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.

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.*

JUDGMENT
Final Written Decision
Determining All Challenged Claims Unpatentable
35 U.S.C. § 318(a)

Dismissing Patent Owner's Motion to Exclude
37 C.F.R. § 42.64(c)

Granting/Dismissing Petitioner's and Patent Owner's Motions to Seal
37 C.F.R. § 42.54

I. INTRODUCTION

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 instituted an *inter partes* review of claims 1–7 of the ’609 patent on all grounds of unpatentability alleged in the Petition. Paper 8 (“Institution Decision” or “Dec.”). After institution of trial, Patent Owner filed a Patent Owner Response. Paper 15 (“PO Resp.”). Petitioner filed a Reply. Papers 34, 35 (“Reply”). Patent Owner filed a Sur-Reply to Petitioner’s Reply. Paper 39 (“Sur-Reply”).

An oral hearing was held on August 7, 2019. A transcript of the hearing is included in the record. Paper 59 (“Tr.”).

We have jurisdiction under 35 U.S.C. § 6. This Final Written Decision is issued pursuant to 35 U.S.C. § 318(a). For the reasons that follow, we determine that Petitioner has established by a preponderance of the evidence that claims 1–7 of the ’609 patent are unpatentable.

A. 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.

B. The ’609 Patent

The ’609 patent, titled “High Melt Flow Fluoropolymer,” issued on October 17, 2006. Ex. 1001, code (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 code (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 1:60–62.

According to the '609 patent, during "conductor coating operation, the presence of alkali metal salt in the fluoropolymer promotes the formation of fluoropolymer drool on the outer surface of the extrusion" equipment, which "appear[s] as unacceptable lumps of insulation" on the conductor. *Id.* at 3:7–16. Thus, the copolymer of the '609 patent "is free of, i.e., does not contain, alkali metal salt in the sense that no alkali metal salt is used in the polymerization or in the isolation of the resulting fluoropolymer." *Id.* at 3:16–20.

The '609 patent also informs that its polymers may contain thermally or hydrolytically unstable endgroups, e.g., $–CF_2CH_2OH$, $–CONH_2$, –COF, and –COOH, which react "usually by decomposition, at temperatures at which fluoropolymers are melt-processed." *Id.* at 3:31–39. The '609 patent thus teaches that a fluorination process is carried out to convert such "unstable endgroups to the stable $–CF_3$ endgroup." *Id.* at 3:31–34.

C. Instituted 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.

D. *Instituted Grounds of Unpatentability*

We instituted an *inter partes* review of claims 1–7 of the ’609 patent on the following grounds. Dec. 25.

Ground	Claims Challenged	35 U.S.C. §	Reference(s)/Basis
1	1–7	102(a)	Hiraga[1]
2	1–7	103(a)	Hiraga and/or Hiraga and Kaulbach[2]
3	1–7	102(e)(2) and/or 103(a)	Kono[3]
4	1–7	103(a)	Kono
5	1–7	103(a)	Kaulbach

Petitioner relies on the Declarations of Dr. Robert A. Iezzi (Ex. 1002) and Daniel M. McGavock (Ex. 1040). Patent Owner relies on the Declarations of Dr. Sue Mecham (Ex. 2006), John L. Hansen (Ex. 2007), Randall Crenshaw (Ex. 2008), and Gregory A. Chapman (Ex. 2009).

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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

For petitions filed prior to November 13, 2018, the Board interprets claims in an unexpired patent using the "broadest reasonable construction in light of the specification of the patent." 37 C.F.R. § 42.100(b) (2017); *Cuozzo Speed Techs., LLC v. Lee*, 136 S. Ct. 2131, 2144–46 (2016). Under that standard, claim terms are given their ordinary and customary meaning in view of the specification, as would be understood by one of ordinary skill in the art at the time of the invention. *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007). Any special definitions for claim terms must be set forth in the specification with reasonable clarity, deliberateness, and precision. *In re Paulsen*, 30 F.3d 1475, 1480 (Fed. Cir. 1994). Only those terms that are in controversy need to be construed, and only to the extent necessary to resolve the controversy. *Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) ("we need only construe terms 'that are in controversy, and only to the extent necessary to resolve the controversy'") (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999)).

Petitioner offered proposed constructions for the terms "polymerized and isolated," "about 30±3 g/10 min," and "about 50 unstable endgroups." Pet. 17–24. In the latter proposed construction, Petitioner includes a separate proposed construction for the phrase "unstable endgroup." *Id.* at 24. Petitioner urges that the broadest reasonable construction of the term "unstable endgroup" includes "unstable endgroups resulting from *any* FEP polymerization process" and not only those exemplified in the '609 patent.

Id. (emphasis added). Petitioner notes that although the ’609 patent identifies four unstable endgroups (–$CONH_2$, –CF_2CH_2OH, –COF, and –COOH), “other unstable endgroups are also possible,” such as ethyl endgroups. *Id.* (citing Ex. 1002 ¶¶ 92–93).

In its Preliminary Response, Patent Owner averred that an express construction was not necessary for either of the terms “about 30±3 g/10 min” or “about 50.” Prelim. Resp. 8–9. Patent Owner did, however, accept and apply Petitioner’s proffered “construction of ‘unstable endgroups’ as including not only the four exemplary endgroups listed in the ’609 patent, but *all* unstable endgroups resulting from any FEP process.” *Id*. at 9–10 (emphasis added).

In our Institution Decision, we considered the evidence and the parties’ mutually agreed-upon constructions to construe the term “unstable endgroups” to include “[all] unstable endgroups resulting from any FEP polymerization process.” Dec. 4–5.

Petitioner, in its Reply, addresses the “unstable endgroups” construction as it was applied to the anticipation and obviousness challenges, expressing concern that our construction included “all” endgroups, regardless of the actual synthesis conditions employed in the relied-upon Examples and Comparative Examples. Reply 1, 14–16; Pet. 45–47; Dec. 18–19. Petitioner argues that the skilled artisan would not “speculate about ***unused*** synthesis conditions, and neither should the Board.” Reply 1. Specifically, Petitioner argues that Patent Owner “now concedes” that “this all-endgroups requirement is wrong,” because one of ordinary skill in the art “would not speculate about synthesis conditions that are not actually used.” *Id.* at 14–15; *see also* Tr. 13:18–19 (“We never used the word ‘all,’ it was brought in through Chemours' arguments in the POPR."). Petitioner further argues that Patent Owner's Declarant "accounts for only four unstable endgroups" in her analysis of a product relied on by Patent Owner to demonstrate commercial success and "ignores others" because they would not be expected to result in the product based on its synthesis. Reply 4 (quoting Ex. 2006 ¶ 85). Petitioner contends Patent Owner's Declarant "concedes that unstable endgroups do not spontaneously appear." *Id.* at 4–5 (citing Ex. 1038, 162:11–23). Petitioner also avers the '609 patent does not support "an all-endgroups requirement" because, for example, it "omits ethyl groups." *Id.* at 5. Thus, according to Petitioner, it is "unreasonable to construe 'unstable endgroups' to require accounting of all known endgroups, even ones unexpected based on the synthesis used." *Id*.

During the oral hearing, Petitioner repeated its disagreement with the claim construction adopted in the Institution Decision as it was applied to certain challenges. Tr. 6:19–17:19. Petitioner agreed, however, that the claim construction set forth in the Institution Decision is correct as long as the references are not "criticized for not identifying end groups that would be unexpected or impossible to form." *Id.* at 14:8–14; *see also id.* at 16:20–17:8 (asserting "all we want to make sure is it's clear that the claim construction only requires the prior art to show end groups that possibly -- that would be possible or expected by a person of skill in the art.").

Given that claim terms are interpreted in view of the knowledge of one of ordinary skill in the art at the time of the invention, we see no reason to modify our earlier construction. On the record now before us, and using the applicable standard of broadest reasonable interpretation, we maintain our construction of “unstable endgroups” to include “[all] unstable endgroups resulting from any FEP polymerization process.” Dec. 4–5.

On the complete record, we determine that it is not necessary to provide an express construction for any other claim term for purposes of resolving the controversy. *See, e.g.*, *Wellman, Inc. v. Eastman Chem. Co.*, 642 F.3d 1355, 1361 (Fed. Cir. 2011) (“[C]laim terms need only be construed ‘to the extent necessary to resolve the controversy.’”) (quoting *Vivid Techs., Inc.*, 200 F.3d at 803).

B. Level of Ordinary Skill in the Art

Petitioner’s declarant, Dr. Iezzi, asserts that one of ordinary skill in the art

> would have a bachelor’s degree or the equivalent training or experience in engineering, chemistry, materials science, or a related field and at least three years of experience relating to research and development of melt-processable fluoropolymers, including extrusion thereof, or a master’s degree or the equivalent training or experience in engineering, chemistry, materials science, or a related field and at least one years of experience relating to research and development of melt-processable fluoropolymers, including extrusion thereof.

Ex. 1002 ¶ 25.

Patent Owner does not appear to dispute Dr. Iezzi’s definition of one of ordinary skill in the art. *See generally* PO Resp. Neither party argues that the outcome of this case would differ based on our adoption of any particular definition of one of ordinary skill in the art. In light of the record now before us, we adopt Dr. Iezzi’s definition of one of ordinary skill in the art. The level of ordinary skill in the art is also reflected by the references themselves. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed.

Cir. 2001) ("[T]he absence of specific findings on the level of skill in the art does not give rise to reversible error 'where the prior art itself reflects an appropriate level and a need for testimony is not shown.'"); *In re GPAC Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995) (finding that the Board of Patent Appeals and Interferences did not err in concluding that the level of ordinary skill in the art was best determined by the references of record).

C. Overview of the Asserted References

1. Hiraga

Hiraga discloses methods of modifying a fluoropolymer via a melt-kneading process. Ex. 1025, 1 at code (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)," such 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, the fluoropolymer "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 step 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 Example 1 and Comparative Example 1 wherein the modified FEP polymer of Example 1 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.

2. Kaulbach

Kaulbach discloses "melt-processable tetrafluoroethylene (TFE)/hexafluoropropylene (HFP) copolymer melt pellets having an improved processability for wire and cable application" and "a method of using this polymer to coat wire and cable conductors." Ex. 1009, 1:9–13.

Kaulbach teaches that metal contaminants may "result in degradation and decomposition of the copolymer at high processing temperatures, which may in turn cause "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 states that the polymer "material is essentially of high purity grade as to metals; that is the total amount of iron, chromium, [and] nickel is less than 200 parts per billion (ppb), preferably less than 100 ppb." *Id.* at 3:24–32. Kaulbach states that "[i]t is believed that metal contaminants, in particular heavy metals like Fe, Ni, [and] Cr might induce a decomposition reaction," and by using material that contains "only less than 50 ppb of Fe+Ni+Cr ions," "the material according to the invention can be called a high purity grade." *Id.* at 4:21–24.

Kaulbach discloses that the manufacturing process for preparing the polymer may include polymerization, coagulation, agglomeration, fluorination, and pelletizing. *Id.* at 4:25–6:30.

Kaulbach discloses that "[t]he polymerization may be carried out in form of a radical emulsion polymerization as it is known in the art," and that initiators such as ammonium or potassium persulfate may be used, along with emulsifiers such as "the ammonium salt of perfluoro-octanoic acid" and buffers such as "NH_3, $(NH_4)_2CO_3$ or $NaHCO_3$" in the polymerization recipe. *Id.* at 4:27–34. Kaulbach discloses that a "preferred version of the polymerization recipe here is an alkali metal salt-free recipe." *Id.* at 4:44–45.

Regarding coagulation, Kaulbach states that mechanical coagulation is preferred over chemical coagulation because chemical coagulation "is generally done with acids" which is "not preferred as it results in very high levels of metal contaminants at all subsequent work up steps." *Id.* at 5:3–17.

Kaulbach seeks to minimize introducing metal contamination during fluorination by ensuring the "agglomerate is soft enough to not scratch off metal contaminants from the wall of the tumble drier." *Id.* at 5:46–48.

Kaulbach also instructs that "[m]elt-pelletizing fluorinated agglomerates provides many advantages compared to the melt pelletizing of non fluorinated agglomerates"—one of which is substantially reducing equipment corrosion that results in an insignificant "pick up of metal contamination." *Id.* at 6:1–8.

Kaulbach states that "[h]igh processing speeds are desired when wires and cables are extrusion coated" and that "[t]o increase the extrusion speed the molecular weight distribution of the used copolymer is believed to be very broad . . . for FEP" copolymers. *Id.* at 1:29–36. Kaulbach notes that "according to conventional wisdom," FEP mixtures that "have a very broad molecular weight distribution which . . . results in [] improved extrudability." *Id.* at 1:56–59. Kaulbach's inventive polymers purport to have "a very narrow molecular-weight distribution, i.e., a ratio of Mw to Mn of less than about 2 (Mw=weight average, Mn=number average molecular weight)," which "may be as low as 1.5," and "is in contrast to FEP-grades recommended for wire coatings with high extrudation rates where a broad molecular weight distribution is recommended." *Id.* at 3:34–41. Kaulbach states that "the art teaches that a broad molecular weight distribution is needed to achieve such high processing rates," but that "[i]t has now been discovered that a narrow molecular weight distribution performs better, thus overcoming a well established prejudice." *Id.* at 3:61–65.

Kaulbach discloses that, "[f]or high speed wire extrusion[,] the MFI [melt flow index] of the polymer is ≥ 15." *Id.* at 3:43–44. Kaulbach discloses several example copolymers. One is "[a] melt pelletized copolymer [] with a MFI-value of 24 [g/10 min] and containing 15% HFP" which "can be extruded with a wire coating extruder at . . . a rate of 1500 feet/min over a run time of the equipment of 6 hours without exhibiting discoloration and without producing substantial amounts of die drools and with fewer cone-breaks in contrast to commercial FEP grades." *Id.* at 3:49–56. Another example copolymer—Sample A11—exhibited a MFI value of 24 g/10 min and had a measured molecular weight distribution value of 1.6. *Id.* at 8:55–65.

3. Kono

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., the "FEP pellet is melted by heating within an extruder for coating a core wire and extrud[ing] from a die, and then draw[ing] 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 adhesion terminus 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 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.

D. Analysis

To anticipate a claim under 35 U.S.C. § 102, "a single prior art reference must expressly or inherently disclose each claim limitation." *Finisar Corp. v. DirecTV Grp., Inc.*, 523 F.3d 1323, 1334 (Fed. Cir. 2008). Accordingly, "the dispositive question regarding anticipation [i]s whether one skilled in the art would reasonably understand or infer from the [prior art reference's] teaching" that every claim element was disclosed in that single reference. *Dayco Prods., Inc. v. Total Containment, Inc.*, 329 F.3d 1358, 1368 (Fed. Cir. 2003).

A claim is unpatentable under 35 U.S.C. § 103(a) if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious to a person of ordinary skill in the art at the time the invention was made. *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). Obviousness is resolved based on underlying factual determinations, including: (1) the scope and content of the prior art; (2) differences between the prior art and the claims at issue; (3) the level of ordinary skill in the art; and (4) objective evidence of nonobviousness, i.e., secondary considerations. *See Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). Secondary considerations may include the following: "commercial success, long-felt but unmet needs, failure of others, etc." *Id.* The totality of the evidence submitted may show that the challenged claims would not have been obvious to one of ordinary skill in the art. *In re Piasecki*, 745 F.2d 1468, 1471–72 (Fed. Cir. 1984).

Petitioner bears the burden of proving unpatentability of the challenged claims, and the burden of persuasion never shifts to Patent Owner. *Dynamic Drinkware, LLC v. Nat'l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015). Petitioner must demonstrate unpatentability by a preponderance of the evidence. 35 U.S.C. § 316(e); 37 C.F.R. § 42.1(d); *see also Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016) (citing 35 U.S.C. § 312(a)(3) (requiring *inter partes* review petitions to identify "with particularity . . . the evidence that supports the grounds for the challenge to each claim")). A party that petitions the Board for a determination of obviousness must show that "a skilled artisan would have been motivated to combine the teachings of the prior art references to achieve the claimed invention, and that the skilled artisan would have had a reasonable expectation of success in doing so." *Procter & Gamble Co. v.*

Teva Pharm. USA, Inc., 566 F.3d 989, 994 (Fed. Cir. 2009) (quoting *Pfizer, Inc. v. Apotex, Inc.*, 408 F.3d 1348, 1361 (Fed. Cir. 2007)).

1. Asserted Anticipation Based on Hiraga (Ground 1)

Petitioner asserts 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, in its Response, presents no arguments specifically directed to Petitioner's Ground 1. *See generally* PO Resp. Petitioner's Reply reiterates its arguments that Hiraga discloses the unstable endgroups expected from its synthesis (Reply 3) and that Hiraga adds potassium to an already-isolated FEP (*id.* at 6).

Claim 1 requires a FEP "polymerized and isolated in the absence of added alkali metal salt." Ex. 1001, 10:19–20. It does not appear to be disputed that Hiraga's Example 1 and Comparative Example 1 ("Example 1C") had an alkali metal (potassium) concentration of 15 ppm. Ex. 1025 ¶¶ 107, 114. Petitioner argues that one of ordinary skill "would have associated the alkali metal's presence in these examples with endgroup stabilization, and not polymerization or isolation." Pet. 28 (citing Ex. 1002 ¶¶ 121–122). Petitioner concludes that, because "Hiraga is silent regarding the addition of alkali metal salts in the polymerization and isolation of Comparative Example 1, and endgroup stabilization is not within the scope of the term 'polymerized and isolated,'" Comparative Example 1 meets this claim limitation. *Id.* at 29. In our Institution Decision, we considered whether Hiraga's Example 1C included 15 ppm potassium before any endgroup stabilization, meaning that the potassium would have had to be added either during polymerization or isolation. Dec. 9. We also considered whether Hiraga disclosed that an alkali metal can be added to the FEP in advance of any finishing steps as a reaction accelerator. *Id.* Petitioner replies: "Adding potassium in those steps [either polymerization or isolation] makes zero sense." Reply 7. We note Petitioner's reliance on the testimony of Patent Owner's declarant Dr. Mecham, in which she could not conclude whether Hiraga adds potassium during either polymerization or isolation. *Id.* (citing Ex. 1038, 115:17–116:6, 118:16–119:18). This testimony, however, reinforces that it is unclear from Hiraga that the FEP is polymerized and isolated in the absence of added alkali metal salt, despite Petitioner's assertions that one of ordinary skill in the art "would understand that, in Examples 1 and 1C, Hiraga adds potassium after isolation but before step (A)." Reply 8. To anticipate a claim, a prior art reference must disclose every limitation of the claimed invention, either expressly or inherently. *Blue Calypso, LLC v. Groupon, Inc.*, 815 F.3d 1331, 1341 (Fed. Cir. 2016). "To establish that a prior art reference inherently—rather than expressly—discloses a claim limitation, 'the limitation at issue necessarily must be present, or [is] the natural result of the combination of elements explicitly disclosed by the prior art.'" *Endo Pharm. Sols., Inc. v. Custopharm Inc.*, 894 F.3d 1374, 1381 (Fed. Cir. 2018) (alteration in original) (quoting *Par Pharm., Inc. v. TWI Pharm., Inc.*, 773 F.3d 1186, 1196 (Fed. Cir. 2014)).

> Inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing *may* result from a given set of circumstances is not sufficient. [Citations omitted.] If, however, the disclosure is sufficient to show that the natural result flowing from the operation as taught would result in the

> performance of the questioned function, it seems to be well settled that the disclosure should be regarded as sufficient.

Cont'l Can Co. USA, Inc. v. Monsanto Co., 948 F.2d 1264, 1269 (Fed. Cir. 1991) (alteration in original) (quoting *In re Oelrich*, 666 F.2d 578, 581 (CCPA 1981)). Petitioner's argument on this point does not appear to be based on an express disclosure that Hiraga's process polymerizes and isolates in the absence of added alkali metal salt. Rather, Petitioner argues that one of ordinary skill in the art would understand when potassium was added in Hiraga's process. Reply 8.

On this complete record, we find Petitioner has not demonstrated that the FEP in Hiraga necessarily is polymerized and isolated in the absence of added alkali metal salt. Particularly in the context of an anticipation ground, we cannot take Hiraga's silence regarding the inclusion of a component (an alkali metal salt), which is required to be absent per the claims, as a clear representation that the component is in fact absent, 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.

Claim 1 also requires a copolymer "having no more than about 50 unstable endgroups/10^6 carbon atoms." Ex. 1001, 10:20–21. We refer to Petitioner's claim construction of the term "unstable endgroups" (Pet. 24), and the claim construction that we adopted based on the apparently mutual agreement of the parties, 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."

We find that the FEPs disclosed in Hiraga's Examples 1 and 1C do not necessarily have fewer than about 50 unstable endgroups per million carbon atoms. Petitioner cites to Hiraga's disclosure that one copolymer (Table 1, row 3) had 0 unstable endgroups per 10^6 carbons. Pet. 31. However, it is unclear from the disclosure of Hiraga which endgroups were actually measured. As noted in our Institution Decision, 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. Dec. 10–11; Ex. 1025 ¶ 112. All unstable endgroups could 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's reliance on Hiraga's disclosure of 0 unstable endgroups 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. Hiraga does not measure all possible unstable groups, and under that application of our claim construction, falls short of anticipating this limitation of claim 1.

Even under a more liberal application of our claim construction, looking only at endgroups that might be present based on Hiraga's synthesis conditions, Petitioner does not meet its burden. Hiraga's Examples 1 and 1C do not state which endgroups they measure. Ex. 1025 ¶¶ 112, 117. Hiraga discloses that "examples of unstable groups include" –COOH, $–CF=CF_2$, and –COF, but the words “examples of” and “include” indicate this is not necessarily a closed set. *Id.* ¶ 44. We also are not persuaded that the examples of unstable endgroups provided by Hiraga (i.e. –COOH, $–CF=CF_2$, and –COF,) signify that those are the only unstable endgroups that would be expected to form under Hiraga’s reaction conditions. Even if we credited Dr. Iezzi’s opinion that only –COOH and –COF endgroups would form as a result of Hiraga’s synthesis conditions (Pet. 30 n.7 (citing Ex. 1002 ¶ 98)), we are not persuaded that Hiraga’s disclosure (1) is in agreement with this opinion, as it provides examples of other unstable endgroups; (2) requires that these are the only unstable endgroups that would need to be measured; or (3) in fact measures those endgroups.

On this complete record, 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.” For the reasons given, Petitioner fails to establish by a preponderance of the evidence that Hiraga anticipates claims 1–7.

2. 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). Pet. 35–38. Petitioner asserts that 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.” *Id*. at 37 (citing Ex. 1002 ¶¶ 154–157). Petitioner further 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 ("Piekarski"), 3:34–39).

Petitioner first asserts that the skilled artisan would have replaced both of Hiraga's melt-kneading steps (A) and (B) with fluorination. *Id.* at 37. We note Petitioner's acknowledgment that Hiraga's step (A) "narrows the FEP's molecular weight distribution by melt-kneading in the presence of heat and oxygen to homogenize molecular weight," and step (B) "then stabilizes the FEP by melt-kneading with heat, oxygen, and water." Reply 7. Hiraga is not only concerned with stabilizing unstable endgroups of a fluoropolymer, but also seeks to tailor the polymer's molecular weight. *See* Ex. 1025 ¶ 30 ("The object of the present invention is to adjust the molecular weight and create a polymer with the most homogeneous molecular weight possible, and not simply stabilize the unstable groups.").

Petitioner, however, has not shown that substituting both melt-kneading steps (A) and (B) with a fluorination step alone would have had any impact on a fluoropolymer's molecular weight, and consequently, its Melt Flow Rate ("MFR"). Pet. 35–38; Reply 6–8. Petitioner acknowledges, and provides record evidence establishing, that a fluoropolymer's molecular weight is inversely related to its MFR. Pet. 9 ("MFR is inversely related to melt viscosity and also molecular weight. Ex. 1009, 6:33–35; Ex. 1006, 3:21–27; Ex. 1002, ¶ 50."); Dec. 12.

Thus, on this record, it remains unclear what impact—if any—a fluorination process alone would have on the MFR of Hiraga's Comparative Example 1 polymer. Pet. 32–33. Hiraga's Comparative Example 1 has a MFR prior to melt kneading of 25 g/10 min, which is outside of the range of "about 30±3 g/10 min" recited in claims 1–7. Ex. 1025 ¶¶ 107, 114, 117. Without evidence as to how fluorination alone would impact the MFR, we are unpersuaded that applying fluorination without any melt-kneading to Hiraga's Comparative Example 1 would result in a fluoropolymer with a melt flow rate of "about 30±3 g/10 min." Thus, Petitioner's first proffered basis for modifying Hiraga—replacing both melt-kneading steps (A) and (B) with fluorination alone (Pet. 37)—lacks persuasive merit.

Second, Petitioner contends that the skilled artisan would have found it obvious to first melt-knead Hiraga's Comparative Example 1 polymer in step (A), then stabilize the polymer's unstable endgroups by fluorination instead of melt-kneading the polymer in step (B). Pet. 37–38 (citing Ex. 1002 ¶ 155–156). In the testimony relied upon by Petitioner, Dr. Iezzi refers to Kaulbach as leading one of ordinary skill in the art to understand and appreciate the importance of minimizing the presence of alkali metals in fluoropolymers. *Id*. (citing Ex. 1002 ¶ 155). As we discuss in more detail below, we are not persuaded that the skilled artisan would have viewed alkali metal salts—such as those that may be intentionally added during polymerization (Ex. 1009, 4:27–34), or used to stabilize unstable endgroups of a polymer (Ex. 1025 ¶¶ 17, 48)—as a contaminant to be avoided. Furthermore, Hiraga itself does not treat alkali metals as contaminants to be avoided, but rather intentionally adds them as preferred accelerators of the stabilization reaction. Ex. 1025 ¶ 17.

Third, Petitioner argues that the skilled artisan would have been motivated to substitute Hiraga's wet-heat method of stabilizing the fluoropolymer at step (B) with a fluorination process because "fluorination provides benefits compared to other stabilization techniques, such as Hiraga's wet-heat treatment." Pet. 38. Petitioner points to evidence of record that purportedly demonstrates that "fluoropolymers with endgroups stabilized using fluorination have better electrical properties than those [] treated using different means." *Id.* (citing Ex. 1027, 2:6–11, 3:34–39, 3:53–54). Specifically, Petitioner avers "that functional endgroups, like –CF_2H groups that are formed during wet-heat stabilization,[4] are responsible for dielectric loss at high frequencies leading to poorer electrical properties." *Id.*

We are not persuaded, however, that this disclosure would have motivated the skilled artisan to eliminate Hiraga's melt-kneading stabilization step, and completely replace it with a fluorination process to stabilize the unstable endgroups. We note that Petitioner tries to make a case here that the patent would have been obvious based on Hiraga alone, but to make its case, relies (indirectly) upon the teachings of Piekarski, which discloses several methods for improving the dissipation factor of FEP copolymers, both at high and low frequencies. *Id*. (citing Ex. 1027, 2:6–11, 3:34–39, 3:53–54).

In our view, however, Petitioner's reliance on Piekarski's disclosure does not explain sufficiently how such omission of Hiraga's melt-kneading stabilization step could have been accomplished because, in Comparative

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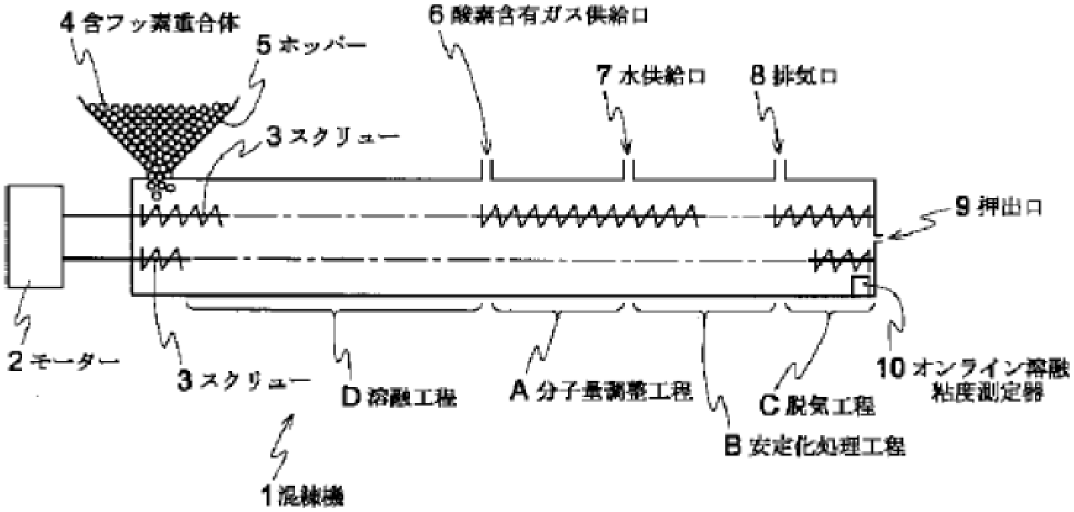
[4] *See* Ex. 1025 ¶ 4 (explaining that unstable end groups can be "treated in the presence of water and heat and thus are converted to stable –CF_2H groups").

Example 1, molecular weight adjustment and endgroup stabilization are being carried out *simultaneously* by melt-kneading. Ex. 1025 ¶¶ 107–118. Specifically, Hiraga explains that the twin screw extruder used as the melt-kneader has several zones, including "molecular weight adjustment zone (A)" and "stabilization treatment zone (B)." *Id.* ¶ 108. Hiraga's extruder is depicted in Figure 1:

FIG. 1



Hiraga's Figure 1 "is a schematic cross-sectional view of an extruder," 1, containing motor 2, screw 3, fluorine-containing polymer 4, hopper 5, oxygen-containing gas supply port 6, water supply port 7, exhaust port 8, extrusion port 9, molecular weight adjustment zone A, stabilization zone B, deaeration zone C, and melt zone D. *Id*. ¶ 120, Fig. 1.

Hiraga explains that molecular weight adjustment, i.e., step (A), is first carried out by melt-kneading the fluorine-containing polymer "in the presence of an oxygen-containing gas such as air." *Id.* ¶ 30. In Hiraga's Figure 1, the oxygen-containing gas supply port 6 is situated at the beginning of molecular weight adjustment zone A. *Id.* at Fig. 1. Hiraga further instructs that "unstable groups of the fluorine-containing polymer cannot be stabilized by the presence of the oxygen alone and, as such, . . . the fluorine-containing polymer is melt-kneaded in the presence of oxygen while further aggressively introducing water." *Id.* ¶ 41. Water supply port 7 is situated between molecular weight adjustment zone A and stabilization treatment zone B. *Id.* at Fig. 1. In Comparative Example 1, Zones A and B "were not partitioned," were at the same temperature, and the air and water were simultaneously supplied. *Id.* ¶ 114. Based on this disclosure, it is not clear how Petitioner's proffered modification of Hiraga's Comparative Example 1 could have been carried out, because the lack of partitioning would render difficult if not impossible Petitioner's proposed modification involving only the process carried out in zone B.

Moreover, the evidence upon which Petitioner indirectly relies appears to allow for up to 50 endgroups per million carbon atoms other than $–CF_3$ in the copolymer to achieve the purported improvement in electrical properties. Pet. 38; Ex. 1027, 3:42–43. On the fully developed record, however, Petitioner has not provided sufficient evidence that establishes Hiraga's Comparative Example 1—after molecular weight adjustment step (A)—has 50 or more terminal groups other than $–CF_3$.[5] In fact, Hiraga does not measure Comparative Example 1's endgroups in this manner, but rather

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[5] The $–CF_2H$ endgroups at issue in this challenge are repeatedly referred to in the record as "stable" or "highly stable." Pet. 11; Ex. 1007, 2:65–67, 3:4–5, 5:10; Ex. 1010, 5:37–38, 5:44–46; Ex. 1025 ¶ 4; Ex. 2017, 3:30–33; Ex. 1002 ¶ 60. Piekarski discloses that another type of stable endgroup, $–CF_3$, is desired, and therefore seeks to limit the total amount of *any* other endgroup, including stable $–CF_2H$ groups, to a value of less than 50 per million carbon atoms. Ex. 1027, 3:34–43, 3:53–54.

focuses on *unstable* endgroups, and appears to measure those endgroups only *after* the stabilization process is complete. Ex. 1025 ¶¶ 115–117.

Even if Petitioner provided such evidence, however, Hiraga already teaches the possibility of fluorination after stabilization via melt-kneading. Ex. 1025 ¶ 50; Ex. 1027, 3:34–43. Thus, on the fully developed record before us, Petitioner has not established that the skilled artisan would have been motivated to completely eliminate Hiraga's stabilization via melt-kneading at step (B) in favor of a fluorination step that Hiraga already teaches may be carried out *after* both melt-kneading steps (A) and (B). Ex. 1025 ¶ 50. It follows that we are not persuaded that the skilled artisan would have been motivated to eliminate the alkali metal salt used in Hiraga's melt-kneading stabilization step (B)[6] to yield a FEP polymer with an alkali metal ion concentration falling within the ranges recited in claims 1–7 of the '609 patent. Therefore, Petitioner has not established that claims 1–7 of the '609 patent are unpatentable over Hiraga alone.

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

Petitioner asserts that claims 1–7 are unpatentable under 35 U.S.C. § 103(a) as obvious over the combined disclosures of Hiraga and Kaulbach. Pet. 35–38.

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

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[6] Hiraga adds alkali metal salts as a catalyst during stabilization via melt-kneading. Ex. 1025 ¶¶ 17, 48, 63; *see also* Ex. 2010, 43:6– 20, 45:19–46:2 (Dr. Iezzi testifying that alkali metal salts in Hiraga are added during polymer stabilization).

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 36–37.

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*. 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 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 argues that "Kaulbach does not teach any reason to avoid alkali metal salt." PO Resp. 15. More particularly, Patent Owner argues that Kaulbach is directed to reducing metal contaminants, not alkali metal salts. *Id.* at 16. For example, Patent Owner argues, “Kaulbach is specifically concerned with reducing the concentration of heavy metals, such as iron, nickel, and chromium” that are “found in the processing equipment used for FEP polymerization and stabilization.” *Id.* (citing Ex. 2006 ¶¶ 45–46; Ex. 1009, 3:29–32). Patent Owner further argues: “Alkali metals are different from heavy metals.” *Id.* at 17 (citing Ex. 2006 ¶ 46; Ex. 2010, 51:21–22). Kaulbach, in Patent Owner’s estimation, does not teach reducing or eliminating alkali metal salt from the final copolymer. *Id.* at 19. Kaulbach’s statements regarding the preferred version of the polymerization recipe being an alkali metal salt free recipe, according to Patent Owner, are agnostic about whether or not alkali metal salts can be added during coagulation of the polymer or stabilization of the polymer. *Id.* at 20 (citing Ex. 1009, 4:45–46; Ex. 2010, 57:15–58:6; Ex. 2006 ¶¶ 48–50).

We disagree that Kaulbach treats all types of metals as “contaminants” as alleged by Petitioner. Rather, despite the commonality of the word “metal,” Kaulbach distinguishes between (1) heavy metal “contaminants” and (2) alkali metal salts which may be purposefully added during FEP synthesis. Ex. 1009, 4:18–20, 4:45–46.

Regarding heavy metal contaminants, Kaulbach discusses corrosion of the FEP-polymer processing equipment, which undisputedly is not made of alkali metals. *See* Ex. 2006 ¶ 46 (Dr. Mecham explaining that “processing equipment typically used in FEP synthesis and extrusion is made of corrosion-resistant metal alloys that typically contain high levels of nickel,” a heavy metal, and not alkali metals due to “their high reactivity and physical characteristics”); Ex. 2010, 50:17–19 (Dr. Iezzi agreeing that processing equipment is not made of alkali metals). In that regard, Kaulbach states that "[m]elt pelletizing of unstabilized polymer resins results in corrosion of the equipment used in the process and in metal contamination of the melt pellets," and further notes that a stabilization process that uses water steam "is very difficult to manage due to corrosion of the equipment." Ex. 1009, 1:65–2:3.

Kaulbach also notes that "excessive metal contamination should be avoided" during fluorination of the agglomerate. *Id.* at 2:39–40. Kaulbach explains: "The fluorination is carried out in a tumble drier to keep the material in motion," and the "agglomerate is soft enough to not scratch off metal contaminants from the wall of the tumble drier. Thus the level of metal contaminants is reduced." *Id.* at 5:35–36, 5:46–48; *see also id.* at 5:53–58 (explaining that during the fluorination, "hard and sharp melt pellets scratch off a considerable amount of metal from the wall of the tumble drier," "[i]ncreasing reaction times result in higher metal contamination" that "is difficult to remove," and "[t]he level of metal contamination was observed to increase by up to 2 orders of magnitude[] when the pellet process was used."). In discussing the advantages of melt pelletizing fluorinated agglomerates over non-fluorinated agglomerates, Kaulbach notes one such advantage is that "[t]he corrosion of the equipment is substantially reduced. The pick up of metal contamination thus is insignificant." *Id.* at 6:1–8. Furthermore, in discussing an "aqueous treatment" step post-fluorination, Kaulbach notes that "the near-absence of gaseous decomposition chemicals and acidic endgroups reduce the corrosion of the stainless steel water treatment vessel considerably. Thus further heavy metal contamination is diminished." *Id.* at 6:23–27; *see also id.* at 5:14–17 (expressing a preference for non-acidic methods during the coagulation step because using acids "results in very high levels of metal contaminants at all subsequent work up steps"); Ex. 2010, 56:9–13 (Dr. Iezzi explaining that "[c]hemical coagulation is generally . . . not done with acids" and that Kaulbach "says it's generally not done with acids, and he does say it's not preferred because you could get high levels of metal contamination."); Ex. 2006 ¶ 49 (Dr. Mecham explaining that Kaulbach teaches to avoid acids during polymer coagulation "because acids can corrode the processing equipment, thereby leading to heavy metal contaminants in the polymer.").

Kaulbach furthermore specifically identifies a class of metals—"heavy metals"—as "metal contaminants," and then specifies three such heavy metals as iron, nickel, and chromium. Ex. 1009, 4:18–20; *see also id.* at 7:55–65 (identifying Fe, Ni, and Cr as "metal contaminations" for samples A0 and A1). The equipment used to process FEP polymers is "typically made of corrosion-resistant metal alloys with a high nickel content." Ex. 2006 ¶ 25 (citing Ex. 2019, 3–4). When referring to "the polymer of the invention" as "essentially of high purity grade as to metals," Kaulbach states that this means "the total amount of iron, chromium, [and] nickel is less than 200 parts per billion (ppb), preferably less than 100 ppb." Ex. 1009, 3:24–32.

Regarding alkali metal salts, Kaulbach indicates they have a different purpose than the heavy metals that Kaulbach seeks to avoid. Ex. 2010, 51:21–22; Ex. 2006 ¶ 46. Notably, Kaulbach discloses that an alkali metal salt, such as sodium bicarbonate buffer, can be intentionally added during FEP polymerization. Ex. 1009, 4:33–34. Dr. Iezzi acknowledges that intentionally added components would not be considered a "contaminant." Ex. 2010, 52:9–17.[7]

Kaulbach discloses a preference for an alkali metal salt-free polymerization recipe. Ex. 1009, 4:45–46. Quite significantly, however, Kaulbach does not indicate why such a recipe is preferred. *Id.*, *generally*. Furthermore, Petitioner's Declarant acknowledges there are more steps to FEP synthesis than the "polymerization" step, such as isolation (or "coagulation")[8], and stabilization. Ex. 2010, 42:2–43:17. Kaulbach is silent about avoiding or minimizing alkali metals during such FEP-synthesis steps post-polymerization. Ex. 1009, *generally*. The evidence of record establishes that alkali metal salts were known to be intentionally added—sometimes preferably—during the isolation and stabilization of fluorine-containing polymers such as FEP copolymers of tetrafluoroethylene (TFE) and hexafluoropropylene (HFP). Ex. 1025 ¶¶ 2, 3, 12, 17, 48, 49; Ex. 1026, 4:6–18; Ex. 2011, 6:1–5; *see also* Ex. 2006 ¶ 49 (Dr. Mecham testifying that "alkali metal salts were commonly used during chemical coagulation in the early 2000s"). Thus, Kaulbach's lack of direction to avoid alkali metal salts during the coagulation and stabilization steps of its FEP polymer supports Patent Owner's position that Kaulbach does not teach avoiding alkali metal salts altogether. It further supports Patent Owner's position that alkali metal

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[7] We observe that Dr. Iezzi's testimony on this point conflicts with Petitioner's counsel's representation of that testimony during the oral hearing. *Compare* Tr. 30:11–20 ("if you intentionally add a metal, it's a contaminant to the polymer" and "that's our expert's interpretation of Kaulbach") *with* Ex. 2010, 52:9–17 (alkali metal salts "wouldn't be a contamination if you purposely added it").

[8] *See* Ex. 2006 ¶ 23 ("Coagulation . . . is one method of isolating a polymer").

salts, unlike heavy metals, are not considered "contaminants" by Kaulbach. PO Resp. 2, 16–18.

Based on these distinctions made by Kaulbach, we are not persuaded that alkali metal salts would have been understood by the skilled artisan to be a heavy metal "contaminant" that should be avoided. Accordingly, we are not persuaded by Petitioner's proffered rationale, inaccurately leveraging Kaulbach's use of the common term "metal" to conflate metal contaminants with alkali metal salts, for modifying Hiraga's Comparative Example 1 FEP to exclude alkali metal salt. *See* Pet. 36 ("Kaulbach touts the *benefits of an alkali-metal free process* by emphasizing that the *absence of metal contamination* in melt-processable FEP copolymers can prevent degradation and decomposition," thus the skilled artisan "would have been motivated to *avoid using alkali metal* in Hiraga's Comparative Example 1" (emphasis added)). Although Kaulbach discloses a "preferred" alkali metal salt-free polymerization recipe, Kaulbach does not explain precisely why that recipe is the preferred one, nor does it specify that alkali metal salts must be absent from every step of the polymerization process. Thus, Petitioner has not established that Kaulbach's disclosure would have motivated the skilled artisan to reduce or eliminate the presence of alkali metals during all steps of synthesizing Hiraga's Comparative Example 1 FEP.

For the reasons given above, we are not persuaded that Petitioner has established by a preponderance of the evidence that claims 1–7 of the '609 patent are unpatentable over Hiraga and Kaulbach.

4. Asserted Anticipation Based on Kono (Ground 3)

Petitioner asserts that claims 1–7 of the ’609 patent are anticipated by Kono. Pet. 38–50.[9] 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). Petitioner also expressed a concern that our Institution Decision applied our construction of “unstable endgroups” too restrictively by requiring certain references to account for endgroups that may not form under given synthesis conditions. Reply 14–15. Thus, we examine which endgroups would be “expected” or “possible” based on the specific synthesis conditions used.

Kono’s Example 2 polymer has a total of 58 measured endgroups: 3 –COF groups, 2 –COOH groups, and 53 –CH_2OH groups. Ex. 1008, Table 1. Kono’s Comparative Example 3 polymer has a total of 50 measured endgroups: 3 –COF groups, 1 –COOH group, and 46 –CH_2OH groups. *Id.* The polymers of Example 2 and Comparative Example 3 employ the use of methanol as a chain transfer agent “to adjust the molecular weight.” *Id.* at 13:7–10, 14:20–25; 12:34–36. Petitioner’s evidence establishes, however, that “[i]f a molecular weight modifier such as methanol is employed, then a portion of the ends may be carbinol (–CH_2OH) as well as the more stable difluoromethyl ends (–CF_2H). The *presence of*

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[9] We note that the Petition appeared 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”); 50 (“Kono renders obvious claim 6”).

methanol can also lead to methyl ester ends (–CO_2CH_3).” Ex. 1010, 5:35–39 (emphasis added).

Thus, applying our “unstable endgroups” construction in a way that would include only the unstable endgroups that would be “expected” based on the polymer’s synthesis, Kono falls short of anticipating claims 1–7 of the ’609 patent because it does not measure methyl ester endgroups. Ex. 1008, 12:57–60. On this point, Petitioner argues that “Dr. Iezzi opines that methyl esters are not detected when methanol is used as a chain transfer agent. (Ex. 1002 ¶ 57 (citing Ex. 1019, 1:53–57).).” Reply 16. We are not persuaded by this argument, however, because neither Dr. Iezzi’s testimony nor the relied upon exhibit appear to speak in absolute terms regarding the formation of methyl ester groups when using methanol as a chain transfer agent. Dr. Iezzi states that the skilled artisan “would have understood that use of methanol as a chain transfer agent during polymerization *can result* in the formation of –CF_2CH_2OH and –COF endgroups in the fluoropolymer. Ex. 1019, 1:53–57.” Ex. 1002 ¶ 57 (emphasis added). Because Dr. Iezzi does not expressly state –CF_2CH_2OH and –COF are the only endgroups that would result from using methanol as a chain transfer agent, however, we do not view his testimony as restricting the expected endgroups to only include –CF_2CH_2OH and –COF. Significantly, the evidence upon which Dr. Iezzi relies also does not definitively address the presence or absence of methyl ester groups when using methanol as a chain transfer agent. *See* Ex. 1019, 1:53–57 (“If methanol is used as the chain transfer agent, –CF_2H and –CF_2CH_2OH end groups will also be present.”).

Therefore, weighing the evidence before us on this point, one reference specifically mentions that methyl ester endgroups may form in "[t]he presence of methanol" when it is used as a "molecular weight modifier"—which is precisely how Kono appears to use methanol in Example 2 and Comparative Example 3. Ex. 1010, 5:35–39; Ex. 1008, 12:34–36, 13:7–10, 14:20–25. On the other hand, Dr. Iezzi lists endgroups that "can" form when methanol is used as a chain transfer agent, but does not definitively state such endgroups are the *only* ones that would be expected when using methanol in this manner. Ex. 1002 ¶ 57. Petitioner's evidence similarly mentions possible endgroups when methanol is used as a chain transfer agent, but does not foreclose the possibility of methyl ester endgroups forming. Ex. 1019, 1:53–55.

Thus, on balance, the record evidence that expressly discloses a connection between using methanol as a molecular weight modifier and the formation of methyl ester endgroups outweighs Petitioner's relied-upon evidence and Dr. Iezzi's silence on this key point. Ex. 1010, 5:35–39; Ex. 1002 ¶ 57; Ex. 1019, 1:53–55.

After considering the respective positions of Petitioner and Patent Owner,[10] and the record fully developed throughout this proceeding, we are not persuaded Petitioner has established by a preponderance of evidence that claims 1–7 of the '609 patent are anticipated by Kono's disclosure of Example 2 and Comparative Example 3. Specifically, Petitioner has not established that Kono's Example 2 and Comparative Example 3 "hav[e] no

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[10] Our anticipation analysis does not rely on Patent Owner's arguments regarding this ground as set forth in the Sur-Reply. Such arguments are objected to by Petitioner as being waived. Sur-Reply 14–17; Paper 48, 1–2; Paper 50, 4–7. Because we do not need to rely on Patent Owner's Sur-Reply arguments regarding this challenge, we need not address Petitioner's waiver argument.

more than about 50 unstable endgroups/10^6 carbon atoms" as required by each of the challenged claims. Ex. 1001, 10:21–22 (claim 1), 10:31–32 (dependent claim 6 requiring no more than about 20 unstable endgroups/10^6 carbon atoms).

In sum, because the evidence of record supports a conclusion that methyl ester endgroups would be expected to form when using methanol as a molecular weight modifier during FEP synthesis, and because Kono does not measure such methyl ester endgroups, Petitioner has not established by a preponderance of the evidence that Kono's Example 2 and Comparative Example 3 anticipate claims 1–7 of the '609 patent.

5. 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. 38–50 (Ground 3), 51 (Ground 4). 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).

a. Stabilization via Fluorination Over Wet-Heat Treatment

Petitioner relies on purported benefits of fluorination to provide the motivation to stabilize the endgroups in Example 2 and Comparative Examples 3 and 5 via fluorination instead of other stabilization methods such as the wet-heat treatment used in Comparative Example 5. Pet. 51. Specifically, Petitioner argues that fluorination results in "better electrical properties obtained by converting $–CF_2H$ endgroups to $–CF_3$ endgroups."

Id. (citing Ex. 1002 ¶ 201; Ex. 1027, 3:35–38). Petitioner also notes that fluorination "was commonly used to remove unstable endgroups." *Id*.

On the fully developed record, Petitioner has not established by a preponderance of the evidence that it would have been obvious for the skilled artisan to employ fluorination instead of wet-heat treatment. Petitioner's assertion that fluorination "was commonly used," without more, is insufficient to establish the obviousness of the proffered substitution of stabilization methods. *See KSR*, 550 U.S. at 418 (explaining "there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness") (quoting *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006)); *see also Belden Inc. v. Berk-Tek LLC*, 805 F.3d 1064, 1073 (Fed. Cir. 2015) ("[O]bviousness concerns whether a skilled artisan not only *could have made* but *would have been motivated to make* the combinations or modifications of prior art to arrive at the claimed invention.") (emphasis in original).

The articulated reasoning that Petitioner does provide to support the proffered substitution—i.e., the purported benefits of fluorination over wet-heat stabilization—falls short. Petitioner does not allege, much less provide evidence to persuasively establish, that any of Kono's Example 2 or Comparative Examples 3 and 5 individually have 50 or more terminal groups other than $–CF_3$, which appears to be the maximum number of such endgroups allowed to realize the purported beneficial electrical properties referred to by Petitioner. *See* Ex. 1027, 3:40–43 (explaining how "the polymer should have fewer than about 50 and preferably fewer than about 20 [end groups other than $–CF_3$] per million carbon atoms"). Kono does not measure endgroups in this manner, but rather focuses on three specific unstable endgroups. Ex. 1008, 12:57–59, 18:16–20. In the absence of such evidence, Petitioner has not established sufficiently that the skilled artisan would have had a reason to omit the wet-heat stabilization method employed in Kono's Comparative Example 5 and replace it with a fluorination process.

Furthermore, Petitioner has not established that the skilled artisan would have applied any stabilization process such as fluorination to Example 2 and Comparative Example 3, because Kono discloses that a certain limited number of unstable endgroups, i.e., "adhesion terminus" groups, are beneficial and desired. *See id.* at 5:1–33 (explaining how functional groups in the FEP "can be changed to contribute to increased adhesion with the core wire," and how the total number of –COF, –COOH, and –CH_2OH groups may be between 15 and 150). Kono discloses that the "adhesive strength" between the polymer and the core wire should be "0.8 kg or more." *Id.* at 3:16–17, 4:48–51. Kono's Example 2 has 58 –COF, –COOH, and –CH_2OH groups and exhibits an adhesion strength of 1.5 kg at an extrusion speed of 2800 ft/min and is described as being "superior." *Id.* at 15:50–57, Table 1. Comparative Example 3 has 50 such groups and exhibits a somewhat inferior adhesive strength of 1 kg at 2800 ft/min. *Id.* Here, we emphasize in particular how close the Comparative Example 3 FEP's adhesive strength is to the 0.8 kg minimum threshold taught by Kono. *Id.* at 3:16–17, 4:48–51. It is not clear on this record why the skilled artisan would have been motivated to potentially decrease the "superior" adhesion strength of the Example 2 FEP or the lower adhesive strength of the Comparative Example 3 FEP, by stabilizing the –COF, –COOH, and –CH_2OH groups that Kono teaches may "contribute to increased adhesion with the core wire." *Id.* at 5:1–33; *see also id.* at 2:10–15 (explaining how completely fluorinated FEP copolymers have inferior adhesion properties and suffer “severe shrink-back.”).

b. Modification of Comparative Example 5’s MFR

Petitioner acknowledges that Comparative Example 5 fails to meet the melt flow rate (“MFR”) limitation recited in claim 1. Pet. 43 (“Under the proper BRI construction, however, 35.1 g/10 min is outside the literal scope of ‘about 30±3 g/10 min’”). Petitioner asserts, however, that “the overlapping MFR range disclosed in Kono and the closeness of Comparative Example 5’s MFR to claim 1’s range supports a *prima facie* case of obviousness.” *Id.* at 43–44. For support, Petitioner points to Kono’s general disclosure of an MFR range of 30–45 g/10 min, and alleges the skilled artisan “would have been able to optimize the reagents and reaction conditions taught in Kono’s Comparative Example 5” to meet the recited range through routine experimentation. *Id.* (citing Ex. 1002 ¶¶ 175–176).

We disagree that it would have been obvious to decrease Comparative Example 5’s MFR of 35.1 g/10 min to fall within the scope of the recited range of “30±3 g/10 min.” Comparative Example 5’s MFR already falls within Kono’s preferred and “more prefer[red]” MFR ranges of “30 (g/10 min.) or more” and “30 to 45 (g/10 min.),” respectively. Ex. 1008, 6:12–13, 6:26–27. Moreover, Kono disparages MFRs below 30 g/10 min, which is encompassed by the claimed range of “30 ± 3,” because such MFR values may cause melt fracture to become severe, resulting in cone-breaks and spark-out. *Id.* at 6:21–25. Indeed, Comparative Example 5 has a higher MFR (35.1 g/10 min) than does Example 7 (34.5 g/10 min) and exhibited fewer “spark-outs” at all speeds measured vis-à-vis Example 7. *Id.* at 18:21–32. Thus, it is not clear on this record why the skilled artisan, based on the teachings of Kono, would have had a reason to decrease Comparative Example 5's MFR at all, much less to the recited range of 30±3 g/10 min.

Petitioner's reliance on Dr. Iezzi's opinion that it would have been obvious to decrease Comparative Example 5's MFR does not persuade us otherwise, because the evidence relied upon by Dr. Iezzi (Ex. 1032 ¶ 11) lacks sufficient specificity. Ex. 1002 ¶¶ 175–176. Namely, the relied-upon evidence generally refers to melt flow rates that are "too small" and "too large" without providing specific MFR values. *See* Ex. 1032 ¶ 11 (stating "[w]hen MFR is too small, the FEP copolymer has a high molecular weight so that some adjustment of the molding conditions such as increase of a melt temperature is necessary" and "[w]hen MFR is too large, the FEP copolymer has a low molecular weight so that decomposed materials of the copolymer may be formed."). The next paragraph in that evidence, however, provides relevant details on this point, stating "[f]rom these viewpoints, MFR (372°C, 5,000 g load) is from 10 to 35 g/min,[11] preferably from 15 to 30 g/10 min." *Id.* ¶ 12. Thus, the relied-upon evidence discloses that MFR values can be as high as 35 g/10 min, which is significantly close to Kono's Comparative Example 5's MFR of 35.1 g/10 min. *Id.*; Ex. 1008, 18:13. The evidence also appears to contradict Kono's teachings, in that the evidence prefers MFR values that Kono disparages. *Compare* Ex. 1032 ¶ 12 (preferring MFR values "from 15 to 30 g/10 min") *with* Ex. 1008, 6:21–25 ("If the MFR is less than 30 (g/10 min.), the extent of melt fracture becomes severe, cone-

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[11] This appears to be a typographical error in the MFR units as evidenced by other repeated recitations of "g/10 min" throughout the same evidence. Ex. 1032, code (57), ¶¶ 6, 12, 24, 48, 56, 59, 63, 67, 71.

breaks or spark-out due to melt fracture may be observed in some cases, and it tends to be difficult to increase the coating speed.”). Thus, we are not persuaded Petitioner has demonstrated sufficiently the skilled artisan would have been motivated to decrease the melt flow rate of Comparative Example 5 to be within the recited range of “30±3 g/10 min.”

6. 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 “[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.

Specifically, Petitioner asserts that Kaulbach’s Sample A11 is “[a] partially-crystalline copolymer” that “contains 87% by weight TFE and 13.0% by weight HFP” and “has an HFPI of 4.1.” *Id.* at 53–54. Petitioner asserts that Kaulbach’s copolymer is polymerized and isolated in the absence of added alkali metal salt, because Kaulbach’s preferred polymerization recipe is “an alkali metal salt-free recipe” and is otherwise “silent regarding use or presence of alkali metal salt in obtaining Sample A11.” *Id.* at 54.

Petitioner avers that although Sample A11 has a melt flow rate[12] of 24 g/10 min[13], it would have been obvious to modify Sample A11's melt flow rate to be within the claimed range of 30±3 g/10 min, because "Kaulbach teaches that the copolymers should have an MFR of 15 g/10 min or higher" and "does not provide an upper limit on the MFR range." Pet. 55. Thus, according to Petitioner, the claimed range "falls within Kaulbach's express range." *Id.* Petitioner asserts further that the skilled artisan "would have been motivated to modify Sample A11 to increase the MFR to meet Kaulbach's goal of providing 'a material . . . which can be processed at higher speeds'" because "[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. Petitioner relies on Kono—asserted separately in this proceeding—as evidence that coating extrusion speed can be increased by increasing the polymer's MFR, and that MFR values below 30 g/10 min are not preferred because "melt fracture

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[12] Kaulbach refers to a "melt flow index" or "MFI" value. Ex. 1009, 1:40–41, 3:43–44. Patent Owner appears to acknowledge that "melt flow index" and "melt flow rate" may be used interchangeably. *See, e.g.*, PO Resp. 28 (stating how Kaulbach "discloses a target MFI (or melt flow rate)[] of his polymer, and teaches the melt flow rate should remain unchanged"); *see also id*. at n.8 (assuming "that MFI and MFR are synonymous"). Thus, for purposes of this Final Decision, we treat the recited "melt flow rate" and Kaulbach's "melt flow index" as interchangeable phrases describing the same parameter.

[13] 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; PO Resp. 28 n.7; *see also* Ex. 1002 ¶ 109 (Dr. Iezzi testifying that reading Kaulbach's units as g/min literally "is nonsensical, and would be recognized as such by a POSA"). Under these circumstances, and for purposes of this Final Decision, we treat Kaulbach's disclosure of melt flow rate in units of "g/min" as "g/10 min."

(‘cone-breaks’) can become severe, coating flaws may be observed, and increasing coating speed is difficult.” *Id.* at 56 (citing Ex. 1008, 6:12–25). Finally, Petitioner points to Kaulbach’s disclosure that Sample A11 has “28 endgroups” selected from –COOH, $–CONH_2$ and –COF groups, and states “[g]iven Kaulbach’s polymerization and processing techniques and the reagents employed therein, no other unstable endgroups would be present in the copolymer of Sample A11.” *Id.* at 57, 57 n.13 (citing Ex. 1002 ¶ 220).

a. Melt Flow Rate

Patent Owner argues that Kaulbach does not disclose a melt flow rate above 24 g/10 min. PO Resp. 28–31. More particularly, Patent Owner argues (1) one of ordinary skill in the art would have understood Kaulbach’s disclosure of an MFR of 15 g/10 min or higher is “nothing more than a rule of thumb in the industry;” (2) the breadth of Kaulbach’s unbounded range renders the claimed MFR “of limited relevance;” and (3) Kaulbach’s disclosure does not tell one of ordinary skill in the art anything about melt flow rates that would actually work in Kaulbach’s invention. *Id*.

Kaulbach expressly discloses an example FEP having a melt flow rate of 24 g/10 min. Ex. 1009, 3:49–50. Importantly, Kaulbach also discloses that, to carry out “high speed wire extrusion the MFI of the polymer is ≥ 15.”[14] *Id.* at 3:42–43, 8:59–60. Other evidence of record indicates FEP copolymers having MFR values of up to 50 g/10 min when “coating at a

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[14] We note this disclosure of Kaulbach does not expressly recite the MFI, i.e., “MFR” units. Ex. 1009, 3:43–44. Because Patent Owner does not allege otherwise, but rather appears to concede Kaulbach’s units are “g/10 min” (Sur-Reply 2), we treat Kaulbach’s disclosure of “≥ 15” as a disclosure of “greater than or equal to 15 g/10 min” for purposes of this Final Written Decision.

high speed," with values of 30–45 g/10 min being preferred, because such MFR values enable coating speeds of 2800 ft/min or more. Ex. 1008, 6:12–28, 5:51–55; *see also id.* at 6:21–25 ("If the MFR is less than 30 (g/10 min.), the extent of melt fracture becomes severe, cone-breaks or spark-out due to melt fracture may be observed in some cases, and it tends to be difficult to increase the coating speed."); Ex. 1006, 2:17–25 (describing fluoropolymers with MFR values from 15–50 g/10 min as "special" because they are "capable of high speed extrusion, but [] also exhibit[] excellent physical properties, characterized by high flex life"); *id.* at 3:13–17 (explaining that an extrusion speed of up to 3000 ft/min "is achieved by the fluoropolymer preferably having a melt flow rate of about 15 g/10 min to 50 g/10 min").

The evidence of record establishes, and Patent Owner acknowledges (PO Resp. 24), that increasing MFR was a way to achieve higher coating speeds. Ex. 1002 ¶ 216 (Dr. Iezzi stating that "[i]t was well known and disclosed in the art as of the priority date of the '609 patent that the higher the MFR (or the lower the viscosity) of an FEP-copolymer, the higher the speeds at which the copolymer can be processed"); Ex. 1008, 2:51–53 ("In order to increase the speed of the coating extrusion, it is generally preferred to reduce the melt viscosity of the resin"); Ex. 2006 ¶¶ 31–32 (Dr. Mecham explaining how MFR "is inversely related to melt viscosity and molecular weight," that "the lower the melt viscosity and molecular weight of an FEP, the higher its MFR," and "the higher the MFR, the faster the polymer could be coated onto a wire"); *see also* Ex. 1038, 88:20–22 (Dr. Mecham stating that "[t]here's a general concept that if you have a higher MFR, you can process faster than if you have a lower MFR"). We also note Kaulbach's express desire for "[h]igh processing speeds . . . when wires and cables are extrusion coated." Ex. 1009, 1:29–30.

The evidence also establishes, however, that increasing MFR, i.e., lowering the melt viscosity, by too much may negatively impact coating quality by, e.g., decreasing the polymer's resistance to stress cracking. Ex. 1008, 2:53–54; Ex. 1006, 1:32–40 (explaining how "melt viscosity of the polymer is a factor that limits the line speed" at which the wire is coated because, "[a]s line speed is increased, a point is reached at which the appearance and quality of the coating begin to deteriorate" and manifests as "surface roughness, variation in coating thicknesses, such as lumps of polymer at intervals along the wire, and defects in the insulating quality of the coating, known as 'sparks'").

Thus, the evidentiary record supports the general proposition that increasing the melt flow rate of a FEP copolymer may yield a desired increase in the speed at which a wire can be coated. The evidence also supports that melt flow rates of up to 50 g/10 min are suitable for such high speed wire coating applications for speeds up to 3000 ft/min.

Turning back to Kaulbach's Sample A11 copolymer, we note it exhibited no "noticeable die drools and no cone-breaks" when coating a wire at line speeds of 1710 and 2006 feet per minute. Ex. 1009, 9:1–22. In another wire coating test, it "did not show noticeable die drool and exhibited only 2 cone-breaks during a period of 29 hours of extruding" various wire colors at a speed of 1700 ft/min. *Id.* at 9:34–47, 10:7–9. In view of Kaulbach's disclosure that MFR values of ≥ 15g/10 min are suitable for high speed wire extrusion, and record evidence establishing that higher coating speeds of 2800 or 3000 ft/min are possible, we are persuaded that the skilled artisan would have been motivated to improve upon the wire coating speeds observed with Kaulbach's Sample A11. We also are persuaded that the skilled artisan would have been motivated to increase the MFR of Kaulbach's Sample A11 to be within the recited range in order to achieve higher processing speeds, because the evidence of record teaches that achieving such speeds may be possible by increasing a FEP copolymer's MFR.

We disagree that Kaulbach discloses an "unbounded" range of MFR values in its disclosure of ≥ 15 g/10 min, thus encompassing "an infinite number of polymers, with melt flow rates of 50, 100, 1000, 10,000 and even higher," because assessing the true scope of a prior art reference requires viewing it through the eyes of the person of ordinary skill. PO Resp. 29 (citing Ex. 2006 ¶ 58); *see In re Rouffet*, 149 F.3d 1350, 1357 (Fed. Cir. 1998) ("Obviousness is determined from the vantage point of a hypothetical person having ordinary skill in the art to which the patent pertains.").

Record evidence on this point does not support that the skilled artisan would have viewed Kaulbach's MFR disclosure of ≥ 15 g/10 min in the manner argued by Patent Owner. PO Resp. 28–31. Rather, the evidence suggests the skilled artisan would have viewed Kaulbach's disclosure as imposing a practical maximum limit on a polymer's melt flow rate. *See* Ex. 1008, 2:51–54 ("In order to increase the speed of the coating extrusion, it is generally preferred to reduce the melt viscosity of the resin. On the other hand, *resistance to stress cracking of the resin decreases because of the lowered melt viscosity*" (emphasis added)); Ex. 1006, 3:21–27 (explaining how manufacturing "high melt flow rate fluoropolymers is not only a matter of reducing molecular weight," because the polymer's physical properties "are strongly dependent upon molecular weight," and, by extension, melt flow rate). In other words, the prior art teaches that the melt flow rate cannot be increased too much, because doing so would negatively impact the physical properties of the coating, such as its resistance to stress cracking.

Moreover, it appears from the evidence that the skilled artisan would have understood there is a "practical maximum" to the melt flow rate parameter, because at some point it becomes too high to effectively coat a wire. Ex. 2006 ¶ 58 (Dr. Mecham stating the skilled artisan "would understand that there is a practical maximum to the MFR of Kaulbach's polymer" because "[a]t some MFR, Kaulbach's FEP would have too low of a melt viscosity, such that it could not be processed at any speed, much less at high speeds"); Ex. 1038, 136:6–11 (Dr. Mecham testifying that "Kaulbach's open-ended MFR range would include all kinds of polymers that had MFRs higher than what he discloses as 24, and anyone who is skilled in the art would understand that there's a maximum to that"); PO Resp. 29.

We are persuaded that the skilled artisan would have been motivated to increase the melt flow rate (MFR) of Kaulbach's Sample A11 FEP from 24 g/10 min[15] to be within the recited range of "about 30±3 g/10 min" in order to achieve higher wire-coating speeds, as asserted in the Petition. Pet. 55–56. The evidence of record establishes the skilled artisan would not have understood Kaulbach's MFR range of ≥15 g/10 min to be

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[15] Dr. Iezzi addresses an apparent typographical error in Kaulbach's MFR units, stating "an MFR value of 24 g/min would convert to a value of 240 g/10 min, which is nonsensical, and which would be recognized as such by a POSA." Ex. 1002 ¶ 109.

"unbounded," but rather would have viewed such disclosure to be a "closed" MFR range, with 15 g/10 min being the minimum value, and the "practical maximum" value depending on the fluoropolymer's overall composition and processing parameters.[16]

b. Molecular Weight Distribution

Patent Owner also argues that that the skilled artisan would not have been motivated to increase Sample A11's melt flow rate to be within the claimed range, because doing so would broaden its molecular weight distribution ("MWD") against Kaulbach's teachings. PO Resp. 3, 23–27, 29, 31–34; Sur-Reply 2, 3, 9–14. Patent Owner argues, particularly, that Kaulbach's invention is a FEP with a "very narrow molecular-weight distribution." PO Resp. 26–27 (citing Ex. 1009, 3:34–35, 3:59–65). Thus, Patent Owner argues, Kaulbach teaches against common practices that were known to broaden the molecular weight distribution of a polymer, such as using chain transfer agents during polymerization, and against using high fluorination temperatures. *Id.* at 27.

In our review of the evidence, Kaulbach is vague regarding how "narrow molecular weight distribution" is defined. Although Kaulbach discloses "a *very narrow* molecular-weight distribution, i.e., a ratio of Mw to Mn of less than about 2 (Mw=weight average, Mn=number average

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[16] Dr. Mecham testifies that the maximum MFR value in a given process which "yield[s] an adequate coating" depends on a number of parameters such as the polymer's monomer composition and molecular weight distribution, and the processing conditions such as temperature and pressure. Ex. 1038, 83:7–84:10. Dr. Iezzi testifies that while Kaulbach does not disclose the maximum MFR, "[t]here would be some upper limit . . . that could be 100, could be 150, could be high, well above" the 24 g/10 min provided for Sample A11. Ex. 2010, 77:7–20.

molecular weight)" which "may be as low as 1.5," Kaulbach does not then precisely define what is considered "narrow" or "broad" distributions along the molecular weight distribution spectrum. Ex. 1009, 3:35–38 (emphasis added). The measured MWD value for Sample A11 was 1.6, which seemingly falls within Kaulbach's "very narrow" MWD range of 1.5 to less than about 2. *Id.* at 8:62–63. Because Kaulbach does not specifically set forth numerical limits on the Mw/Mn ratios that constitute "narrow" and "broad" molecular weight distributions, it is plausible that the skilled artisan may have been able to slightly increase Sample A11's MFR of 24 g/10 min to be within the claimed range, and still end up with a "narrow" MWD polymer as suggested by Kaulbach, even if that meant slightly "broadening" Sample A11's MWD.

In any event, the skilled artisan would not have been constrained to follow only Kaulbach's teachings regarding a "narrow" molecular weight distribution from the entire universe of available prior art when considering how to increase the coating speed of Kaulbach's Sample A11. Rather, the person of ordinary skill would have considered *all* the available knowledge at his or her disposal regarding how to accomplish a higher coating speed, including increasing Sample A11's MFR. Record evidence supports the proposition that broad molecular weight distribution polymers have certain benefits, such as high strength. *See* Ex. 1038, 92:19–93:2 (Dr. Mecham testifying "if you have a broader molecular-weight distribution, you have a higher composition of – or a higher fraction of high-molecular weight materials, that's going to strengthen the material more than if you had a narrow distribution where you didn't have that high fraction"); *id.* at 171:5–12 (Dr. Mecham testifying that increasing MFR without broadening the molecular weight is problematic and may lead to a polymer with poor strength and poor processing conditions); *see also* PO Resp. 25 ("Broadening the molecular weight distribution of an FEP allows one to create a polymer with enough low molecular weight chains to keep the melt viscosity low, but also enough high molecular weight chains to *boost the mechanical properties, stability, and insulation quality of the final coating*." (citing Ex. 2013, 2:60–3:2; Ex. 2012, 44, 63) (emphasis added)).

Furthermore, Patent Owner admits that maintaining a narrow molecular weight distribution in the copolymer magnifies "[t]he drawbacks and challenges of increasing melt flow rate" because "the polymer chains have a narrower range of length and molecular weight." PO Resp. 32. Thus, according to Patent Owner, "to increase Kaulbach's melt flow rate to within the claimed range *but retain its narrow distribution*, one would have to decrease the molecular weight of all of the polymer chains," which "would magnify the problems of high melt flow rate products (e.g., decreased mechanical and physical properties) and likely result in an unusable coating." *Id.* at 32–33 (emphasis added); *see also* Ex. 1038, 136:13–15 (Dr. Mecham testifying that increasing Kaulbach's MFR "any higher than [] 24 [g/10 min] is risky *with that narrow molecular weight distribution*." (emphasis added)). Due to the potential problems associated with keeping the molecular weight distribution narrow, then, it is not clear on this fully developed record why the skilled artisan would have been motivated to maintain such a narrow molecular weight distribution when seeking to achieve even higher coating speeds with Kaulbach's Sample A11.

On this point, Kaulbach states that "a narrow molecular weight distribution performs better" at achieving high processing rates than polymers with “broad” molecular weight distributions. Ex. 1009, 3:59–65. This portion of Kaulbach’s disclosure, however, lacks specificity regarding what is deemed “narrow” and “broad.” Furthermore, this general statement does not seem to apply to the specific Sample A11 copolymer which achieved processing speeds of 1710, 2006, and 1700 feet per minute (Ex. 1009, 9:1–47 (Tables 3 and 4)), speeds that are significantly lower than those achieved by Kono’s process, which Patent Owner and Dr. Mecham admit uses a “broad” molecular weight distribution. PO Resp. 33; Ex. 2006 ¶ 65. Thus, even though Kaulbach generically touts that “high processing rates can be achieved” “[d]espite a narrow molecular weight distribution” (Ex. 1009, 3:59–60), this purported discovery would not have prevented the skilled artisan, at the time of the invention of the ’609 patent, from considering other techniques—such as broadening the polymer’s molecular weight distribution—to achieve higher coating speeds with Sample A11. Based on the evidence presented, we are persuaded that one such technique would have included increasing Sample A11’s MFR from 24 g/10 min to the recited range of “about 30±3 g/10 min,” even if doing so would have required broadening the molecular weight distribution of the polymer beyond the “narrow molecular weight distribution” suggested, but not required or precisely defined, by Kaulbach.

The preponderance of the evidence supports Petitioner’s assertion that Kaulbach’s Sample A11 polymer meets all of the limitations of claims 1–7, except for the express melt flow rate limitation of “about 30±3 g/10 min.” Ex. 1002 ¶¶ 203–240; Ex. 1009, 7:8–48, 8:57–9:47. For the reasons expressed above, however, Petitioner has persuaded us that the skilled artisan would have been motivated to increase the melt flow rate of

Kaulbach's Sample A11 from 24 g/10 min to be within the range of "about 30±3 g/10 min" as recited in claims 1–7 in order to achieve higher wire coating speeds than those observed for Sample A11. In sum, we are persuaded by Petitioner's arguments, evidence, and claim chart supporting its challenge that Kaulbach renders claims 1–7 of the '609 patent obvious. Pet. 52–62.

7. Objective Indicia of Non-Obviousness

Before we make a final obviousness determination, we must consider the evidence of obviousness in light of any evidence of secondary considerations of nonobviousness presented by Patent Owner. *See Graham*, 383 U.S. at 17–18 ("Such secondary considerations as commercial success, long felt but unsolved needs, failure of others, etc., might be utilized to give light to the circumstances surrounding the origin of the subject matter sought to be patented. As indicia of obviousness or nonobviousness, these inquiries may have relevancy."); *Transocean Offshore Deepwater Drilling, Inc. v. Maersk Drilling USA, Inc.*, 699 F.3d 1340, 1349 (Fed. Cir. 2012) ("This objective evidence must be 'considered as part of all the evidence, not just when the decisionmaker remains in doubt after reviewing the art.'" (quoting *Stratoflex, Inc. v. Aeroquip Corp.*, 713 F.2d 1530, 1538–39 (Fed. Cir. 1983))).

All types of objective evidence of nonobviousness must be shown to have a nexus to the claimed invention. *In re GPAC Inc.*, 57 F.3d 1573, 1580 (Fed. Cir. 1995) (nexus generally); *In re Huang*, 100 F.3d 135, 140 (Fed. Cir. 1996) (commercial success). The stronger the showing of nexus, the greater the weight accorded the objective evidence of nonobviousness. *See*

Ashland Oil, Inc. v. Delta Resins & Refractories, Inc., 776 F.2d 281, 306 (Fed. Cir. 1985), *cert. denied*, 475 U.S. 1017 (1986).

Patent Owner presents arguments directed to objective indicia of non-obviousness. PO Resp. 36–40. These objective indicia include an allegation regarding the claimed subject matter's unexpected results, its commercial success, long-felt but unmet need, and industry praise. *Id.*

a. Unexpected Results

To be particularly probative, evidence of unexpected results must establish that there is a difference between the results obtained and those of the closest prior art, and that the difference would not have been expected by one of ordinary skill in the art at the time of the invention. *Kao Corp. v. Unilever U.S., Inc.*, 441 F.3d 963, 970 (Fed. Cir. 2006). Patent Owner alleges that the combination of alkali metal salt concentration, melt flow rate, and number of unstable endgroups recited in claims 1–7 "unexpectedly results in a superior wire coating" that is "capable of high speed extrusion at lower extrusion temperatures, produces high quality coating over a broad polymer melt temperature range, and enjoys long extrusion runs without the need to shut down the extruder for cleaning." PO Resp. 36–37 (citing Ex. 1001, 1:60–67, 3:50–56). Patent Owner asserts the recited alkali metal salts and maximum stable endgroups prevent "degradation at severe operating conditions." *Id.* at 37 (citing Ex. 1001, 7:10–20, 6:44–51). Patent Owner also avers "the claimed FEP unexpectedly exhibits superior electrical properties as compared to prior art FEPs." *Id.* (citing Ex. 1001, 8:27–64).

We find no persuasive merit in Patent Owner's assertion of unexpected superior results. "[W]hen unexpected results are used as evidence of non-obviousness, the results must be shown to be unexpected compared with the closest prior art." *In re Baxter Travenol Labs.*, 952 F.2d 388, 392 (Fed. Cir. 1991). "It is well settled that unexpected results must be established by factual evidence. Mere argument or *conclusory statements in the specification does not suffice*." *In re De Blauwe*, 736 F.2d 699, 705 (Fed. Cir. 1984) (emphasis added). Patent Owner relies merely on general statements within the patent itself, rather than any data that compares the claimed invention to the closest prior art. Patent Owner's general statement that "the claimed FEP unexpectedly exhibits superior electrical properties as compared to prior art FEPs" fails to quantify the superior electrical properties of the claimed FEP, fails to identify the prior art FEPs or delineate their electrical properties, and fails to compare the two to provide the factual evidence required by case law.

b. Commercial Success

"When a patentee can demonstrate commercial success, usually shown by significant sales in a relevant market, and that the successful product is the invention disclosed and claimed in the patent, it is presumed that the commercial success is due to the patented invention." *J.T. Eaton & Co. v. Atl. Paste & Glue Co.*, 106 F.3d 1563, 1571 (Fed. Cir. 1997); *WBIP, LLC v. Kohler Co.*, 829 F.3d 1317, 1329 (Fed. Cir. 2016). "Demonstrating that an invention has commercial value, that it is commercially successful, weighs in favor of its non-obviousness." *WBIP*, 829 F.3d at 1337.

Patent Owner alleges that the FEP 9494 polymer, which Patent Owner asserts is encompassed by claims 1–7, is a commercial success because "FEP 9494 sales grew substantially after its introduction to the industry in 2005, and the revenue from sales of FEP 9494 since that time demonstrates the commercial success of the product." PO Resp. 37 (citing

Ex. 2007 ¶¶ 10, 30–34). Patent Owner states that "gross profit margins from FEP 9494 demonstrate that FEP 9494 is highly profitable, which is further indicative of its commercial success." *Id.* at 37–38 (citing Ex. 2007 ¶¶ 12, 35–37). Patent Owner also asserts that FEP 9494 "exceeded expectations in the marketplace and outperformed other fluoropolymer products," further evincing commercial success. *Id.* at 38 (citing Ex. 2007 ¶¶ 13, 38–41).

We begin with the required nexus inquiry. *See Ashland Oil*, 776 F.2d at 305 n.42 ("Case law requires that a nexus be established between the merits of the claimed invention and the evidence proffered on secondary considerations, if the evidence on secondary considerations is to be given substantial weight in the calculus of obviousness/nonobviousness."). The presumption of nexus between the proffered evidence and the merits of the claimed invention (*see J.T. Eaton*, 106 F.3d at 1571) is rebuttable, as "a patent challenger may respond by presenting evidence that shows the proffered objective evidence was 'due to extraneous factors other than the patented invention.'" *WBIP*, 829 F.3d at 1329 (quoting *Demaco Corp. v. F. Von Langsdorff Licensing Ltd.*, 851 F.2d 1387, 1393 (Fed. Cir. 1988)). Such evidence may include, for example, demonstrating the commercial success "is due to an unclaimed feature," or if such feature "was known in the prior art." *Ormco Corp. v. Align Tech., Inc.*, 463 F.3d 1299, 1312 (Fed. Cir. 2006); *see also Richdel, Inc. v. Sunspool Corp.*, 714 F.2d 1573, 1580 (Fed. Cir. 1983) (holding the claims obvious despite a purported showing of commercial success when the patentee failed to show the "commercial success [] its marketed system enjoyed was due to anything disclosed in the patent in suit which was not readily available in the prior art").

Here, we determine that insufficient nexus exists between FEP 9494 and the limitations of challenged claims 1–7, because the claimed features were already disclosed in the prior art. Specifically, as set forth *supra* in our discussion regarding Kaulbach, Sample A11 satisfies all of the recited elements except for the melt flow rate limitation of "about 30±3 g/10 min." Ex. 1009, 8:57–65. Kaulbach discloses melt flow rates of greater than or equal to 15 g/10 min being used for high speed wire extrusion, which encompasses the claimed range. Ex. 1009, 3:42–43. Other evidence of record discloses FEP copolymers having MFR values of up to 50 g/10 min when "coating at a high speed," with values of 30–45 g/10 min being preferred because such MFR values enable coating speeds of 2800 ft/min or more. Ex. 1008, 6:12–28, 5:51–55; *see also id.* at 6:21–25 ("If the MFR is less than 30 (g/10 min), the extent of melt fracture becomes severe, cone-breaks or spark-out due to melt fracture may be observed in some cases, and it tends to be difficult to increase the coating speed."); Ex. 1006, 2:17–25 (describing fluoropolymers with MFR values from 15–50 g/10 min as "special" because they are "capable of high speed extrusion, but [] also exhibit[] excellent physical properties, characterized by high flex life"); *id.* at 3:13–17 (explaining that an extrusion speed of up to 3000 ft/min "is achieved by the fluoropolymer preferably having a melt flow rate of about 15 g/10 min to 50 g/10 min"). In view of such express disclosure in the prior art, the claimed features were indeed known. Under such circumstances, we find an insufficient nexus between the proffered evidence and the merits of the claimed invention.

Moreover, even assuming there is sufficient nexus, we still find Patent Owner's evidence insufficient to establish commercial success. Specifically, Patent Owner does not provide sufficient evidence regarding FEP 9494's market share. First, Patent Owner does not make clear what it believes the relevant market to be, nor the size or volume of the relevant market. Instead, Patent Owner presents gross sales figures for FEP 9494, but such gross sales figures, particularly in the absence of a defined market, are inadequate to establish commercial success. *See Ex parte Jellá*, 90 USPQ 1009, 1012 (BPAI 2008) (precedential) ("[G]ross sales figures do not show commercial success absent evidence as to market share . . . or as to the time period during which the product was sold, or as to what sales would normally be expected in the market").

Even further, a proper commercial success analysis requires according the appropriate weight to any such evidence. When, as here, the patent itself may have precluded others from entering the relevant market, sales figures are weak evidence of commercial success. *See Merck & Co., Inc. v. Teva Pharm. USA, Inc.*, 395 F.3d 1364, 1376–77 (Fed. Cir. 2005) (explaining how financial success of a given product "is not significantly probative" of non-obviousness when "others were legally barred from commercially testing" them, and how "[b]ecause market entry by others was precluded on" the bases of patent protection and FDA exclusivity, "the inference of non-obviousness . . . from evidence of commercial success, is weak").

Patent Owner relies in part on various sales figures from 2005 through 2018 for FEP 9494. Ex. 2007 ¶¶ 10, 30–34. Patent Owner states that FEP 9494 is covered by the claims of the '609 patent, which issued on October 17, 2006, from an application filed on June 21, 2004, and claiming priority to a provisional filed on May 14, 2003. PO Resp. 37; Ex. 1001, codes (22), (45), (60). Thus, the existence of the '609 patent, covering the

FEP 9494 product, would have precluded others from freely entering the market. *See Galderma Labs., L.P. v. Tolmar, Inc.*, 737 F.3d 731, 740 (Fed. Cir. 2013) (quoting *Merck & Co.*, 395 F.3d at 1377) ("Where 'market entry by others was precluded [due to blocking patents], the inference of non-obviousness of [the asserted claims], from evidence of commercial success, is weak.'"). Because FEP 9494 was covered by at least one patent from 2006–2011, and by at least two patents (US Patents 7,122,609 B2 and 8,076,431 B2) from 2011–2018, Patent Owner's proffered sales data is weak, and the alleged commercial success of FEP 9494 is mitigated by the existence of blocking patents, because those patents would have precluded others from entering the relevant market.

In sum, after considering the fully developed record evidence, we are not persuaded that Patent Owner's arguments and evidence regarding the FEP 9494 polymer's commercial success outweigh the obviousness of claims 1–7 of the '609 patent.

c. Long-Felt Need

As discussed above, we find an insufficient nexus between the proffered evidence and the merits of the claimed invention. Accordingly, even if Patent Owner presented persuasive evidence of long-felt need, the required nexus would still be lacking. Nevertheless, we discuss Patent Owner's evidence relating to long-felt need.

Evidence of a long felt but unsolved need that is met by the claimed invention is further evidence of non-obviousness. *Millennium Pharm., Inc. v. Sandoz Inc.*, 862 F.3d 1356, 1369 (Fed. Cir. 2017). Establishing long-felt need first requires objective evidence that a recognized problem existed in the art for a long period without solution. *See Orthopedic Equip. Co., Inc. v.*

All Orthopedic Appliances, Inc., 707 F.2d 1376 (Fed. Cir. 1983); *In re Gershon*, 372 F.2d 535, 539 (CCPA 1967). Second, another must not have satisfied the long-felt need before the invention of the challenged patent. *Newell Cos. v. Kenney Mfg. Co.*, 864 F.2d 757, 768 (Fed. Cir. 1988). Third, the invention of the challenged patent must satisfy the long-felt need. *In re Cavanagh*, 436 F.2d 491, 496 (CCPA 1971); *see also Perfect Web Techs., Inc. v. InfoUSA, Inc.*, 587 F.3d 1324, 1332–33 (Fed. Cir. 2009) (articulating all three factors).

Patent Owner asserts the FEP 9494 "filled a long-felt need in the industry and received tremendous industry praise," because it "significantly reduced plate out, could be extruded at high speeds with fewer faults, and processed consistently from start to finish of the extrusion process and from lot to lot." PO Resp. 38 (citing Ex. 2008 ¶¶ 3, 4, 7, 10, 11).

We cannot determine, from Patent Owner's presentation of the evidence, whether the recognized problem existed in the art for a long period without solution. Patent Owner makes general statements about the problems of the then-existing FEPs on the market. PO Resp. 38. These statements, however, do not persuasively establish the length of time the recognized problem existed. Patent Owner's evidence also does not establish the exact nature of the "recognized problem" solved by FEP 9494. Although the competitor's products referred to by Patent Owner allegedly had problems that "often resulted in unusable wire," it appears from the logical converse that those products would have sometimes resulted in usable wire. *Id.* Accordingly, although Patent Owner's FEP 9494 may have been a better product, it is not clear that it solved a recognized problem that existed without solution.

In a similar vein, because Patent Owner admits "a number of FEPs for use in plenum-rated cables were on the market at the time," (PO Resp. 38) it is unclear that Patent Owner establishes that "another must not have satisfied the long-felt need before the invention of the challenged patent." *Newell*, 864 F.2d at 768. Patent Owner asserts that FEP 9494 possessed properties superior to those of the existing products on the market, but this assertion does not answer the question of whether the long-felt need was not satisfied by the existing products. Again, Patent Owner's evidence does not establish that the existing FEPs could not be extruded at high speeds while still producing a high quality wire coating.

d. Industry Praise

As discussed above, we find an insufficient nexus between the proffered evidence and the merits of the claimed invention. Accordingly, even if Patent Owner presented persuasive evidence of industry praise, the required nexus would still be lacking. Nevertheless, we discuss Patent Owner's evidence relating to industry praise.

Industry praise for an invention may provide evidence of non-obviousness where the industry praise is linked to the claimed invention. *See Geo. M. Martin Co. v. Alliance Mach. Sys. Int'l LLC*, 618 F.3d 1294, 1305 (Fed. Cir. 2010); *Asyst Techs. Inc., v. Emtrak, Inc.*, 544 F.3d 1310, 1316 (Fed. Cir. 2008).

Patent Owner points to one customer's enthusiasm for FEP 9494 and that customer's 18-month exclusivity agreement, assertedly because FEP 9494 was perceived by that customer to be "the best product on the market because of its superior processing and coating properties." PO Resp. 39 (citing Ex. 2008 ¶ 11). Petitioner disagrees with Patent Owner's characterization of the customer enthusiasm for the FEP 9494 product. *See generally* Reply 25–26.

On this record, Patent Owner's evidence of industry praise is entitled to minimal weight. Although there is some evidence describing the enthusiasm of one customer for FEP 9494, this sole customer's enthusiasm is not shown to be reflective of the industry's opinion as a whole, and thus, we agree with Petitioner that much of Patent Owner's evidence is of little probative value.

III. MOTION TO EXCLUDE

Petitioner moves to exclude (1) Exhibit 2040 (a Chemours brochure) as untimely non-testimonial evidence; (2) Section IV(c) of Patent Owner's Sur-Reply as waived because the arguments therein were omitted from the Response; and (3) Section III of Patent Owner's Sur-Reply as waived because the arguments therein were not addressed in the Response. Paper 48, 1–5. Patent Owner filed a Response. Paper 49. Petitioner filed a Reply. Paper 51.

Regarding the exhibit and portions of the Sur-Reply sought to be excluded, we do not affirmatively rely upon Exhibit 2040 in our present determination, nor do we need to rely on the identified Patent Owner arguments in Section IV(c) or Section III of its Sur-Reply. Therefore, we need not decide Patent Owner's Motion to Exclude, and we dismiss the motion and request as moot.

We note that Petitioner styles its motion as a "Motion to Exclude and Strike." Paper 48, 1. Petitioner notes: "To preserve their objections and arguments, Petitioners hereby move to strike and exclude the improper evidence and argument." *Id.* at 1 n.1. We have addressed the portion of

Petitioner's combined motion directed to excluding evidence and portions of papers before us, and have determined to dismiss Petitioner's motion as moot. Accordingly, we need not reach the portion of Petitioner's combined motion directed to striking the same, even if such a portion of the motion were properly presented.

Accordingly, the Motion to Exclude is *dismissed.*

IV. MOTIONS TO SEAL

Patent Owner and Petitioner each filed three separate Motions to Seal portions of certain papers and exhibits. Papers 16, 38, 43 (Patent Owner); Papers 24, 36, 54 (Petitioner).

In its first Motion to Seal, Patent Owner seeks to seal the confidential versions of Exhibits 2007, 2009, 2021, 2022, 2029–2032, 2034, and 2036, namely, the Declarations of John Hansen and Gregory Chapman, and documents containing financial and other proprietary information relied upon by Patent Owner in making its secondary considerations case. Paper 16, 1–4. Patent Owner represents that the parties agreed to a modified version of the Board's Default Protective Order, and submits a Proposed Protective Order as Appendix A. *Id.* at 5. In its second Motion to Seal, Patent Owner seeks to seal its Patent Owner Response to Petitioner's Motion for Routine and Additional Discovery (Paper 30). Paper 38, 1. Patent Owner submitted both a public and a confidential version of this document. Papers 30, 39. In its third Motion to Seal, Patent Owner seeks to seal Exhibit 2039. Paper 43, 1. Patent Owner represents that good cause exists because this document references Exhibits 2036 and 1040, also sought to be placed under seal. *Id.* at 2.

In its first Motion to Seal, Petitioner seeks to seal Petitioners' Motion for Routine and Additional Discovery from Patent Owner (Paper 25). Paper 24, 1. Petitioner submits that good cause exists to seal this paper to the extent it references or incorporates information from Exhibits 2021, 2029, and 2032. *Id.* at 1–2. In its second Motion to Seal, Petitioner seeks to seal Petitioner's Reply (Paper 35), and Exhibits 1040, 1041, and 1043. Paper 36, 1. Petitioner represents that the Reply and other exhibits sought to be sealed reference information that Patent Owner has designated as confidential. *Id.* at 2. Petitioner submitted both a public and a confidential version of its Reply. Papers 34, 35. In its third Motion to Seal, Petitioner seeks to seal Petitioner's demonstrative exhibits, filed as Exhibit 1062. Paper 54. Regarding Petitioner's third Motion to Seal, the Board, pursuant to a call with the parties, expunged the version of the demonstrative exhibits containing confidential information, and required Petitioner to file a version of the demonstrative exhibits that contained no confidential information. Ex. 1063, 21:20–24, 26:14–17. Petitioner filed such a version of its demonstrative exhibits (also designated Exhibit 1062) and, thus, Petitioner's third Motion to Seal is dismissed as moot.

"There is a strong public policy for making all information filed in a quasi-judicial administrative proceeding open to the public, especially in an *inter partes* review which determines the patentability of claims in an issued patent and therefore affects the rights of the public." *Garmin Int'l v. Cuozzo Speed Techs., LLC,* IPR2012–00001, Paper 34 at 1–2 (PTAB Mar. 14, 2013). For this reason, except as otherwise ordered, the record of an *inter partes* review trial shall be made available to the public. *See* 35 U.S.C. § 316(a)(1); 37 C.F.R. § 42.14. The standard for granting a motion to seal is good cause. 37 C.F.R. § 42.54. That standard includes showing that the information addressed in the motion to seal is truly confidential, and that such confidentiality outweighs the strong public interest in having the record open to the public. *See Garmin*, Paper 34 at 2–3.

After having considered the arguments, we determine that the parties establish good cause for sealing the documents identified in the respective Motions. Specifically, the parties demonstrate that the information they seek to seal consists of exhibits and testimony dealing with confidential financial information and proprietary information regarding products germane to this proceeding, and papers that rely on the exhibits and testimony sought to be sealed. *See, e.g.*, Paper 16, 2–4; Paper 24, 1–2; Paper 36, 1–4; Paper 38, 2; Paper 43, 2. Accordingly, the Motions (Papers 16, 24, 36, 38, and 43) are *granted* and the Proposed Protective Order (Paper 16, Appendix A) is *entered*. As discussed above, however, Petitioner's third Motion to Seal (Paper 54) is *dismissed* as moot.

There is an expectation that information will be made public where the information is identified in a final written decision, and that confidential information that is subject to a protective order ordinarily would become public 45 days after final judgment in a trial, unless a motion to expunge is granted. 37 C.F.R. § 42.56; Office Patent Trial Practice Guide, 77 Fed. Reg. 48,756, 48,761 (Aug. 14, 2012). A party who is dissatisfied with the Final Decision may appeal the Decision pursuant to 35 U.S.C. § 141(c), and has 63 days after the date of the Decision to file a notice of appeal. 37 C.F.R. § 90.3(a). Thus, it remains necessary to maintain the record, as is, until resolution of an appeal, if any. In view of the foregoing, the confidential documents filed in the instant proceeding will remain under seal, at least until the time period for filing a notice of appeal has expired or, if an appeal is taken, the appeal process has concluded. The record for the instant proceeding will be preserved in its entirety, and the confidential documents will not be expunged or made public, pending appeal. Notwithstanding 37 C.F.R. § 42.56 and the Office Patent Trial Practice Guide, neither a motion to expunge confidential documents nor a motion to maintain these documents under seal is necessary or authorized at this time. *See* 37 C.F.R. § 42.5(b).

V. CONCLUSION[17]

We conclude that Petitioner has satisfied its burden of demonstrating, by a preponderance of the evidence, that the subject matter of claims 1–7 of the ’609 patent are unpatentable.

VI. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that Petitioner establishes, by a preponderance of the evidence, that claims 1–7 of U.S. Patent No. 7,122,609 B2 are unpatentable;

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[17] Should Patent Owner wish to pursue amendment of the challenged claims in a reissue or reexamination proceeding subsequent to the issuance of this decision, we draw Patent Owner’s attention to the April 2019 *Notice Regarding Options for Amendments by Patent Owner Through Reissue or Reexamination During a Pending AIA Trial Proceeding.* *See* 84 Fed. Reg. 16,654 (Apr. 22, 2019). If Patent Owner chooses to file a reissue application or a request for reexamination of the challenged patent, we remind Patent Owner of its continuing obligation to notify the Board of any such related matters in updated mandatory notices. *See* 37 C.F.R. § 42.8(a)(3), (b)(2).

FURTHER ORDERED that Petitioner's Motion to Exclude is *dismissed*;

FURTHER ORDERED that the parties' Motions to Seal (Papers 16, 24, 36, 38, and 43) are *granted* and the Proposed Protective Order (Paper 16, Appendix A) *entered,* but that Petitioner's third Motion to Seal (Paper 54) is *dismissed* as moot; and

FURTHER ORDERED that this is a Final Written Decision; therefore, parties to the proceeding seeking judicial review of the decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

In summary:

Claims	**35 U.S.C. §**	**Reference(s)/ Basis**	**Claims Shown Unpatentable**	**Claims Not Shown Unpatentable**
1–7	102(a)	Hiraga		1–7
1–7	103(a)	Hiraga, Kaulbach		1–7
1–7	102(e)(2)	Kono		1–7
1–7	103(a)	Kono		1–7
1–7	103(a)	Kaulbach	1–7	
Overall Outcome			1–7	

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