

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SYMRISE AG and SYMRISE INC.,
Petitioner,

v.

INOLEX INVESTMENT CORPORATION,
Patent Owner.

IPR2023-01035
Patent 10,995,048 B2

Before ULRIKE W. JENKS, TINA E. HULSE, and
ROBERT A. POLLOCK, *Administrative Patent Judges*.

HULSE, *Administrative Patent Judge*.

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

I. INTRODUCTION

Symrise AG and Symrise Inc. (collectively, “Petitioner”) filed a Petition requesting an *inter partes* review of claims 1–6, 8–10, and 22–28 of U.S. Patent No. 10,995,048 B2 (Ex. 1001, “the ’048 Patent”). Paper 1 (“Pet.”). Inolex Investment Corp. (“Patent Owner”) filed a Preliminary Response to the Petition. Paper 6 (“Prelim. Resp.”).

We have authority under 35 U.S.C. § 314, which provides that an *inter partes* review may not be instituted “unless . . . there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition.” 35 U.S.C. § 314(a). Upon considering the argument and evidence presented in the papers, we determine that Petitioner has established a reasonable likelihood that it would prevail in showing the unpatentability of at least one claim challenged in the Petition. Accordingly, we institute an *inter partes* review of the challenged claims of the ’048 Patent.

A. *Real Parties-in-Interest*

Petitioner identifies itself as the real party-in-interest. Pet. 2–3.

Patent Owner identifies itself as the real party-in-interest. Paper 5, 1.

B. *Related Proceedings*

The parties both state that they are not aware of any judicial or administrative proceedings involving the ’048 Patent. Pet. 3; Paper 5, 1.

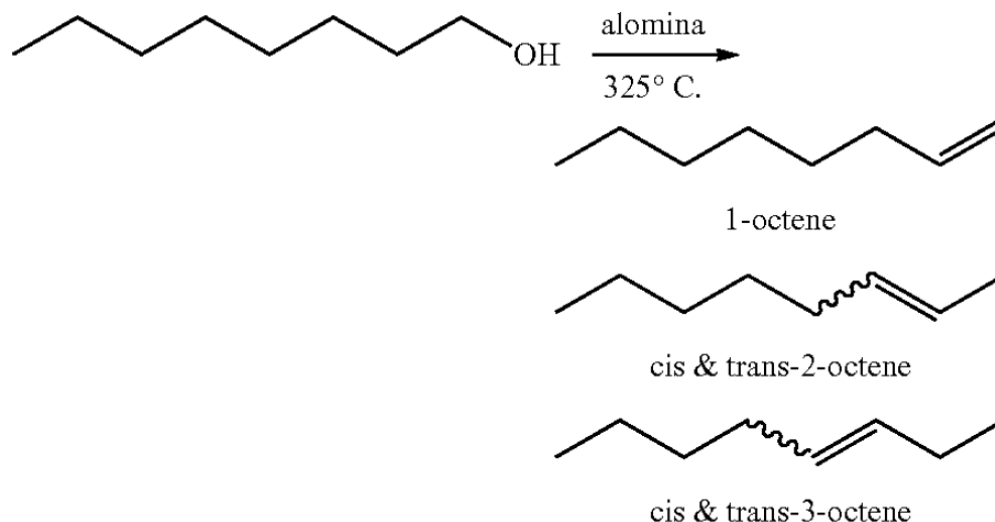
C. *The ’048 Patent*

The ’048 Patent, entitled “Natural 1,2-Alkanediols, Compositions Having Natural 1,2-Alkanediols and Processes for Making the Same,” was filed on November 13, 2019, and claims the benefit of U.S. Patent Application No. 16/262,902, filed on January 30, 2019, and of Provisional

Application No. 62/623,958, filed on January 30, 2018. Ex. 1001, codes (54), (22), (63), (60).

The '048 Patent relates to natural and renewable antimicrobial compounds for use in alternative preservation systems for consumer products, such as personal care products. *Id.* at 1:25–31. Personal care products, like cosmetics, are packaged in clean but not sterile conditions. *Id.* at 1:39–42. As such, small amounts of microbes may be in products which, over time, may grow to a level significant enough to result in discoloration or a foul odor. *Id.* at 1:43–55. To address microbial growth, manufacturers add chemical preservatives, which are typically petrochemically based and derived from fossil fuels. *Id.* at 1:61–64. The Specification states there is a desire to develop alternatives to traditional preservation and to use chemical components that are derived from sustainable and renewable resources (“feedstocks”). *Id.* at 2:13–16. Such “natural” and “renewable” products are formed by “new” carbon (versus “old” carbon from fossil fuels) and are known in the art as non-petrochemically derived or “bio” products. *Id.* at 3:35–40.

According to the Specification, caprylyl glycol (i.e., 1,2-octanediol) is one of the fastest growing alternative preservation components in the world. *Id.* at 2:51–58. One known way to prepare caprylyl glycol is shown by the chemical reaction below:



Id. at 5:3–30. The chemical reaction above shows the conversion of 1-octanol using heat and an acid catalyst (i.e., alumina) to form a mixture of 1-octene, cis- and trans-2-octene, and cis- and trans-3-octene.

Using a mixture of alkenes ultimately provides a mixture of diols upon dihydroxylation, providing a low yield of the desired terminal 1,2-diol material and producing unwanted contaminants. *Id.* at 5:7–10. But separating 2-, 3-, and 4-octene (not shown) regioisomers from the desired 1-octene is difficult and causes a lower net chemical yield of 1-octene. *Id.* at 6:2–5. Thus, according to the Specification, “[t]here is a strong need in the art for a highly regioselective, and high-chemical conversion rate process for creating a bio-1-octene from a bio-1-octanol.” *Id.* at 6:22–24.

The Specification states that it is known that bio-1-butanol can convert to bio-1-butene with high selectivity and high chemical yield. *Id.* at 7:19–25. The ’048 Patent states, however, that “even with such a result for bio-1-butene, it is noted that the conversion of 1-octanol to 1-octene is not simply a homolog of a conversion of 1-butanol to bio-1-butene.” *Id.* at 7:39–42.

Accordingly, the Specification states that there is a need in the art for continued improvement to consumer products to provide additives to keep products safe from contamination while avoiding traditional preservatives and relying on components for consumer product compositions derived from natural bio-sources. *Id.* at 7:46–56. The Specification further states that “[t]here is more particularly a need for a natural, and preferably renewable/sustainable feedstock source to create a natural, bio-caprylyl glycol (i.e., a natural or bio-1,2-octanediol) and the associated bio-1-alkene intermediate.” *Id.* at 7:56–60.

D. Illustrative Claim

Petitioner challenges claims 1–6, 8–10, and 22–28 of the ’048 Patent, of which claim 1 is the only independent claim. Claim 1 is illustrative and reproduced below:

1. A method for making a bio-alkene, comprising:
dehydrating a bio-1-alcohol by heating the bio-1-alcohol in a reactor with a catalyst, wherein the resulting bio-alkene has a carbon chain of about 5 to about 20 carbon atoms and a bio-1-alkene regioselectivity of at least about 80%.

Ex. 1001, claim 1.

E. The Asserted Grounds of Unpatentability

Petitioner asserts that claims 1–6, 8–10, and 22–28 are unpatentable on the following grounds:

Claims Challenged	32 U.S.C. § ¹	Reference(s)
1–6, 8–10, 22, 23, and 26–28	103	Le ²
24 and 25	103	Le and Cheng ³
1–6, 8–10, 22, 23, and 26–28	103	De Bruyn ⁴ and Le
24 and 25	103	De Bruyn, Le, and Cheng
1–6, 8–10, 22, 23, and 26–28	103	Wright ⁵
24 and 25	103	Wright and Cheng

Petitioner also relies on the Declaration of Douglass F. Taber, Ph.D. Ex. 1002.

II. ANALYSIS

A. *Person of Ordinary Skill in the Art*

Petitioner contends that a person of ordinary skill in the art at the time of the invention (“POSITA”) would have had “a bachelor’s degree and two or more years of experience or a master’s degree in organic synthesis or chemical engineering, with education substituting for experience and *vice versa*.” Pet. 15 (citing Ex. 1002 ¶ 16). Patent Owner takes no position on

¹ The Leahy-Smith America Invents Act (“AIA”), Pub. L. No. 112-29, 125 Stat. 284, 287–88 (2011), amended 35 U.S.C. § 103, effective March 16, 2013. Because the ’048 Patent has an effective filing date after March 16, 2013, the AIA version of § 103 applies. Our decision, however, would be the same under either version.

² Le et al., US 2011/0196114 A1, published Aug. 11, 2011. Ex. 1007 (“Le”).

³ Cheng et al., US 6,528,665 B1, issued Mar. 4, 2003. Ex. 1010 (“Cheng”).

⁴ De Bruyn et al., US 2005/0065389 A1, published Mar. 24, 2005. Ex. 1008 (“De Bruyn”).

⁵ Michael E. Wright, US 2012/0238788 A1, published Sept. 20, 2012. Ex. 1009 (“Wright”).

the level of ordinary skill in the art in its Preliminary Response. Prelim. Resp. 8.

We adopt Petitioner’s definition as it appears to be consistent with the prior art’s demonstration of the level of ordinary skill in the art at the time of the invention. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001) (explaining that specific findings regarding ordinary skill level are not required “where the prior art itself reflects an appropriate level and a need for testimony is not shown” (quoting *Litton Indus. Prods., Inc. v. Solid State Sys. Corp.*, 755 F.2d 158, 163 (Fed. Cir. 1985))).

Moreover, we find on this record that Dr. Taber is qualified to opine from the perspective of a skilled artisan as he is a person of at least ordinary skill in the art. *See* Ex. 1002 ¶¶ 2–4, App’x A.

B. Claim Construction

In an *inter partes* review, the Board applies the same claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. § 282(b). *See* 37 C.F.R. § 100(b). Under that standard, claim terms “are generally given their ordinary and customary meaning” as understood by a person of ordinary skill in the art at the time of the invention. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–13 (Fed. Cir. 2005) (en banc).

The parties dispute the construction of the phrase “bio-alkene has a carbon chain length about 5 to about 20 carbon atoms” in claim 1. According to Petitioner, because the term “about” is a “term of degree,” the phrase should be construed to mean “a carbon chain length with a minimum of 4 carbon atoms and a maximum of 21 carbon atoms.” Pet. 6, 8. Petitioner asserts that “about 5” must include a carbon chain length of 4 carbon atoms, as 6 carbon atoms is already covered by the range of “about 5

to about 20 carbon atoms.” *Id.* at 6–7. Moreover, Petitioner notes that during prosecution of the parent application, U.S. Application No. 16/262,902, Patent Owner filed an amendment after allowance, replacing the phrase “having a carbon chain length of about 8” with the phrase “having a carbon chain length of 7.” *Id.* at 7 (quoting Ex. 1006, 335). Finally, Petitioner contends that because carbon atoms are not divisible, “about 5” necessarily includes 4 carbon atoms. *Id.*

In response, Patent Owner argues that the claim phrase should be construed to mean “a bio-alkene having a carbon chain length of 5 to 20 carbon atoms, permitting trace impurities and minor undesired fractions.” Prelim. Resp. 11–12. Patent Owner asserts that because the claim recites that “*the resulting bio-alkene* has a carbon chain of about 5 to about 20 carbon atoms,” Petitioner’s proposed construction cannot be correct because the intrinsic record “makes clear that bio-alkenes having a carbon chain of 4 carbon atoms are not encompassed in the present invention.” *Id.* at 11. Patent Owner concludes that adopting Petitioner’s construction would implicate the validity of claim 1 over the prior art discussed in the Specification and therefore cannot be correct. *Id.* at 14 (citing *Tubular Rollers, LLC v. Maximus Oilfield Prods., LLC*, No. 21-2319, 2023 WL 4230371, at *11 (Fed. Cir. June 28, 2023)).

At this stage of the proceeding, we determine Petitioner’s construction is most consistent with the plain ordinary meaning of “about” and the intrinsic evidence. The claim recites that the carbon chain length of the resulting bio-alkene is “*about 5 to about 20.*” Ex. 1001, claim 1 (emphasis added). We agree with Petitioner that use of the term “about” indicates a lack of specificity with respect to the claimed range. *See Cohesive Techs., Inc. v. Waters. Corp.*, 543 F.3d 1351, 1368 (Fed. Cir. 2008) (“When ‘about’

is used as part of a numeric range, the use of the word ‘about,’ avoids a strict numeric boundary to the specified parameter.”)(internal quotations omitted). In other words, the claim term “about 5 to about 20” does not require precisely 5 to 20 carbons. Moreover, we agree that a carbon atom in a compound is not divisible. Keeping these principles in mind, we find “about 5” at the lower end of the range encompasses at least a carbon chain length of 4, and “about 20” at the upper end of the range encompasses at least a carbon chain length of 21.

We also agree with Petitioner that the prosecution history of the parent application supports construing “about” to encompass one additional carbon atom, as evidenced by the amendment after allowance amending the term “carbon chain length of about 8” to “carbon chain length of 7.” *See* Ex. 1006, 335. Thus, the intrinsic evidence supports Petitioner’s construction and the plain ordinary meaning of “about.”

In contrast, Patent Owner’s proposed construction of “a bio-alkene having a carbon chain length of 5 to 20 carbon atoms, permitting trace impurities and minor undesired fractions” offers no meaning for the term “about.” That is, on this record, it is unclear how having “trace impurities and minor undesired fractions” has any bearing on the number of carbon atoms in the resulting bio-alkene. *See* Ex. 1001, 8:22–30. Patent Owner relies heavily on the Specification’s description of prior art bio-alkenes with a carbon chain length of 4 carbons with the claimed regioselectivity as known in the art. *Id.* at 13 (citing Ex. 1001, 7:19–25). Patent Owner also notes that the ’048 Patent teaches that “conversion of 1-octanol to 1-octene is not simply a homolog of a conversion of 1-butanol to bio-1-butene.” *Id.*

Patent Owner then argues that adopting Petitioner’s construction would “implicate the validity of claim 1 over prior art discussed in the

specification that was before the Patent Office.” Prelim. Resp. 15.

According to Patent Owner, “it is appropriate to construe the claims to preserve their validity when, as here, that construction ‘is practicable, is based on sound claim construction principles, and does not revise or ignore the explicit language of the claims.’” *Id.* (citing *Tubular Rollers*, 2023 WL 4230371, at *11).

First, we note that Patent Owner’s citation to *Tubular Rollers* is to the dissenting opinion. *See id.*, at *9 (Judge Reyna dissenting-in-part). Nevertheless, *Tubular Rollers* fails to support Patent Owner’s argument, as Patent Owner’s proposed construction *does* “revise or ignore the explicit language of the claims” by ignoring the term “about.” To adopt Patent Owner’s construction would be contrary to the Federal Circuit’s caution “against judicial rewriting of claims to preserve validity.” *See Rhine v. Casio, Inc.*, 183 F.3d 1342, 1345 (Fed. Cir. 1999).

Thus, at this stage of the proceeding, we adopt Petitioner’s proposed construction as consistent with the plain and ordinary meaning of the term and the intrinsic evidence. That said, as seen below, even if we were to adopt Patent Owner’s construction and construe the claims to omit the term “about,” our decision to institute this *inter partes* review would still be the same, as the prior art teaches carbon chain lengths between 5 and 20. *See Wellman, Inc. v. Eastman Chem. Co.*, 642 F.3d 1355, 1361 (Fed. Cir. 2011) (“[C]laim terms need only be construed ‘to the extent necessary to resolve the controversy.’” (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999))).

C. Alleged Obviousness over Le Alone or with De Bruyn

Petitioner argues that claims 1–6, 8–10, 22, 23, and 26–28 are unpatentable as obvious over Le alone or over the combination of Le and

De Bruyn. Pet. 20–31, 33–46. Patent Owner does not substantively respond to these grounds in its Preliminary Response. *See generally* Prelim. Resp.

On this record, we determine that Petitioner has established a reasonable likelihood that it would prevail in showing that the challenged claims are unpatentable over the cited references.

1. Le (Ex. 1007)

Le is a U.S. patent application published on August 11, 2011, entitled “Polyolefin Derived from Renewable Resources, and Method for Producing Same.” Ex. 1007, codes (43), (54). Le relates to “a polymer obtained by polymerization of an olefin, derived from renewable materials, having a number of carbon atoms included in the range of from 6 to 9.” *Id.* ¶ 2. Le explains that although polyolefins can be derived from oil products, the exploitation of fossil resources is problematic for various reasons. *Id.* ¶ 13. As such, Le states that “there has, over the past few years, been an increasing interest in polymers derived from renewable starting materials.” *Id.*

Le describes a two-step process for producing the polymer according to the invention, comprising:

- A. treatment of said fatty substance [e.g., plant oil or animal fat] so as to form an olefin (a) comprising a number of carbon atoms included in the range of from 6 to 9;
- B. polymerization of the constitutive monomers, at least one of which is the olefin (a).

Id. ¶¶ 50, 59. Le explains that Step A of the process is a dehydration step that can be carried out in the presence of a dehydration catalyst, such as a γ -alumina-based catalyst, in the presence of the alcohols obtained from renewable sources at temperatures ranging from 250 to 400°C. *Id.* ¶¶ 63, 65.

“When a saturated alcohol of which the only alcohol function is in the alpha-position is dehydrated, a single isomer (an alpha-olefin) is obtained.” *Id.*

¶ 68. As an example of Step A, Le describes obtaining and dehydrating hexan-1-ol to form 1-hexene (i.e., a bio-1-alkene with 6 carbons). *Id.*

¶¶ 94–100.

2. *De Bruyn (Ex. 1008)*

De Bruyn is a U.S. patent application published on March 24, 2005, entitled “Method of Increasing the Carbon Chain Length of Olefinic Compounds.” Ex. 1008, codes (43), (54). De Bruyn notes that there is a high demand for longer-chain alpha-olefins and relates to a process for increasing the carbon chain length of olefinic compounds. *Id.* ¶¶ 1, 2.

De Bruyn describes a process starting with an olefinic compound and subjecting it to hydroformylation to produce an aldehyde and/or alcohol with an increased carbon chain length compared to the starting olefinic compound. *Id.* ¶¶ 7–8. De Bruyn then describes dehydrating the alcohol to produce an olefinic compound with an increased carbon chain length to the starting olefinic compound. *Id.* ¶¶ 10. De Bruyn states that the process preferably produces alpha-olefins, such as 1-hexene and/or 1-octene. *Id.* ¶ 13. De Bruyn further states that alpha-olefins can be produced from shorter chain olefinic compounds “in purities of greater than 95% of the desired isomer.” *Id.* ¶ 35. Example 3 of De Bruyn describes the dehydration of 1-hexanol to 1-hexene with high regioselectivity. *Id.* ¶ 53 (“A total of 94% of the 1-hexanol was converted to alkenes, with a selectivity towards hexenes of 98.6%, of which 97.5% was 1-hexene.”).

3. *Analysis*

A patent claim is unpatentable under 35 U.S.C. § 103 if the differences between the claimed invention and the prior art are such that the

claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains. 35 U.S.C. § 103; *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations, including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of skill in the art; and (4) objective evidence of nonobviousness. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

“[A] patent composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art.” *KSR*, 550 U.S. at 418. “[I]t can be important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does.” *Id.* Moreover, a person of ordinary skill in the art must have had a reasonable expectation of success of doing so. *PAR Pharm., Inc. v. TWI Pharms., Inc.*, 773 F.3d 1186, 1193 (Fed. Cir. 2014).

Petitioner asserts that Le teaches or suggests each limitation of claim 1. Pet. 20–24. On this record—and without a substantive response from Patent Owner—we find Petitioner has shown sufficiently that Le teaches or suggests each limitation of claim 1. For example, Petitioner asserts that Le describes that a “dehydration step is carried out in a reactor so as to form a mixture of alkene and water . . . in the presence of a dehydration catalyst, for example a gamma-alumina-based catalyst . . . in the presence of the alcohols obtained from the starting materials of renewable origin.” *Id.* at 21 (citing Ex. 1007 ¶¶ 62–63; Ex. 1002 ¶ 51). Petitioner notes the alcohol is dehydrated in a reactor by heating it to a temperature range of 250 to 400°C.

Id. (citing Ex. 1007 ¶¶ 65, 71). Petitioner also notes the numerous examples in Le teaching dehydrating bio-1-hexanol, bio-1-heptanol, and bio-1-nonanol derived from plant oils into their respective bio-1-alkenes (i.e., bio-1-hexene, bio-1-heptene, and bio-1-nonene). *Id.* at 22 (citing Ex. 1007 ¶¶ 94–105, 110–114, 117). Thus, according to Petitioner, “a POSITA understands that Le teaches dehydrating a bio-1-alcohol (e.g., bio-1-hexanol to bio-1-nonanol derived from plant oil) by heating the bio-1-alcohol in a reactor (e.g., at 250 to 400°C) with a catalyst (e.g., a γ -alumina catalyst) to form a bio-1-alkene (e.g., bio-1-hexene, bio-1-heptene, or bio-1-nonene derived from plant oil).” *Id.* at 22 (citing Ex. 1002 ¶¶ 52, 54). Petitioner further asserts that Le teaches the resulting bio-alkene has a carbon chain of about 5 to about 20 carbon atoms by teaching production of bio-1-hexene, bio-1-heptene, and bio-1-nonene (i.e., carbon chain lengths of 6, 7, and 9 carbons, respectively). *Id.* at 23 (citing Ex. 1002 ¶ 55).

Petitioner acknowledges that Le does not expressly use the word “regioselectivity.” *Id.* at 23. But Petitioner asserts that Le does teach that when a bio-1-alcohol is dehydrated, “a single isomer (an alpha-olefin) is obtained,” as opposed to “when the saturated alcohol is not in the alpha position, a mixture of two isomers is formed.” *Id.* at 23–24 (citing Ex. 1007 ¶ 68; Ex. 1002 ¶¶ 58–59). Petitioner’s declarant, Dr. Taber, testifies that a POSITA would understand that Le’s “single isomer” is at least 95% 1-alkene “because if there were any significant impurity production it would have been readily apparent and reported.” Ex. 1002 ¶ 59. Although Dr. Taber does not cite any objective evidence in support of this opinion, we are persuaded at this stage of the proceeding—and without the benefit of Patent Owner’s substantive response—that Petitioner has shown sufficiently that a POSITA reading Le would have understood that it would have been

obvious to design a dehydration reaction of a bio-1-alcohol to result in a predominantly bio-1-alkene of at least 80%. Ex. 1002 ¶¶ 35–40, 48.

To the extent Le is insufficient with respect to the regioselectivity limitation of claim 1, Petitioner bolsters its challenge with De Bruyn. According to Petitioner, Example 4 of De Bruyn describes dehydrating 1-hexanol over a γ -alumina catalyst at 290°C to produce 1-hexene with a regioselectivity of 97.0%. Pet. 39 (citing Ex. 1008 ¶¶ 68–71, Table 10; Ex. 1002 ¶¶ 88, 92, 96); *see also id.* at 40 (asserting Example 5 of De Bruyn teaches dehydrating a bio-1-octanol to produce bio-1-octene with regioselectivities of at least 97.4% (citing Ex. 1008 ¶¶ 80–83, Table 14; Ex. 1002 ¶¶ 93–95)).

Although De Bruyn teaches using petroleum-derived starting materials, Petitioner asserts that a POSITA would have understood that performing De Bruyn's dehydration using Le's bio-1-hexanol or bio-1-octanol would predictably yield the corresponding bio-1-alkene with a regioselectivity of at least about 80%. Pet. 35 (citing Ex. 1002 ¶¶ 82–84). Petitioner asserts that a POSITA would have understood that De Bruyn's method of dehydrating 1-heptanol and 1-octanol using a bio-1-heptanol or bio-1-octanol of Le would form a bio-1-alkene such as bio-1-heptene and bio-1-octene. Moreover, Petitioner asserts that a POSITA would have understood the advantages of using natural feedstocks and would have been motivated to use the natural feedstocks of Le for a variety of reasons, including marketing, cost, and availability of materials. *Id.* (citing Ex. 1002 ¶ 90). At this stage of the proceeding, Patent Owner provides no evidence that petroleum-derived starting materials would behave differently from natural feedstocks in De Bruyn's method, or that one of ordinary skill in the art would expect any such differences.

In light of Petitioner's arguments and evidence, we are persuaded that Petitioner has shown sufficiently that a POSITA would have combined De Bruyn's dehydration methods with Le's bio-1-alcohols to reach the invention of claim 1 with a reasonable expectation of success.

Regarding dependent claims 2–6, 8–10, 22, 23, and 26–28, we have considered the arguments and evidence presented by Petitioner and find Petitioner has shown sufficiently that Le alone and the combination of Le and De Bruyn teach or suggest the additional limitations of those claims, and that a POSITA would have had a reason to combine the references with a reasonable expectation of success for the reasons stated in the Petition. *See* Pet. 24–31 (citing, e.g., Ex. 1007 ¶¶ 2, 7, 19, 20, 59, 62–66, 68, 94–109, 117, 119, 168–174; Ex. 1002 ¶¶ 55–60, 63–76); Pet. 41–46 (citing, e.g., Ex. 1007 ¶¶ 2, 7, 19, 20, 59, 62–68, 117, 171, 173; Ex. 1008 ¶¶ 6, 53, 68–71, 81–83, Table 10, Table 14; Ex. 1002 ¶¶ 74, 75, 80–84, 87, 88, 90, 92–95, 97–112).

4. Conclusion

At this stage of the proceeding, we find Petitioner has shown a reasonable likelihood that it would prevail on its assertions that claims 1–6, 8–10, 22, 23, and 26–28 would have been obvious over Le alone or Le and De Bruyn.

D. *Alleged Obviousness of Claims 24 and 25 over Le and Cheng or Le, De Bruyn and Cheng*

Petitioner argues that claims 24 and 25 are unpatentable as obvious over the combination of Le and Cheng or the combination of Le, De Bruyn, and Cheng. *Id.* at 31–33, 46–49. Patent Owner does not substantively respond to these grounds in its Preliminary Response. *See generally* Prelim. Resp.

On this record, we determine that Petitioner has established a reasonable likelihood that it would prevail in showing that the challenged claims are unpatentable over the cited references. We incorporate here our earlier findings and discussion regarding Le and De Bruyn.

1. Cheng (Ex. 1010)

Cheng is a U.S. patent entitled, “Preventing Undesired Odor in and/or Purifying Alkanediols,” which was filed on April 3, 2002, and issued on March 4, 2003. Ex. 1010, codes (54), (22), (45). Cheng states that alkanediols, especially vicinal alkanediols, such as 1,2-alkanediols, are typically produced by hydrolysis of epoxyalkanes. *Id.* at 1:6–9. One commercial method of producing epoxyalkane starting materials involves reacting an alkene with hydrogen peroxide in the presence of a heavy metal catalyst. *Id.* at 1:11–14. Although effective, Cheng explains that the process can produce small amounts of impurities that produce commercially unacceptable odors in the resulting alkanediols. *Id.* at 1:15–19. Thus, Cheng describes “commercially attractive ways of preventing undesired odors in alkanediols . . . and most especially in vicinal alkanediols such as 1,2-alkanediols.” *Id.* at 1:40–45.

2. Analysis

Regarding claim 24, Petitioner asserts that Le describes a process of polymerizing an olefin having 6 to 9 carbon atoms from “renewable materials” to produce a polymer. Pet. 32, 47 (citing Ex. 1007 ¶¶ 2; Ex. 1002 ¶¶ 78, 114). Petitioner further asserts that Cheng describes converting a 1-hexene to a 1,2-epoxyhexane, which is then converted to a 1,2 hexanediol. *Id.* at 32, 48 (citing Ex. 1010, 13:56–14:58, 16:1–40; Ex. 1002 ¶¶ 78, 114). According to Petitioner, it would have been obvious to combine Le and Cheng because “vicinal alkanediols, such as 1,2-alkanediols” are used for

commercial applications, and Cheng describes a “commercially attractive way[]” of using the hexene product of Le. *Id.* at 32, 48 (citing Ex. 1010, 1:6–10, 1:40–48; Ex. 1002 ¶¶ 77–78, 114). Petitioner states “[t]hese end products are different from bio-alkenes or bio-based polymers.”⁶ *Id.* at 33, 48.

Regarding claim 25, Petitioner asserts that Le teaches the bio-alkenes can be further subjected to catalytic polymerization or free-radical polymerization methods to form a bio-based polymer. Pet. 33, 48 (citing Ex. 1007 ¶¶ 19–26, 36, 115–130; Ex. 1002 ¶¶ 79, 115). Petitioner asserts a POSITA would have had a reason to use Cheng’s “commercially attractive way[]” of using the bio-1-hexene product of Le to prepare vicinal alkanediols, which Cheng explains have known commercial applications. *Id.* at 31, 46–47 (citing Ex. 1002 ¶¶ 77, 113).

On this record, for the reasons stated by Petitioner above, we find Petitioner has shown sufficiently that the combinations of Le and Cheng and Le, De Bruyn, and Cheng teach the additional limitations of claims 24 and

⁶ Claim 24 recites: “The method according to claim 1, wherein the bio-alkene is further reacted to form a bio-based compound different from the bio-alkene or a bio-based polymer.” Ex. 1001, claim 24. It appears Petitioner interprets claim 24 as requiring the formation of a bio-based compound that is “different from the bio-alkene” and “different from . . . a bio-based polymer. Although the claim—if read alone—could be interpreted that way, we do not agree with Petitioner’s interpretation in light of dependent claim 25. That is, we read claim 24 as requiring the formation of a bio-based compound that is different from the bio-alkene or requiring the formation of a bio-based polymer. That is the only construction that is consistent with claim 25, which depends from claim 24 and further recites forming a bio-based polymer. In other words, claim 25 would not make sense if claim 24 precluded the formation of a bio-based polymer. That said, the parties should clarify this issue during trial if they disagree with our interpretation.

25 and that a POSITA would have had a reason to combine the references with a reasonable expectation of success.

3. Conclusion

At this stage of the proceeding, we find Petitioner has shown a reasonable likelihood that it would prevail on its assertions that claims 24 and 25 would have been obvious over Le and Cheng or Le, De Bruyn, and Cheng.

E. Alleged Obviousness over Wright Alone and Wright and Cheng

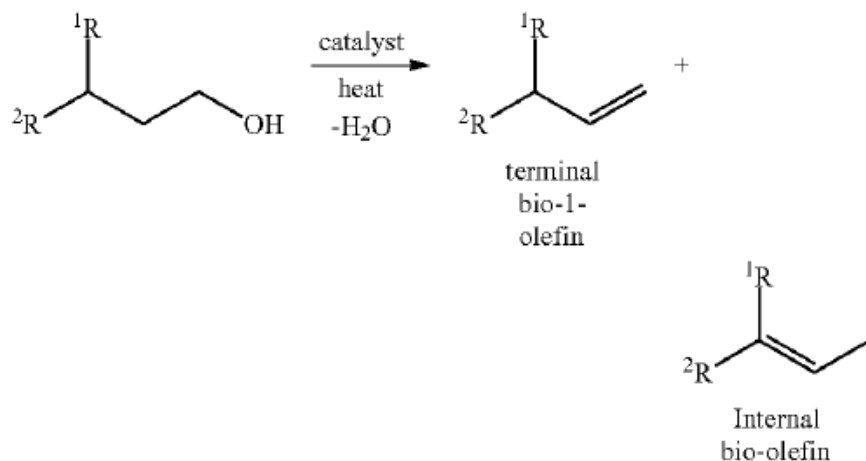
Petitioner asserts that claims 1–6, 8–10, 22, 23, and 26–28 are unpatentable as obvious over Wright. Pet. 49–59. Petitioner also asserts that claims 24 and 25 are unpatentable as obvious over Wright and Cheng. *Id.* at 59–61.

On this record, we determine Petitioner has shown a reasonable likelihood that it would prevail in showing the challenged claims would have been obvious over the cited art. We incorporate here our earlier findings and discussion regarding Cheng.

1. Wright (Ex. 1009)

Wright is a U.S. patent application published September 20, 2012, entitled “Process for the Dehydration of Aqueous Bio-Derived Terminal Alcohols to Terminal Alkenes.” Ex. 1009, codes (43), (54). Inventor Michael E. Wright is also an inventor on the ’048 Patent. *Compare id.*, code (76) *with* Ex. 1001, code (72).

Wright relates to a method for dehydrating bio-1-alcohols to bio-1-alkenes with high selectivity (>95%). *Id.*, Abstract, ¶ 18. Wright depicts the reaction as follows:



Id. ¶ 16. The chemical reaction above shows a bio-1-alcohol converting to a terminal bio-1-olefin and an internal bio-olefin, all with ¹R and ²R branching from the third carbon in the compound. According to Wright, “¹R and ²R can be hydrogen, an alkyl radical of C1 to C20, and any combination thereof.” *Id.* ¶ 17.

Wright also states that in some embodiments, “the bio-1-alcohol is 1-pentanol and/or 1-hexanol.” *Id.* ¶ 22. In Example 1, Wright teaches the dehydration of bio-1-butanol to bio-1-butene with a regioselectivity for bio-1-butene of 94–95%. *Id.* ¶ 34, Table 1.

2. Analysis

As an initial matter, Patent Owner argues that the Board should deny institution under 35 U.S.C. § 325(d) for only these grounds (i.e., Grounds 5 and 6). Prelim. Resp. 19–25. Specifically, Patent Owner argues that Wright was considered by the Office and Petitioner has failed to demonstrate that the Office erred in any material way. *Id.* Even if we found Patent Owner’s arguments persuasive, after the Supreme Court’s decision in *SAS Institute, Inc. v. Iancu*, 138 S. Ct. 1348 (2018), we are compelled to proceed with this *inter partes* review on all grounds raised in the Petition because we find

Petitioner has shown a reasonable likelihood of prevailing on Grounds 1–4 above. *See* Guidance on the impact of SAS on AIA trial proceedings, available at <https://www.uspto.gov/patents/ptab/trials/guidance-impact-sas-aia-trial> (“If the PTAB institutes a trial, the PTAB will institute on all challenges raised in the petition.”). Thus, we find Patent Owner’s § 325(d) arguments to be moot.

Regarding the challenges over Wright, for claim 1, Petitioner asserts that Wright describes subjecting bio-1-alcohols to heat in a reactor with a catalyst to produce corresponding bio-1-alkenes having a chain length of 4 to 23 carbon atoms with high regioselectivity (>92%). Pet. 51–52 (citing, e.g., Ex. 1009 ¶¶ 3, 16, 17, 27, 30, 34, claim 1; Ex. 1002 ¶¶ 117–122). Petitioner notes Wright also describes examples of dehydrating bio-1-butanol to bio-1-butene, which has a chain length of 4 carbons and falls within the scope of “about 5” carbon atoms. *Id.* at 53 (citing Ex. 1009 ¶¶ 27, 34, claim 2; Ex. 1002 ¶¶ 122, 124). Wright also teaches in some embodiments, “the bio-1-alcohol is 1-pentanol and/or 1-hexanol.” Ex. 1009 ¶ 22.

We are persuaded that Petitioner has shown sufficiently that Wright teaches each limitation of claim 1 and that a POSITA reading Wright would have found claim 1 obvious (if not anticipated). Patent Owner asserts that the disclosure in Wright “generically discloses a wide range of chain lengths from C1 to C20” and that Wright focuses on bio-1-butene. Prelim. Resp 23. Patent Owner also notes that the ’048 Patent notes that “conversion of 1-octanol to 1-octene is not simply a homolog of a conversion of 1-butanol to bio-butene.” *Id.* At this stage of the proceeding, we are not persuaded. Wright also teaches that in some embodiments, the bio-1-alcohol is

1-pentanol or 1-hexanol. Ex. 1009 ¶ 22. Thus, Wright is not just limited to 1-butene, as Patent Owner suggests.

Furthermore, we have reviewed the arguments and evidence presented in the Petition as to the remaining challenged claims and find Petitioner has shown sufficiently that Wright or the combination of Wright and Cheng also teaches each limitation of claims 2–6, 8–10, and 22–28 and that a POSITA would have had a reason to combine Wright and Cheng with a reasonable expectation of success for the reasons stated in the Petition, which we adopt here for purposes of this Decision. Pet. 55–61 (citing Ex. 1002 ¶¶ 127–139).

III. CONCLUSION

For the foregoing reasons, we determine that Petitioner has established a reasonable likelihood of prevailing on its assertion that at least one of the challenged claims of the '048 Patent is unpatentable. Accordingly, we institute an *inter partes* review of claims 1–6, 8–10, and 22–28 of the '048 Patent on each of the grounds raised in the Petition.

Our determination in this Decision is not a final determination on the construction of any claim term or the patentability of any challenged claim and, thus, leaves undecided any factual issues necessary to determine whether sufficient evidence supports Petitioner's contentions by a preponderance of the evidence in the final written decision. *See TriVascular, Inc. v. Samuels*, 812 F.3d 1056, 1068 (Fed. Cir. 2016) (noting that “there is a significant difference between a petitioner's burden to establish a ‘reasonable likelihood of success’ at institution, and actually proving invalidity by a preponderance of the evidence at trial”) (quoting 35 U.S.C. § 314(a) and comparing § 316(e)). Any argument not raised in a timely Patent Owner Response to the Petition, or as permitted in another

manner during trial, shall be deemed waived even if asserted in the Preliminary Response.

IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that, pursuant to 35 U.S.C. § 314(a), an *inter partes* review of claims 1–6, 8–10, and 22–28 of U.S. Patent No. 10,995,048 B2 is instituted with respect to all challenged claims and all grounds set forth in the Petition; and

FURTHER ORDERED that, pursuant to 35 U.S.C. § 314(c) and 37 C.F.R. § 42.4, notice is hereby given of the institution of a trial, which will commence on the entry date of this decision.

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