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Paper No. 8
Entered: November 13, 2018

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

DAIKIN INDUSTRIES LTD. and DAIKIN AMERICA, INC.,
Petitioner,

v.

THE CHEMOURS COMPANY FC, LLC,
Patent Owner.

Case IPR2018-00992
Patent 7,122,609 B2

Before JO-ANNE M. KOKOSKI, KRISTINA M. KALAN, and SHELDON M. McGEE, *Administrative Patent Judges*.

KALAN, *Administrative Patent Judge*.

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

I. INTRODUCTION

A. Background

Daikin Industries Ltd. and Daikin America, Inc. (collectively, "Petitioner") filed a Petition requesting an *inter partes* review of claims 1–7 of U.S. Patent No. 7,122,609 B2 (Ex. 1001, "the '609 patent"). Paper 1 ("Pet."). The Chemours Company FC, LLC ("Patent Owner") filed a Preliminary Response to the Petition. Paper 7 ("Prelim. Resp.").

We have jurisdiction under 35 U.S.C. § 314, which provides that an *inter partes* review may not be instituted "unless . . . there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition." 35 U.S.C. § 314(a). Upon consideration of the Petition and the Preliminary Response, and the evidence of record, we determine that Petitioner has shown a reasonable likelihood that it would prevail in showing the unpatentability of at least one of claims 1–7. Accordingly, we institute an *inter partes* review of claims 1–7 of the '609 patent.

B. Related Proceedings

The parties identify the following district court proceeding as related to the '609 patent: *Chemours Company FC, LLC v. Daikin Industries, Ltd.*, Civil Action No. 1:17-cv-01612-GMS (D. Del.). Pet. 62; Paper 4, 2.

C. The '609 Patent (Ex. 1001)

The '609 patent, titled "High Melt Flow Fluoropolymer," issued on October 17, 2006. Ex. 1001, at [54], [45]. The '609 patent relates to a partially-crystalline copolymer of tetrafluoroethylene ("TFE") and hexafluoropropylene ("HFP") in an amount corresponding to particular hexafluoropropylene index ("HFPI"), and about 0.2% to 3% by weight of perfluoro(alkyl vinyl ether). *Id.* at [57]. Such copolymers, also known as fluorinated ethylene-propylene or "FEP" copolymers, "can be extruded at high speed onto conductor over a broad polymer melt temperature range to give insulated wire of high quality." *Id.* at 1:59–61.

D. Challenged Claims

Claim 1 is the only independent claim of the '609 patent. Claims 2–7 depend directly or indirectly from claim 1. Claim 1 is reproduced below:

> 1. A partially-crystalline copolymer comprising tetrafluoroethylene, hexafluoropropylene in an amount corresponding to a hexafluoropropylene index (HFPI) of from about 2.8 to 5.3, said copolymer being polymerized and isolated in the absence of added alkali metal salt, having a melt flow rate of within the range of about 30±3 g/10 min, and having no more than about 50 unstable endgroups/10^6 carbon atoms.

Ex. 1001, 10:15–21.

G. The Asserted Grounds of Unpatentability

Reference(s)	**Basis**	**Claims Challenged**
Hiraga[1]	§ 102(a)	1–7
Hiraga and/or Hiraga and Kaulbach[2]	§ 103(a)	1–7
Kono[3]	§ 102(e)(2) and/or § 103(a)	1–7
Kono	§ 103(a)	1–7
Kaulbach	§ 103(a)	1–7

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[1] JP 2002-249585, published September 6, 2002 (as translated) (Ex. 1025).

[2] U.S. Pat. No. 6,541,588 B1, issued April 1, 2003 (Ex. 1009).

[3] U.S. Pat. No. 6,743,508 B2, issued June 1, 2004 (Ex. 1008).

II. ANALYSIS

A. Claim Construction

In an *inter partes* review, claim terms in an unexpired patent are interpreted according to their broadest reasonable constructions in light of the Specification of the patent in which they appear. *See* 37 C.F.R. § 42.100(b); *Cuozzo Speed Techs., LLC v. Lee*, 136 S. Ct. 2131, 2142 (2016).[4] Under the broadest reasonable construction standard, claim terms are presumed to have their ordinary and customary meaning, as would be understood by one of ordinary skill in the art in the context of the entire disclosure. *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007). Only terms that are in controversy need to be construed, and then only to the extent necessary to resolve the controversy. *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999).

Petitioner offers proposed constructions for a number of recited limitations, namely, "polymerized and isolated," "about 30±3 g/10 min" and "about 50 unstable endgroups." Pet. 16–24. The latter construction concerns the phrase "unstable endgroup." *Id.* at 23. Petitioner notes that although the '609 patent exemplifies four unstable endgroups ($–CONH_2$, $–CF_2CH_2OH$, –COF, and –COOH), "other unstable endgroups are also possible," such as ethyl endgroups. *Id.* at 24 (citing Ex. 1002, ¶¶ 92–93).

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[4] The revised claim construction standard for interpreting claims in *inter partes* review proceedings as set forth in the final rule published October 11, 2018 does not apply to this proceeding, because the new "rule is effective on November 13, 2018 and applies to all IPR, PGR and CBM petitions filed on or after the effective date." Changes to the Claim Construction Standard for Interpreting Claims in Trial Proceedings Before the Patent Trial and Appeal Board, 83 Fed. Reg. 51340 (Oct. 11, 2018) (to be codified at 37 C.F.R. pt. 42).

Thus, Petitioner urges that the broadest reasonable construction of the term “unstable endgroup” includes such “endgroups resulting from any FEP polymerization process” and not only those species exemplified in the ’609 patent. *Id.* Patent Owner accepts Petitioner’s proposed claim construction for the term “unstable endgroups.” Prelim. Resp. 10 n.1.

For purposes of this Decision, we construe the term “unstable endgroups” to include not only those unstable endgroups exemplified in the ’609 patent, but “[all] unstable endgroups resulting from any FEP polymerization process” as agreed to by the parties. Based on the record before us, we determine that no other claim terms require an explicit construction at this time.

B. Prior Art

i. Hiraga (Ex. 1025)

Hiraga discloses methods of modifying a fluoropolymer via a melt-kneading process. Ex. 1025, at [57]. Hiraga discloses that the modification method efficiently stabilizes unstable groups contained on the melt-processable fluoropolymer, homogenizes and prevents a decrease in the fluoropolymer’s molecular weight, and increases the fluoropolymer’s processability, thus enabling the production of “a molded article free of air bubbles and coloration.” *Id.* ¶ 11.

Hiraga’s method “may be applied to any melt-processable fluorine-containing polymer having unstable groups, but is particularly effective as a stabilization treatment for the unstable groups of” copolymers containing “tetrafluoroethylene (TFE) [and] hexafluoropropylene (HFP),” also known as “FEP” polymers. *Id.* ¶¶ 19, 26. According to Hiraga, unstable groups include vinyl end groups (–$CF=CF_2$) and acid fluoride end groups (–COF), and may cause bubbles and cavities to form in the final product. *Id.* ¶ 3.

To achieve “the most homogeneous molecular weight possible, and not simply stabilize the unstable groups,” Hiraga teaches that it is important “that water is not present” during the first step, i.e., “step (A),” “in which the treatment with oxygen-containing gas is carried out.” *Id.* ¶ 30. Because the fluoropolymer’s unstable groups cannot be stabilized in the presence of oxygen alone, however, it “is melt-kneaded in the presence of oxygen while further aggressively introducing water, thereby both stabilizing the unstable groups and also oxidizing to remove coloration substances (step (B)).” *Id.* ¶ 41. Hiraga discloses that a reaction accelerator may be added before or during either step A or B, and that such reaction accelerators may be a compound containing an alkaline metal, an alkaline earth metal, an ammonium salt, ammonia, an alcohol, an amine, or a salt thereof. *Id.* ¶¶ 48–49.

Hiraga discloses Comparative Example 1 (“Example 1C”) wherein a modified FEP polymer containing 15 ppm potassium was processed to yield a FEP copolymer with a melt flow rate of 30.0 g/10 min, and zero unstable groups per 10^6 carbons. *Id.* ¶¶ 107, 114–117.

ii. Kaulbach (Ex. 1009)

Kaulbach discloses “melt-processable tetrafluoroethylene (TFE)/hexafluoropropylene (HFP) copolymer melt pellets having an improved processability for wire and cable application and to a method of using this polymer to coat wire and cable conductors.” Ex. 1009, 1:9–13. Kaulbach teaches that metal contaminants in the copolymer may cause it to degrade or decompose at high processing temperatures, which may in turn cause discoloration and "a build up of die drools." *Id.* at 2:4–8. According to Kaulbach, "[d]ie drools are accumulations of molecular fractions of the polymer at the surface of the die exit" and "impair the coating processing." *Id.* at 2:8–10. To assist with this and other potential problems, Kaulbach instructs that the copolymer "should be made more thermally stable not only by eliminating the thermally unstable endgroups but also by avoiding metal contaminants." *Id.* at 2:27–29. Kaulbach discloses that a "preferred version of the polymerization recipe here is an alkali metal salt-free recipe." *Id.* at 4:44–45.

iii. Kono (Ex. 1008)

Kono discloses pellets that comprise "a copolymer obtained by copolymerizing monomer components containing tetrafluoroethylene (TFE) and hexafluoropropylene (HFP)," also known as a "FEP pellet." Ex. 1008, 3:32–36. Kono discloses that the inventive FEP pellet is used in a coating extrusion process for insulating a core wire, i.e., by melting the FEP pellet "by heating within an extruder for coating a core wire and extruded from a die, and then drawn down by coating the core wire to thereby form an insulated cable." *Id.* at 4:29–34.

Kono discloses that the extrusion process with the inventive FEP pellet can be carried out at a speed of 2800 ft/min when the adhesive strength between the insulating material and the core wire is 0.8 kg or more. *Id.* at 4:42–50. Kono hypothesizes that the "excellent adhesive strength" exhibited by the inventive FEP pellets when extruded may be due to the presence of a certain functional group, also known as an "adhesion factor" or, if the adhesion factor is located at end of the polymer, as an "adhesion terminus." *Id.* at 5:1–9. Kono teaches that the functional group is "not particularly limited as long as it contributes to enhanced adhesion with the core wire at high temperature, and includes, for example, a functional group which is generally known to be unstable at high temperature." *Id.* at 5:14–18. Kono identifies several such known functional groups, including $–COOM$, $–SO_3M$, $–OSO_3M$, $–SO_2F$, $–SO_2Cl$, $–COF$, $–CH_2OH$, $–CONH_2$, and $–CF=CF_2$, where M is selected from an alkyl group, a hydrogen atom, a metallic cation and a quaternary ammonium cation. *Id.* at 5:18–22.

Kono discloses that the number of functional groups located at the terminal portion of the polymer depends on a number of factors, including the polymer's melt flow rate and the monomers present therein. *Id.* at 5:23–27. Kono also discloses example pelletized FEP powders where, *inter alia*, the number of certain functional groups (i.e., "adhesion terminus" groups) per 10^6 carbon atoms were measured. *Id.* at 12:11–16:47. The "adhesion terminus" groups measured for Kono's Examples 1–7 and Kono's Comparative Examples 1–5 were limited to $–COF$, $–COOH$, and $–CH_2OH$. *Id.* at 15:1–18:20.

C. Asserted Anticipation Based on Hiraga (Ground 1)

Petitioner assets that claims 1–7 are unpatentable as anticipated under 35 U.S.C. § 102(a) in view of Hiraga. Pet. 25–35. Petitioner asserts that Hiraga "discloses FEP-copolymers that anticipate the challenged claims." *Id.* at 25. Petitioner provides a detailed explanation alleging where each limitation of the claims can be found in Hiraga. *Id.* at 26–35 (citing Ex. 1002 ¶¶ 110–147).

Patent Owner challenges Petitioner's position that claims 1–7 are anticipated by Hiraga. Prelim. Resp. 10–16. Specifically, Patent Owner avers that Petitioner's anticipation challenge fails because "(1) Hiraga's FEP in Example 1C was not 'polymerized and isolated in the absence of alkali metal salt,' and (2) [Petitioner] fails to show that Hiraga's FEP necessarily has no more than 'about 50 unstable endgroups' per million carbon atoms." *Id.* at 10.

Regarding Patent Owner's first argument, we note that claim 1 requires a FEP "polymerized and isolated in the absence of added alkali metal salt." Ex. 1001, 10:19–20. Patent Owner argues that a clear reading of Hiraga's Example 1C is that "the FEP includes 15 ppm potassium before any endgroup stabilization—meaning that it was added either during polymerization or isolation." Prelim. Resp. 12. Patent Owner also points out Hiraga's disclosure that an alkali metal can be added to the FEP "in advance" of any finishing steps as a reaction accelerator. *Id.* (citing Ex. 1025 ¶¶ 17, 48, 49). We agree that Petitioner has not demonstrated, on this record, that the FEP in Hiraga is polymerized and isolated in the absence of added alkali metal salt, because the presence of 15 ppm potassium and the reaction accelerator conditions described in Hiraga indicate that the polymerization and isolation may take place in the presence of an alkali metal.

Patent Owner's second argument, using Petitioner's construction of the limitation "unstable endgroup," posits that the "FEP disclosed in Hiraga's examples does not necessarily have fewer than about 50 unstable endgroups per million carbon atoms." Prelim. Resp. 13. According to Patent Owner, Hiraga's disclosure of "zero" unstable endgroups per million (i.e., 10^6) carbon atoms "does not identify the types of unstable endgroups that are measured." *Id.* at 14. More particularly, it does not include endgroups other than –COOH, and –COF. *Id.* at 13–14.

We agree with Patent Owner that, on this record, Petitioner fails to establish a reasonable likelihood that Hiraga anticipates claims 1–7 of the ’609 patent. In particular, Petitioner fails to provide sufficient evidence to establish that Hiraga discloses a FEP polymer with the recited number of unstable endgroups, i.e., “no more than about 50 unstable endgroups/10^6 carbon atoms.” We begin with Petitioner’s claim construction of the term “unstable endgroups” (Pet. 23–24), which we adopted for purposes of this Decision, namely, that the term “unstable endgroups” includes not only those unstable endgroups exemplified in the ’609 patent, but “all unstable endgroups resulting from any FEP polymerization process.” Such unstable endgroups include ethyl groups ($–CF_2CH_2CH_3$). Ex. 1002 ¶ 93; Ex. 1035 ¶ 2.6; *see also* Ex. 1008, 5:14–22 (reciting various known terminal functional groups that are “unstable at high temperature”); Ex. 1010, 5:38–39 (“[t]he presence of methanol can also lead to methyl ester ends ($-CO_2CH_3$)”); Ex. 1025 ¶¶ 3, 34, 44 (identifying a vinyl group ($–CF=CF_2$) along with carboxylic acid (–COOH) and acid fluoride (–COF) groups as unstable groups).

Petitioner also cites to Hiraga’s disclosure that the copolymer (Table 1, row 3) had 0 unstable endgroups per 10^6 carbons. Pet. 31. However, as noted by Patent Owner, this range is specific to only two endgroups, and does not address other endgroups such as $–CONH_2$ or alkyl ester endgroups (such as methyl ester groups). Prelim. Resp. 15–16. Petitioner’s reliance on Hiraga’s disclosure of 0 unstable endgroups of -COOH and –COF groups per million carbon atoms is insufficient to establish that Hiraga discloses “no more than about 50” of *all* possible unstable endgroups resulting from any FEP polymerization process per our construction of this limitation.

For these reasons, we agree with Patent Owner that, on this record, Petitioner fails to establish a reasonable likelihood that Hiraga anticipates claims 1–7.

D. Asserted Obviousness Based on Hiraga Alone (Ground 2)

Petitioner asserts that Hiraga alone renders claims 1–7 of the ’609 patent obvious under 35 U.S.C. § 103(a) because the skilled artisan would have found it obvious to substitute Hiraga’s melt-kneading process with an alternative fluorination process, “or to use melt-kneading only to adjust the [melt flow rate] of the copolymer and separately remove unstable endgroups using fluorination.” Pet. 37 (citing Ex. 1002 ¶¶ 154–157). Petitioner asserts that the skilled artisan would have been motivated to use such a fluorination process in Hiraga “for many reasons,” including because the skilled artisan would have understood that fluorination is “an alkali-metal-free stabilization method,” and also “provides benefits compared to other stabilization techniques, such as Hiraga’s wet-heat treatment.” *Id.* at 37–38 (citing Ex. 1002 ¶ 155–156). Petitioner points to evidence that purportedly demonstrates fluoropolymers containing endgroups that are stabilized via a fluorination process have “better electrical properties than those untreated or treated using different means.” *Id.* at 38 (citing Ex. 1027, 3:34–39).

Patent Owner challenges Petitioner’s assertion that it would have been obvious to modify Hiraga’s process in the manner proposed. Prelim. Resp. 16–20. Specifically, Patent Owner notes Hiraga’s emphasis on a two-step melt-kneading process, describing it as “the present invention,” and that the proffered substitution “would eviscerate [Hiraga’s] core invention.” *Id.*

at 19. Patent Owner also questions how fluorination would achieve Hiraga's stated objective (Ex. 1025 ¶ 30) to "create a polymer with the most homogeneous molecular weight possible, and not simply stabilize the unstable groups," because Petitioner failed to provide evidence to demonstrate "that fluorination has any impact on molecular weight." Prelim. Resp. 20. Patent Owner also contends that Hiraga does not recognize the need for minimizing alkali metal salt concentration, because it teaches such salts as polymerization initiators and reaction accelerators. *Id.* at 17. Additionally, Patent Owner avers that "Hiraga does not appreciate the importance of the claimed high" melt flow rate ("MFR") range, because Comparative Example 1 achieved melt flow rates of 30 and 38.1 g/10 min which each fall outside a target range "of between 22.5 to 28.0 g/10 min." *Id.* at 18.

For several reasons, we do not agree that Petitioner has established a reasonable likelihood that claims 1–7 are obvious based on the disclosure of Hiraga alone. As noted by Patent Owner (Prelim. Resp. 20), Hiraga is not only focused on stabilizing unstable endgroups of fluoropolymers, but also seeks to tailor the fluoropolymer's molecular weight in order to "create a polymer with the most homogeneous molecular weight possible." Ex. 1025 ¶ 30. Petitioner fails to explain how, or provide evidentiary support to reasonably establish that, substituting both steps of Hiraga's two-step melt-kneading process with a fluorination process would have any impact on a fluoropolymer's molecular weight. We note Petitioner's recognition that a polymer's molecular weight is inversely related to its melt flow rate. Pet. 9 (citing Ex. 1009, 6:33–35; Ex. 1006, 3:21–27; Ex. 1002 ¶ 50). Thus, it is unclear what impact, if any, a fluorination process would have on the melt flow rate of the polymer disclosed in Hiraga's Comparative Example 1—i.e., the polymer that Petitioner relies on in its obviousness challenge. Pet. 37–38. We emphasize that, prior to melt-kneading, Comparative Example 1 has a melt flow rate of 25 g/10 min, which is outside the claimed range of "about 30±3 g/10 min." Ex. 1025 ¶¶ 107, 114, 117. Only after melt-kneading does the polymer exhibit a melt flow rate falling within the recited range. Although Petitioner urges that it likewise would have been obvious to modify the fluoropolymer's molecular weight by melt-kneading "and separately remove unstable endgroups using fluorination," Petitioner does not sufficiently explain why the skilled artisan would do so. Pet. 37–38.

We, therefore, are not persuaded that Petitioner has established a reasonable likelihood of establishing that claims 1–7 are unpatentable as obvious over the disclosure of Hiraga alone.

E. Asserted Obviousness Based on Hiraga and Kaulbach (Ground 2)

Petitioner asserts that claims 1–7 of the '609 patent are unpatentable as obvious under 35 U.S.C. § 103(a) over Hiraga in view of Kaulbach. Pet. 35–38.

In asserting that claims 1–7 are unpatentable as being obvious over the combined disclosures of Hiraga and Kaulbach, Petitioner specifically points to Hiraga's Comparative Example 1, which "employs melt-kneading to remove unstable endgroups from a fluoropolymer that was blended with an alkali metal after polymerization and isolation." *Id.* at 35–36. Petitioner then turns to Kaulbach's disclosure regarding certain benefits that may be realized by avoiding metal contamination, specifically alkali metal contamination, when processing melt-processable FEP. *Id.* at 36.

Petitioner asserts that the skilled artisan, armed with the teachings of Kaulbach, "would have been motivated to avoid using alkali metals in Hiraga's Comparative Example 1, and would have employed one of the other reaction accelerators Hiraga discloses." *Id.* at 36. Petitioner urges that "[d]oing so would result in a final copolymer made without the addition of alkali metal salt," thus rendering claims 1–7 obvious. *Id.*

Petitioner asserts further that the disclosures of Hiraga and Kaulbach are properly combinable because the references are "directed to the same technology and seek to obtain the same benefits," and also focus on preparing "copolymers of high MFR that are stabilized to remove unstable endgroups." *Id.* at 36. As such, the skilled artisan, upon considering Hiraga's examples, "would have logically looked to Kaulbach for ways to further improve the melt-processability of the copolymer," and would have reasonably expected "improved processability and low incidences of flaws" in a FEP copolymer by avoiding metal contamination therein as taught by Kaulbach. *Id.* at 37. Alternatively, Petitioner argues that it would have been obvious to one of ordinary skill in the art to use fluorination in place of Hiraga's melt-kneading process, because fluorination is an alkali-metal-free stabilization method, and because fluorination provides benefits compared to other stabilization techniques. *Id.* at 37–38.

Patent Owner first argues that Hiraga "does not appreciate the importance of eliminating or reducing alkali metal ions." Prelim. Resp. 17. Patent Owner points to Hiraga's use of alkali metal salts as polymerization initiators and reaction accelerators, and argues that Kaulbach "is primarily concerned with non-alkali metals—such as iron, chromium, and nickel—and teaches that such metals can lead to polymer decomposition." *Id.* Patent

Owner alleges that Petitioner "relies on one lone sentence in Kaulbach stating that alkali metal salt-free recipes are preferred," but that Kaulbach fails to explain why there is such a preference, and allows for alkali metal salts such as potassium and sodium to be used. *Id*. Patent Owner thus urges that "taken as a whole, Kaulbach does not appreciate the criticality of avoiding all alkali metal salts." *Id*.

Based on this preliminary record, we disagree with Patent Owner. We note that Petitioner does not solely rely on "one lone sentence" within Kaulbach to support its argument as Patent Owner contends. Prelim. Resp. 17. Rather, Petitioner identifies four passages in Kaulbach. Pet. 36 (citing Ex. 1009, 2:4–11, 2:27–31, 4:45–46, and 5:14–17). Kaulbach's disclosure as identified by Petitioner goes beyond merely discouraging the presence of *alkali* metals in FEP polymers, but rather instructs to avoid "metal contaminants" generally in such polymers. *See* Ex. 1009, 2:4–6, 27–31 (explaining that metal contamination should be avoided because "[m]etal contaminants are difficult to cope with" and "may result in degradation and decomposition of the copolymer at high processing temperatures" leading to problems with the coating process such as die drool); *see also id.* at 4:19–20 (identifying metal contaminants such as iron, nickel, and chromium "in particular," but not limiting metal contaminants to only these three species). Because Kaulbach discusses specific problems known to occur when processing FEP polymers that contain metal contaminants generally, i.e., metal contamination not necessarily limited to alkali metal salts, we decline to read Kaulbach's disclosure as narrowly as Patent Owner urges.

Furthermore, we are not persuaded by Patent Owner's argument that because Kaulbach "teaches that potassium persulfate and sodium bicarbonate may be used" in the same paragraph in which Kaulbach discloses a preference for "alkali metal salt-free recipes," Kaulbach does not appreciate why alkali metal salts should be minimized. Prelim. Resp. 17 (citing Ex. 1009, 4:28–34, 4:44–45). Here, Kaulbach teaches that an initiator such as ammonium or potassium persulfate may be used in the polymerization reaction. Ex. 1009, 4:27–30. Kaulbach further discloses that buffers such as ammonia, ammonium carbonate, and sodium bicarbonate "can be incorporated in the recipe." *Id.* at 4:32–33. Kaulbach does not state, however, that such initiators or buffers are required components of the polymerization reaction, but instead indicates that they "may be" or "can be" used. *Id.* at 4:27–30, 4:32–33. Also, should an initiator and/or buffer be used, Kaulbach provides alkali-metal free options from which to choose. *Id.* Thus, Kaulbach's teaching that potassium persulfate and sodium bicarbonate *may* be used does not negate Kaulbach's overall teaching that metal contaminants are problematic and should be avoided. *See In re Fritch*, 972 F.2d 1260, 1264 (Fed. Cir. 1992) ("It is well settled that a prior art reference is relevant for all that it teaches to those of ordinary skill in the art.").

For these reasons, based on the record currently before us, we conclude that Petitioner has demonstrated a reasonable likelihood that it would prevail in showing that claims 1–7 are unpatentable as being obvious over Hiraga and Kaulbach.

F. Asserted Anticipation Based on Kono (Ground 3)

Petitioner asserts that claims 1–7 of the ’609 patent are anticipated by Kono. Pet. 38–50.[5] Petitioner argues that Kono discloses “copolymers meeting each of the relevant claim limitations.” Pet. 39. Petitioner provides a detailed explanation alleging where each limitation can be found in Kono for these claims. *Id.* at 40–50 (citing Ex. 1002 ¶¶159–197).

Patent Owner challenges Petitioner’s position that claims 1–7 are anticipated by Kono. Prelim. Resp. 20–26. Specifically, Patent Owner avers that Petitioner’s anticipation challenge fails because Kono does not disclose a FEP polymer “that has no more than about 50 unstable endgroups per million carbon atoms.” *Id.* at 20. According to Patent Owner, using Petitioner’s construction of the limitation “unstable endgroup,” there is “no evidence demonstrating that Kono’s FEPs necessarily lack any other unstable endgroups” beyond those measured, i.e., –COOH, –COF, and $–CH_2OH$. *Id.* at 20–21. According to Patent Owner, Kono’s disclosure of 15–150 unstable endgroups per million (i.e., 10^6) carbon atoms does not include endgroups other than –COOH, –COF, and $–CH_2OH$. *Id.* at 22. Further, Patent Owner contends that Kono’s broad range of 15–150 for the –COOH, –COF, and $–CH_2OH$ endgroups does not anticipate the claimed range of “no more than about 50 unstable endgroups/10^6 carbon atoms,” which may include unstable endgroups other than those disclosed in Kono, such as $–CONH_2$ groups, methyl ester groups, and vinyl groups. *Id.* (citing Ex. 1008, 5:27–33).

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[5] Petitioner appears to argue that only claims 1–5 and 7 are anticipated by Kono, and that claim 6 is only rendered obvious by Kono. Pet. 40 (“Kono anticipates claims 1–5, and 7”); *id.* at 50 (“Kono renders obvious claim 6”).

We agree with Patent Owner that, on this record, Petitioner fails to establish a reasonable likelihood that Kono anticipates claims 1–7 of the ’609 patent. In particular, Petitioner fails to provide sufficient evidence to establish that Kono discloses a FEP polymer with the recited number of unstable endgroups, i.e., “no more than about 50 unstable endgroups/10^6 carbon atoms.” We begin with Petitioner’s claim construction of the term “unstable endgroups” (Pet. 20), which we adopted for purposes of this Decision, namely, that the term “unstable endgroups” includes not only those unstable endgroups exemplified in the ’609 patent, but “all unstable endgroups resulting from any FEP polymerization process.” Such unstable endgroups include ethyl groups ($–CF_2CH_2CH_3$). Ex. 1002 ¶ 93; Ex. 1035 ¶ 2.6; *see also* Ex. 1008, 5:14–22 (reciting various known terminal functional groups that are “unstable at high temperature”); Ex. 1010, 5:38–39 (“[t]he presence of methanol can also lead to methyl ester ends ($–CO_2CH_3$)”); Ex. 1025 ¶¶ 3, 34, 44 (identifying a vinyl group ($–CF=CF_2$) along with carboxylic acid (–COOH) and acid fluoride (–COF) groups as unstable groups).

Petitioner also cites to Kono’s disclosure “that the total number of $-CH_2OH$, –COOH, and –COF groups should be between 15–150 per 10^6 carbon atoms.” Pet. 39. However, as noted by Patent Owner, this range is specific to only three endgroups, and does not address other endgroups such as $-CONH_2$, methyl ester groups, and vinyl groups. Prelim. Resp. 20–21; Ex. 1008, 5:27–33. Simply stated, Petitioner’s reliance on Kono’s range of 15–150 $–CH_2OH$, –COOH, and –COF groups per million carbon atoms is insufficient to establish that Kono discloses “no more than about 50” of *all* possible unstable endgroups resulting from any FEP polymerization process per our construction of this limitation.

For the same reason, Petitioner's reliance on Kono's Example 2 and Comparative Example 3 falls short of establishing anticipation. Pet. 40–50. These specific embodiments only measured "the numbers of the respective groups –COF, –COOH and $–CH_2OH$." Ex. 1008, 12:57–59, Table 1. Notably, Kono does not indicate whether two of the four exemplary endgroups identified in the '609 patent are present, much less whether other possible unstable endgroups are present as well. This is particularly important here given how close the measured values already are to the claimed limit for *all* unstable endgroups; Kono's Example 2 contains 58 of the measured endgroups, while Comparative Example 3 has 50 of such endgroups. We also note Patent Owner's evidence that states that methanol may lead to unstable endgroups such as carbinol ($–CH_2OH$) and methyl ester endgroups ($–CO_2CH_3$). Ex. 1010, 5:35–51.

For these reasons, we agree with Patent Owner that, on this record, Petitioner fails to establish a reasonable likelihood that Kono anticipates claims 1–7.

G. Asserted Obviousness Based on Kono (Grounds 3 and 4)

In the alternative, Petitioner asserts that claims 1–7 of the '609 patent are rendered obvious in view of Kono. Pet. 38–51. In support of its obviousness challenge, Petitioner relies on the same general disclosure of Kono as in its anticipation challenge, and additionally relies on Kono's Comparative Example 5 as well as Kono's disclosure of a fluorination process. Pet. 51 (citing Ex. 1002 ¶¶ 198–202).

Petitioner asserts that it would have been obvious for the skilled artisan to employ a fluorination process "for a reduced time or at a reduced temperature" to treat the polymers of Kono's Example 2 and Comparative Example 3 in order "to reduce the number of unstable endgroups to the minimum necessary for sufficient adhesion strength." *Id*. According to Petitioner, copolymers subjected to a fluorination process "were known to have benefits over those unstabilized or stabilized by other procedures, such as the wet-heat treatment of Kono, including better electrical properties obtained by converting $–CF_2H$ endgroups to $–CF_3$ endgroups." *Id.*

Patent Owner focuses on Kono's disclosure of only a limited number of unstable endgroups for all embodiments, including Comparative Example 5. Prelim. Resp. 26–28. Patent Owner argues that it would not have been obvious to fluorinate the FEP polymers of Kono because doing so would "undermine the purpose of Kono: to produce FEP pellets ***with*** unstable endgroups so as to increase adhesive strength between the FEP and the wire." *Id.* at 26. Patent Owner asserts that Kono disparages Comparative Example 5 because it has no "reported unstable –COF, -COOH, and $–CH_2OH$ groups." *Id.* As such, Patent Owner argues that the skilled artisan would not have been motivated to fluorinate Kono's FEP polymers, or use another terminal group stabilization treatment, and that Petitioner's allegation is "based solely on hindsight." *Id.* at 27–28.

As we explained with respect to Petitioner's anticipation challenge based on Kono, we agree that Petitioner does not establish sufficiently that Kono discloses the recited unstable endgroup limitation. *See supra* Section II.F. We also determine that Petitioner fails to identify a sufficient reason for the skilled artisan to have modified the teachings of Kono to arrive at the recited unstable endgroup range. In that regard, Kono expresses a desire to maintain unstable endgroups because these groups "contribute[] to enhanced adhesion [of the FEP] with the core wire at high temperature." Ex. 1008, 5:14–16. Kono describes Comparative Example 5, which has zero –COF and –COOH endgroups,[6] as "inferior in adhesion strength" to Example 7, which has 21 –COOH groups. *Id.* at 18:36–40. Kono also states that Comparative Example 3, containing a total of 50 –COF, –COOH, and -CH_2OH endgroups, is "inferior in at least one of the evaluation criteria" such as spark-out, cone-breaks and adhesive strength between the insulating material and the core wire. *Id.* at 15:50–59.

In view of these teachings, Petitioner does not explain sufficiently why the skilled artisan would have been motivated to employ a fluorination process to minimize or eliminate unstable endgroups in Kono. Nor has Petitioner explained how the skilled artisan would even arrive at what "a sufficient number of unstable endgroups" would be in designing the proffered fluorination process. Pet. 51. Thus, we agree with Patent Owner that Petitioner's obviousness challenge based on Kono employs impermissible hindsight. Prelim. Resp. 28. For these reasons, and on this record, Petitioner fails to establish a reasonable likelihood that Kono renders obvious claims 1–7.

H. Asserted Obviousness Based on Kaulbach (Ground 5)

Petitioner asserts that claims 1–7 of the '609 patent are obvious in view of Kaulbach. Pet. 52–62 (citing Ex. 1002 ¶¶ 105–106, 203–240). Petitioner specifically relies on Sample A11 of Kaulbach and alleges that

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[6] We observe that Kono gives no measurement value for CH_2OH groups. Ex. 1008, 18:19.

"[i]n Sample A11, Kaulbach discloses a copolymer that renders obvious each and every limitation of claims 1–7 of the '609 patent." *Id.* at 53. Petitioner sets forth a detailed explanation of how Kaulbach's Sample A11 purportedly meets or renders obvious the recited limitations. *Id.* at 53–62.

Patent Owner disagrees that it would have been obvious to adjust Sample A11's melt flow rate of 24 g/10 min[7] to be within the recited range of "about 30±3 g/10 min," and further challenges Petitioner's view that Kaulbach desires an alkali-metal free recipe. Prelim. Resp. 28–32. Patent Owner also argues that (i) Kaulbach fails "to appreciate the criticality of minimizing or eliminating alkali metals," (ii) "Kaulbach is primarily concerned with polymer decomposition from non-alkali metals—iron, chromium, and nickel," and (iii) Kaulbach "expressly teaches that potassium persulfate and sodium bicarbonate—both alkali metal salts—may be used to prepare the FEP." *Id.* at 31. These arguments are similar to the arguments made by Patent Owner that we addressed above with respect to Petitioner's challenge based on Hiraga and Kaulbach, and are unpersuasive for the same reasons. *See supra* Section II.E.

Turning now to Sample A11's melt flow rate, Petitioner contends that the skilled artisan would have been motivated to increase the melt flow rate from 24 g/10 min to be within the claimed range. Pet. 55–56. Specifically, Petitioner points to Kaulbach's general teaching[8] that the "copolymers

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[7] The parties agree that Kaulbach incorrectly reports melt flow rate in units of g/min rather than in g/10 min. Pet. 55 n.12; Prelim. Resp. 29 n.3. For purposes of this Decision, we treat Kaulbach's disclosure of melt flow rate in g/min as g/10 min.

[8] The disclosure to which Petitioner refers discusses a melt flow index ("MFI") value. Ex. 1008, 1:40–41, 3:43–44. Patent Owner does not dispute that a "melt flow index" is any different than the recited "melt flow rate."

should have an MFR of 15 g/10 min or higher," and that Kaulbach provides no upper limit on the melt flow rate. *Id.* at 55. Thus, Petitioner asserts that Kaulbach's range completely encompasses the claimed range. Further, Petitioner avers that "[i]t was well known at the time of the '609 patent that the higher the MFR of the FEP-copolymer, the higher the speeds at which the copolymer can be processed." *Id.* at 56 (citing Ex. 1002 ¶ 216). Thus, Petitioner contends that the skilled artisan would have found it obvious to modify Sample A11 accordingly. *Id.*

Patent Owner argues that Kaulbach suggests that a copolymer with a melt flow rate of 24 g/10 min is the preferred embodiment, and the melt flow rates for Kaulbach's sample polymers range from 20–24 g/10 min. Prelim. Resp. 30. Patent Owner also contends that the skilled artisan would not have been motivated to adjust the melt flow rate based on the knowledge in the art "that higher MFR leads to higher processing speeds and that [melt flow rates] of 30 g/10 min or greater reduce melt fracture," because Kaulbach tries to solve such issues in a different way—i.e., "through a narrow molecular weight distribution." *Id.*

For the reasons below, we agree that Petitioner has established a reasonable likelihood that claims 1–7 are obvious in view of Kaulbach.

Rather, Patent Owner appears to acknowledge that these terms may be used interchangeably. *See* Prelim. Resp. 30 (referring to Kaulbach's MFI as "a broad, open-ended MFR range of 15 g/10 min or higher"). For purposes of this Decision, we assume that the recited "melt flow rate" and Kaulbach's "melt flow index" are interchangeable phrases describing the same parameter.

We note that Kaulbach's disclosure of a melt flow rate of greater than or equal to 15 g/10 min[9] fully encompasses the recited range of 30±3 g/10 min. In such circumstances, the narrower range may be obvious, because "[s]electing a narrow range from *within* a somewhat broader range disclosed in a prior art reference is no less obvious than identifying a range that simply *overlaps* a disclosed range. In fact, when, as here, the claimed ranges are completely encompassed by the prior art, the conclusion is even more compelling than in cases of mere overlap." *In re Peterson*, 315 F.3d 1325, 1329–30 (Fed. Cir. 2003) (citation omitted). We also note that Kaulbach's disclosure is not limited to its preferred embodiments. *See Fritch*, 972 F.2d at 1264. Thus, the melt flow rate of Sample A11, i.e., 24 g/10 min, does not negate Kaulbach's general teaching that "[f]or high speed wire extrusion the [melt flow rate] of the polymer is ≥15 [g/10 min]." Ex. 1009, 3:43–44.

We also are not persuaded, on this record, by Patent Owner's argument that because Kaulbach attempts to achieve "high processing rates" in a different way, the skilled artisan would not have considered Kono's technique for increasing the speed of wire coating extrusion process. Prelim. Resp. 30–31. Rather, we note that "if a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is

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[9] We note Kaulbach does not expressly recite the units when it discloses that the "MFI of the polymer is ≥15." Ex. 1009, 3:43–44. Because Patent Owner does not allege otherwise, but rather appears to concede the MFI units are "g/10 min" (Prelim. Resp. 29–30), we assume for purposes of this Decision that Kaulbach's disclosure of "≥15" is a disclosure of "greater than or equal to 15 g/10 min."

obvious unless its actual application is beyond his or her skill." *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 417 (2007).

Therefore, based on the current record, we agree that Petitioner has established a reasonable likelihood that claims 1–7 are obvious in view of Kaulbach.

III. CONCLUSION

For the foregoing reasons, we are persuaded that the Petition establishes a reasonable likelihood that Petitioner would prevail on its challenge to claims 1–7 of the '609 patent.

As discussed above, we question the sufficiency of Petitioner's contentions with respect to certain grounds, but nevertheless institute an *inter partes* review of claims 1–7 on all asserted grounds. Although we exercise our discretion and institute review, we remind the parties that we have not yet made a final determination as to the patentability of any of the challenged claims.

IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that, pursuant to 35 U.S.C. § 314(a), an *inter partes* review is hereby instituted as to claims 1–7 of the '609 patent with respect to the grounds set forth in the Petition; and

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

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