

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SYMRISE AG and SYMRISE INC.,
Petitioners,

v.

INOLEX INVESTMENT CORP.,
Patent Owner.

Case IPR2023-01035
U.S. Patent No. 10,995,048

Title: NATURAL 1,2-ALKANEDIOLS, COMPOSITIONS HAVING NATURAL
1,2-ALKANEDIOLS AND PROCESSES FOR MAKING THE SAME

**PATENT OWNER'S REVISED NON-CONTINGENT MOTION TO
AMEND AND REQUEST FOR PRELIMINARY GUIDANCE**

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35 U.S.C. § 112(d)	22
35 U.S.C. § 316(d)	1, 4
37 C.F.R. § 42.121	1, 4, 12

LIST OF EXHIBITS

Exhibit No.	Description
Ex. 2001	Declaration of Michael E. Wright, Ph.D.
Ex. 2002	J. Ross, “Heterogeneous Catalysis,” Elsevier B.V. (2012) (“Ross”)
Ex. 2003	Kim <i>et al.</i> , “Dual-bed catalytic system comprising Al ₂ O ₃ and Ba/Al ₂ O ₃ with enhanced 1-octene productivity in 1-octanol dehydration for linear α -olefin production,” <i>J. Ind. Eng. Chem.</i> 119:376-85 (2023) (“Kim”)
Ex. 2004	Experimental data for Comparative Example 10 of U.S. Patent No. 10,995,048 for the conversion of 1-octanol to octenes
Ex. 2005	Deposition Testimony of Douglass F. Taber, January 23, 2024
Ex. 2006	Second Declaration of Michael E. Wright, Ph.D.
Ex. 2007	Deposition Testimony of Douglass F. Taber, June 11, 2024
Ex. 2008	Int’l Patent Pub. No. WO 2022/122139 A1 (“Bugdahn”)
Ex. 2009	D.J. Ward <i>et al.</i> , “Sustainable routes to alkenes: applications of homogeneous catalysis to the dehydration of alcohols to alkenes,” <i>Catal. Sci. Technol.</i> 13:2638-2647 (2023) (“Ward”)

I. INTRODUCTION

Patent Owner Inolex Investment Corp. (“Inolex” or “Patent Owner”) appreciates the Board’s analysis provided in the Preliminary Guidance (Paper 16) and submits this Revised Non-Contingent Motion to Amend (“Revised Motion”) under the Pilot Program for motions to amend No. 10,995,048 (“the ’048 Patent”) to more narrowly define the invention and address the invalidity grounds set forth by Petitioner and the Preliminary Guidance.

Inolex respectfully requests that the Board grant this Revised Motion and issue the corresponding substitute claims presented herein. Specifically, Inolex proposes cancelling challenged claims 1-6, 8-10, and 22-28,¹ and substituting claims 29-44, respectively. *See* Appendix A (showing amendments). This one-to-one substitution creates a presumption that the number of amended claims is reasonable.

II. OVERVIEW OF THE EXISTING ’048 CLAIMS AND NARROWING AMENDMENTS

As the Board found in its institution decision, the ’048 patent is directed to “natural and renewable antimicrobial compounds for use in alternative preservation

¹ Claims 7 and 11-21 were not challenged in the Petition and are therefore ineligible for amendment. *See Apple Inc. v. Uniloc 2017 LLC*, IPR2018-01092, Paper 25 at 45 (P.T.A.B. Dec 13, 2019).

systems for consumer products, such as personal care products.” Paper 7 at 3.

The Board held that Petitioners demonstrated a reasonable likelihood that they would prevail on the assertion that substitute claims 29-44 would have been obvious over: Le (US 2011/0196114 A1, Ex. 1007) and De Bruyn (US 2005/0065389 A1, Ex. 1008) (Ground II), Wright ’788 (US 2012/0238788 A1, Ex. 1009) (Ground III), Wright ’451 (WO2015/130451 A1, Ex. 1039) (Ground IV), or Wu (U.S. Patent No. 4,234,752) in view of Chokkaram (J. Mol. Catalysis A: Chemical 121:157-69 (1997)) (Ground V).

The proposed substitute claims substantially narrow the substitute claims to incorporate limitations that are not taught or suggested by the prior art of Grounds II-V, and also provide unexpected results over the closest prior art. Specifically, substitute independent claim 29 requires “dehydrating a bio-1-alcohol by heating the bio-1-alcohol in a continuous flow reactor at a temperature of 240 °C to 360 °C with a calcium-promoted γ -alumina catalyst calcined at a temperature of about 420 °C to about 480 °C, wherein the catalyst has not been silanized.” Substitute independent claim 29 also requires that “the resulting bio-alkene has a carbon chain of 6 to 10 carbon atoms and is produced in a conversion of at least 95% and has a bio-1-alkene regioselectivity of 95% to about 99% from a single pass reaction after at least 20 hours time-on-stream.”

These limitations are not taught or suggested by Le in view of De Bruyn,

Wright '788, Wright '451, or Wu in view of Chokkaram, or any other prior art of record. What is more, as discussed in the Second Declaration of Michael E. Wright, Ph.D. (the "Second Wright Decl.," Ex. 2006), the methods of substitute claim 29, as well as dependent claims 34, 37, 40, and 43 and dependent claims 35, 38, 41, and 44, provide unexpected results over the closest prior art.

Dependent claims 30-44, among other features, are also narrowed to require that the heating is performed in a reactor "the calcium-promoted γ -alumina has a CaO content of about 1% to about 2%" (claims 33, 36, 39, and 42); that "the calcium-promoted catalyst has been calcined at a temperature of about 440 °C to about 460 °C" (claims 34, 37, 40, and 43); and that "the reactor is heated at a temperature of 315 °C to 350 °C" (claims 35, 38, 41, and 44). These limitations, including those added to the independent claim, are supported by the disclosure and distinguish the substitute claims from the prior art of record.

In support of the patentability of revised substitute claims 29-44, Inolex relies upon the First and Second Wright Declarations (Exs. 2001 & 2006), the sworn testimony of Petitioners' expert, Dr. Douglass Taber (Exs. 2005 & 2007), as well as Exs. 2008 & 2009.

III. STATEMENT OF RELIEF REQUESTED

Inolex respectfully requests that the Board consider this Motion and grant entry of the following proposed amendments:

- Cancel claim 1-6, 8-10, and 22-28;
- Substitute the cancelled claims with claims 29-44 as shown below (with the claimed dependencies shown in parentheses):

Original Claim	Substitute Claim
1	29
2 (1)	30 (29)
3 (2)	31 (29)
4 (3)	32 (29)
5 (1)	33 (29)
6 (1)	34 (33)
8 (1)	35 (34)
9 (1)	36 (30)
10 (9)	37 (36)
22 (1)	38 (37)
23 (1)	39 (31)
24 (1)	40 (39)
25 (24)	41 (40)
26 (1)	42 (32)
27 (26)	43 (42)
28 (26)	44 (43)

IV. PROCEDURAL REQUIREMENTS OF 37 C.F.R. § 41.121

The Board “must determine whether the motion to amend meets the statutory and regulatory requirements set forth in 35 U.S.C. § 316(d) and 37 C.F.R. § 42.121.” *Lectrosonics, Inc. v. Zaxcom, Inc.*, IPR2018-01129, Paper 15, at 4 (PTAB Feb. 25, 2019) (precedential). The requirements are: (1) the amendment proposes a reasonable number of substitute claims; (2) the proposed claims are supported in the original disclosure; (3) the amendment responds to a ground of

unpatentability involved in the trial; and (4) the amendment does not seek to enlarge the scope of the claims of the patent or introduce new subject matter. *Id.* at 4-8. For the reasons stated below, these requirements are met.

A. The Number of Substitute Claims Is Reasonable

“There is a rebuttable presumption that a reasonable number of substitute claims per challenged claim is one (1) substitute claim.” *Id.* at 4. Inolex proposes 15 substitute claims, each of which corresponds to a challenged claim. Thus, Inolex has proposed a one-to-one substitution of claims, which is presumptively a reasonable number.

B. The Specification Provides Written Description Support for the Proposed Substitute Claims

“[T]he Board requires that a motion to amend set forth written description support in the originally filed disclosure of the subject patent for each proposed substitute claim, and also set forth support in an earlier filed disclosure for each claim for which benefit of the filing date of the earlier filed disclosure is sought.” *Id.* at 7. “[T]o meet this requirement, citation should be made to the original disclosure of the application, as filed, rather than to the patent as issued.” *Id.* at 8. Table 1 below provides citations to written support for each limitation of the substitute claims, as disclosed in Provisional Application No. 62/623,985 filed on January 30, 2018 (Ex. 1003 at pp. 20-52), Non-Provisional Application No.

16/262,902, as filed on January 30, 2019 (Ex. 1006 at pp. 23-79), and Non-Provisional Application No. 16/682,059, as filed on November 13, 2019 (Ex. 1005 at pp. 4-54).

Patent Owner notes that Provisional Application No. 62/623,985, filed on January 30, 2018, does not include explicit written support for the limitations of revised substitute claims 29-44, which all require “a calcium-promoted γ -alumina catalyst calcined at a temperature of about 420 °C to about 480 °C.” Thus, revised substitute claims 29-44 have an earliest priority date of January 30, 2019 (based on the filing of Non-Provisional Application No. 16/262,902, Ex. 1006). Accordingly, Patent Owner does not include any citations to Ex. 1003 for written support for revised substitute claims 29-44.

Table 1. Written Support for Elements of Substitute Claims

	Element(s) of Substitute Claims	Citation to Support in Non-Provisional Priority Application (Ex. 1006), and As-Filed Specification (Ex. 1005)
[29 pre]	29. A method for making a bio-alkene, comprising: a method for making a bio-alkene, comprising:	Ex. 1006 (pp. 23-79) at [0030], [0032], [0050], [0055], [0071], [0072], [0125], Table 2, [0127], FIG. 1, Abstract. Ex. 1005 (pp. 4-54) at [0030], [0032], [0050], [0055], [0071], [0072], [0125], Table 2, [0127], FIG. 1, Abstract.
[29a]	dehydrating a bio-1-	Ex. 1006 (pp. 23-79) at [0040],

	Element(s) of Substitute Claims	Citation to Support in Non-Provisional Priority Application (Ex. 1006), and As-Filed Specification (Ex. 1005)
	alcohol by heating the bio-1-alcohol in a continuous flow reactor at a temperature of 240 °C to 360 °C	[0042], [0071], [0074]-[0077], Table 1, [0083], [0084], [0087], [0088], [0125]-[0127], Table 2, [0133], Table 5, [0134], claims 13, 16, 19, 20. Ex. 1005 (pp. 4-54) at [0040], [0042], [0071], [0074]-[0077], Table 1, [0084], [0125]-[0127], Table 2, [0133], Table 5, [0134].
[29b]	with a calcium-promoted γ -alumina catalyst	Ex. 1006 (pp. 23-79) at [0034], [0040], [0042], [0069], [0071], [0076], Table 1, [0077], [0078], [0084], [0123]-[0125], Table 2, [0126], claims 15-23. Ex. 1005 (pp. 4-54) at at [0034], [0040], [0042], [0069], [0071], [0076], Table 1, [0077], [0078], [0084], [0123]-[0125], Table 2, [0126], claims 13-21.
[29c]	calcined at a temperature of about 420 °C to about 480 °C,	Ex. 1006 (pp. 23-79) at [0035], [0040], [0042], [0084], claims 20 and 40. Ex. 1005 (pp. 4-54) at [0035], [0040], [0042], [0084], claim 18.
[29d]	wherein the catalyst has not been silanized, and	Ex. 1006 (pp. 23-79) at [0027], [0076], Table 1, [0081], [0123]-[0125], Table 2, [0126], [0127], [0132], [0133], [0135]. Ex. 1005 (pp. 4-54) at [0027], [0076], Table 1, [0081], [0123]-

	Element(s) of Substitute Claims	Citation to Support in Non-Provisional Priority Application (Ex. 1006), and As-Filed Specification (Ex. 1005)
		[0125], Table 2, [0126], [0127], [0132], [0133], [0135].
[29e]	wherein the resulting bio-alkene has a carbon chain of 6 to 10 carbon atoms and	Ex. 1006 (pp. 23-79) at [0031], [0066], claim 3. Ex. 1005 (pp. 4-54) at [0031], [0066], claim 3.
[29f]	is produced in a conversion of at least 95% and a bio-1-alkene regioselectivity of 95% to about 99% from a single-pass reaction after at least 20 hours time-on-stream.	Ex. 1006 (pp. 23-79) at [0031], [0033], [0066], [0074], [0076], Table 1, [0125], Table 2, [0127], [0133], Table 5, [0134], claim 11. Ex. 1005 (pp. 4-54) at [0023], [0031], [0033], [0066], [0074], [0076], Table 1, [0125], Table 2, [0127], [0133], Table 5, [0134], [0135], Fig. 7.
[30a]	30. The method according to claim 29, wherein the bio-alkene has a carbon chain length of 6 to 8 carbon atoms.	Ex. 1006 (pp. 23-79) at [0031], [0066], [0067], [0068], [0089], claim 4. Ex. 1005 (pp. 4-54) at [0031], [0066], [0067], [0068], [0089].
[31a]	31. The method according to claim 29, wherein the bio-alkene has a carbon chain length of 6 carbon atoms.	Ex. 1006 (pp. 23-79) at [0031], [0066], [0067], [0068], [0089], [0133], Table 5, [0134], claims 2-4. Ex. 1005 (pp. 4-54) at [0066], [0067], [0068], [0089], [0133], Table 5, [0134].

	Element(s) of Substitute Claims	Citation to Support in Non-Provisional Priority Application (Ex. 1006), and As-Filed Specification (Ex. 1005)
[32a]	32. The method according to claim 29, wherein the bio-alkene is bio-octene.	Ex. 1006 (pp. 23-79) at [0031], [0058], [0066], [0067], [0076], Table 1, [0081], [0089], [0121], [0122], [0125], [0127], Table 2, claim 5, Fig. 4. Ex. 1005 (pp. 4-54) at [0031], [0058], [0066], [0067], [0076], Table 1, [0081], [0089], [0121], [0122], [0125], [0127], Table 2, Fig. 4.
[33a]	33. The method according to claim 29, wherein the calcium-promoted γ -alumina has a CaO content of about 1% to about 2%.	Ex. 1006 (pp. 23-79) at [0034], [0042], [0078], [0123]-[0125], Table 2, [0126], claims 18, 39. Ex. 1005 (pp. 4-54) at [0034], [0042], [0078], [0123]-[0125], Table 2, [0126], claims 16.
[34a]	34. The method according to claim 33, wherein prior to the dehydrating, the calcium-promoted catalyst has been calcined at a temperature of about 440 °C to about 460 °C.	Ex. 1006 (pp. 23-79) at [0035], [0042], [0076], Table 1, [0084], [0123], [0125], Table 2, [0126], claims 21 and 41. Ex. 1005 (pp. 4-54) at [0035], [0042], [0076], Table 1, [0084], [0123], [0125], Table 2, [0126], claim 19.
[35a]	35. The method according to claim 37, wherein the reactor is heated at a temperature of 315 °C to 350 °C.	Ex. 1006 (pp. 23-79) at [0057], [0125], Table 2, [0127], [0133], Table 5, [0134]. Ex. 1005 (pp. 4-54) at [0057], [0125], Table 2, [0127], [0133],

	Element(s) of Substitute Claims	Citation to Support in Non-Provisional Priority Application (Ex. 1006), and As-Filed Specification (Ex. 1005)
		Table 5, [0134].
[36a]	36. The method according to claim 29, wherein the calcium-promoted γ -alumina has a CaO content of about 1% to about 2%.	See limitation 33a, <i>supra</i> .
[37a]	37. The method according to claim 36, wherein prior to the dehydrating, the calcium-promoted catalyst has been calcined at a temperature of about 440 °C to about 460 °C.	See limitation 34a, <i>supra</i> .
[38a]	38. The method according to claim 37, wherein the reactor is heated at a temperature of 315 °C to 350 °C.	See limitation 35a, <i>supra</i> .
[39a]	39. The method according to claim 29, wherein the calcium-promoted γ -alumina has a CaO content of about 1% to about 2%.	See limitation 33a, <i>supra</i> .
[40a]	40. The method according to claim 39, wherein prior to the dehydrating, the calcium-promoted catalyst has been calcined at a temperature of about 440 °C to about 460 °C.	See limitation 34a, <i>supra</i> .
[41a]	41. The method according to claim 40, wherein the reactor is heated at a temperature of	See limitation 35a, <i>supra</i> .

	Element(s) of Substitute Claims	Citation to Support in Non-Provisional Priority Application (Ex. 1006), and As-Filed Specification (Ex. 1005)
	315 °C to 350 °C.	
[42a]	42. The method according to claim 29, wherein the calcium-promoted γ -alumina has a CaO content of about 1% to about 2%.	See limitation 33a, <i>supra</i> .
[43a]	43. The method according to claim 42, wherein prior to the dehydrating, the calcium-promoted catalyst has been calcined at a temperature of about 440 °C to about 460 °C.	See limitation 34a, <i>supra</i> .
[44a]	44. The method according to claim 43, wherein the reactor is heated at a temperature of 315 °C to 350 °C.	See limitation 35a, <i>supra</i> .

C. The Substitute Claims Are Responsive to the Instituted Grounds

The proposed substitute claims are responsive to the grounds for institution (and to Petitioners' Opposition) because they distinguish from the prior art of record, and in particular from Le in view of De Bruyn, Wright '788, Wright '451, or Wu in view of Chokkaram. More specifically, substitute claim 29 requires "dehydrating a bio-1-alcohol by heating the bio-1-alcohol in a continuous flow reactor at a temperature of 240 °C to 360 °C with a calcium-promoted γ -alumina catalyst calcined at a temperature of about 420 °C to about 480 °C, wherein the

catalyst has not been silanized,” and “wherein the resulting bio-alkene has a carbon chain of 6 to 10 carbon atoms and is produced in a conversion of at least 95% and a bio-1-alkene regioselectivity of 95% to about 99% from a single-pass reaction after at least 20 hours time-on-stream.” As discussed herein, and in the Second Wright Declaration (Ex. 2006), the substitute claims are patentable over the instituted grounds as well as Grounds 1-5 in Petitioners’ Opposition (Paper 14). *See* 37 C.F.R. § 42.121(a)(2)(i).

D. The Substitute Claims Do Not Enlarge the Scope of the Original Claims

The substitute claims do not broaden the original claims in any manner. Instead, they are narrower, as reflected in Appendix A attached hereto, which reflects the amendments to the claims (underlined text reflects added limitations, while strikethrough text indicates portions being removed). Each and every one of substitute claims 30-44 depends directly or indirectly from substitute claim 29, and thereby incorporates these limitations by reference. Because the independent claim is narrower than the original independent claims, the dependent claims are necessarily narrower than the original claims.

In addition, certain dependent claims have been further narrowed. For example, substitute claims 33, 36, 39, and 42 require that “the calcium-promoted γ -alumina has a CaO content of about 1% to about 2%”; substitute claims 34, 37, 40,

and 43 require that “the calcium-promoted catalyst has been calcined at a temperature of about 440 °C to about 460 °C”; and substitute claims 35, 38, 41, and 44 require that “the reactor is heated at a temperature of 315 °C to 350 °C.” Further, original claims 26-28, which recited a product-by-process, remain cancelled and all substitute claims are directed to methods.

**V. THE SUBSTITUTE CLAIMS ARE PATENTABLE OVER
GROUNDS 1-5 OF PETITIONERS’ OPPOSITION**

As discussed herein, Inolex submits that its revised non-contingent amendments distinguish substitute claim 29 (and dependent claims 30-44) as non-obvious over the prior art of record, and more particularly each of Petitioners’ Opposition Grounds 1-5.

**A. Substitute Claim 29 Satisfies the Written Description
Requirement of 35 U.S.C. § 112(a) (Opposition Ground 1)**

The Board found that previously submitted substitute claims 29-44 satisfied the written description requirements, and revised substitute claims 29-44 are similarly supported by the as-filed specification (Ex. 1005) and priority application (Ex. 1006). Indeed, nearly all limitations of the substitute claims have *ipsis verbis* support in the specification. Ex. 2006, ¶¶80-82.

Patent Owner further notes that written support for claims 29, which requires “a conversion of at least 95% and a bio-1-alkene regioselectivity of 95% to about 99% from a single-pass reaction after at least 20 hours time-on-stream” can be

found at Examples 5, 11, 12, Fig. 7, and [0023] which discusses prior art methods in which conversion and regioselectivity were lost after “a mere 20 h or time-on-stream”. Ex. 1006 & 1005 at [0023], [0127], [0133]-[0135], Fig. 7; Ex. 2006, ¶80.

Patent Owner further notes that written support for claims 35, 38, 41, and 44, which require the reactor is heated at a temperature of 315 °C to 350 °C, can be found in Examples 3-4 and 11, set forth in Exs. 1006 & 1005 at [0125], Table 2 (Example 3), [0057], [0126], Fig. 3 (Example 4), [0127] (Example 5), [0133]-[0134], and Table 5 (Example 11). Specifically, Examples 3-5 show the claimed regioselectivity and conversion for reactor temperatures of 315 °C, while Example 11 shows the same for reactor temperatures of 330 °C and 350 °C, respectively. *See id.*; Ex. 2006, ¶81. As further discussed herein, Example 11 also demonstrates that a reactor temperature of 370 °C does not provide the claimed conversion of at least 95% from a single-pass reaction (a conversion of 93.3% was obtained). Thus, the specification shows that Patent Owner was in possession of processes wherein the reactor is heated at a temperature of 315 °C to 350 °C. *See* Ex. 2006, ¶81.

B. Substitute Claim 29 Is Patentable Over Le in View of De Bruyn (Opposition Ground 2)

Le and De Bruyn disclose the use of commercially available γ -alumina catalysts suitable for the dehydration of alcohols. Ex. 1007, [0064], [0066], [0171]; Ex. 2006, ¶¶51-52, 56, 83, 87. As Dr. Taber admits, a person of ordinary skill in

the art (“POSITA”) reading Le or De Bruyn would have been motivated to use one of the commercially available γ -alumina catalysts disclosed therein—for example, ESM 110[®] catalyst from Eurosupport or Pural[®] KR1 catalyst from Sasol. *See* Ex. 2006, ¶¶83, 87, 88 (and citations therein). However, a POSITA would not know anything about how those commercially available catalysts were prepared—for example, whether the commercial alumina catalysts in Le or De Bruyn were chemically modified or calcined. *See* Ex. 2001, ¶40, ¶55, ¶64; Ex. 2006, ¶¶51-52, 56, 83, 87.

Le provides no details concerning the conversion or 1-alkene regioselectivity obtained in Le’s exemplary embodiment (*see* Ex. 1007 at [0171]-[0172]), which would have been important information to a POSITA. *See* Ex. 2001, ¶45; Ex. 2006, ¶¶52-53, 56, 83-85. De Bruyn, on the other hand, discloses details concerning conversion and bio-1-alkene regioselectivity, but conversion with a single-pass reaction is limited to 59% to 77%. Ex. 2006, ¶¶54, 56, 86, 88. It is only through recycling unreacted starting materials that De Bruyn can achieve a conversion over 90%. *See id.* Further, even if a POSITA inferred that the catalysts used in Le or De Bruyn had been calcium promoted (which De Bruyn teaches as being a possibility), a POSITA would therefore expect that calcium-promoted catalysts would be limited to conversion of 59% to 77% with a single-pass reaction. Ex. 2006, ¶¶55, 56, 86-88. What is more, based on his lack of knowledge

in the general area of heterogeneous catalysis, Dr. Taber's testimony concerning what a POSITA would infer beyond specific examples set forth in Le and De Bruyn is speculative and unreliable. See Ex. 2006, ¶¶7-18, 53, 85, 87.

In contrast to Le and De Bruyn, substitute claim 29 requires a conversion of at least 95% and a C₆ to C₁₀ bio-1-alkene regioselectivity of 95% to about 99% after a single pass reaction and at least 20 hours time-on-stream. This is accomplished by heating a C₆ to C₁₀ bio-1-alcohol in a continuous flow reactor at a temperature of 240 °C to 360 °C with a calcium-promoted γ -alumina catalyst calcined at a temperature of about 420 °C to about 480 °C, wherein the catalyst has not been silanized. Nothing in Le or De Bruyn provide a POSITA any reasonable expectation the claimed catalyst could provide the required bio-1-alkene conversion and regioselectivity from a single-pass reaction after at least 20 hours time-on-stream. See Ex. 2006, ¶¶55-56, 87-95. For at least these reasons, the method of substitute claim 29 is non-obvious over Le in view of De Bruyn (i.e., Opposition Ground 2).

C. Substitute Claim 29 Is Patentable Over Wright '788 (Opposition Ground 3)

Wright '788 discloses γ -alumina catalysts first treated with an aqueous base solution, washed with water, dried, and then reacted with a chlorosilane, washed with a hydrocarbon solvent, and air-dried. Ex. 1009, [0020], [0034]; Ex. 2006,

¶¶58, 108. Thus, while Wright '788 discloses the possibility of preparing base-treated γ -alumina catalysts that are not silanized, the lack of working examples showing conversion, regioselectivity, or time-on-stream for such catalysts would have led a POSITA reviewing Wright '788 to pursue silanization as a strategy to improve these outcomes. Ex. 2006, ¶¶59-63. Indeed, base-treatment without silanization is effectively disclosed by Wu, and the same discussion of Wu would apply equally to Wright '788 in the event the Board finds that Wright '788 would have motivated a POSITA to explore that option. Ex. 2006, ¶¶97-100, 106.

Nothing in Wright '788 would have motivated a POSITA to select “a calcium-promoted γ -alumina catalyst calcined at a temperature of about 420 °C to about 480 °C, wherein the catalyst has not been silanized” with any reasonable expectation of providing the high conversion with regioselectivity with a single-pass reaction after at least 20 hours time-on-stream, as required by substitute claim 29. Ex. 2006, ¶¶61, 109-111.

Further, the '048 patent provides a direct comparison between the modified γ -alumina catalysts of Wright '788 and the inventive catalyst required by substitute claim 29. Ex. 1001, col. 28, ll. 54-67 (Example 10); Ex. 2004; Ex. 2006, ¶¶112-113. As Dr. Wright discusses at length, a POSITA viewing this comparative data would view these results as an apt comparison and as entirely unexpected. Ex. 2006, ¶¶113-116.

D. Substitute Claim 29 Is Patentable Over Wright '451 (Opposition Ground 4)

The Board found that Wright '451 discloses conversion of at least 95%, and regioselectivity ranges “92% to about 99%” or “95% to about 99%,” as well as overlapping ranges for the reactor temperature of “about 240 °C to about 360 °C” and calcination temperature of “about 400 °C to about 480 °C.” Paper 16 at 11-12; Ex. 2006, ¶¶66, 69.

With respect to the calcination temperature, Wright '451 discloses that “drying or calcination can be carried out ... at temperatures of about 100 °C to about 900 °C, or about 200 °C to 600 °C for a time period of about 1 h to about 8 h, or about 2 h to 6 h,” along with examples in which drying and/or calcination of various catalysts is performed at 120 °C, 200 °C, 500 °C, 550 °C, and/or 600 °C. Ex. 1039, [67], pp. 24-33 (Examples 2-4, 8-22, and 24); Ex. 2006, ¶¶69, 115-116, 120. Substitute claim 29 more specifically requires that the calcium-promoted γ -alumina catalyst calcined at the more narrow temperature range of about 420 °C to about 480 °C. Ex. 2006, ¶121.

Where a claimed inventions falls within a prior art range, a presumption of obviousness will be rebutted if it can be shown: (1) that the prior art taught away from the claimed invention, *In re Geisler*, 116 F.3d 1465, 1471 (Fed.Cir.1997); or (2) that there are new and unexpected results relative to the prior art, *In re*

Woodruff, 919 F.2d 1575, 1578 (Fed.Cir.1990).

As shown in the '048 patent, a calcium-promoted γ -alumina catalyst calcined at 440 °C provides unexpectedly better 1-octene regioselectivity and higher conversion compared to the same catalyst calcined at 500 °C. Ex. 1001, col. 26, l. 10 – col. 27, l. 9 (Examples 1-3); Ex. 2006, ¶¶20, 123. Specifically, the calcium-promoted γ -alumina catalyst calcined at 500 °C provided a 1-octene regioselectivity of 93.1% at a conversion of 95.5%, while calcination at 440 °C provided a 1-octene regioselectivity of 96.7% at a conversion of 97.2%. *See id.* Thus, the '048 patent demonstrates that the calcination temperature of 500 °C (as taught by *Wright '451*) provides a *less reactive and less selective* catalyst than that of the present invention. Ex. 2006, ¶123.

A POSITA would have viewed this result as an entirely unexpected, as nothing in *Wright '451* (or any other prior art of record) teaches or suggests lower calcination temperature can improve both conversion and 1-alkene regioselectivity. Ex. 2006, ¶124. Further, this result is a difference in kind and not one of degree, as even a 1-2% improvement in either conversion or 1-alkene regioselectivity can provide significant benefit from the perspective of reactor design and operating costs—for example, by eliminating a recycle stream. Ex. 2006, ¶¶6, 20, 122-124. Here, 1-octene regioselectivity increased from 93.1% to 96.7% and conversion increased from 95.5% to 97.2%. Ex. 2006, ¶21, 123. A POSITA would view these

improvements as significant for either variable, but to see improvements in both is very significant and highly unexpected. Ex. 2006, ¶21, 123-124.

Wright '451's also discloses reactor temperatures of about 220 °C to about 440 °C, and examples at 340 °C, 360 °C, 380 °C, and 400 °C. Ex. 1039, [13], [42]; Ex. 2006, ¶120. In contrast, substitute claim 29 requires dehydrating a bio-1-alcohol by heating the bio-1-alcohol in a continuous flow reactor at a temperature of 240 °C to 360 °C, and Example 11 of the '048 discloses that increasing the reactor temperature from 350 °C to 370 °C reduced conversion (to hexenes) from 96.9% to 93.3%, while 1-hexene regioselectivity was constant (96.6% vs. 96.4%). Ex. 1001, col. 29, ll. 1-25, Table 5; Ex. 2006, ¶¶125-126. A POSITA would also view this result as unexpected. Ex. 2006, ¶¶126-127. Specifically, *Wright '451* teaches that the lowest 1-butanol conversion is always at 340 °C and *conversion increases with temperature.*" Ex. 1039, [42]-[46]. Nothing in *Wright '451* would have taught or suggested to a POSITA that conversion of 1-hexanol would decrease at 370 °C. Ex. 2006, ¶¶125-127. What is more, a POSITA would view increase in conversion at lower temperatures as a difference in kind and not one of degree. *See id.* As discussed above, even a 1-2% improvement in conversion can provide significant design and operational benefits. *Id.* Here, a POSITA would view the improvement in 1-hexene conversion from 93.3% to 96.9% while maintaining regioselectivity as very significant and unexpected. *See id.*

What is more Dr. Taber's testimony concerning a POSITA's understanding of the operation and mechanism of the dehydration process at issue is not credible and therefore any testimony he attempts to provide in rebuttal concerning whether a result would be expected or unexpected should be accorded little probative value. *See* Ex. 2006, ¶¶7-14, 63, 73, 87, 89, 99, 114-115 (and citations therein).

E. Substitute Claim 29 Is Patentable Over Wu in view of Chokkaram (Opposition Ground 5)

Substitute claim 29 is patentable over Wu in view of Chokkaram because a POSITA would have no reason to combine those references in order to improve regioselectivity or conversion with any reasonable expectation of success. Ex. 2006, ¶¶102-104. Indeed, neither Wu nor Chokkaram teaches or suggests use of a calcium-promoted catalyst, but rather is limited to base-treatment. Ex. 2006, ¶¶96-105. What is more Dr. Taber's testimony concerning a POSITA's understanding of Wu's teachings as well as his understanding of the operation and mechanism of the dehydration process at issue is not credible and should be accorded little probative value. *See* Ex. 2006, ¶¶7-14, 99.

In addition, Wright '451 includes a comparative example that reproduced Wu's catalyst, and demonstrates that base-treated γ -alumina does not provide high conversion for any significant time-on-stream. *See* Ex. 1039, [42], [98], Table 2, Fig. 9; Ex. 2006, ¶106. Calcination of the base-treated catalysts of Wu does not

improve the results, as either conversion or regioselectivity was observed to decrease. Ex. 1039, [43], [102]-[103], Table 2, Fig. 10; Ex. 2006, ¶106. Therefore, a POSITA would not have looked to Wu as being relevant to the problem of obtaining high conversion of 1-alkanols to 1-alkenes with high regioselectivity for at least 20 hours time-on-stream, as required by substitute claim 29. Ex. 2006, ¶¶106-107. Nor would the combination of Wu and Chokkaram have led a POSITA to use the claimed calcium-promoted γ -alumina catalyst calcined at a temperature of about 420 °C to about 480 °C, wherein the catalyst has not been silanized, with any expectation of success. Ex. 2006, ¶¶101-105.

F. Substitute Claims 30-44 Are Patentable Over The Prior Art

Substitute claims 30-44 depend directly or indirectly from independent substitute claim 29, and incorporate all of its limitations. 35 U.S.C. § 112(d). Thus, for the same reasons discussed above with respect to substitute claim 29, dependent claims 30-44 are also non-obvious and patentable over the prior art. Ex. 2006, ¶129.

Further, substitute dependent claims 34, 37, 40, and 43 further require that “prior to the dehydrating, the catalyst has been calcined at a temperature of about 440 °C to about 460 °C.” As discussed above, the '048 patent shows that a calcium-promoted γ -alumina catalyst calcined at 440 °C provides unexpectedly better 1-octene regioselectivity and higher conversion compared to the same

catalyst calcined at 500 °C. Ex. 1001, col. 26, l. 10 – col. 27, l. 9 (Examples 1-3); Ex. 2006, ¶¶123-124, 130-131. Therefore, to the extent that the Board finds a calcination temperature range of about 420 °C to about 480 °C is overly broad, then the more narrow temperature range of about 440 °C to about 460 °C should be found to be commensurate in scope with this unexpected result. *See id.*, ¶¶123-124, 130-131.

Finally, substitute dependent claims 35, 38, 41, and 44 further require that “the reactor is heated at a temperature of 315 °C to 350 °C.” As discussed above, Example 11 of the ’048 shows that increasing the reactor temperature from 350 °C to 370 °C reduced conversion (to hexenes) from 96.9% to 93.3%, while 1-hexene regioselectivity was constant (96.6% vs. 96.4%). Ex. 1001, col. 29, ll. 1-25, Table 5; Ex. 2006, ¶¶125-127, 132-133. Therefore, to the extent that the Board finds a calcination temperature range of about 420 °C to about 480 °C is overly broad, then the more narrow temperature range of 315 °C to 350 °C should be found to be commensurate in scope with this unexpected result. *See id.*, ¶¶125-127, 132-133.

VI. THE LEVEL OF ORDINARY SKILL IN THE ART

The Board set forth a definition of a POSITA (*see* Paper 7 at 6-7) that Inolex accepts for the purposes of this proceeding.

VII. CLAIM CONSTRUCTION

In its Preliminary Guidance, the Board construed the term “about” (as this

term appeared in original claims 1-4 of the '048 patent) as being a term of degree that allowed for the recited number of carbon atoms, plus or minus one carbon atom. *See* Paper 7 at 9-10. Based on the Board's construction, "about 5" and "about 6", as these terms appear in original claims 1-4 of the '048 patent, encompass carbon chain lengths of at least 4 and 5 carbon atoms, respectively. *See id.* at 9. And, "about 20," "about 14," "about 10," and "about 8," as these terms appear in original claims 1-4 of the '048 patent, encompass carbon chain lengths of at least 21, 15, 11, and 9 carbon atoms, respectively. *See id.*

In order to remove any ambiguity from the substitute claims, Inolex has deleted the term "about" from substitute claims 29-32, as it pertains to the length of the carbon chains recited by these claims. Substitute claims 29, 34, 37, 40, and 43 include the term "about" in reference to temperature. Inolex submits that the term "about" should be given its plain and ordinary meaning of "approximately." In the context of this technology, an approximate "temperature" would include deviations of a few degrees centigrade, and at most, plus or minus five degrees centigrade from a specified temperature. *See* Ex. 2006, ¶36.

Inolex submits that none of the limitations added to the proposed substitute claims require construction and should instead be construed in accordance with their ordinary meaning. *See Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (*en banc*); *see also* Ex. 2006, ¶33.

To the extent the term “a calcium-promoted γ -alumina catalyst” needs to be construed, Inolex submits that this means “a γ -alumina catalyst that has been modified by reacting with a Ca^{+2} compound.” See Ex. 2006, ¶34.

To the extent the term “from a single-pass reaction” needs to be construed, this term excludes any affirmative steps of isolating unreacted bio-1-alcohol from the effluent stream of the continuous flow reactor and recycling it in a second pass through the reactor order to improve the overall conversion of bio-1-alcohol to bio-1-alkene. See Ex. 2006, ¶35.

VIII. CONCLUSION

For each original claim the Board finds unpatentable, Inolex respectfully requests that the Board grant this revised motion to amend as to the substitute claims.

Date: June 13, 2024

Respectfully submitted,

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APPENDIX A

Claim Amendments

1.-6. (Cancelled)

8.-10. (Cancelled)

22.-28. (Cancelled)

29. (Proposed Substitute for Claim 1) A method for making a bio-alkene, comprising:

dehydrating a bio-1-alcohol by heating the bio-1-alcohol in a continuous flow reactor at a temperature of 240 °C to 360 °C with a calcium-promoted γ -alumina catalyst calcined at a temperature of about 420 °C to about 480 °C, wherein the catalyst has not been silanized, and

wherein the resulting bio-alkene has a carbon chain of 6 to 10 ~~about 5 to about 20~~ carbon atoms and is produced in a conversion of at least 95% % and has a bio-1-alkene regioselectivity of 95% to about 99% from a single-pass reaction after at least 20 hours time-on-stream ~~at least about 80%.~~

30. (Proposed Substitute for Claim 2) The method of claim ~~1~~29, wherein the bio-alkene has a carbon chain of ~~about 6 to 8~~about 14 carbon atoms.

31. (Proposed Substitute for Claim 3) The method according to claim ~~2~~29, wherein the bio-alkene has a carbon chain ~~length~~ of ~~about 6 to about 10~~ carbon atoms.

32. (Proposed Substitute for Claim 4) The method according to claim ~~3~~29, wherein the bio-alkene is bio-octene ~~has a carbon chain length of about 6 to about 8 carbon atoms.~~

33. (Proposed Substitute for Claim 5) The method according to claim ~~4~~29, wherein the calcium-promoted γ -alumina has a CaO content of about 1% to about 2% ~~bio-alkene is bio-octene.~~

34. (Proposed Substitute for Claim 6) The method according to claim ~~5~~33, wherein prior to the dehydrating, the calcium-promoted catalyst has been calcined at a temperature of about 440 °C to about 460 °C ~~reactor is a fixed bed~~

reactor.

35. (Proposed Substitute for Claim 8) The method according to claim ~~134~~, wherein the reactor is heated at a temperature of 315 °C to 350 °C~~catalyst is selected from ZnAl_2O_4 and a γ -alumina catalyst.~~
36. (Proposed Substitute for Claim 9) The method according to claim ~~130~~, wherein the calcium-promoted γ -alumina has a CaO content of about 1% to about 2%~~bio-alkene has a bio-1-alkene regioselectivity of about 92% to about 99%.~~
37. (Proposed Substitute for Claim 10) The method according to claim ~~936~~, wherein prior to the dehydrating, the calcium-promoted catalyst has been calcined at a temperature of about 440 °C to about 460 °C~~bio-alkene has a bio-1-alkene regioselectivity of about 95% to about 99%.~~
38. (Proposed Substitute for Claim 22) The method according to claim ~~137~~, wherein the reactor is heated at a temperature of 315 °C to 350 °C~~method comprises a distillation step to refine the bio-alkene.~~
39. (Proposed Substitute for Claim 23) The method according to claim ~~131~~, wherein the calcium-promoted γ -alumina has a CaO content of about 1% to about 2%~~bio-alkene results from a process wherein the bio-1-alcohol in water is dehydrated by heating the bio-1-alcohol with a catalyst under a purge gas.~~
40. (Proposed Substitute for Claim 24) The method according to claim ~~391~~, wherein prior to the dehydrating, the calcium-promoted catalyst has been calcined at a temperature of about 440 °C to about 460 °C~~bio-alkene is further reacted to form a bio-based compound different from the bio-alkene or a bio-based polymer.~~
41. (Proposed Substitute for Claim 25) The method according to claim ~~2440~~, wherein the bio-alkene reactor is heated at a temperature of 315 °C to 350 °C~~is further reacted by a free radical or a catalytic polymerization process to form a bio-based polymer.~~
42. (Proposed Substitute for Claim 26) ~~A bio-alkene made by the~~ The method of according to claim ~~132~~, calcium-promoted γ -alumina has a CaO content of about 1% to about 2%.
43. (Proposed Substitute for Claim 27) The method ~~bio-alkene~~ according to claim

2642, wherein prior to the dehydrating, the calcium-promoted catalyst has been calcined at a temperature of about 440 °C to about 460 °C~~bio-alkene is selected from straight or branched chain bio-alkenes.~~

44. (Proposed Substitute for Claim 28) The method~~bio-alkene~~ according to claim 2643, wherein the reactor is heated at a temperature of 315 °C to 350 °C~~resulting bio-alkene is selected from bio-1-pentene, bio-1-iso-pentene, bio-1-hexene, bio-1-heptene, bio-1-octene, bio-1-nonene, bio-1-decene, and bio-1-dodecene.~~

CERTIFICATE OF COMPLIANCE

The undersigned certifies that this brief complies with the type-volume limitations of 37 C.F.R. § 42.24. This brief is 25 pages or less, and contains 5,469 words as calculated by the “Word Count” feature of Microsoft Word for Office 365, the word processing program used to create it.

Date: June 13, 2024

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CERTIFICATE OF SERVICE

I hereby certify that on June 13, 2024, a true and correct copy of the foregoing
PATENT OWNER'S REVISED NON-CONTINGENT MOTION TO AMEND
AND REQUEST FOR PRELIMINARY GUIDANCE was served on counsel of
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