example 1 (9:61-10:40) (which of course use 9.8 wt% of MA).”); *id.* at 19–20 (“Miura does not disclose a species or example that falls within the claimed [methyl acetate] range of 0.5–9 wt%.”).

Patent Owner further argues that, because Miura provides “no specific examples falling within the claimed range,” Miura fails to disclose the claimed subject matter with “sufficient specificity to constitute anticipation under the statute.” *Id.* at 21 (quoting MPEP § 2131.03(II)) (citations omitted).

3. Analysis

Having considered the parties’ positions and evidence of the record, summarized above, we conclude that Miura teaches all elements of claim 11 for the reasons set forth on pages 43–52 and 57–58 of the Petition and pages 9–15 of the Reply, which we adopt. We provide the following additional analysis.

The first dispute between the parties relates to the question of whether Miura discloses distillation of a mixture containing the required amount of methyl acetate. The parties agree that Miura expressly discloses a carbonylation reaction mixture containing a carboxylic acid ester (such as methyl acetate) at a range of 0.1% to 20% by weight, and more preferably about 0.5 to 6% by weight. PO Resp. 14–15; Ex. 1006, 5:50–55, 6:23–25. We further agree with Petitioner that Miura explicitly discloses that its “distillation process” can be applied directly to the reaction mixture. Pet. 45–46; Reply 9–12. That is, “[Miura] discloses both performing the distillation on the reactor mixture (or liquid reaction composition) from carbonylation or after it has been processed (e.g., flashed).” Ex. 1002 ¶ 80; *see also* Ex. 1054 ¶ 7. Specifically, Miura, immediately after describing a carbonylation reaction mixture containing hydrogen iodide, water, methanol, methyl iodide, acetic acid, and methyl acetate (Ex. 1006, 6:19–26), discloses the following:

The present invention may also be applied *to such a reaction mixture* (or liquid reaction composition). The present invention *may also be applied to a light component or fraction* in the reaction mixture (or liquid reaction composition) separated by a first distillation (a distillation by a plate column, a packed column, *a flash distillation column*, or others).

Reply 10–12 (citing Ex. 1006, 6:30–35 (emphasis added)); *see also* Ex. 1006, 4:55–5:5 (“The present invention is applied to the distillation of a mixture The typical mixture may include a reaction mixture which is obtained from a carbonylation reaction”), 7:59–60; Ex. 1002 ¶ 80; Ex. 1054 ¶ 7. Accordingly, we determine that Miura discloses distillation of a mixture containing the required amounts of methyl acetate.

Patent Owner further questions whether Miura discloses all the elements in the “same form and order as in the claim” or whether Miura discloses all the elements with “sufficient specificity” to constitute anticipation. PO Resp. 10–40. Here, Patent Owner takes issue with the fact that the two examples disclosed in Miura, Comparative Example 1 and Example 1, use methyl acetate at a concentration of 9.8% by weight, which falls within the range of 0.1% to 20% by weight disclosed by Miura, but not the narrow ranges of 0.5% to 6% by weight or 2 to 6% by weight disclosed by Miura and relied upon by Petitioner. PO Resp. 10–40; Ex. 1006, 5:50–55, 9:61–10:40; Reply 9, 13. We find, however, that Petitioner’s reliance on the disclosed ranges of 0.5% to 6% by weight or 2 to 6% by weight is proper, and we do not agree that the law requires a prior art reference to disclose a working example of a claimed method in order to be found anticipatory. *See e.g., In re Petering*, 301 F.2d 676, 681 (CCPA 1962) (affirming an anticipation challenge of a claim that covered specific

chemical compounds in light of a prior art patent that disclosed a class of compounds of which those specific compounds were members).

Patent Owner relies on several cases to support its proposition that “when the prior art discloses a range which touches or overlaps the claimed range, but no specific examples falling within the claimed range are disclosed, a case by case determination must be made as to anticipation.”

PO Resp. 21 (citing *Ineos USA LLC v. Berry Plastics Corp.*, 783 F.3d 865 (Fed. Cir. 2015); *Atofina v. Great Lakes Chem. Corp.*, 441 F.3d 991 (Fed. Cir. 2006); *ClearValue, Inc. v. Pearl River Polymers, Inc.*, 668 F.3d 1340 (Fed. Cir. 2012)). We agree that a case by case determination must be made as to anticipation, and in this regard, we agree with Petitioner that

[a]ll of these cases . . . involved situations where the Federal Circuit found a “slight overlap” in ranges between the prior art and the claimed range at issue or where a broad prior art genus was being compared to a narrow species in a patent claim. On the contrary, all of these cases can be easily distinguished from the present [*inter partes* review] where the prior art Miura range falls **completely** within the range claimed in the ’483 patent. See, e.g., *Atofina v. Great Lakes Chem. Corp.*, 441 F.3d 991 (Fed. Cir. 2006) (involving a “slight overlap” between the prior art and claims at issue); *OSRAM Sylvania, Inc. v. Am. Induction Techs. Inc.*, 701 F.3d 698 (Fed. Cir. 2012) (remanding for a determination of whether a person of ordinary skill would interpret a broader prior art range as disclosing a narrower patent range)

Reply 14–15. Although, as Patent Owner asserts, Miura discloses a range and not a specific amount, the claimed range (i.e., 0.5% to 9%) completely encompasses the range disclosed in the prior art (i.e., 0.5% to 6%). Thus, even if “a range is no more a disclosure of the end points of the range than it is of each of the intermediate points,” *Atofina*, 441 F.3d at 998, here, the end

points and each of the intermediate points disclosed in Miura fall within the claimed range. Moreover, there is no evidence that tends to show any difference between the two ranges to support a conclusion that Miura does not anticipate. *See* Ex. 1054 ¶ 9.

Accordingly, in view of the above, we determine that Petitioner has demonstrated, by a preponderance of the evidence, that the subject matter of claim 11 of the '483 patent is anticipated by Miura.

D. Conclusion

In sum, we determine that Petitioner has demonstrated by a preponderance of the evidence that Miura anticipates claim 11 of the '483 patent.

III. PATENT OWNER'S MOTION TO AMEND CLAIMS

In an *inter partes* review, amended claims are not added to a patent as of right, but rather must be proposed as part of a motion to amend. 35 U.S.C. § 316(d). The Board must assess the patentability of the proposed substitute claims “without placing the burden of persuasion on the patent owner.” *Aqua Prods., Inc. v. Matal*, 872 F.3d 1290, 1328 (Fed. Cir. 2017). Patent Owner's proposed substitute claims, however, must still meet the statutory requirements of 35 U.S.C. § 316(d) and the procedural requirements of 37 C.F.R. § 42.121. *See* “Guidance on Motions to Amend in view of *Aqua Products*” (Nov. 21, 2017) (“*Guidance*”).⁵ Accordingly, Patent Owner must demonstrate (1) the amendment responds to a ground of unpatentability

⁵ The guidance memorandum is publicly available at https://www.uspto.gov/sites/default/files/documents/guidance_on_motions_to_amend_11_2017.pdf.

involved in the trial; (2) the amendment does not seek to enlarge the scope of the claims of the patent or introduce new subject matter; (3) the amendment proposes a reasonable number of substitute claims; and (4) the original disclosure sets forth written description support for each proposed claim. *See* 37 C.F.R. § 42.121.

A. Proposed Substitute Claims

In its Motion to Amend, Patent Owner first proposes to cancel claims 1–3, 5, 6, 9, 10, 12, and 15. MTA 3. Second, Patent Owner proposes to substitute independent claim 1, and dependent claims 6 and 12, with substitute claims 16–18, respectively. Proposed substitute claims 16–18 are reproduced below (underlining indicating additions to language appearing in the original claim and double brackets indicating deletions of language appearing in the original claim).

16. (Proposed Substitute for Claim 1) A process for producing acetic acid and for improving a liquid-liquid separation of a condensate while reducing a concentration of hydrogen iodide in an overhead and a side cut stream, comprising:

flash evaporation or flash distillation of a reaction mixture in a flasher, wherein the reaction mixture is separated in the flasher into a volatile phase component and a low-volatile phase component;

distilling a mixture containing hydrogen iodide, water, methyl iodide, acetic acid, and methyl acetate in a first distillation column to form [[an]] the overhead containing a lower boiling point component, the mixture that is distilled in the

first distillation column comprises said volatile phase component; [[and]]

condensing the overhead from the first distillation column to form the condensate containing separated liquid phases[[,]] of an aqueous phase and an organic phase; and

distilling the side cut stream in a second distillation column;⁶

wherein the mixture comprising the volatile phase component contains an effective amount of water in a concentration of not more than 5% by weight and methyl acetate in a concentration of 0.5 to 9% by weight, and is separated, in the distillation step in the first distillation column, into the overhead containing methyl iodide, [[and a]] the side cut stream containing acetic acid, [[or]] and a bottom stream containing acetic acid[[.]];⁷

wherein the overhead is withdrawn from a top of the first distillation column, the bottom stream is withdrawn from a bottom of the first distillation column, and the side cut stream is withdrawn from a side of the first distillation column and is fed to the second distillation column;

wherein the side cut stream has a concentration of hydrogen iodide of 1–350 ppm, water of 0.3 to 5% by weight, and methyl acetate of 0.1 to 3% by weight;

wherein the aqueous phase of said condensate comprises: a concentration of water of 50–90% by weight; a concentration of acetic acid of 10–40% by weight; and a concentration of

⁶ Referenced as “element 16[e]” in Patent Owner’s Motion to Amend (MTA 7), Petitioner’s Opposition to the Motion to Amend (Opp. MTA 15), and Patent Owner’s Reply in Support of its Motion to Amend (PO Reply MTA 9–10).

⁷ Referenced as “element 16[f]” in Patent Owner’s Motion to Amend (MTA 7), Petitioner’s Opposition to the Motion to Amend (Opp. MTA 15–16), and Patent Owner’s Reply in Support of its Motion to Amend (PO Reply MTA 4).

hydrogen iodide of 10–1000 ppm; and⁸

wherein the organic phase of said condensate comprises: a concentration of methyl iodide of 75–98% by weight; a concentration of acetic acid of 1–10% by weight; a concentration of water of not more than 1% by weight; and a concentration of hydrogen iodide of not more than 70 ppm.

17. **(Proposed Substitute for Claim 6)** The process according to claim ~~[[1,]] 16,~~ wherein a zone having a high water concentration is formed inside ~~[[a]] the first~~ distillation column at a position upper than a position at which the mixture containing the volatile phase component is fed to the first distillation column,

in the zone having the high water concentration, hydrogen iodide is allowed to react with methyl acetate for producing methyl iodide and acetic acid, ~~[[and]]~~

the distillation provides the overhead containing the resulting methyl iodide~~[[.]], and~~

the material of the first distillation column comprises a nickel-based alloy.

18. **(Proposed Substitute for Claim 12)** The process according to claim ~~[[1,]] 16,~~ wherein ~~[[the separated liquid phases are a lower phase and an upper phase,]] the [[lower]] organic~~ phase has a methyl acetate concentration of 1 to 15% by weight, and the ~~[[upper]] aqueous~~ phase has a methyl acetate concentration of 0.4 to 8% by weight.

MTA, Appendix A (Claims Listing).

B. Requirements of 37 C.F.R. § 42.121

For reasons set forth below, we determine Patent Owner has satisfied its burden with respect to the above-discussed requirements of 37 C.F.R. § 42.121.

⁸ Referenced as “element 16[i]” in Patent Owner’s Motion to Amend (MTA 7–8), Petitioner’s Opposition to the Motion to Amend (Opp. MTA 18), and Patent Owner’s Reply in Support of its Motion to Amend (PO Reply MTA 9).

Patent Owner seeks to add three substitute claims to replace the three challenged claims found unpatentable and asserts that the proposed amendments “are responsive to all three Grounds as set forth in the [Institution Decision].” *See* MTA, 1–2. Petitioner does not challenge whether the number of substitute claims is reasonable, nor does Petitioner challenge whether the amendments are responsive to a ground of unpatentability in the trial. After independent review, we do not find that the number of substitute claims is unreasonable or that those claims are not responsive to grounds of unpatentability in this trial.

Patent Owner characterizes each of the substitute independent claims as retaining all of the features of the corresponding original claims, adding various additional features, and thus not enlarging the scope of its corresponding patent claim. *Id.* at 4. Patent Owner further provides detailed claim charts indicating where support for the language of substitute claims 16–18 can be found in the originally filed specification of Application No. 14/378,049 (Ex. 2009; now the ’483 Patent) (“the ’049 Applic.”). *Id.* at 5–9. Petitioner does not challenge Patent Owner’s proposed substitute claims on the issues of enlarging the scope of the original claims or for adding new matter or unsupported subject matter. We find written description support for Patent Owner’s proposed substitute claims and find that the proposed substitute claims do not seek to enlarge the scope of the claims of the ’483 patent or introduce new subject matter. *See id.*

In view of the above, we determine that Patent Owner has satisfied the procedural requirements of 37 C.F.R. § 42.121. Accordingly, we now focus on whether proposed substitute claims 16–18 are patentable over the prior art of record.

C. Analysis of the Patentable Distinction of Proposed Claims Over the Prior Art

As discussed above, Patent Owner does not have the burden of persuasion with respect to the patentability of the substitute claims presented in its Motion to Amend. *See Aqua Products*, 872 F.3d at 1327; *Guidance*. We determine whether the substitute claims are unpatentable by a preponderance of the evidence based on the entirety of the record, including any opposition made by the Petitioner. *See Guidance*.

1. Obviousness of Claim 16 over the Combination of Miura and Zinobile as Evidenced by the Liu Declaration

Petitioner contends that substitute claim 16 would have been obvious over the combination of Miura and Zinobile⁹ as evidenced by the Declaration of Dr. Yaw-Hwa Liu (Ex. 1055). Opp. MTA 8–18. In support of its assertion that claim 16 is obvious over the combination of Miura and Zinobile, Petitioner provides a detailed discussion and claim chart explaining how each claim limitation is disclosed in Miura. *Id.*

In reply, Patent Owner argues that (1) Miura is improperly interpreted by Petitioner; (2) Zinobile does not provide the necessary rationale or motivation; and (3) the combination of references fails to teach or suggest the following elements of claim 16:

Element 16[e]: “distilling the side cut stream in a second distillation column”;

Element 16[f]: “wherein the mixture comprising the volatile phase component contains an effective amount of water in a concentration of not more than 5% by weight and methyl acetate in a concentration of 0.5 to 9% by weight, and is separated, in the distillation step in the

⁹ Ex. 1012, Raymond J. Zinobile U.S. Pub. No. 2006/0247466 A1, published Nov. 2, 2006 (“Zinobile”).

first distillation column, into the overhead containing methyl iodide, [[and a]] the side cut stream containing acetic acid, [[or]] and a bottom stream containing acetic acid[[.]]”); and

Element 16[i]: “wherein the aqueous phase of said condensate comprises: a concentration of water of 50–90% by weight; a concentration of acetic acid of 10–40% by weight; and a concentration of hydrogen iodide of 10–1000 ppm.”

PO Reply MTA 4–11.

We address the dispute between the parties in detail below.

a. Element 16[e] (2nd distillation column)

Element 16[e] requires a side cut stream that goes to a second distillation column. See PO Reply MTA 10 n.4. With regard to Element 16[e], Patent Owner contends as follows:

Miura admittedly discusses subjecting the light component to a second distillation (at 6:49–51), but it does so in the context of refluxing the distillate through the same distillation column. Miura does not teach further distilling the side cut that goes from a first distillation column and into a second distillation column. Ex. 2006, ¶ 104.

Miura discloses a [hydrogen iodide] concentration of 40 ppm in the acetic acid side cut at 10:38. However there is no teaching or disclosure about the water or [methyl acetate] content in the side cut. Ex. 2006, ¶ 104

MTA 16. Patent Owner notes that Miura uses the phrase “further separated by distillation,” but argues that Miura never refers to a “column.” PO Reply MTA 9–10 (citing Ex. 1006, 9:40–41; Ex. 1054 ¶ 15; Ex. 2035, Hinnenkamp Depo., 66:13–67:14.).

Petitioner responds as follows:

Miura notes that its distillation process can be applied to the “reaction mixture” (*id.* at 6:30–31; *see also*, 5:1–26, 7:59–60), **or** “to a light component or fraction in the reaction mixture (or

liquid reaction composition) separated by . . . a flash distillation column” (*Id.* at 6:32-35). (Ex. 1054, ¶ 7). As discussed in the Petition and Reply, the concept of distilling a mixture, e.g., reaction mixture, having the recited water and methyl acetate concentrations claimed in original Claim 1 of the ’483 patent was known, as demonstrated by Miura. In an attempt to distinguish Miura, Daicel attempts in its amendment to add a “flash evaporation or flash distillation” step to Claim 16—even though flash vessels have been used in acetic acid production for decades. (Ex. 1054 at ¶ 15, Ex. 1050 at 448:13-449:15; Ex. 2006 at ¶ 57). In any event, this feature is clearly described in Miura, and the Miura examples describe distilling a mixture that has been processed, e.g., flashed. ([PO Resp.] at 9; Ex. 2006 at ¶ 56; Ex. 1054 at ¶ 15 and Appendix).

Opp. MTA 8–9.

Petitioner further contends that, while the term “column” is not used by Miura in its disclosure of a second distillation, Miura repeatedly refers to performing distillations using a distillation column. Pet. Sur-reply MTA 10–12; Ex. 1006, 2:15–17, 2:24–27, 9:33–44. For example, Miura discloses as follows:

The present invention relates to a process (e.g., a distillation process, and a production process of acetic acid) useful for inhibiting condensation of hydrogen iodide in a distillation column, reducing corrosion of a distillation column, and decreasing a concentration of hydrogen iodide in a bottom solution or a side stream solution of a distillation column.

Ex. 1006, 1:5–10.

Having considered the parties’ positions and evidence of the record, summarized above, we find that a preponderance of the evidence, summarized above, supports Petitioner’s position. In particular, we agree that Miura, when read in its entirety, suggests to a person of ordinary skill in the art that the additional distillation steps would have been conducted in a

distillation column. Pet. Sur-reply MTA 10–12; *see also* Ex. 1054 ¶ 15 (citing Ex. 1015, 13 (Fig 1)).

- a. Element 16[f] (effective amount of methyl acetate) and Element 16[i] (amount of acetic acid and hydrogen iodide in aqueous phase)*

With regard to Element 16[f], Patent Owner makes clarifying amendments to original claim 1 to account for certain added limitations such as Element 16[e] (flash evaporation or flash distillation step), but does not otherwise alter the limitation related to the concentration of methyl acetate, which is a limitation disputed by the parties. In this regard, we determine that Miura discloses distillation of a mixture containing the required amounts of methyl acetate for the same reasons discussed above with regard to original claim 1. *See supra* Section II.C.3.

Petitioner relies on Example 1 of Miura in combination with Zinobile to account for amendments to claim 1 adding numerous compositional ranges to the aqueous phases, organic phases, and side cut stream (e.g., Element 16[i]). Here, Petitioner contends that Miura Example 1 (operating at 9.8 wt.% methyl acetate) corresponds to Comparative Example 3 of the '483 patent (operating at 10 wt.% methyl acetate) and that a comparison of the downstream compositions recited in claim 16 show that “there is nothing new or inventive about the compositional ranges now being claimed in Claim 16.” Opp. MTA 9–10 (citing Ex. 1054 ¶¶ 16–21). In particular, Petitioner contends as follows:

[Patent Owner] does not contend that there are any *compositional* differences between the overhead phases of Miura and Comparative 3. Indeed, the distillation feed compositions [Patent Owner] highlights as different (water and methyl iodide) are actually extremely similar—**both falling within** [Patent

Owner]’s ***proposed claims***. As the ’483 patent indicates (supported by Dr. Bhise’s testimony), this similarity in feed composition supports a similarity in results, e.g., phase separation properties. (Ex. 1001, 10:5-11; Ex. 2006, ¶ 77).

Pet. Sur-reply MTA 8 (citing Ex. 1001, 10:5–11; Ex. 2006 ¶ 77).

Petitioner further contends that lowering the concentration of methyl acetate in Example 1 of Miura from 9.8 wt.% to 9 wt.% would have been an obvious modification. First, Petitioner relies on Zinobile to show “that problems with single phasing [in a water/methyl iodide system] can be resolved by reducing methyl acetate concentration, and that a [person of ordinary skill in the art] would apply this understanding to lower the methyl acetate concentration in the overhead of the first distillation column.” Pet. Sur-reply MTA 7 (citing Opp. MTA at 11; Ex. 1054 ¶ 19). Petitioner characterizes:

Zinobile, for example, indicates that methyl acetate content impacts phase separation during extraction in acetic acid systems and teaches that methyl iodide becomes more soluble, which would result in single phasing “with increasing levels of methyl acetate” (Ex. 1012 at ¶[0048]; Ex. 1054 at ¶ 19). Zinobile goes on to teach that “[a]t high enough methyl acetate . . . levels, phase separation of methyl iodide in the water extraction may not occur.” (Ex. 1012 at ¶[0048]). Thus, Zinobile teaches that problems with single phasing can be resolved by reducing methyl acetate concentration. (*Id.*; Ex. 1054 at ¶ 19). In view of the foregoing, it would have been obvious to a POSITA starting with Miura Example 1, and faced with the phase separation problems described by Daicel, to reduce the methyl acetate concentration, as described by Zinobile, to arrive at levels below 9 wt.% and have acceptable phase separation. (Ex. 1054 at ¶ 19). Moreover, by reducing the methyl acetate levels of Miura Example 1 to achieve acceptable phase separation according to Zinobile, the various component concentrations would approach those indicated in Examples 3 and 4 of the ’483 patent, which also all

fall within the ranges of proposed Claim 16. (Ex. 1001 at Table 1, Examples 3 and 4; Ex. 1054 at ¶ 20).

Opp. MTA 11–12.

Alternatively, Petitioner further contends as follows:

Additional motivation for lowering the methyl acetate concentration in the feed of Example 1 is provided in Miura itself, which indicates that lower amounts of methyl acetate are ***favored*** in the mixture to be distilled. (Ex. 1006 at 5:51-55 (teaching that the concentration of the carboxylic acid ester in the mixture is “more preferably” in range of . . . 0.5 to 6% by weight, e.g., about 2 to 6% by weight); Ex. 1054 at ¶ 20).

Id. at 12.

Having considered the parties’ positions and evidence of the record, we find that a preponderance of the evidence, summarized above, supports Petitioner’s position. First, we agree that evidence of the record supports a finding that Miura Example 1 “corresponds” to Comparative Example 3 of the ’483 patent. Ex. 2006 ¶ 77 (“Miura’s single working Example 1 of 9.8 wt% [methyl acetate] would correspond to Comparative Example 3 of the ’483 Patent specification of 10 wt% [methyl acetate]”). As it relates to claim 16, we find no meaningful compositional differences between the distillation feed compositions (e.g., water and methyl iodide) of Miura Example 1 and Comparative Example 3, and that this similarity in feed composition supports a similarity in results (e.g., phase separation properties) falling within the compositional ranges (e.g., amount of acetic acid and hydrogen iodide in aqueous phase) recited in claim 16.¹⁰ Ex. 1054

¹⁰ See Ex. 1055, Dr. Liu’s un rebutted testimony further demonstrates that the compositions added by proposed claim 16 read directly on Comparative Ex. 3 of the ’483 patent. We credit Liu and Mr. Hinnenkamp’s un rebutted testimony that Dr. Liu’s experiment is representative of a commercial scale

¶¶ 16–21; *see also* Ex. 1055 ¶¶ 7–21; Ex. 1006, 10:36 (hydrogen iodide is not condensed).

We further agree with Petitioner that a person of ordinary skill in the art would have had a reason to modify the teaching of Miura to lower the amount of methyl acetate in the distillation mixture because it was known that phase separation can be improved by lowering the amount of methyl acetate. Ex. 1012 ¶ 48 (“[I]t is desirable that the distillate that is condensed and provided for extraction contain methanol and methyl acetate at a combined concentration of less than about 10 Wt. %, more desirably less than about 5 Wt. %. . . .”); Ex. 1054 ¶ 19.

For these reasons, we determine that a preponderance of the evidence demonstrates that substitute claim 16 would have been obvious based on the combined teachings of Miura and Zinobile.

2. Obviousness of Claim 17 over the Combination of Miura, Zinobile, Lindenbergh, and Gambale

Claim 17 depends from claim 16, but further recites “a zone having a high water concentration is formed inside the first distillation column at a position upper than a position at which the mixture containing the volatile phase component is fed to the first distillation column . . . the material of the first distillation column comprises a nickel-based alloy.” PO Reply MTA 11.

Petitioner contends that

FIG. 3 of Miura . . . clearly shows a zone of high water at the top of the distillation column for Example 1, which would be “at a position upper than a position at which the mixture containing

process for the components of the phases considered here. Ex. 2035, 68:16–69:10; Ex. 2036, 39:13–40:2.

the volatile phase component is fed to the first distillation column” as specified by proposed Claim 17. (Ex. 1054 at ¶ 23). Thus, this feature is taught by Miura Example 1. (*Id.*)

Opp. MTA 19. With regard to the “nickel-based alloy” element of claim 17, Petitioner contends as follows:

As of the priority date of the ’483 patent, there were a finite number of materials of construction from which a POSITA could select for a first distillation column in acetic acid production. (Ex. 1050, 575:5–17; Ex. 1054 at ¶ 25). As indicated by Lindenbergh and Gambale, nickel-based alloys were routinely selected when stainless steel provided inadequate corrosion resistance, as would be expected with the distillation column of Claim 17. (Ex. 1054 at ¶ 25). As a result, proposed Claim 17 should be rejected as obvious over Miura in view of Zinobile, Lindenbergh, and Gambale. (*Id.*).

Id. at 20.

Patent Owner contends the following:

While Petitioner cites [Lindenbergh¹¹ and Gambale¹²] for support, this proposed ground fails by virtue of claim 17 depending on claim 16. Pet. Opp., pp. 18-20. The unreliable Liu testing and Miura’s Ex. 1 cannot correspond to Comp. Ex. 3 of the ’483 patent. Further, Miura, Zinobile, [Lindenbergh and Gambale] do not disclose or suggest the claimed effective amounts of MA and water, and elements 16[e] and 16[i] of base claim 16.

PO Reply MTA 11.¹³

¹¹ Ex. 1056, Lindenbergh et al., *Production of Acetic Acid from Methanol*, Preliminary Plant Design Chemical Process Technology, FVO Nr. 3164, 29 March 1996.

¹² Ex. 1057, Dean Gambale, *Choosing Specialty Metals for Corrosion-Sensitive Equipment*, AMER. INST. CHEM. ENG’G, 62–66. (2010).

¹³ Patent Owner relies on attorney argument to criticize the declaration of Dr. Liu, which we give little to no weight. See *Gemtron Corp. v. Saint-*

Having considered the parties' positions and evidence of the record, we find that a preponderance of the evidence, summarized above, supports Petitioner's position. With regard to the limitation of a "zone having a high water concentration," the '483 patent teaches that a zone having a high water concentration above the feed is formed by feeding 0.5 to 4.5% by weight water and 0.5 to 9% by weight methyl acetate. Ex. 1001, Abstract, 4:51–5:2; 10:16–24; 14:23–31. Given that we have already concluded that the systems of the '483 patent and Miura have similar feed compositions with the distillations performing comparable separations, we further conclude that one skilled in the art would understand that the distillation zone of Miura also forms a high water concentration zone at a position above the feed as described in the '483 patent. See Ex. 1002 ¶¶ 87–88; *see also* Pet. 54–57.

With regard to the "nickel-based alloy" element of claim 17, we find that a preponderance of the evidence supports Petitioner's position that nickel-based alloys were routinely selected when stainless steel provided inadequate corrosion resistance. Opp. MTA 20. For example, Gambale "focuses on corrosion-sensitive equipment typically found in processing plants and the specialty-metal material options and techniques that should be considered when stainless steel and fluorinated polymers are insufficient." Ex. 1057, 1. "For corrosion-related applications, the term specialty metal generally refers to titanium, nickel alloys, zirconium, and tantalum." *Id.* With regard to selection of nickel-based alloys, Gambale states, "[n]ickel alloys are often selected when steels do not offer adequate corrosion

Gobain Corp., 572 F.3d 1371, 1380 (Fed. Cir. 2009) ("[U]nsworn attorney argument . . . is not evidence and cannot rebut . . . other admitted evidence. . .").

resistance. . . . [.] are applicable in a wide range of acids, salt solutions, and caustic environments, and are suitable in the chemical . . . industr[y].”

Ex. 1057, 3–4.

For these reasons, we determine that a preponderance of the evidence demonstrates that substitute claim 17 would have been obvious based on the combined teachings of Miura, Zinobile, Lindenbergh, and Gambale.

3. Obviousness of Claim 18 over the Combination of Miura and Zinobile as Evidenced by the Liu Declaration

Claim 18 depends from claim 16 and further narrows the methyl acetate concentrations for the organic phase (1–15 wt.%) and aqueous phase (0.4–8 wt.%).

Petitioner contends that

the methyl acetate concentrations of the organic and aqueous phases in Comparative Example 3, which corresponds to Example 1 of Miura, fall only just *barely* above the range limits for methyl acetate content recited in Claim 18. As discussed above, a [person of ordinary skill in the art] would be motivated from Zinobile and Miura itself to reduce the methyl acetate levels in the mixture to be distilled to provide acceptable phase separation in the decanter. (Ex. 1054 at ¶¶ 18-21; Ex. 1006 at 5:51-55). A reduction in methyl acetate content in the mixture to be distilled would necessarily result in concomitant reductions in methyl acetate content in the organic and aqueous phases. (Ex. 1054 at ¶ 27). As a result, the resulting phase compositions would approach those shown in Examples 3 (methyl acetate in feed: 4.2 wt.%) and 4 (methyl acetate in feed: 7.2 wt.%) of the ’483 patent, which fall squarely within the ranges of proposed Claim 18. (Ex. 1001, Table 1, Example 3 and Example 4; Ex. 1054 at ¶ 27). In view of the foregoing, a [person of ordinary skill in the art] motivated to reduce the methyl acetate content in the mixture to be distilled to the ranges described as “more preferred” by Miura would, as a result, reduce the methyl acetate

content of the organic and aqueous phases [be within] to the ranges claimed in Proposed Claim 18. (Ex. 1054 at ¶ 27).

Opp. MTA 21–22.

Patent Owner responds as follows:

this proposed combination fails because claim 18 depends on claim 16, which is not obvious for the reasons above. Again, the Liu declaration is insufficient, and Petitioner has not accounted for all claimed features of substitute claims 16 and 18.

PO Reply MTA 11.

Having considered the parties’ positions and evidence of the record, we find that a preponderance of the evidence, summarized above, supports Petitioner’s position.¹⁴ We adopt Petitioner’s position in this regard. Accordingly, we determine that a preponderance of the evidence demonstrates that substitute claim 18 would have been obvious based on the combined teachings of Miura and Zinobile.

D. Whether Patent Owner’s Proposed Claims Are Indefinite or Enabled

Having determined that substitute claims 16–18 are unpatentable over the prior art of record, we do not reach Petitioner’s arguments that the substitute claims are indefinite or lack enablement. Opp. MTA 1–8, 22–24.

E. Conclusion

In sum, we determine that the entirety of the record demonstrates by a preponderance of the evidence that proposed substitute claims 16–18 are

¹⁴ Patent Owner relies on attorney argument to criticize the declaration of Dr. Liu, which we give little to no weight. See *Gemtron Corp.* 572 F.3d at 1380 (Fed. Cir. 2009) (“[U]nsworn attorney argument . . . is not evidence and cannot rebut . . . other admitted evidence . . .”).

unpatentable. For these reasons, we deny Patent Owner's Motion to Amend with respect to the proposed substitute claims

IV. PETITIONER'S MOTION TO EXCLUDE EVIDENCE

Petitioner seeks to exclude the entirety of the Declaration of Dr. Vijay Bhise (Ex. 2006) because "Dr. Bhise does not possess the qualities required by Rule 702" (Paper 44, 2–6), is "not competent to opine on the issues in this case" (*id.* at 7), because his testimony "fails to satisfy the requirements of FRE 703, requiring the disclosure of the basis for his opinions" (*id.* at 10–11), and because he appeared "purposefully evasive" in his responses to basic questions during his deposition (*id.* at 11–15 (citing Ex. 1050)).

We have reviewed the testimony provided by Dr. Bhise and see no credible basis that would warrant its exclusion. Petitioner's objections go to the weight and sufficiency of the testimony, rather than its admissibility. We are capable of discerning from the testimony, and the evidence presented, whether the witness's testimony should be entitled to any weight, either as a whole or with regard to specific issues. We weigh such testimony on an issue-by-issue basis, as appropriate. Furthermore, Petitioner has had the opportunity to address any alleged deficiencies in the testimony of Dr. Bhise in its multiple filings throughout this proceeding, and we are capable of weighing that testimony accordingly. Thus, we deny Petitioner's motion seeking to exclude the testimony of Dr. Bhise in this proceeding.

V. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that claim 11 of the '483 patent is determined to be unpatentable;

FURTHER ORDERED that Patent Owner's Motion to Amend is *granted-in-part* as to its request to cancel claims 1–3, 5, 6, 9, 10, 12, 13, and 15 of the '483 patent;

FURTHER ORDERED that Patent Owner's Motion to Amend is *denied-in-part* as to substitute claims 16–18;

FURTHER ORDERED that Petitioner Motion to Exclude is *denied*; and

FURTHER ORDERED that because this is a final decision, parties to the 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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