

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

FAVORED TECH CORPORATION,
Petitioner,

v.

P2I LTD.,
Patent Owner.

IPR2020-01198
Patent 10,421,876 B2

Before KRISTINA M. KALAN, CHRISTOPHER M. KAISER,
and JEFFREY W. ABRAHAM, *Administrative Patent Judges*.

KAISER, *Administrative Patent Judge*.

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

INTRODUCTION

A. Background

Favored Tech Corporation (“Petitioner”) filed a Petition (Paper 1, “Pet.”) requesting an *inter partes* review of claims 1–15 of U.S. Patent No. 10,421,876 B2 (Ex. 1001, “the ’876 patent”). P2i Ltd. (“Patent Owner”) filed a Preliminary Response. Paper 6 (“Prelim. Resp.”). With our authorization, Petitioner filed a Reply (Paper 7), and Patent Owner filed a Sur-Reply (Paper 8).

We have authority to determine whether to institute an *inter partes* review. 35 U.S.C. § 314(b) (2018); 37 C.F.R. § 42.4(a) (2019). The standard for instituting an *inter partes* review is set forth in 35 U.S.C. § 314(a), 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.”

After considering the Petition, the Preliminary Response, the Reply, the Sur-Reply, and the evidence of record, we determine that Petitioner has demonstrated a reasonable likelihood that it would prevail with respect to at least one challenged claim. Accordingly, we institute *inter partes* review of all challenged claims on all asserted grounds.

B. Related Matters

The parties identify no judicial or administrative matters related to the present proceeding. Pet. 2; Paper 4, 1.

C. The Asserted Grounds of Unpatentability

Petitioner contends that claims 1–15 of the '876 patent are unpatentable based on the following grounds (Pet. 22–74):¹

Claims Challenged	35 U.S.C. §	References/Basis
1–3, 9, 11–15	103(a)	Coulson, ² Badyal, ³ Cohen ⁴
1–8, 10–15	103(a)	Coulson, Badyal, Holliday ⁵
1–4, 10, 12–15	103(a)	Coulson, Badyal, Padiyath ⁶
1–3, 5–8, 11–15	103(a)	Coulson, Badyal, Francesch ⁷
1–3, 5–8, 12–15	103(a)	Coulson, Badyal, Tropsch ⁸

D. The '876 Patent

The '876 patent, titled “Coatings,” issued on September 24, 2019. Ex. 1001, codes (45), (54). The patent “relates to protective coatings.” *Id.* at 1:5. “Specifically, [it] relates to protective coatings for electronic or electrical devices and components thereof, and methods of forming such coatings.” *Id.* at 1:5–8.

The '876 patent discusses the problems with prior-art coating methods. Specifically, it discloses that, when plasma polymerized coatings are formed with high power, “the polymer becomes more crosslinked and becomes more resistant to smearing” but also suffers from decreased “water

¹ Petitioner also relies on a declaration from Dr. Karen Gleason. Ex. 1002.

² WO 2007/083122 A1, published July 26, 2007 (Ex. 1004).

³ WO 99/64662 A1, published Dec. 16, 1999 (Ex. 1005).

⁴ US 2,716,638, issued Aug. 30, 1955 (Ex. 1006).

⁵ US 3,816,564, issued June 11, 1974 (Ex. 1007).

⁶ US 2007/0020451 A1, published Jan. 25, 2007 (Ex. 1008).

⁷ Laia Francesch, Elena Garreta, Mercedes Balcells, Elazer R. Edelman & Salvador Borrós, *Fabrication of Bioactive Surfaces by Plasma Polymerization Techniques Using a Novel Acrylate-Derived Monomer*, 2 PLASMA PROCESSES & POLYMERS 605, 605–611 (2005) (Ex. 1009).

⁸ US 5,804,669, issued Sept. 8, 1998 (Ex. 1011).

contact angle through more monomer fragmentation.” *Id.* at 1:57–62. With prior-art processes, “the process window for producing tack and smudge-free coatings ha[s] a limited plasma processing range and the final coating has a compromised water contact angle.” *Id.* at 2:1–4.

According to the ’876 patent, “[h]igh levels of polymer crosslinking (formerly only achievable with high average power continuous wave plasmas) can be achieved by adding a crosslinking molecule to the monomer to produce a cross-linked co-polymer.” *Id.* at 2:49–52. “This has the advantage of increasing the plasma processing range so stable coatings can now be produced in low average energy pulse plasma conditions.” *Id.* at 2:52–55. Meanwhile, “[t]he high degree of retention of the hydrophobic monomer structures from the low energy pulsed plasma gives coatings of the co-polymer a good hydrophobic coating (as evidenced by water contact angles) and a coating that is not sticky or smeary to the touch.” *Id.* at 2:56–60. The patent describes the crosslinkers and monomer compounds that may be used in forming such a coating. *Id.* at 4:36–14:28.

“Although the invention is of benefit in the context of a wide variety of substrates, the substrate may, in all aspects of the invention, advantageously be an electronic substrate,” such as “an electronic or electrical device” or “an electronic component.” *Id.* at 14:30–58.

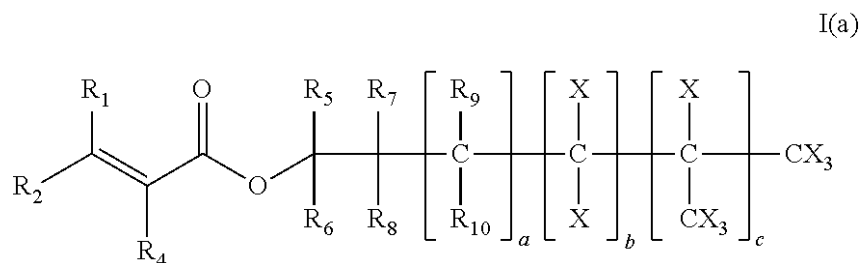
E. Illustrative Claim

Claims 1–15 of the ’876 patent are challenged. Claim 1 is independent and illustrative; it recites:

1. An electronic or electrical device or electronic or electrical component thereof comprising a protective cross-linked polymeric coating on a surface of said device or component;

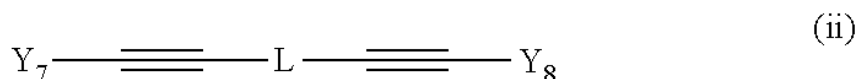
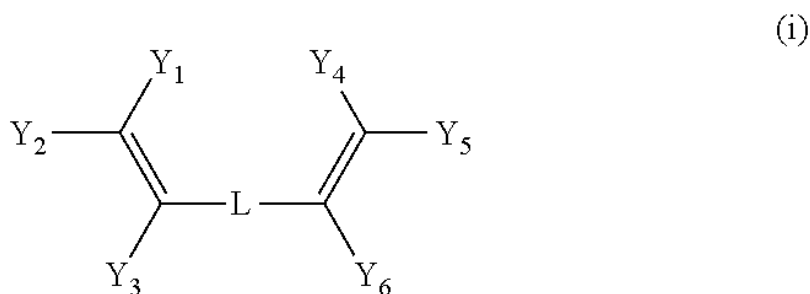
wherein the protective cross-linked polymeric coating is obtained by exposing said device or component to a plasma comprising a monomer compound and a crosslinking reagent for a period of time sufficient to allow formation of the protective cross-linked polymeric coating on a surface thereof,

wherein the monomer compound is a compound of formula I(a):

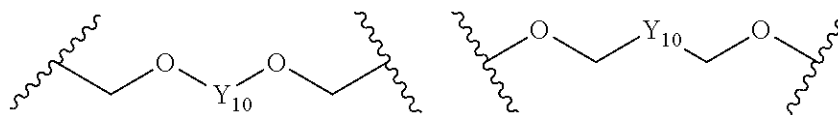


wherein each of R₁, R₂, R₄ and R₅ to R₁₀ is independently selected from hydrogen or an optionally substituted C₁-C₆ branched or straight chain alkyl group; each X is independently hydrogen or halogen; a is from 0-10; b is from 3 to 7; and c is 0 or 1;

and wherein the crosslinking reagent comprises two or more unsaturated bonds attached by means of one or more linker moieties and has a boiling point of less than 500° C. at standard pressure, the crosslinking reagent having one of the following structures:

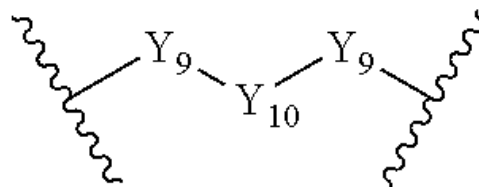


where Y1, Y2, Y3, Y4, Y5, Y6, Y7 and Y8 are each independently selected from hydrogen, optionally substituted cyclic, branched or straight chain C1-C6 alkyl or aryl; and L is a linker moiety; wherein for compound (i) L is of formula A having one of the following structures:



and Y10 is selected from optionally substituted cyclic, branched or straight chain C1-C8 alkylene and a siloxane group;

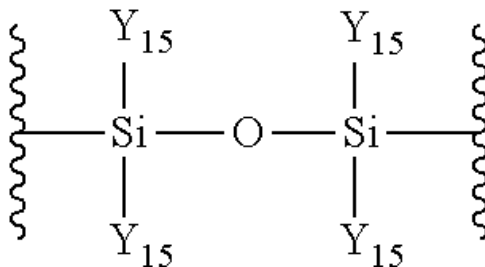
or wherein for compound (i) L is of formula B having the following formula:



where each Y9 is independently selected from, a bond, —O—, —O—C(O)—, —C(O)—O—, —Y11—O—C(O)—, —C(O)—O—Y11—, —OY11—, and —Y11O—, where Y11 is an

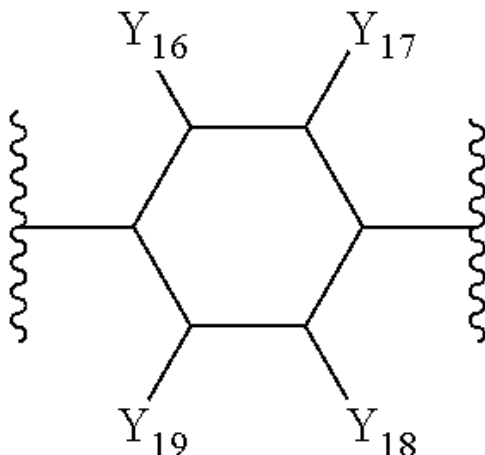
optionally substituted cyclic, branched or straight chain C1-C8 alkylene; and

wherein Y10 has the following formula:



and each Y15 is independently selected from optionally substituted branched or straight chain C1-C6 alkyl;

or wherein Y10 has the following formula:



and Y16 to Y19 are each independently selected from H and optionally substituted branched or straight chain C1-C8 alkyl or alkenyl.

Ex. 1001, 18:26–19:57.

ANALYSIS

A. Claim Construction

In an *inter partes* review, we construe a claim in an unexpired patent “in accordance with the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent.” 37 C.F.R. § 42.100(b) (2019). “[T]he ordinary and

customary meaning of a claim term is the meaning that the term would have to a person of ordinary skill in the art in question at the time of the invention.” *Phillips v. AWH Corp.*, 415 F.3d 1303, 1313 (Fed. Cir. 2005) (en banc). “Importantly, the person of ordinary skill in the art is deemed to read the claim term not only in the context of the particular claim in which the disputed term appears, but in the context of the entire patent, including the specification.” *Id.*

Between them, the parties present two claim-construction issues. First, both parties propose that “halogen” be construed to “include[] at least fluorine, chlorine, and bromine.” Pet. 19; Prelim. Resp. 23. We adopt this construction of “halogen” based on the lack of any dispute between the parties.

Second, Patent Owner argues that “the preamble of claim 1 – ‘an electronic or electrical device or electronic or electrical component thereof’ – is a claim limitation.” Prelim. Resp. 23–24. Petitioner presents no argument on this issue. Pet. 18–19. We need not decide whether the preamble of claim 1 is limiting in order to decide whether to institute review. As explained in detail below, Petitioner has shown sufficiently that the prior art teaches or suggests the preamble of claim 1 regardless of whether the preamble is a limitation. Thus, we do not decide this issue expressly at this time. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (citing *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999) (“[O]nly those terms need be construed that are in controversy, and only to the extent necessary to resolve the controversy.”)).

B. Asserted Obviousness over Coulson, Badyal, and Cohen

Petitioner argues that claims 1–3, 9, and 11–15 would have been obvious over the combination of Coulson, Badyal, and Cohen. Pet. 22–42, 69–74.

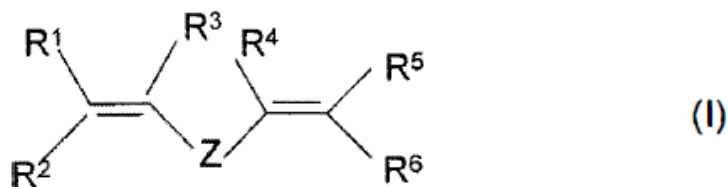
1. Coulson

Coulson relates to “electronic or electrical devices, which are treated to protect them from liquid damage, for example from environmental damage in particular from water or other liquids, as well as to processes for their production.” Ex. 1004, 1:4–7. Specifically, Coulson teaches treating electronic devices with coatings applied by plasma polymerization of fluorinated monomers. *Id.* at code (57), 3:14–25, 11:1–12:22. Among Coulson’s fluorinated monomers are PFAC8 and PFMAC8. *Id.* at 12:13–22; *see* Ex. 1002 ¶¶ 67, 114, 120. Coulson describes its “highly liquid repellent nano-coatings” as allowing electronic devices with the coatings to be “fully immersed in water . . . without any lasting harm.” Ex. 1004, 3:14–18, 4:29–5:10.

2. Badyal

Badyal “relates to the coating of surfaces, in particular to the production of oil- and water-repellent surfaces, as well as to coated articles obtained thereby.” Ex. 1005, 1:3–5. Specifically, Badyal discloses “a method of coating a surface with a polymer layer.” *Id.* at 4:4–5. This method “comprises exposing said surface to a plasma comprising one or more organic monomeric compounds, at least one of which comprises two double bonds, so as to form a layer of cross-linked polymer on said surface.” *Id.* at 4:6–9. Badyal’s “compound with more than one double bond” is a

compound having the generic formula shown in Badyal's formula (I), reproduced below:



Id. at 4:31–5:5. In Badyal's formula (I), two double bonds are connected by "bridging group" Z. *Id.* at 5:1–5. There are three additional groups attached to each double bond, indicated in formula (I) as R¹ through R⁶. *Id.* at 5:1–3. These groups "are all independently selected from hydrogen, halo, alkyl, haloalkyl or aryl optionally substituted by halo." *Id.* at 5:3–5. Badyal discloses that "[e]xamples of suitable bridging groups Z for use in the compound of formula (I) are those known in the polymer art." *Id.* at 5:18–19.

Badyal's monomer of formula (I) "is suitably mixed with another monomeric compound," which "may also contain a perhaloalkyl moiety." *Id.* at 6:24–7:2. These other monomeric compounds include both PFAC8 and PFMAC8. *Id.* at 7:17–9:17; *see* Ex. 1002 ¶¶ 115, 121. Badyal teaches using its method to coat "any solid substrate, such as fabric, metal, glass, ceramics, paper or polymers." Ex. 1005, 9:28–30.

3. Cohen

Cohen "relates to a novel monomeric vinyl compound and polymers prepared therefrom." Ex. 1006, 1:15–16. Specifically, Cohen teaches the use of divinyltetramethyldisiloxane (DVTMDS) as a copolymer with a methacrylate to produce a crosslinked polymer product. *Id.* at 1:25–34, 2:14–30, 2:60–63, 3:52–65, 4:18–31.

4. *Analysis*

Petitioner argues that the combination of Coulson, Badyal, and Cohen teaches or suggests the subject matter of claims 1–3, 9, and 11–15 and that a person of ordinary skill in the art would have had a reason to combine the teachings of these references. Pet. 22–42, 69–74. Patent Owner does not dispute that the combination of Coulson, Badyal, and Cohen teaches or suggests the subject matter of the challenged claims, but Patent Owner argues that Cohen is non-analogous art to the '876 patent and that a person of ordinary skill in the art would not have had a reason to combine the teachings of these references. Prelim. Resp. 32–44, 48–58.

a. Claim 1

As stated above, claim 1 recites “[a]n electronic or electrical device or electronic or electrical component thereof.” Ex. 1001, 18:26–29. Petitioner argues that Coulson and Cohen both teach this portion of claim 1. Pet. 26. Patent Owner does not disagree. Prelim. Resp. 32–44, 48–58. Coulson teaches treating electronic devices with coatings applied by plasma polymerization of fluorinated monomers. Ex. 1004, code (57), 3:14–25, 11:1–12:22. Accordingly, Petitioner has shown sufficiently that the combination of Coulson, Badyal, and Cohen teaches or suggests this portion of claim 1.

Claim 1 also recites

a protective cross-linked polymeric coating on a surface of said device or component; wherein the protective cross-linked polymeric coating is obtained by exposing said device or component to a plasma comprising a monomer compound and a crosslinking reagent for a period of time sufficient to allow formation of the protective cross-linked polymeric coating on a surface thereof.

Ex. 1001, 18:28–36. Petitioner argues that the combination of Coulson and Cohen teaches or suggests this portion of claim 1. Pet. 26–27. Patent Owner does not disagree. Prelim. Resp. 32–44, 48–58. Coulson teaches treating electronic devices with coatings applied by plasma polymerization of fluorinated monomers. Ex. 1004, code (57), 3:14–25, 11:1–12:22. Coulson’s coatings protect the coated devices against damage from water. *Id.* at 12:24–13:17, 14:7–23. Badyal teaches using a crosslinking agent in plasma polymerization of fluorinated monomers to produce water-repellent coatings on a solid substrate. Ex. 1005, 1:3–5, 6:24–7:15, 8:15–9:19, 9:28–32, 11:15–24. Badyal’s crosslinked coatings had improved durability. *Id.* at 4:1–9, 4:17–29. Accordingly, Petitioner has shown sufficiently that the combination of Coulson, Badyal, and Cohen teaches or suggests this limitation of claim 1.

The remainder of claim 1 defines the limits on the “monomer compound” and “crosslinking reagent.” Ex. 1001, 18:37–19:57. Petitioner argues that both Coulson and Badyal teach or suggest monomer compounds within the scope of those recited in claim 1. Pet. 27–30. Patent Owner does not disagree. Prelim. Resp. 32–44, 48–58. Among the monomer compounds that fall within the scope of claim 1 are PFAC8 and PFMAC8. Ex. 1001, 20:65–21:6. Among Coulson’s fluorinated monomers are PFAC8 and PFMAC8. Ex. 1004, 12:13–22; *see* Ex. 1002 ¶¶ 67, 114, 120. Badyal also teaches the use of both PFAC8 and PFMAC8. Ex. 1005, 7:17–9:17; *see* Ex. 1002 ¶¶ 115, 121. Accordingly, Petitioner has shown sufficiently that the combination of Coulson, Badyal, and Cohen teaches or suggests this limitation of claim 1.

Finally, Petitioner argues that the combination of Badyal and Cohen teaches or suggests crosslinking reagents within the scope of those recited in claim 1. Pet. 27–30. Patent Owner does not disagree. Prelim. Resp. 32–44, 48–58. Badyal teaches a generic crosslinking reagent for use in plasma polymerization that is similar to formula (i) in claim 1. *Compare* Ex. 1001, 18:54–66, *with* Ex. 1005, 4:31–5:2. Cohen teaches crosslinking reagents within the scope of Badyal’s generic formula, including DVTMDS. Ex. 1006, 1:21–34, 2:14–30, 2:60–63, 3:52–65, 4:18–31. DVTMDS is among the crosslinking reagents that fall within the scope of claim 1. Ex. 1001, 20:65–21:6. Accordingly, Petitioner has shown sufficiently that the combination of Coulson, Badyal, and Cohen teaches or suggests this limitation of claim 1.

b. Claim 2

Claim 2 depends from claim 1 and adds a limitation requiring that “the protective cross-linked polymeric coating [be] a physical barrier to mass and electron transport.” Ex. 1001, 19:58–60. Petitioner argues that the recited barrier properties “would have been an expected and routine result of” or “inherent in” the combination of Coulson, Badyal, and Cohen. Pet. 69–72. Patent Owner does not disagree. Prelim. Resp. 32–44, 48–58. Dr. Gleason testifies in support of Petitioner’s argument. Ex. 1002 ¶¶ 132, 207–211. Accordingly, Petitioner has shown sufficiently that the combination of Coulson, Badyal, and Cohen teaches or suggests this limitation of claim 2.

c. Claim 3

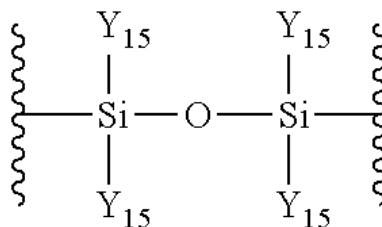
Claim 3 depends from claim 1 and adds a limitation requiring that “the protective cross-linked polymeric coating form[] a liquid repellent

surface defined by a static water contact angle (WCA) of at least 90°.”

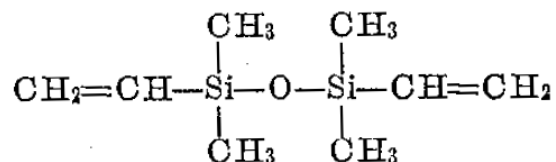
Ex. 1001, 19:61–64. Petitioner argues that the recited barrier properties “would have been an expected and routine result of” or “inherent in” the combination of Coulson, Badyal, and Cohen. Pet. 72–74. Patent Owner does not disagree. Prelim. Resp. 32–44, 48–58. Dr. Gleason testifies in support of Petitioner’s argument. Ex. 1002 ¶¶ 66–69, 132, 213–214. Accordingly, Petitioner has shown sufficiently that the combination of Coulson, Badyal, and Cohen teaches or suggests this limitation of claim 3.

d. Claim 9

Claim 9 depends from claim 1 and adds a limitation requiring that, “when for compound (i) L is of formula B and Y₁₀ has the following formula:



Each Y₁₅ is methyl, and each Y₉ is a bond.” Ex. 1001, 20:40–50. Petitioner argues that the DVTMDS of Cohen has this structure. Pet. 40. Patent Owner does not disagree. Prelim. Resp. 32–44, 48–58. Dr. Gleason testifies in support of Petitioner’s argument. Ex. 1002 ¶¶ 127, 137. Cohen teaches that DVTMDS has the following structure:



Ex. 1006, 1:21–34. Comparing this structure to the crosslinking reagent recited in claim 9, when Y₁₀ has the formula recited in claim 9, with each

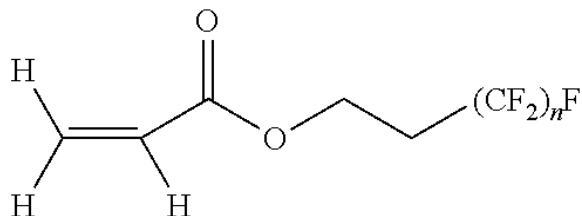
Y₁₅ being a methyl group, when each Y₉ is a bond, and when each of Y₁ through Y₆ is hydrogen, the crosslinking reagent of the '876 patent would be the DVTMDS of Cohen. *See* Ex. 1002 ¶¶ 127, 137. Accordingly, Petitioner has shown sufficiently that the combination of Coulson, Badyal, and Cohen teaches or suggests this limitation of claim 9.

e. Claim 11

Claim 11 depends from claim 1 and adds a limitation requiring that “the crosslinking reagent [be] selected from” a list including “1,3-divinyldimethyltetramethyldisiloxane (DVTMDS).” Ex. 1001, 20:65–21:6. Petitioner argues that “DVTMDS is the crosslinker in the asserted combination of Coulson[], Badyal, and Cohen.” Pet. 40. Patent Owner does not disagree. Prelim. Resp. 32–44, 48–58. As discussed above with respect to claims 1 and 9, Cohen teaches using DVTMDS as a copolymer with a methacrylate to produce a crosslinked polymer product. Ex. 1006, 1:25–34, 2:14–30, 2:60–63, 3:52–65, 4:18–31. Accordingly, Petitioner has shown sufficiently that the combination of Coulson, Badyal, and Cohen teaches or suggests this limitation of claim 11.

f. Claims 12 and 13

Claim 12 depends from claim 1 and adds a limitation requiring that “the compound of formula I(a) [have] the following formula:

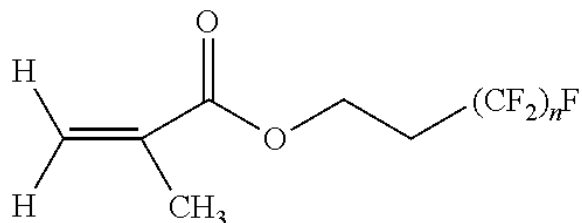


where n is from 2 to 10.” Ex. 1001, 21:7–19. Claim 13 depends from claim 12 and further limits “the compound of formula I(a)” to a compound

selected from a list including “1H,1H,2H,2H-perfluorodecyl acrylate (PFAC8).” *Id.* at 21:20–22:3. Petitioner argues that “both Coulson[] and Badyal described PFAC8 as a preferred monomer.” Pet. 41. Patent Owner does not disagree. Prelim. Resp. 32–44, 48–58. As discussed above with respect to claim 1, both Coulson and Badyal teach the use of PFAC8 in their processes. Ex. 1004, 12:13–22; Ex. 1005, 7:17–9:17; *see* Ex. 1002 ¶¶ 67, 114, 115, 120, 121. Accordingly, Petitioner has shown sufficiently that the combination of Coulson, Badyal, and Cohen teaches or suggests the PFAC8 of claim 13. Moreover, claim 13 depends from claim 12, so its recited compounds all fall within the scope of the compounds recited in claim 12. Accordingly, Petitioner has shown sufficiently that the combination of Coulson, Badyal, and Cohen teaches or suggests a compound within the scope of claim 12.

g. Claims 14 and 15

Claim 14 depends from claim 1 and adds a limitation requiring that “the compound of formula I(a) [have] the following formula:



where n is from 2 to 10.” Ex. 1001, 22:4–15. Claim 15 depends from claim 14 and further limits “the compound of formula I(a)” to a compound selected from a list including “1H,1H,2H,2H-perfluorodecyl methacrylate (PFMAC8).” *Id.* at 22:16–20. Petitioner argues that “both Coulson[] and Badyal described PFMAC8 as a preferred monomer.” Pet. 41–42. Patent Owner does not disagree. Prelim. Resp. 32–44, 48–58. As discussed above

with respect to claim 1, both Coulson and Badyal teach the use of PFMAC8 in their processes. Ex. 1004, 12:13–22; Ex. 1005, 7:17–9:17; *see* Ex. 1002 ¶¶ 67, 114, 115, 120, 121. Accordingly, Petitioner has shown sufficiently that the combination of Coulson, Badyal, and Cohen teaches or suggests the PFMAC8 of claim 15. Moreover, claim 15 depends from claim 14, so its recited compounds all fall within the scope of the compounds recited in claim 14. Accordingly, Petitioner has shown sufficiently that the combination of Coulson, Badyal, and Cohen teaches or suggests a compound within the scope of claim 14.

h. Analogous Art

As discussed above, Petitioner relies on a combination of references that includes Cohen. Patent Owner argues that Cohen is not analogous art to the '876 patent. Prelim. Resp. 41–44; Sur-Reply 1–5. Petitioner disagrees. Reply 1–4.

For a reference to be proper for use in an obviousness combination, the reference must be analogous art to the claimed invention. *In re Bigio*, 381 F.3d 1320, 1325 (Fed. Cir. 2004). A reference is analogous art if it either (1) falls within the same field of endeavor as the claimed invention or (2) is reasonably pertinent to the problem faced by the inventor of the claimed invention. *Id.* Patent Owner argues that Cohen is neither within the same field of endeavor as the '876 patent nor reasonably pertinent to any problem faced by the inventors. Prelim. Resp. 42–44.

With respect to the first prong, Patent Owner argues that the field of endeavor of the '876 patent is “plasma polymerized protective coatings.” *Id.* at 42–43; *but see id.* at 45–47 (arguing with respect to Holliday, Francesch, and Tropsch that the field of endeavor is instead “plasma polymerized

protective coatings for electronic devices”). Petitioner argues that the field of endeavor is “polymer coatings.” Reply 1–3.

With respect to the second prong, Patent Owner argues that the problem faced by the inventors of the ’876 patent was “creating improved plasma polymerized protective coatings for electronic devices.” Prelim. Resp. 44; *but see* Prelim. Resp. 45–47 (defining the problem variously as “addressing challenges associated with controlling the tackiness, smear resistance, water resistance and electrical barrier properties of ultra-thin film plasma polymerized coatings for electronics,” “creating improved hydrophobic and barrier coatings for electronic devices,” and “providing improved plasma polymerized coatings for electronic devices”). Petitioner argues that the problem was “achieving highly crosslinked coatings at low power.” Reply 3–4.

“[I]t is necessary to consider ‘the reality of the circumstances,’—in other words, common sense—in deciding in which fields a person of ordinary skill would reasonably be expected to look for a solution to the problem facing the inventor.” *In re Oetiker*, 977 F.2d 1443, 1447 (Fed. Cir. 1992) (quoting *In re Wood*, 599 F.2d 1032, 1036 (CCPA 1979)). “References are selected as being reasonably pertinent to the problem based on the judgment of a person having ordinary skill in the art.” *In re Kahn*, 441 F.3d 977, 986–87 (Fed. Cir. 2006). At least on the present record, the disclosure of Badyal shows that a person of ordinary skill in the art, exercising common sense, would have looked to references including Cohen for crosslinking reagents.

As noted above, the parties have offered at least three definitions of the field of endeavor of the ’876 patent. Petitioner argues that the field of

endeavor is “polymer coatings,” and Patent Owner argues it is either “plasma polymerized protective coatings” or “plasma polymerized protective coatings for electronic devices.” Under at least the first two of these definitions, Badyal is analogous art. With respect to Petitioner’s proposed field of endeavor, Badyal relates to “[a] method of coating a surface with a polymer layer.” Ex. 1005, code (57). With respect to the first of the two fields of endeavor Patent Owner proposes, Badyal’s method for making polymer coatings involves plasma polymerization and produces a crosslinked polymer layer that have “oil or water repellent properties.” *Id.* at 4:4–29. Arguably, Badyal falls outside Patent Owner’s narrower proposed field because it does not teach coating “electronic devices” with its method. We are not persuaded, however, that the field of endeavor of the ’876 patent can be limited to solely “electronic devices.” The claims of the ’876 patent extend beyond electronic devices, also encompassing “electrical device[s],” as well as “electronic or electrical components” of devices. Ex. 1001, 18:26–29. Moreover, the specification of the ’876 patent expressly refuses to limit the substrates that may be coated to “electronic substrate[s],” stating instead that “the invention is of benefit in the context of a wide variety of substrates.” *Id.* at 14:30–32. Finally, the ’876 patent states that its field is “protective coatings for electronic or electrical devices and components thereof.” *Id.* at 1:5–8. Accordingly, at least on the present record, we determine that Badyal falls within the same field of endeavor as the ’876 patent.

Because Badyal falls within the same field of endeavor as the ’876 patent, it reflects the knowledge of a person of ordinary skill in the art in that field. Thus, because Badyal refers to “bridging groups . . . known in the

polymer art,” a person of ordinary skill in the art would have looked to references in the “polymer art” for guidance on choosing an appropriate crosslinking reagent.⁹ Ex. 1005, 5:18–19. Cohen clearly is in the polymer art. Ex. 1006, 1:15–16 (“This invention relates to a novel monomeric vinyl compound and polymers prepared therefrom.”).

Where, as here, an asserted reference within the field of endeavor of a challenged patent expressly refers to references in another field, we are not persuaded that asserted references in that other field are non-analogous art under the test articulated in *Oetiker*, *Wood*, and *Kahn*. Accordingly, at least on the present record, we are not persuaded that Cohen should be excluded from Petitioner’s obviousness combination as non-analogous art. We encourage the parties to develop the record further on this point during trial.

i. Reason to Combine

“An invention is not obvious just ‘because all of the elements that comprise the invention were known in the prior art.’” *Broadcom Corp. v. Emulex Corp.*, 732 F.3d 1325, 1335 (Fed. Cir. 2013) (quoting *Power-One, Inc. v. Artesyn Techs., Inc.*, 599 F.3d 1343, 1351 (Fed. Cir. 2010)). Instead, there must also be “some articulated reasoning with some rational underpinning” to combine the known elements in the manner required in the claim at issue. *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007).

⁹ Patent Owner argues that Badyal’s disclosure should be limited to a narrower class of bridging groups than “those known in the polymer art.” Prelim. Resp. 37–39. We discuss this argument below with respect to the reason to combine the references.

(1) The Parties' Arguments

Here, Petitioner argues that a person of ordinary skill in the art would have had a reason to combine the teachings of Coulson, Badyal, and Cohen. First, Petitioner argues that “Badyal would have motivated the [person of ordinary skill in the art] to improve the Coulson[] coatings by adding a crosslinking reagent during plasma polymerization because Badyal taught . . . that crosslinked polymer coatings typically exhibited improved durability, barrier properties, smoothness, and solvent resistance.” Pet. 34–35 (citing Ex. 1002 ¶¶ 129–131; Ex. 1005, 1:31–2:1, 4:1–29; Ex. 1006, 3:51–65). In particular, Petitioner argues that a person of ordinary skill in the art “would have viewed protective coatings with enhanced durability as highly desirable.” *Id.* at 35 (citing Ex. 1002 ¶ 129). Second, Petitioner argues that a person of ordinary skill in the art, when choosing from among crosslinkers within Badyal’s broad genus containing bridging groups known in the polymer art, “would have preferred crosslinking reagents like DVTMDS with a normal boiling point close to or less than those of PFAC8 and PFMAC8 . . . to facilitate supplying a plasma chamber with monomer and crosslinker vapors.” *Id.* at 36 (citing Ex. 1002 ¶¶ 47, 126, 133). In addition, Petitioner argues that a person of ordinary skill in the art would have had a reasonable expectation of success in combining the teachings of Coulson, Badyal, and Cohen. *Id.* at 38–39 (citing Ex. 1002 ¶¶ 134–135).

Patent Owner argues that a person of ordinary skill in the art would not have been motivated to incorporate any crosslinker falling within Badyal’s disclosed genus into Coulson’s coating. Prelim. Resp. 32–37. Patent Owner also argues that Badyal would not have motivated a person of ordinary skill in the art to use the particular crosslinker identified in Cohen.

Id. at 37–41, 48–53. Finally, Patent Owner argues that a person of ordinary skill in the art would not have had a reasonable expectation of success in combining the teachings of Coulson, Badyal, and Cohen. *Id.* at 53–58.

(2) Reason to Combine Coulson and Badyal

On the present record, Petitioner has shown sufficiently that a person of ordinary skill in the art would have had a reason to improve the plasma polymerized coatings of Coulson by incorporating a crosslinker, as taught by Badyal. Badyal teaches that durability of plasma polymerized coatings was a problem to be solved. Ex. 1005, 4:1–2 (“the durability of such coatings can be improved”). It also teaches that its method produces “cross-linked polymeric coatings” that “will have good durability,” meaning, “[f]or example,” that the coatings “would be better able to withstand washing.” *Id.* at 4:26–29. Dr. Gleason testifies that a person of ordinary skill in the art “would have recognized that durability is important for protective coatings applied to electronics like mobile phones or medical devices, which are used continuously for years while often being exposed to challenging conditions like liquid exposure.” Ex. 1002 ¶ 129.

Against this evidence of a reason to combine Badyal and Coulson, Patent Owner offers two arguments. First, Patent Owner argues that, because Coulson teaches the properties of a coating are affected by the substrate, and because Coulson and Badyal concern coatings applied to different substrates, a person of ordinary skill in the art would not have looked to Badyal to improve Coulson. Prelim. Resp. 33–35. At least on the present record, we disagree. Patent Owner is correct that Coulson is concerned with coating electrical or electronic devices and that Badyal is concerned largely with coating fabrics. Ex. 1004, code (57), 1:3–7;

Ex. 1005, 1:14–2:8. But Badyal is not limited to coating fabrics. Instead, Badyal teaches coating “any solid substrate, such as fabric, metal, glass, ceramics, paper or polymers,” as well as “biomedical devices.” Ex. 1005, 9:28–30, 11:21–24. Generally, Petitioner relies on Badyal’s durable and versatile coatings using a crosslinker; we are not persuaded that the focus of Badyal and Coulson on different substrates would have caused a person of ordinary skill in the art to avoid combining the teachings of the references.

Second, Patent Owner argues that, because “crosslinked polymers tend to be more stiff and rigid compared to non-crosslinked polymers,” and because “[i]ncreased polymer rigidity . . . may negatively impact sound quality, discouraging a [person of ordinary skill in the art] from incorporating a crosslinker” into Coulson’s coatings for electronic devices. Prelim. Resp. 35–36. This argument is based on Coulson’s desire “to protect electronic devices while also not having an ‘adverse impact on sound quality.’” *Id.* at 35 (quoting Ex. 1004, 2:11–12). The statement about protecting sound quality in Coulson, however, applies only to “devices which are used in sound reproduction and which utilise transducers such as loudspeakers, microphones, ringers and buzzers.” Ex. 1004, 2:1–12. These are not the only devices Coulson teaches coating. *Id.* at 1:3–5 (“The present invention relates to novel products in the form of electronic or electrical devices, which are treated to protect them from liquid damage”), 4:17–27 (defining “electronic or electrical device” to include “any piece of electrical or electronic equipment which may be used, as well as components thereof such as printed circuit boards (PCBs), transistors, resistors, electronic components or semi-conductor chips”). Thus, even if we accept Patent Owner’s argument that a person of ordinary skill in the art following

Coulson's teachings regarding coating devices used in sound reproduction would have considered crosslinked coatings to be undesirable, there is no reason to conclude that such thinking would have extended to coating any and all electronic or electrical devices. Accordingly, we are persuaded on the current record that a person of ordinary skill in the art would have had reason to combine the teachings of Badyal with those of Coulson.

(3) Reason to Combine Cohen with Coulson and Badyal

On the present record, Petitioner has shown sufficiently that a person of ordinary skill in the art would have had a reason to implement the plasma polymerization process of Coulson and Badyal using the crosslinking reagent taught by Cohen. Badyal teaches a genus of crosslinking reagents comprising a bridging group that is "known in the polymer art." Ex. 1005, 4:31–5:19. As discussed above with respect to claim 1, the DVTMDS of Cohen falls within the scope of the genus of crosslinking reagents that Badyal teaches using in its plasma polymerization process. Dr. Gleason testifies that DVTMDS has several properties that a person of ordinary skill in the art would have believed made it a good choice from among those compounds meeting Badyal's criteria for a crosslinking reagent. Ex. 1002 ¶¶ 132–133. These properties include compatibility with the monomer compounds used in Badyal and Coulson, prior use in plasma polymerization processes, and a "low normal boiling point" that "enables the easy introduction of vapors of this crosslinking reagent into the vacuum chamber used for plasma deposition." *Id.*

Against this evidence of a reason to combine the teachings of Cohen with those of Badyal and Coulson, Patent Owner offers two arguments.

First, Patent Owner argues that, rather than teaching the use of any bridging group “known in the polymer art,” Badyal instead teaches only the use of “suitable bridging groups . . . structured according to formula (II)” of Badyal. Prelim. Resp. 37–39; *see* Ex. 1005, 5:18–6:20. We disagree. As Patent Owner notes, Badyal does describe a smaller category of bridging groups that do not include the bridging group present in Cohen’s DVTMDS. Ex. 1005, 5:20–6:20. But these groups are described as “optional” or as “a particularly preferred embodiment.” *Id.* at 5:20–25. A reference may be relied upon for all that it would have reasonably suggested to a person of ordinary skill in the art, including nonpreferred embodiments. *Merck & Co. v. Biocraft Laboratories*, 874 F.2d 804, 807 (Fed. Cir. 1989). Accordingly, when a reference discloses the optional inclusion of a component, it teaches or suggests both compositions including that component and compositions lacking that component. *Upsher-Smith Labs. v. PamLab, LLC*, 412 F.3d 1319, 1323 (Fed. Cir. 2005). Thus, the fact that Badyal discloses certain subcategories of preferred compounds does not answer the question of whether Badyal would have directed a person of ordinary skill in the art to all bridging groups known in the polymer art. On the present record, we determine that it does.

Next, Patent Owner argues that, even if Badyal would have directed a person of ordinary skill in the art to all bridging groups known in the polymer art, that disclosure is “so expansive” that “it fails to describe a meaningful preference that would have led a [person of ordinary skill in the art] to arrive at the particular structures for the linker moieties L in claim 1 of the ’876 patent.” Prelim. Resp. 39–41. We disagree. As discussed above, Dr. Gleason testifies that a person of ordinary skill in the art would

have chosen Cohen's DVTMDS because of its useful properties, including compatibility with the monomer compounds used in Badyal and Coulson, prior use in plasma polymerization processes, and a "low normal boiling point" that "enable[d] the easy introduction of vapors of this crosslinking reagent into the vacuum chamber used for plasma deposition." Ex. 1002 ¶¶ 132–133. This testimony is not rebutted on the present record, and it provides a reason for a person of ordinary skill in the art to have chosen the DVTMDS of Cohen over any of the other compounds taught or suggested by Badyal.

(4) Reasonable Expectation of Success

Finally, Patent Owner argues that, even if there were a reason to combine the teachings of Cohen with those of Coulson and Badyal, a person of ordinary skill in the art would not reasonably have expected success in making such a combination. Prelim. Resp. 53–56. Specifically, Patent Owner argues that plasma polymerization is an unpredictable process and that crosslinking reagents like Cohen's DVTMDS, known to work in conventional polymerization processes, would not necessarily have been expected to work in plasma polymerization. *Id.* Petitioner disagrees, arguing that Badyal taught that compounds falling within its generic crosslinker structure would be suitable for use in plasma polymerization. Pet. 38–39. On the present record, we are persuaded Petitioner has shown a reasonable expectation of success sufficient to permit us to institute review. As Petitioner notes, *id.*, Badyal teaches that crosslinkers with bridging groups "known in the polymer art" were suitable for use in plasma polymerization, including in mixtures with PFAC8 or PFMAC8. Ex. 1005, 4:6–9, 4:31–5:5, 5:18–19, 6:24–7:2, 7:17–9:17. Although these teachings

may not be sufficient to show a certainty of success with all known bridging groups, particularly in an unpredictable process such as plasma polymerization, certainty of success is not required, only a reasonable expectation of success. *In re O'Farrell*, 853 F.2d 894, 903–904 (Fed. Cir. 1988). On the present record, we consider Badyal's teaching that crosslinkers with bridging groups "known in the polymer art" were suitable for use in plasma polymerization to be sufficient to show this reasonable expectation.

5. *Conclusion*

As discussed above, Petitioner has shown sufficiently that the combination of Coulson, Badyal, and Cohen teaches or suggests the subject matter of claims 1–3, 9, and 11–15 and that a person of ordinary skill in the art would have had a reason to combine the teachings of these references. Accordingly, Petitioner has demonstrated a reasonable likelihood of prevailing on the unpatentability of these claims on this ground.

C. Asserted Obviousness over Coulson, Badyal, and Holliday

Petitioner argues that claims 1–8 and 10–15 would have been obvious over the combination of Coulson, Badyal, and Holliday. Pet. 42–52, 69–74.

1. *Holliday*

Holliday relates to a "composition . . . for use in providing electrical insulation." Ex. 1007, 1:12–13. Specifically, the compositions of Holliday "comprise a curable composition comprising a mixture of a polyolefin, polyvinyl chloride and a reactive allylic or vinylic compound or mixture." *Id.* at 1:16–19. Holliday teaches that "it is important to include at least one plasticizing, crosslinking allylic or vinylic monomer" in the composition. *Id.* at 3:21–24. In particular, Holliday teaches the use of diallyl-1,4-

cyclohexanedicarboxylate (DCHD) or 1,4-divinyl-oxybutane (BDVE¹⁰). *Id.* at 3:34–35, 3:52–53.

2. *Analysis*

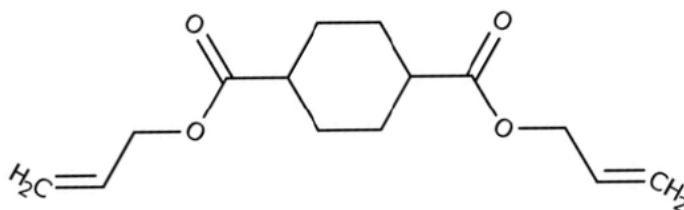
Petitioner argues that the combination of Coulson, Badyal, and Holliday teaches or suggests the subject matter of claims 1–8 and 10–15 and that a person of ordinary skill in the art would have had a reason to combine the teachings of these references. Pet. 42–52, 69–74. Patent Owner does not dispute that the combination of Coulson, Badyal, and Holliday teaches or suggests the subject matter of the challenged claims, but argues that Holliday is non-analogous art to the '876 patent and that a person of ordinary skill in the art would not have had a reason to combine the teachings of these references. Prelim. Resp. 32–42, 45, 48–58.

a. Claims 1–3

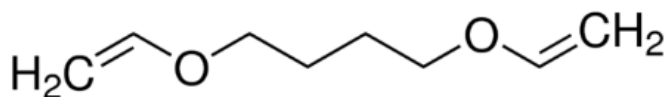
As discussed above with respect to the asserted ground of obviousness over the combination of Coulson, Badyal, and Cohen, Petitioner has shown sufficiently that Coulson and Badyal teach or suggest the subject matter of claims 1–3 other than the specific crosslinking reagent. Petitioner argues that both the DCHD and BDVE of Holliday satisfy the limitations of claim 1 regarding the structure of the crosslinker. Pet. 42–44. Patent Owner does not disagree. Prelim. Resp. 32–42, 45, 48–58.

Holliday teaches using either DCHD or BDVE as a crosslinker. Ex. 1007, 3:21–24, 3:34–35, 3:52–53. Dr. Gleason testifies that DCHD and BDVE have the following structures:

¹⁰ Dr. Gleason testifies that 1,4-divinyl-oxybutane is also known as 1,4-butanediol divinyl ether (BDVE). Ex. 1002 ¶ 74.



DCHD

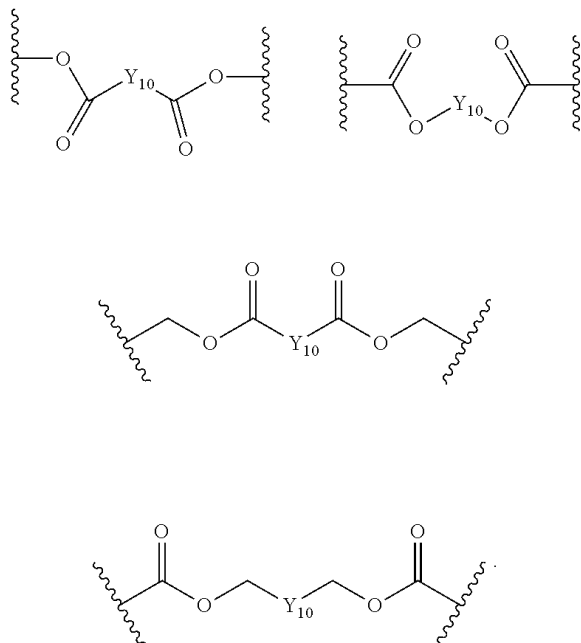


BDVE

Ex. 1002 ¶ 144. Comparing these structures to the crosslinking reagent structures in claim 1, both reagents fall within the scope of claim 1's formula (i) with Y₁ through Y₆ each being hydrogen. *Id.*; *see* Ex. 1001, 18:54–19:9. For DCHD, the linker moiety L of formula (i) satisfies the requirements of formula B of claim 1 with Y₉ being —Y₁₁—O—C(O)—, Y₁₁ being a C₁ alkylene, and Y₁₆ through Y₁₉ being hydrogen. Ex. 1002 ¶ 148; *see* Ex. 1001, 19:20–57. For BDVE, the linker moiety L of formula (i) satisfies the requirements of formula A of claim 1 with Y₁₀ being a C₂ alkylene. Ex. 1002 ¶ 149; *see* Ex. 1001, 19:9–19. In addition, claim 11 of the '876 patent makes clear that both BDVE and DCHD fall within the scope of crosslinking reagents in claim 1. Ex. 1001, 20:65–21:6. Accordingly, Petitioner has shown sufficiently that the combination of Coulson, Badyal, and Holliday teaches or suggests the subject matter of claims 1–3.

b. Claim 4

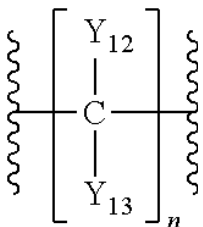
Claim 4 depends from claim 1 and adds a limitation requiring that “compound (i) L [be] of the formula B,” and that linking moiety L have one of the following structures:



Ex. 1001, 19:65–20:15. DCHD has the third linking structure recited in claim 4 when Y_{10} has the structure recited at Ex. 1001, 19:45–54, and Y_{16} through Y_{19} are all hydrogen. Ex. 1002 ¶ 155. Accordingly, Petitioner has shown sufficiently that the combination of Coulson, Badyal, and Holliday teaches or suggests this limitation of claim 4.

c. Claims 5 and 6

Claim 5 depends from claim 1 and adds a limitation requiring that “when for compound (i) L is of formula A, Y_{10} has the following formula:



wherein each Y_{12} and Y_{13} is independently selected from H, halo, optionally substituted cyclic, branched or straight chain alkyl, or $-OY_{14}$, where Y_{14} is selected from optionally substituted branched or straight chain C_1 - C_8 alkyl or alkenyl, and n is an integer from 1 to 10.” Ex. 1001, 20:17–32. Claim 6 depends from claim 5 and adds a limitation requiring that “each Y_{12} [be] H and each Y_{13} [be] H.” *Id.* at 20:33–34. Holliday’s BDVE has the recited structure when Y_{12} and Y_{13} both are hydrogen and n is 2. Ex. 1002 ¶¶ 156–157. Accordingly, Petitioner has shown sufficiently that the combination of Coulson, Badyal, and Holliday teaches or suggests these limitations of claims 5 and 6.

d. Claim 7

Claim 7 depends from claim 5 and adds a limitation requiring that “each Y_{12} [be] fluoro and each Y_{13} [be] fluoro.” Ex. 1001, 20:35–36. Petitioner argues that “Badyal taught that alkyl chains in bridging group Z could be perfluoroalkyl chains and that highly fluorinated coatings exhibit ‘super-hydrophobicity.’” Pet. 49 (quoting Ex. 1005, 5:18–23, 10:32–11:1). Dr. Gleason testifies that a person of ordinary skill in the art would have been motivated to substitute fluorine for the hydrogens at Y_{12} and Y_{13} in Holliday’s BDVE in order to maximize hydrophobicity in protective coatings. Ex. 1002 ¶¶ 46, 58, 158. Accordingly, Petitioner has shown sufficiently that the combination of Coulson, Badyal, and Holliday teaches or suggests this limitation of claim 7.

e. Claim 8

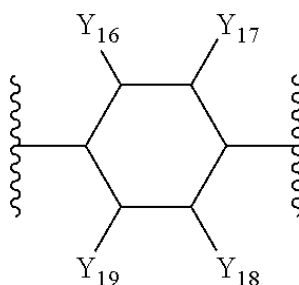
Claim 8 depends from claim 5 and adds a limitation requiring that “ n [be] from 4 to 6.” Ex. 1001, 20:37–38. Petitioner argues that a person of ordinary skill in the art would have been motivated to modify Holliday’s

BDVE to double the length of the two-carbon alkyl chain “to produce more hydrophobic coatings.” Pet. 50. Dr. Gleason testifies that increasing the length of the alkyl chain in BDVE would result in “improv[ing] the hydrophobicity of the resulting protective coatings.” Ex. 1002 ¶ 159.

Dr. Gleason also testifies that the resulting compound, HDVE, “was already a known reagent in the polymer field and had been used previously as a crosslinker in combination with acrylate-based monomers.” *Id.* (citing Ex. 1011, 3:1–14, 3:46–54). Accordingly, Petitioner has shown sufficiently that the combination of Coulson, Badyal, and Holliday teaches or suggests this limitation of claim 8.

f. Claim 10

Claim 10 depends from claim 1 and adds a limitation requiring that “when for compound (i) L is of formula B and Y₁₀ has the following formula:



Y₁₈ is H or vinylene, and Y₁₆, Y₁₇ and Y₁₉ are each H.” Ex. 1001, 20:51–64. For Holliday’s DCHD, the linker moiety L of formula (i) satisfies the requirements of formula B of claim 1 with Y₉ being —Y₁₁—O—C(O)—, Y₁₁ being a C₁ alkylene, and Y₁₆ through Y₁₉ being hydrogen. Ex. 1002 ¶ 148; *see* Ex. 1001, 19:20–57. Accordingly, Petitioner has shown sufficiently that the combination of Coulson, Badyal, and Holliday teaches or suggests this limitation of claim 10.

g. Claims 11–15

As discussed above with respect to claim 1, Holliday’s DCHD and BDVE are both compounds expressly named in claim 11. As discussed above with respect to the asserted ground of obviousness over Coulson, Badyal, and Cohen, both Coulson and Badyal teach the use of PFAC8 and PFMAC8, compounds expressly named in claims 12–15. Accordingly, Petitioner has shown sufficiently that the combination of Coulson, Badyal, and Holliday teaches or suggests these limitations of claims 11–15.

h. Analogous Art

As discussed above, Petitioner relies on a combination of references that includes Holliday. Patent Owner argues that Holliday is not analogous art to the ’876 patent. Prelim. Resp. 41–42, 45; Sur-Reply 1–5. Petitioner disagrees. Reply 1–4.

As discussed above, Badyal falls within the same field of endeavor as the ’876 patent and refers to “bridging groups . . . known in the polymer art.” Ex. 1005, 5:18–19. Thus, a person of ordinary skill in the art would have looked to references in the “polymer art” for guidance on choosing an appropriate crosslinking reagent, and Holliday clearly is in the polymer art. Ex. 1007, 1:12–19 (“The compositions disclosed comprise a curable composition comprising a mixture of a polyolefin, polyvinyl chloride and a reactive allylic or vinylic compound of mixture.”). Accordingly, at least on the present record, we are not persuaded that Holliday should be excluded from Petitioner’s obviousness combination as non-analogous art. We encourage the parties to develop the record further on this point during trial.

i. Reason to Combine

As discussed above, Petitioner has shown sufficiently that a person of ordinary skill in the art would have had a reason to combine the teachings of Coulson with those of Badyal. On the present record, Petitioner has shown sufficiently that a person of ordinary skill in the art would have had a reason to implement the plasma polymerization process of Coulson and Badyal using the crosslinking reagents taught by Holliday. Badyal teaches a genus of crosslinking reagents comprising a bridging group that is “known in the polymer art.” Ex. 1005, 4:31–5:19. As discussed above with respect to claim 1, the DCHD and BDVE of Holliday both fall within the scope of the genus of crosslinking reagents that Badyal teaches using in its plasma polymerization process. Dr. Gleason testifies that these reagents had several properties that a person of ordinary skill in the art would have believed made them good choices from among those compounds meeting Badyal’s criteria for a crosslinking reagent. Ex. 1002 ¶¶ 151–152.

3. *Conclusion*

As discussed above, Petitioner has shown sufficiently that the combination of Coulson, Badyal, and Holliday teaches or suggests the subject matter of claims 1–8 and 10–15 and that a person of ordinary skill in the art would have had a reason to combine the teachings of these references. Accordingly, Petitioner has demonstrated a reasonable likelihood of prevailing on the unpatentability of these claims on this ground.

D. Asserted Obviousness over Coulson, Badyal, and Padiyath

Petitioner argues that claims 1–4, 10, and 12–15 would have been obvious over the combination of Coulson, Badyal, and Padiyath. Pet. 52–57, 69–74.

1. Padiyath

Padiyath “relates to barrier films for protection of moisture or oxygen sensitive articles.” Ex. 1008 ¶ 1. The films of Padiyath comprise polymers that can be applied using plasma polymerization. *Id.* ¶¶ 5–7, 11, 25, Fig. 3. In particular, Padiyath teaches using cyclohexane dimethanol diacrylate esters (CDMDA¹¹). *Id.* ¶ 54.

2. Analysis

Petitioner argues that the combination of Coulson, Badyal, and Padiyath teaches or suggests the subject matter of claims 1–4, 10, and 12–15 and that a person of ordinary skill in the art would have had a reason to combine the teachings of these references. Pet. 52–57, 69–74. Patent Owner does not dispute that the combination of Coulson, Badyal, and Padiyath teaches or suggests the subject matter of the challenged claims, but Patent Owner argues that a person of ordinary skill in the art would not have had a reason to combine the teachings of these references. Prelim. Resp. 32–41, 48–58.

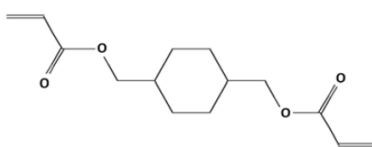
a. Claims 1–3

As discussed above with respect to the asserted ground of obviousness over the combination of Coulson, Badyal, and Cohen, Petitioner has shown

¹¹ The record contains evidence that the cyclohexane dimethanol diacrylate esters of Padiyath are cyclohexane-1,4-dimethanol diacrylate (CDMDA). Ex. 1002 ¶¶ 76, 166; Ex. 1030 ¶¶ 144–146; Ex. 1031 ¶ 27; Ex. 1032.

sufficiently that Coulson and Badyal teach or suggest the subject matter of claims 1–3 other than the specific crosslinking reagent. Petitioner argues that the CDMDA of Padiyath satisfies the limitations of claim 1 regarding the structure of the crosslinker. Pet. 53–54. Patent Owner does not disagree. Prelim. Resp. 32–41, 48–58.

Padiyath teaches using CDMDA as a crosslinker. Ex. 1008 ¶¶ 2, 25, 52, 54. Dr. Gleason testifies that CDMDA has the following structure:



Ex. 1002 ¶ 76. Comparing this structure to the crosslinking reagent structures in claim 1, this structure falls within the scope of claim 1's formula (i), with Y_1 through Y_6 each being hydrogen. *Id.*; see Ex. 1001, 18:54–19:9. For CDMDA, the linker moiety L of formula (i) satisfies the requirements of formula B of claim 1 with Y_9 being $—C(O)—O—Y_{11}—$, Y_{11} being a C_1 alkylene, and Y_{16} through Y_{19} being hydrogen. Ex. 1002 ¶¶ 166, 169; see Ex. 1001, 19:20–57. Accordingly, Petitioner has shown sufficiently that the combination of Coulson, Badyal, and Padiyath teaches or suggests the subject matter of claims 1–3.

b. Claims 4 and 10

CDMDA has the fourth linking structure recited in claim 4 when Y_{10} has the structure recited at Ex. 1001, 19:45–54, and Y_{16} through Y_{19} are all hydrogen. Ex. 1002 ¶ 176. Accordingly, Petitioner has shown sufficiently that the combination of Coulson, Badyal, and Padiyath teaches or suggests the subject matter of claim 4. In CDMDA, linking moiety L has the structure recited in claim 10 when Y_{16} through Y_{19} are all hydrogen. *Id.*

¶ 177. Accordingly, Petitioner has shown sufficiently that the combination of Coulson, Badyal, and Padiyath teaches or suggests the subject matter of claim 10.

c. Claims 12–15

As discussed above with respect to the asserted ground of obviousness over Coulson, Badyal, and Cohen, both Coulson and Badyal teach the use of PFAC8 and PFMAC8, compounds expressly named in claims 12–15. Accordingly, Petitioner has shown sufficiently that the combination of Coulson, Badyal, and Padiyath teaches or suggests the subject matter of claims 12–15.

d. Reason to Combine

As discussed above, Petitioner has shown sufficiently that a person of ordinary skill in the art would have had a reason to combine the teachings of Coulson with those of Badyal. On the present record, Petitioner has shown sufficiently that a person of ordinary skill in the art would have had a reason to implement the plasma polymerization process of Coulson and Badyal using the crosslinking reagent taught by Padiyath. Badyal teaches a genus of crosslinking reagents comprising a bridging group that is “known in the polymer art.” Ex. 1005, 4:31–5:19. As discussed above with respect to claim 1, the CDMDA of Padiyath falls within the scope of the genus of crosslinking reagents that Badyal teaches using in its plasma polymerization process. Dr. Gleason testifies that CDMDA had several properties that a person of ordinary skill in the art would have believed made it a good choice from among those compounds meeting Badyal’s criteria for a crosslinking reagent. Ex. 1002 ¶¶ 170–174.

3. *Conclusion*

As discussed above, Petitioner has shown sufficiently that the combination of Coulson, Badyal, and Padiyath teaches or suggests the subject matter of claims 1–4, 10, and 12–15 and that a person of ordinary skill in the art would have had a reason to combine the teachings of these references. Accordingly, Petitioner has demonstrated a reasonable likelihood of prevailing on the unpatentability of these claims on this ground.

E. Asserted Obviousness over Coulson, Badyal, and Francesch

Petitioner argues that claims 1–3, 5–8 and 11–15 would have been obvious over the combination of Coulson, Badyal, and Francesch. Pet. 57–63, 69–74.

1. *Francesch*

Francesch relates to the development of “[a] new acrylate-type monomer, pentafluorophenyl methacrylate (PFM) . . . for plasma polymerization.” Ex. 1009, 606. In particular, “[p]lasma polymerized films presented the labile pentafluorophenyl group on the surface, which was optimum for subsequent biotin binding.” *Id.* In preparing these films, Francesch teaches using BDVE as a crosslinker. *Id.* at 607 (“PFM was also copolymerized with . . . 1,4-butanediol divinyl ether . . . as [a] crosslinker[.]”).

2. *Analysis*

Petitioner argues that the combination of Coulson, Badyal, and Francesch teaches or suggests the subject matter of claims 1–3, 5–8, and 11–15 and that a person of ordinary skill in the art would have had a reason to combine the teachings of these references. Pet. 57–63, 69–74. Patent

Owner does not dispute that the combination of Coulson, Badyal, and Francesch teaches or suggests the subject matter of the challenged claims, but instead argues that Holliday is non-analogous art to the '876 patent and that a person of ordinary skill in the art would not have had a reason to combine the teachings of these references. Prelim. Resp. 32–42, 45–46, 48–58.

a. Claims 1–3, 5–8, and 11–15

As discussed above with respect to the asserted ground of obviousness over the combination of Coulson, Badyal, and Holliday, Petitioner has shown sufficiently that the use of BDVE in the plasma polymerization method of Coulson and Badyal teaches or suggests the subject matter of claims 1–3, 5–8, and 11–15. Like Holliday, Francesch also teaches the use of BDVE as a crosslinker in a plasma polymerization method. Ex. 1009, 606–07. Accordingly, Petitioner has shown sufficiently that the combination of Coulson, Badyal, and Francesch teaches or suggests the subject matter of claims 1–3, 5–8, and 11–15.

b. Analogous Art

As discussed above, Petitioner relies on a combination of references that includes Francesch. Patent Owner argues that Francesch is not analogous art to the '876 patent. Prelim. Resp. 41–42, 45–46; Sur-Reply 1–5. Petitioner disagrees. Reply 1–4.

As discussed above, Badyal falls within the same field of endeavor as the '876 patent and refers to “bridging groups . . . known in the polymer art.” Ex. 1005, 5:18–19. Thus, a person of ordinary skill in the art would have looked to references in the “polymer art” for guidance on choosing an appropriate crosslinking reagent, and Francesch clearly is in the polymer art.

Ex. 1009, 606 (discussing creation of “[p]lasma polymerized films”), 610 (discussing creation of film using “plasma polymerization”). Accordingly, at least on the present record, we are not persuaded that Francesch should be excluded from Petitioner’s obviousness combination as non-analogous art. We encourage the parties to develop the record further on this point during trial.

c. Reason to Combine

As discussed above, Petitioner has shown sufficiently that a person of ordinary skill in the art would have had a reason to combine the teachings of Coulson with those of Badyal. On the present record, Petitioner has shown sufficiently that a person of ordinary skill in the art would have had a reason to implement the plasma polymerization process of Coulson and Badyal using the crosslinking reagent taught by Francesch. Badyal teaches a genus of crosslinking reagents comprising a bridging group that is “known in the polymer art.” Ex. 1005, 4:31–5:19. As discussed above with respect to the obviousness ground based on Coulson, Badyal, and Holliday, the BDVE of Francesch falls within the scope of the genus of crosslinking reagents that Badyal teaches using in its plasma polymerization process. Dr. Gleason testifies that BDVE had several properties that a person of ordinary skill in the art would have believed made it a good choice from among those compounds meeting Badyal’s criteria for a crosslinking reagent. Ex. 1002 ¶¶ 182–186.

3. *Conclusion*

As discussed above, Petitioner has shown sufficiently that the combination of Coulson, Badyal, and Francesch teaches or suggests the subject matter of claims 1–3, 5–8 and 11–15 and that a person of ordinary

skill in the art would have had a reason to combine the teachings of these references. Accordingly, Petitioner has demonstrated a reasonable likelihood of prevailing on the unpatentability of these claims on this ground.

F. Asserted Obviousness over Coulson, Badyal, and Tropsch

Petitioner argues that claims 1–3, 5–8 and 12–15 would have been obvious over the combination of Coulson, Badyal, and Tropsch. Pet. 64–74.

1. Tropsch

Tropsch “relates to a process for preparing polymers comprising peroxycarboxyl groups.” Ex. 1011, 1:4–5. The process of Tropsch involves the addition of “hydrogen peroxide . . . to a suspension of a polymer comprising monoolefinically unsaturated dicarboxylic anhydride basic building blocks.” *Id.* at 1:51–53. The polymer suspension can be a copolymer using “methyl acrylate, ethyl acrylate, . . . [or] the corresponding methacrylates.” *Id.* at 1:65–2:2, 3:1–8, 3:47–54. The polymer may be crosslinked, and Tropsch teaches using 1,6-hexanediol divinyl ether (HDVE) as a crosslinker. *Id.* at 4:34–39.

2. Analysis

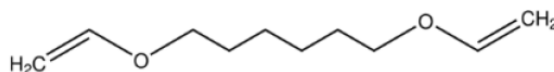
Petitioner argues that the combination of Coulson, Badyal, and Tropsch teaches or suggests the subject matter of claims 1–3, 5–8, and 12–15 and that a person of ordinary skill in the art would have had a reason to combine the teachings of these references. Pet. 64–74. Patent Owner does not dispute that the combination of Coulson, Badyal, and Tropsch teaches or suggests the subject matter of the challenged claims, but Patent Owner argues that Tropsch is non-analogous art to the ’876 patent and that a person

of ordinary skill in the art would not have had a reason to combine the teachings of these references. Prelim. Resp. 32–42, 46–58.

a. Claims 1–3

As discussed above with respect to the asserted ground of obviousness over the combination of Coulson, Badyal, and Cohen, Petitioner has shown sufficiently that Coulson and Badyal teach or suggest the subject matter of claims 1–3 other than the specific crosslinking reagent. Petitioner argues that the HDVE of Tropsch satisfies the limitations of claim 1 regarding the structure of the crosslinker. Pet. 64–65. Patent Owner does not disagree. Prelim. Resp. 32–42, 46–58.

Tropsch teaches using HDVE as a crosslinker. Ex. 1011, 4:34–39. Dr. Gleason testifies that HDVE has the following structure:



Ex. 1002 ¶ 195. Comparing this structure to the crosslinking reagent structures in claim 1, this structure falls within the scope of claim 1’s formula (i) with Y₁ through Y₆ each being hydrogen. *Id.*; *see* Ex. 1001, 18:54–19:9. For HDVE, the linker moiety L of formula (i) satisfies the requirements of formula A of claim 1 with Y₁₀ being a C₄ alkylene. Ex. 1002 ¶ 196; *see* Ex. 1001, 19:9–19. Accordingly, Petitioner has shown sufficiently that the combination of Coulson, Badyal, and Tropsch teaches or suggests the subject matter of claims 1–3.

b. Claims 5, 6, and 8

Tropsch’s HDVE has the structure recited in claims 5 and 6 when Y₁₂ and Y₁₃ both are hydrogen and n is 4. Ex. 1002 ¶¶ 202–203. Accordingly, Petitioner has shown sufficiently that the combination of Coulson, Badyal,

and Tropsch teaches or suggests the subject matter of claims 5 and 6. With n equal to 4, HDVE also satisfies the limitation of claim 8, so Petitioner has shown sufficiently that the combination of Coulson, Badyal, and Tropsch teaches or suggests the subject matter of claim 8.

c. Claim 7

Petitioner argues that “Badyal taught that alkyl chains in bridging group Z could be perfluoroalkyl chains and that highly fluorinated coatings exhibit ‘super-hydrophobicity.’” Pet. 68 (quoting Ex. 1005, 5:18–23, 10:32–11:1). Dr. Gleason testifies that a person of ordinary skill in the art would have been motivated to substitute fluorine for the hydrogens at Y_{12} and Y_{13} in Tropsch’s HDVE in order to maximize hydrophobicity in protective coatings. Ex. 1002 ¶¶ 46, 158, 204. Accordingly, Petitioner has shown sufficiently that the combination of Coulson, Badyal, and Tropsch teaches or suggests this limitation of claim 7.

d. Claims 12–15

As discussed above with respect to the asserted ground of obviousness over Coulson, Badyal, and Cohen, both Coulson and Badyal teach the use of PFAC8 and PFMAC8, compounds expressly named in claims 12–15. Accordingly, Petitioner has shown sufficiently that the combination of Coulson, Badyal, and Tropsch teaches or suggests the subject matter of claims 12–15.

e. Analogous Art

As discussed above, Petitioner relies on a combination of references that includes Tropsch. Patent Owner argues that Tropsch is not analogous art to the ’876 patent. Prelim. Resp. 41–42, 46–48; Sur-Reply 1–5. Petitioner disagrees. Reply 1–4.

As discussed above, Badyal falls within the same field of endeavor as the '876 patent and refers to “bridging groups . . . known in the polymer art.” Ex. 1005, 5:18–19. Thus, a person of ordinary skill in the art would have looked to references in the “polymer art” for guidance on choosing an appropriate crosslinking reagent, and Tropsch clearly is in the polymer art. Ex. 1011, 1:4–5 (“The present invention relates to a process for preparing polymers”). Accordingly, at least on the present record, we are not persuaded that Tropsch should be excluded from Petitioner’s obviousness combination as non-analogous art. We encourage the parties to develop the record further on this point during trial.

f. Reason to Combine

As discussed above, Petitioner has shown sufficiently that a person of ordinary skill in the art would have had a reason to combine the teachings of Coulson with those of Badyal. On the present record, Petitioner has also shown sufficiently that a person of ordinary skill in the art would have had a reason to implement the plasma polymerization process of Coulson and Badyal using the crosslinking reagent taught by Tropsch. Badyal teaches a genus of crosslinking reagents comprising a bridging group that is “known in the polymer art.” Ex. 1005, 4:31–5:19. As discussed above with respect to claim 1, the HDVE of Tropsch falls within the scope of the genus of crosslinking reagents that Badyal teaches using in its plasma polymerization process. Dr. Gleason testifies that HDVE has several properties that a person of ordinary skill in the art would have believed made it a good choice from among those compounds meeting Badyal’s criteria for a crosslinking reagent. Ex. 1002 ¶¶ 197–199.

3. *Conclusion*

As discussed above, Petitioner has shown sufficiently that the combination of Coulson, Badyal, and Tropsch teaches or suggests the subject matter of claims 1–3, 5–8 and 12–15 and that a person of ordinary skill in the art would have had a reason to combine the teachings of these references. Accordingly, Petitioner has demonstrated a reasonable likelihood of prevailing on the unpatentability of these claims on this ground.

G. Additional Arguments Raised by Patent Owner

Patent Owner raises two arguments for denying the petition that are not tied to any specific asserted ground of unpatentability. We discuss these arguments below.

1. Petitioner's Alleged Lack of Thorough Explanation and Incorporation by Reference

Patent Owner argues that “the Petition chronically fails to explain the significance of the evidence and frequently incorporates by reference the Gleason declaration.” Prelim. Resp. 26–28. We disagree. As shown by the extensive discussion above, we are able to understand Petitioner’s arguments and the significance of the supporting evidence.

Moreover, Patent Owner’s examples of alleged lack of thorough explanation and improper incorporation by reference do not, in our opinion, rise to a level sufficient to deny institution. For example, Patent Owner takes issue with the following statement from the Petition: “A POSA also would have known that DVTMDS was compatible with various polymerization methods, including plasma polymerization. Ex. 1002 ¶ 132; *see e.g.*, Ex. 1006 1:31-34; Ex. 1017 Abstract, 4:1-30; Ex. 1033 at [0040-

43].” Prelim. Resp. 26 (quoting Pet. 37). Patent Owner also objects to the cited portion of Dr. Gleason’s declaration. *Id.* at 26–27 (quoting Ex. 1002 ¶ 132). This is neither a failure to explain the argument fully nor a case of improper incorporation by reference. Instead, Petitioner in this instance makes a statement of fact, then cites to the record evidence supporting that fact. On this record, this is sufficient.¹² Dr. Gleason’s testimony provides the inference that Petitioner draws from the evidence: that a person of ordinary skill in the art would have known of DVTMDS’s compatibility with plasma polymerization, as well as other polymerization methods. Ex. 1002 ¶ 132. The additional evidence cited in the Petition supports drawing that inference. Cohen teaches that DVTMDS “may be copolymerized with other copolymerizable materials using any of the methods now known in the art.” Ex. 1006, 1:31–34. Exhibits 1017 and 1033 teach that DVTMDS may be plasma polymerized. Ex. 1017, 4:1–30; Ex. 1033 ¶¶ 40–43. The same analysis applies to the Patent Owner’s other examples. *See* Prelim. Resp. 27 (quoting Pet. 34–35).

It is true, as Patent Owner argues, that some parties provide so little explanation of their arguments that we are forced “to ‘play archeologist with the record.’” *Id.* (quoting *Cisco Systems, Inc. v. C-Cation Technologies, LLC*, IPR2014-00454, Paper 12 at 10 (PTAB Aug. 29, 2014) (citing *DeSilva*

¹² We do not mean to suggest that, for any and all points a party wishes to make, it is sufficient merely to state in a brief the finding or conclusion the party wishes us to draw and then accompany that statement with an unexplained string citation to the evidence. It is sufficient here because the finding of fact—that a person of ordinary skill in the art would have known that DVTMDS was compatible with plasma polymerization in addition to other polymerization methods—was well-supported by the specific portions of the cited evidence without the need for any additional logical inferences.

v. DiLeonardi, 181 F.3d 865, 866–67 (7th Cir. 1999))). But the mere fact that Petitioner could have provided more explanation than it did is not proof that Petitioner’s explanation is legally deficient. The explanations Petitioner offers in this case are sufficient to comply with 37 C.F.R. §§ 42.22(a)(2) and 42.104(b)(5), which require “[a] full statement of the reasons for the relief requested, including a detailed explanation of the significance of the evidence,” and an identification of “the relevance of the evidence to the challenge raised,” respectively.

2. *Petition’s Alleged Excessive Redundant Grounds*

Patent Owner argues that the Petition asserts “excessive redundant grounds.” Prelim. Resp. 28–29; Sur-Reply 5. Petitioner disagrees. Reply 4–5.

Patent Owner argues that we may deny a petition where “[t]he number of asserted grounds and references is disproportionately large when compared with the number of distinct challenged claims.” *Adaptics Ltd. v. Perfect Company*, IPR2018-01596, Paper 20 at 21–22 (PTAB Mar. 6, 2019). Patent Owner also notes that the Petition fails to explain why the number of asserted grounds needs to be as high as it is. But we are not persuaded on the present record that any such explanation is necessary.

In *Adaptics*, the petitioner asserted five grounds of unpatentability to challenge nine claims. *Id.* at 8–9. Already, then, the present Petition is more reasonable than the *Adaptics* petition, because it challenges more claims with the same number of grounds. Pet. 4 (challenging 15 claims on a total of five grounds). But the comparison to *Adaptics* is even less apt than this. In *Adaptics*, three of the five asserted grounds used “and/or” to separate the asserted references, turning each of those three grounds into multiple

additional grounds. *Adaptics*, Paper 20 at 9. The result was to present effectively “hundreds of possible combinations” of references. *Id.* at 19.

In the present Petition’s 15 challenged claims, 14 are challenged on more than one ground, and seven are challenged on all five grounds. But the present Petition presents nowhere near the “hundreds of possible combinations” of *Adaptics*. Instead, the Petition asserts five distinct grounds of unpatentability, relying on no more than three references per ground and only seven references in total, to challenge fifteen claims. The Petition does not exceed the word-count limit in our rules, and Petitioner did not find it necessary to resort to multiple, parallel petitions to present this set of asserted grounds. We see no reason to require Petitioner to explain why it chose not to assert fewer grounds of unpatentability.

CONCLUSION

Upon consideration of the Petition, the Preliminary Response, the Reply, the Sur-Reply, and the evidence presented, we determine that Petitioner has shown a reasonable likelihood that it will prevail in showing that at least one of the challenged claims is unpatentable. Accordingly, we institute an *inter partes* review of all challenged claims based on all grounds asserted in the Petition.

ORDER

It is hereby

ORDERED that, pursuant to 35 U.S.C. § 314(a), an *inter partes* review is hereby instituted on all claims of the ’876 patent and on all relevant grounds set forth in the Petition; and

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

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