

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ASCEND PERFORMANCE MATERIALS OPERATIONS LLC,
Petitioner,

v.

SAMSUNG SDI CO., LTD.,
Patent Owner.

IPR2020-00349
Patent 9,819,057 B2

Before CHRISTOPHER L. CRUMBLEY, JO-ANNE M. KOKOSKI, and
SHELDON M. McGEE, *Administrative Patent Judges*.

CRUMBLEY, *Administrative Patent Judge*.

JUDGMENT

Final Written Decision

Determining All Challenged Claims Unpatentable
Denying-in-Part Petitioner's Motion to Exclude
Granting-in-Part Patent Owner's Motion to Exclude
35 U.S.C. § 318(a); 37 C.F.R. § 42.64(c)

I. INTRODUCTION

In this *inter partes* review, instituted pursuant to 35 U.S.C. § 314, Ascend Performance Materials Operations LLC (“APM”) challenges the patentability of claims 1–5 and 13–17 of U.S. Patent No. 9,819,057 B2 (Ex. 1001, “the ’057 patent”), owned by Samsung SDI Co., Ltd. (“Samsung”).

We have jurisdiction under 35 U.S.C. § 6. This Final Written Decision, issued pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73, addresses issues and arguments raised during trial. For the reasons discussed below, we determine that APM has shown by a preponderance of the evidence that claims 1–5 and 13–17 of the ’057 patent are unpatentable.

A. Procedural History

On December 23, 2019, APM petitioned for an *inter partes* review of claims 1–5 and 13–17 of the ’057 patent, and one day later filed a Corrected Petition.¹ Paper 3 (“Pet.”). Samsung filed a Preliminary Response. Paper 6. On July 16, 2020, we instituted an *inter partes* review of the challenged claims. Paper 13 (“Institution Decision” or “Inst. Dec.”). Following institution, Samsung filed a Patent Owner Response (Paper 18, “PO Resp.”), APM filed a Reply (Paper 30, “Pet. Reply”), and Samsung filed a Sur-Reply (Paper 35, “PO Sur-Reply”).

APM relied upon the declaration testimony of Dr. Brett Lucht (Ex. 1002) to support the Petition. APM submitted an additional declaration of from Dr. Lucht with its Reply (Ex. 1037). Samsung took cross-

¹ The Corrected Petition appears to be identical to the originally-filed Petition, except for non-substantive corrections to the Table of Authorities.

examination of Dr. Lucht via deposition and submitted the transcript. Ex. 2049.

Samsung submitted the declaration testimony of three witnesses along with its Preliminary Response: Dr. Menahem Anderman (Ex. 2003), Dr. Seung Bum Suh (Ex. 2004), and Dr. Dai-In Park (Ex. 2005). With its Patent Owner's Response, Samsung submitted supplemental declarations from each of these three witnesses. Ex. 2021 (Anderman); Ex. 2022 (Suh); Ex. 2023 (Park). APM took cross-examination of all three witnesses via deposition and submitted the transcripts. Ex. 1041 (Anderman); Ex. 1042 (Suh); Ex. 1043 (Park).

APM filed a Motion to Exclude, seeking to exclude from the record the declaration testimony of Dr. Anderman and Dr. Suh, as well as various exhibits submitted with Samsung's Sur-Reply. Paper 38, "Pet. Mot. Exclude." Samsung filed an Opposition (Paper 45, "PO Opp. Exclude") and APM filed a Reply in support of its motion (Paper 47, "Pet. Exclude Reply"). Samsung also filed a Motion to Exclude, seeking to exclude various exhibits as irrelevant or lacking authentication. Paper 39 ("PO Mot. Exclude"). APM filed an Opposition (Paper 42, "Pet. Opp. Exclude") and Samsung filed a Reply (Paper 46, "PO Exclude Reply").

Samsung also filed a Motion for Leave to Petition For a Certificate of Correction (Paper 9), which APM opposed (Paper 12). In an Order (Paper 52) entered concurrently with this Decision, we grant Samsung's Motion. The proposed certificate of correction does not affect the grounds on which we determine the challenged claims to be unpatentable herein, and the corrections have no bearing on the outcome of this *inter partes* review.

Oral hearing was requested by both parties. Papers 36, 37. We heard argument on April 22, 2021, and a transcript of the hearing has been entered into the record. Paper 51 (“Tr.”).

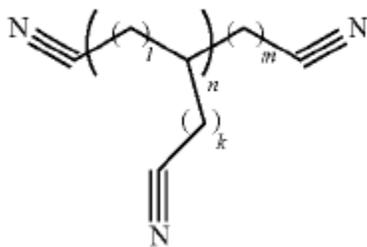
B. Related Proceedings

APM and Samsung both state that there is no pending litigation involving the '057 patent or any other related proceeding. Pet. 2; Paper 4, 1.

C. The '057 Patent

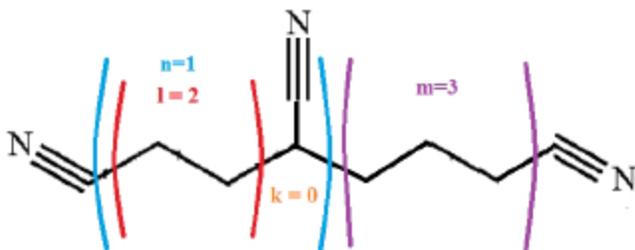
The '057 patent, entitled “Rechargeable Lithium Battery,” issued November 14, 2017, from an application for patent filed March 14, 2013. Ex. 1001, [22], [45], [54]. The patent claims priority to Provisional Application No. 61/698,311, filed September 7, 2012. *Id.* at [60]. The '057 patent addresses a feature of rechargeable lithium batteries known as thermal impact durability, which is the ability of a battery to withstand high temperatures caused by continuous charging or storage in a hot environment. *Id.* at 1:49–56. In particular, the electrolyte of the battery may, when exposed to heat, decompose and generate gas which may cause the battery to rupture or explode. *Id.* The '057 patent states that thermal impact durability may be improved by including additives in the electrolyte composition. *Id.*

Specifically, the '057 patent discloses a battery comprising a nitrile additive having a specific chemical formula, as follows:



Chemical Formula 1

In Chemical Formula 1, each of k , l , and m is an integer between 0 and 20, selected such that the compound has an asymmetric structure, and n is an integer between 1 and 7. *Id.* at 2:10–14, 19–20. The patent defines “asymmetric structure” as “asymmetric about the central carbon atom (i.e., the central carbon atom depicted in the general formula of Chemical Formula 1).” *Id.* at 2:14–19. In one embodiment according to the ’057 patent, k , l , and m are selected such that they are different from one another. *Id.* at 2:18–19. The patent provides hexane tricarbonitriles (HTCN) as an exemplary class of compounds within Chemical Formula 1, and specifically mentions 1,3,6-hexane tricarbonitrile, 1,3,5-hexane tricarbonitrile, and 2,3,6-hexane tricarbonitrile.² As an illustration of how these compounds fall within Chemical Formula 1, APM provides the following annotated diagram of 1,3,6-HTCN:



Pet. 11. As shown in the annotations, in 1,3,6-HTCN, k , l , and m are different (0, 2, and 3, respectively), and n is 1.³

The inventors of the ’057 patent theorize that, “due to a coordination bond between unshared electron pairs on the N at the terminal end of the CN

² The ’057 patent and the parties also refer to these compounds as “hexane Tri-Cyanide[s].” (*See, e.g.*, Ex. 1001, 4:1–5). We use the initialism “HTCN” herein to encompass either terminology.

³ Samsung provides a slightly different annotated diagram of 1,3,6-HTCN (Prelim. Resp. 28), but does not disagree with the values of k , l , m , or n .

group and various metals . . . of the positive active material,” the disclosed compounds form a film on the surface of the positive electrode that helps improve the thermal impact durability of the battery. Ex. 1001, 4:53–60. The patent also notes that, due to the asymmetric nature of the compound, it forms a more stable and stronger bond than a symmetric compound, or a similar compound having only two CN groups at its terminal ends. *Id.* at 5:5–12.

D. The Challenged Claims

APM challenges claims 1–5 and 13–17 of the '057 patent, of which claims 1 and 13 are independent. Claim 1, reproduced below, is illustrative of the subject matter of the challenged claims.

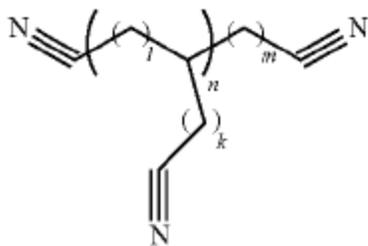
1. A rechargeable lithium battery, comprising:

a positive electrode;

a negative electrode;

an electrolyte; and

a compound represented by Chemical Formula 1 in at least one of the positive electrode, the negative electrode or the electrolyte:



Chemical Formula 1

wherein:

each of k, l and m is independently an integer of 0 to 20, and each of k, l and m are different from each other such that

the compound of Chemical Formula 1 has an asymmetric structure, and

n is an integer of 1 to 7; and

wherein the compound represented by Chemical Formula 1 is present in the positive electrode, the negative electrode or the electrolyte in an amount of about 0.1 to about 10% based on a total weight of the positive electrode, the negative electrode or the electrolyte in which the compound represented by Chemical Formula 1 is present.

Ex. 1001, 16:10–36.

Claim 13 is substantively similar to claim 1, but recites an electrolyte composition comprising a solvent, lithium salt, and the compound of Chemical Formula 1 instead of the rechargeable lithium battery of claim 1. To the extent our analysis herein focuses on claim 1, it should be understood to apply equally to claim 13.

Claims 2–5 depend from claim 1, while claims 14–17 depend from claim 13. Each set of dependent claims is identical; in other words, the added limitation of claim 2 is the same as that added by claim 14, and so on. Neither party argues these sets of dependent claims individually, and our analysis herein as to claims 2–5 should be understood to apply equally to claims 14–17. Of particular note, claims 5 and 17 recite specific compounds as the compound of Chemical Formula 1: 1,3,6-Hexane Tri-Cyanide (1,3,6-tricyanohexane; 1,3,6-HTCN) or 1,2,6-Hexane Tri-Cyanide (1,2,6-tricyanohexane; 1,2,6-HTCN).

E. Instituted Grounds

We instituted an *inter partes* review of all claims challenged in the Petition on the following grounds of unpatentability:

Claims Challenged	35 U.S.C. §⁴	Reference(s)
1–5, 13–17	102(b) or (a)	Shimura ⁵
1–4, 13–16	102(b)	Kotani ⁶
1–5, 13–17	103(a)	Kotani, Yamada ⁷
1–5, 13–17	103(a)	Fujii ⁸ , Yamada
1–5, 13–17	103(a)	Michot ⁹
1–5, 13–17	103(a)	Michot, Sakata ¹⁰
1–5, 13–17	103(a)	Michot, Takahashi ¹¹

⁴ The Leahy-Smith America Invents Act (“AIA”), Pub. L. No. 112-29, 125 Stat. 284 (September 16, 2011), included revisions to 35 U.S.C. § 103 that became effective on March 16, 2013. Because the ’057 patent issued from an application filed before March 16, 2013, we apply the pre-AIA versions of the statutory bases for unpatentability.

⁵ International Patent Application No. WO 2012-029388 to Shimura et al., published March 8, 2012 (Ex. 1004). APM filed an English translation of the reference as Exhibit 1005; citations herein to “Shimura” are to the provided translation.

⁶ Japanese Patent Application Publication No. JP 2010-073367 to Kotani et al., published April 2, 2010 (Ex. 1007). APM filed an English translation of the reference as Exhibit 1008; citations herein to “Kotani” are to the provided translation.

⁷ U.S. Patent Application Publication No. 2011/0311864 A1 to Yamada et al., published December 22, 2011 (Ex. 1026).

⁸ European Patent Application Publication No. EP 2 120 279 A1 to Fujii et al., published November 18, 2009 (Ex. 1006).

⁹ Canadian Patent No. CA 2246955 C to Michot et al., issued December 22, 1999 (Ex. 1009). APM filed an English translation of the reference as Exhibit 1010; citations herein to “Michot” are to the provided translation.

¹⁰ United States Patent Application Publication No. 2008/0102369 A1 to Sakata et al., published May 1, 2008 (Ex. 1018).

¹¹ United States Patent Application Publication No. 2010/0028786 A1 to Takahashi, published February 4, 2010 (Ex. 1019).

Pet. 31. APM alleges that each of the asserted references are prior art to the '057 patent under 35 U.S.C. § 102(a) or (b). *Id.* at 30. During trial, Samsung only challenged the prior art status of Shimura, as discussed below. We find that the remaining references qualify as prior art to the '057 patent.

II. APM MOTION TO EXCLUDE

APM's Motion to Exclude seeks to exclude Exhibits 2003 and 2021, the initial and supplemental Declarations, respectively, of Dr. Anderman, as well as Exhibit 2022, the supplemental Declaration of Dr. Suh. Pet. Mot. Exclude 1. APM also moves to exclude Exhibits 2047, 2048, and 2051, which are exhibits presented to Dr. Lucht during his deposition and submitted by Samsung with its Sur-Reply. *Id.* For the following reasons, we deny-in-part and dismiss-in-part APM's Motion.

A. Anderman Testimony (Exs. 2003 & 2021)

APM's argument that Dr. Anderman's testimony should be excluded is grounded in Federal Rule of Evidence (FRE) 702, because Samsung allegedly failed to establish Dr. Anderman's qualifications to testify as an expert witness. Pet. Mot. Exclude 1–2 (citing *See Daubert v. Merrell Dow Pharms., Inc.*, 509 U.S. 579, 597 (1993)). APM highlights Dr. Anderman's allegedly limited experience in the field of electrolyte additives, as well as various answers he gave during cross-examination that allegedly demonstrated his lack of knowledge of basic chemical concepts. *Id.* at 2–6.

Samsung defends Dr. Anderman's qualifications, but also argues that APM waived its FRE 702 objection to Dr. Anderman's testimony. PO Opp. Exclude 1–7. Samsung points out that APM did not serve any objection to Exhibit 2003 until October 16, 2020, well after the time period for serving objections to pre-institution evidence had passed. *Id.* at 1–2. And, when it

did serve objections to both Exhibits 2003 and 2021, APM only presented hearsay objections under FRE 802 or relevance objections under FRE 403. Paper 19, 2, 4.

APM defends its objections as both timely and proper, and claims that any delay in objecting to Dr. Anderman's qualifications is excusable because the issue did not come to light until his deposition, at which time the normal period for serving objections had passed. Pet. Reply Exclude 1–4. APM also claims that its hearsay objections to Dr. Anderman's testimony “encompasses the issue of Dr. Anderman's qualification to testify as an expert,” so a motion to exclude on the basis of FRE 702 is proper. *Id.* at 1–2.

We have serious doubts regarding APM's explanation why its objections to Dr. Anderman's testimony were timely or proper. While we accept that some deficiencies in an expert's testimony may not come to light until deposition, Dr. Anderman's deposition did not take place until December 17, 2020, well after APM served its objections to the declarations on October 16. Ex. 1041. Furthermore, the proper procedure for late-arising objections would be to request a conference call with the Board to seek permission to file objections out of time, rather than to simply serve them and ask the Board to excuse the delay only when opposing counsel raises the issue. And even if APM's objections had been timely, we are not persuaded that an objection under FRE 802 for hearsay properly puts opposing counsel on notice of an objection to a witness's qualifications as an expert.

In any event, even if APM's FRE 702 objections were timely and proper, we would deny the Motion to Exclude. “The policy considerations for excluding expert testimony, such as those implemented by the gatekeeping framework established by the Supreme Court in *Daubert v.*

Merrell Dow Pharm., Inc., 509 U.S. 579 (1993), are less compelling in bench proceedings such as *inter partes* reviews than in jury trials.” *Nestle Healthcare Nutrition, Inc. v. Steuben Foods, Inc.*, IPR2015-00249, Paper 76 at 23 (PTAB June 2, 2016). To be sure, we take into account the qualifications of an expert witness—and any shortcomings revealed through cross-examination—when evaluating the weight to be given that witness’s testimony. But the wholesale exclusion of a witness’s declarations is rarely called for in a proceeding before the Board. We will evaluate Dr. Anderman’s qualifications in determining the weight to be given his testimony.

B. *Suh Testimony (Ex. 2022)*

Dr. Suh’s supplemental Declaration provides his testimony supporting Samsung’s argument that Shimura is not prior art to the ’057 patent. As discussed below, we do not reach the issue of antedation. For this reason, our decision in this matter would not change depending on whether Dr. Suh’s supplemental Declaration is in the record, and thus APM’s Motion as to this exhibit can be dismissed as moot.

C. *Sur-Reply Exhibits (Exs. 2047, 2048, 2052)*

APM moves to exclude three exhibits submitted for the first time with Samsung’s Sur-Reply. Pet. Mot. Exclude 9–10. According to APM, these exhibits were introduced during the deposition of Dr. Lucht, and were objected to by APM’s counsel at that time. *Id.* APM asserts that introducing exhibits with a sur-reply is in violation of the Board’s procedural rules and deprived it of the ability to respond. *Id.*

Samsung contends that APM’s Motion on this issue is improper, because it does not raise an evidentiary objection, but rather a procedural

violation. PO Opp. Exclude 12. Samsung directs us to our Consolidated Trial Practice Guide, which states that “[i]f a party believes that a brief filed by the opposing party . . . is accompanied by belatedly presented evidence . . . it may request authorization to file a motion to strike.” *Id.* at 13 (quoting Consolidated Trial Practice Guide¹² at 80 (Nov. 21, 2019)). Samsung also contends that submitting deposition exhibits with a sur-reply is proper under the Board’s procedures, because the Consolidated Trial Practice Guide permits sur-replies to be accompanied by deposition transcripts. *Id.* (citing Consolidated Trial Practice Guide at 73).

We agree with Samsung that APM’s objections to the late-filed exhibits should have been brought as a motion to strike, instead of a motion to exclude. That procedural infirmity aside, however, we would still deny APM’s Motion on these exhibits. We do not fully adopt Samsung’s rationale that *any* exhibit made of record during a deposition may be submitted with a sur-reply, because such a rule would give parties the incentive to raise completely new evidence during a deposition, and then introduce that evidence into the record with a sur-reply, depriving the opposing party the opportunity to fully address that evidence. That said, if exhibits are introduced during a deposition for the purposes of testing the witness’ testimony, a party should be able to submit those exhibits with the transcript, so the Board has the full context available in order to evaluate the testimony. But such exhibits should be considered only for that purpose, not as evidence supporting the party’s arguments on the merits.

Upon considering the content of Exhibits 2047, 2048, and 2051, we determine that they appear relevant to Samsung’s cross-examination of

¹² Available at <https://www.uspto.gov/TrialPracticeGuideConsolidated>

Dr. Lucht, and thus constitute proper evidence to submit along with the deposition transcript. We will, however, consider the exhibits only for the purposes of evaluating Dr. Lucht's testimony, not for Samsung's arguments regarding the patentability of the challenged claims.

For these reasons, we *deny-in-part* and *dismiss-in-part* APM's Motion to Exclude.

III. SAMSUNG MOTION TO EXCLUDE

In its Motion to Exclude, Samsung asks that we exclude Exhibits 1012, 1020, and 1022¹³ under FRE 401 as irrelevant, because they were never relied upon in any of APM's briefs or in Dr. Lucht's testimony. PO Mot. Exclude 1. APM did not raise any opposition to the Motion as to these exhibits (*see* Pet. Opp. Exclude 4), and we thus grant Samsung's Motion to exclude Exhibits 1012, 1020, and 1022.

Samsung also moves to exclude Exhibit 1014 under FRE 901 as lacking authentication. *Id.* at 2. Exhibit 1014 is a comparison document allegedly showing the changes between the provisional application to which the '057 patent claims priority, and the subsequent nonprovisional application that issued as the '057 patent. *Id.* Because our decision below relies on the actual text of the provisional and nonprovisional applications—and our own comparison of those documents—we have not relied on the comparison document of Exhibit 1014. Samsung's Motion as to this exhibit is, therefore, dismissed as moot.

For these reasons, we *grant-in-part* and *dismiss-in-part* Samsung's Motion to Exclude.

¹³ Samsung also moved to exclude Exhibit 1011 on this basis, but subsequently withdrew its Motion as to this exhibit. PO Reply Exclude 1.

IV. ANALYSIS OF UNPATENTABILITY

A. Claim Construction

For petitions such as this one, filed after November 13, 2018, claims “shall be construed using the same claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. 282(b),” which is articulated in *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc). 37 C.F.R. § 100(b) (2019). Under the *Phillips* standard, the “words of a claim ‘are generally given their ordinary and customary meaning,’” which is “the meaning that the term would have to a person of ordinary skill in the art in question at the time of the invention, i.e., as of the effective filing date of the patent application.” *Phillips*, 415 F.3d at 1312–13 (quoting *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1582 (Fed. Cir. 1996)). Only those terms in controversy need to be construed and only to the extent necessary to resolve the controversy. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999)).

In our Institution Decision, we held that the claim term “asymmetric structure” required no further construction beyond the express requirements of the claim itself. Inst. Dec. 16. Specifically, because claim 1 requires that the values of k, l, and m are different in the compound of Chemical Formula 1, we reasoned that the resulting compound, by definition, must be asymmetric. *Id.* We also held that, in the context of Chemical Formula 1, the values of k, l, and m are determined by counting “the number of bridging carbon atoms between nitrile groups.” *Id.* at 21. During trial, the parties continued to dispute the meaning of these claim terms. *See* PO Resp. 29–38; Pet. Reply 11–16. Because we can resolve the question of patentability

without relying on either of these constructions, we need not revisit them in this Decision.

Prior to institution, the parties also disputed the meaning of Chemical Formula 1; namely, whether the compound depicted in the formula was permitted to have alkyl substituents. Our Institution Decision did not reach this question, as we did not consider it necessary to determine whether to institute trial. During trial, however, it became clear that the parties' dispute over this claim term is central to the question of whether the '057 patent is entitled to claim priority to the filing date of its provisional application. We, therefore, will take up the construction of Chemical Formula 1 when we resolve the question of priority below.

B. Level of Ordinary Skill in the Art

Factors pertinent to a determination of the level of ordinary skill in the art include “(1) the educational level of the inventor; (2) type of problems encountered in the art; (3) prior art solutions to those problems; (4) rapidity with which innovations are made; (5) sophistication of the technology; and (6) educational level of workers active in the field.” *Envtl. Designs, Ltd. v. Union Oil Co.*, 713 F.2d 693, 696–697 (Fed. Cir. 1983) (citing *Orthopedic Equip. Co. v. All Orthopedic Appliances, Inc.*, 707 F.2d 1376, 1381–82 (Fed. Cir. 1983)). Not all such factors may be present in every case, and one or more of these or other factors may predominate in a particular case. *Id.* Moreover, “[t]hese factors are not exhaustive but are merely a guide to determining the level of ordinary skill in the art.” *Daiichi Sankyo Co. v. Apotex, Inc.*, 501 F.3d 1254, 1256 (Fed. Cir. 2007). In determining a level of ordinary skill, we also may look to the prior art, which may reflect an appropriate skill level. *Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed.

Cir. 2001). Additionally, the Supreme Court informs us that “[a] person of ordinary skill is also a person of ordinary creativity, not an automaton.” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 421 (2007).

To establish the level of ordinary skill, APM relies on the Declaration of Dr. Lucht. Pet. 22–23 (citing Ex. 1002 ¶ 11). Dr. Lucht testifies that a person having ordinary skill in the art at the time of the invention would “typically have a bachelor’s degree in chemistry or chemical engineering with at least three years of experience working in the field of lithium ion batteries and electrolyte technology.” Ex. 1002 ¶ 11. Samsung, citing the testimony of Dr. Anderman, contends that the person of ordinary skill would have “at least a bachelor’s degree in chemistry or chemical engineering with at least five years’ experience in the field of rechargeable lithium battery research, development, and design.” PO Resp. 38 (citing Ex. 2003 ¶ 31). As we noted in the Institution Decision, both parties appear to be in general agreement regarding the level of skill, and neither party contends that the minor distinction of three versus five years of experience would have any effect on our analysis of APM’s challenges. Samsung agrees, noting that “the differences in the parties’ proposed level of ordinary skill in the art should not have a material impact on the Board’s patentability analysis.” PO Resp. 38.

C. Principles of Law

To prevail in challenging Samsung’s claims, APM must demonstrate by a preponderance of the evidence that the claims are unpatentable. 35 U.S.C. § 316(e) (2012); 37 C.F.R. § 42.1(d). In order to find a claim anticipated, we must find not only that all elements of a claim are disclosed within the four corners of a single prior art reference, but that the elements

are “arranged as in the claim.” *Net MoneyIN, Inc. v. VeriSign, Inc.*, 545 F.3d 1359, 1369 (Fed. Cir. 2008).

A claim is unpatentable under 35 U.S.C. § 103 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 at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.” *KSR*, 550 U.S. at 406. The question of obviousness is resolved on the basis of underlying factual determinations, including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of ordinary skill in the art; and (4) when available, evidence such as commercial success, long felt but unsolved needs, and failure of others. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966); *see also KSR*, 550 U.S. at 407 (“While the sequence of these questions might be reordered in any particular case, the [*Graham*] factors continue to define the inquiry that controls.”).

The Supreme Court made clear that we apply “an expansive and flexible approach” to the question of obviousness. *KSR*, 550 U.S. at 415. Whether a patent claiming the combination of prior art elements would have been obvious is determined by whether the improvement is more than the predictable use of prior art elements according to their established functions. *Id.* at 417. Reaching this conclusion, however, requires more than merely showing that the prior art includes separate references covering each separate limitation in a challenged claim. *Unigene Labs., Inc. v. Apotex, Inc.*, 655 F.3d 1352, 1360 (Fed. Cir. 2011). Rather, obviousness additionally requires that a person of ordinary skill at the time of the invention “would have selected and combined those prior art elements in the

normal course of research and development to yield the claimed invention.”
Id.

D. Anticipation by Shimura

APM contends that claims 1–5 and 13–17 are anticipated by the disclosure of Shimura. Pet. 34–40.

1. Shimura

Shimura describes a battery having a positive and negative electrode, as well as an electrolyte solution including a nitrile compound. Ex. 1005, claim 1. Shimura provides several examples of its battery. *Id.* at Table 1. Example 15, in particular, discloses a battery having 2% 1,3,6-hexanetricarbonitrile in its electrolyte solution. *Id.* Dr. Lucht testifies that 1,3,6-hexanetricarbonitrile is a synonym for 1,3,6-hexane tri-cyanide, one of the compounds recited in dependent claims 5 and 17 of the '057 patent. Ex. 1002 ¶ 82. Notably, Samsung does not contest the disclosure of Shimura, or contend that it does not anticipate the challenged claims if it is prior art to the '057 patent. We, therefore, turn to the question of Shimura's prior art status.

2. Availability of Shimura as Prior Art

APM contends that Shimura is prior art to the '057 patent for two alternative reasons. First, if the '057 patent is *not* entitled to claim priority to the September 7, 2012 filing date of its provisional application, and instead may only claim priority to the March 14, 2013 filing date of the nonprovisional, then Shimura is prior art under 35 U.S.C. § 102(b) because it was published on March 8, 2012, more than a year prior to the nonprovisional's filing date. APM argues that changes made to the nonprovisional application that issued as the '057 patent are not fully

supported by the disclosure of the provisional application. Samsung disputes this, and contends that the '057 patent is entitled to the provisional application's filing date.

Alternatively, if Samsung is correct that the '057 patent is entitled to the provisional filing date, then Shimura may be prior art under 35 U.S.C. § 102(a). If this is the case, however, Samsung attempts to swear behind Shimura by providing evidence that the inventors of the '057 patent conceived of the invention and reduced it to practice by at least February 21, 2012. APM, for its part, disputes Samsung's evidence of antedation.

As discussed below, we determine that the claims of the '057 patent, as interpreted in light of the disclosure of the nonprovisional application, are not fully supported by the disclosure of the provisional application. Therefore, Shimura is prior art to the '057 patent under § 102(b). We need not reach Samsung's evidence of antedation.

APM raises three arguments why the scope of the '057 patent is broader than that disclosed in the provisional application. First, APM argues that each issued claim of the patent includes the term "asymmetric," and that term was not defined in the provisional application. Pet. 7. But the nonprovisional application, and thus the '057 patent, provided a specific definition¹⁴ for the term that, APM argues, differs from what a person of ordinary skill would have understood the term to mean. *Id.* at 7–9. APM thus contends that the express definition broadened the scope of what is encompassed by an "asymmetric" compound. *Id.*

¹⁴ "As used herein, the term 'asymmetric structure' means that the compound of Chemical Formula 1 is asymmetric about the central carbon atom." Ex. 1001, 2:13–15.

Second, APM notes that although Chemical Formula 1 itself is identical between the provisional and nonprovisional applications, the nonprovisional adds the following statement: “For example, the compound represented by Chemical Formula 1 may be 1,3,6-hexane tricarbonitrile, 1,3,5-hexane tricarbonitrile, or 2,3,6-hexane tricarbonitrile.” Ex. 1001, 2:32–35. APM argues that a person of ordinary skill in the art would not have understood Chemical Formula 1 as originally disclosed to encompass the second or third exemplary compounds listed in the nonprovisional, thus broadening the scope of the formula from what was originally disclosed. Pet. 9–12.

Finally, APM directs us to 1,2,6-HTCN, claimed in dependent claims 5 and 17 of the patent, and argues that the compound is not disclosed in the provisional application. Pet. 12. APM argues that this species is but one of an approximate 55,000 compounds falling within the scope of Chemical Formula 1, and a person of skill in the art would not have understood the patentee to have possession of a single undisclosed species from such a large genus. Pet. Reply 9–11.

Below, we focus on the second of APM’s three arguments regarding priority, as our determination on that issue resolves the question in APM’s favor. We need not reach the first or third arguments.

The crux of APM’s second priority argument is that a person of ordinary skill in the art, viewing Chemical Formula 1 in light of the original disclosure of the provisional application, would not have understood the genus of compounds falling within the formula to include those having alkyl substituents—or, indeed, any substituents at all—on the main carbon backbone of the compound. Pet. 11–12; Pet. Reply 3–4. APM argues that Chemical Formula 1 is a “bond-line formula,” which is well-understood by

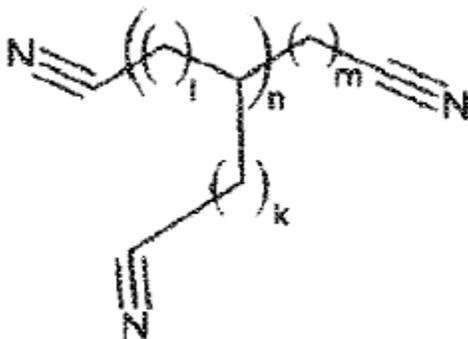
those in the art to represent a series of bonds between carbon atoms, with the carbon atoms represented by the vertices of the lines. Pet. Reply 3. Dr. Lucht testifies that “absent any indication otherwise, Chemical Formula 1 does not allow for any substituents to be added to the chemical structure at the location of the $-CH_2-$ bends.” Ex. 1037 ¶ 10. In Dr. Lucht’s analysis, the variability of the compounds in Chemical Formula 1 is limited to altering the number of carbon atoms in the backbone chain of the compound (represented as k, l, and m), as well as the number of nitrile groups (represented as n). *Id.* Even with these limited alterations, Dr. Lucht estimates that the number of compounds that may be created by varying the k, l, m, and n values of Chemical Formula 1 is over 55,000. *Id.* ¶ 23.

According to APM, this understanding of the meaning of Chemical Formula 1 necessarily changed with the filing of the nonprovisional application, because the nonprovisional states that at least two compounds¹⁵ having alkyl substituents on the carbon backbone fall within the formula. Pet. Reply 5. A person of ordinary skill in the art reading the nonprovisional application, and seeing these exemplary compounds, allegedly would have understood that Chemical Formula 1 must necessarily permit at least alkyl substituents. If APM is correct, then the genus defined by Chemical Formula 1 in the nonprovisional application necessarily includes thousands, if not millions, of compounds having alkyl substituents which would not fall within the original scope of Chemical Formula 1, and the full breadth of the

¹⁵ Specifically, the nonprovisional recites 1,3,5-HTCN (which has an alkyl substituent at the 5 carbon) and 2,3,6-HTCN (an alkyl substituent at the 2 carbon) as exemplary compounds within the genus defined by Chemical Formula 1.

'057 patent's claims are not supported by the original provisional application's disclosure.

Samsung responds by arguing that nothing in the provisional application specifically excludes alkyl substituents from the scope of Chemical Formula 1, and that any such disclaimer would have to be clear and unmistakable. PO Resp. 24. Rather, according to Samsung, Chemical Formula 1 is only required to disclose the common structural features of the genus it encompasses, which is depicted by the diagram disclosed in the provisional application:



Samsung argues that, for example, 1,3,6-HTCN (which has no alkyl substituent) and 2,3,6-HTCN (which does) share common structural features of a carbon backbone and 3 nitrile groups, and these are all that is required to be disclosed by the formula to define the genus. PO Resp. 26. Because substituents, including alkyl substituents, are optional features, APM contends that they need not be recited in the claims. PO Sur-reply 2.

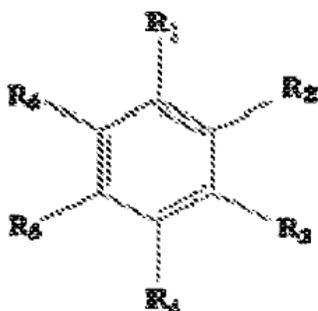
Responding to APM's arguments regarding bond-line formulas, Samsung argues that such formulas are used to depict single compounds that do not include any variability. PO Sur-reply 4 (citing Ex. 1035, 7-8). By contrast, Samsung observes, Chemical Formula 1 includes the brackets corresponding to the k, l, m, and n variables, meaning that it applies to a

genus of compounds and cannot be interpreted as a bond-line formula, as APM contends. *Id.*

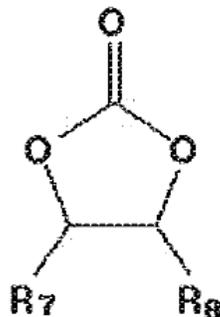
Upon reviewing the parties' arguments, the disclosure of the provisional application, and the testimony of Drs. Lucht and Anderman, we agree with APM that a person of ordinary skill in the art would not have understood Chemical Formula 1 to encompass compounds having substituents off the carbon backbone, other than the nitrile groups shown in the diagram above. This is best demonstrated by looking to the disclosure of the provisional application itself. When the inventors of the '057 patent intended to disclose a chemical formula that permitted substituents to be optionally added, they knew how to do so: by using so-called "R groups," a common way in the chemical arts of representing that substitutions may be made at a certain point in a compound. For example, Chemical Formulas 1[a]¹⁶ and 2 of the provisional application are as follows:

¹⁶ Confusingly, the provisional application actually contains two formulas labeled "Chemical Formula 1." Ex. 2002, 5, 17. The first corresponds to Chemical Formula 1 of the issued patent, while the second was corrected to "Chemical Formula 2" in the issued patent. *See* Ex. 1001, 9:40. For clarity, we will refer to the second "Chemical Formula 1" of the provisional as "Chemical Formula 1[a]."

[Chemical Formula 1]



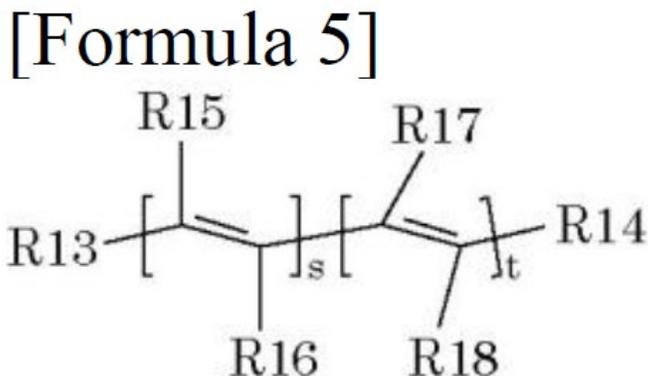
[Chemical Formula 2]



In Chemical Formula 1[a], for example, “R₁ to R₆ are each independently hydrogen, a halogen, a C1 to C10 alkyl group, a C1 to C10 haloalkyl group, or a combination thereof.” Ex. 2002, 17:14–16. Chemical Formula 2 similarly provides a defined list of potential substituents as the R₇ and R₈ groups. The conclusion to be drawn from these other examples is that, if the inventors intended for the tricarbonitrile of Chemical Formula 1 to have optional substituents selected from a set of potential moieties, they would have done so using R groups, as they did in the other chemical formulas in the application.

Counsel for Patent Owner speculated at oral argument that the inventors of the '057 patent did not use R groups in Chemical Formula 1 because the variability of the compound's backbone would have led to confusion if R groups were included. Tr. 53–54 (“[I]t would be potentially confusing to one of ordinary skill in the art to have, for example, an R group off the M carbon that's shown in Chemical Formula 1 when as the N group is expanded, you're looking at different substituents on different M

groups.”).¹⁷ But R groups are commonly used in formulas that have some sort of structural variability. For example, the Kotani prior art reference contains a formula that has variability on the carbon backbone while still including R groups:



Ex. 1008, 3. We are not persuaded that the inventors would have avoided using R groups in Chemical Formula 1, if their intent was for the formula to encompass optional substituents selected from a certain set of moieties at certain places on the carbon backbone of the molecule.

This leaves a person of ordinary skill, reading the provisional’s disclosure, with two potential options: one, that the inventors intended to disclose that no substituents are permitted on the carbon backbone of Chemical Formula 1, or two, that any chemically feasible substituent may be added at any point. Of these, Dr. Anderman appears to favor the latter. *See*

¹⁷ Counsel also argued that relying on the other formulas of the provisional as demonstrating the use of R groups was a new argument that should not be considered. Tr. 39:24–40:6. But Dr. Lucht discussed R groups in his Reply Declaration. Ex. 1037 ¶ 12. And even if he had not, in determining how a person of ordinary skill in the art would have interpreted the disclosure of the provisional application, we cannot simply ignore a portion of the provisional that provides an example of common chemical practice in representing substituents.

Ex. 1041, 105:8–10 (“If you leave it open, you can have any variation at all. Chemically feasible.”). But Dr. Anderman’s testimony on this point is not credible. During cross-examination, Dr. Anderman lacked familiarity with a number of basic chemical terms, as well as technical terminology relevant to rechargeable lithium batteries, and had limited understanding of what substituents were “chemically feasible.” *See id.*, 99–102, 105, 112–13, 136–37.¹⁸ But even more importantly, expanding Chemical Formula 1 to include all substituents that are chemically feasible would expand the genus to an absurd degree, and would encompass compounds that even Dr. Anderman admitted would have no use as electrolyte additives. *Id.* at 115–116.

As noted above, Dr. Lucht estimates that there are over 55,000 compounds encompassed by Chemical Formula 1—and that is if no substituents are permitted on the carbon backbone other than the explicitly disclosed nitrile groups. If Chemical Formula 1 were understood to permit any chemically feasible substituent to be added at any carbon, the scope of the genus would be expanded to include an untold number of compounds. Claims directed to a genus of that size would immediately raise questions of enablement and indefiniteness. While those are not questions before us today, when faced with one interpretation of Chemical Formula 1 that leads to such problems, and a more limited alternative that does not, we believe a person of ordinary skill in the art would be led to interpret the formula in the more limited manner.

¹⁸ On this point, we agree with APM’s description of Dr. Anderman’s testimony that “At best, Dr. Anderman’s experience in battery manufacture suggests an expertise in the battery elated business development rather than the development of electrolyte additives.” Pet. Mot. Exclude 2–3.

Thus, we reach the conclusion that a person of ordinary skill in the art, reading the disclosure of the provisional application, would not have considered Chemical Formula 1 to encompass compounds having substituents on the carbon backbone of the molecule. The nonprovisional application, however, includes at least two exemplary compounds within the genus defined by the formula, which have alkyl substituents. The skilled artisan reading these exemplary compounds would necessarily conclude that Chemical Formula 1 as defined in the issued '057 patent must at least permit alkyl substituents, and may in fact have other kinds of substituents as well. The scope of the formula is broader than what is supported by the provisional application. As such, we conclude that the claims of the '057 patent, which incorporate Chemical Formula 1, are not entitled to claim priority to the September 7, 2012 filing date of its provisional application. The earliest possible priority date is March 14, 2013, meaning that Shimura is prior art to the '057 patent under § 102(b) and cannot be sworn behind.

3. Conclusion as to Anticipation

In the Petition, APM sets forth how Shimura discloses all elements of the challenged claims. Pet. 34–40. Samsung does not contest APM's contentions as to the disclosure of Shimura; indeed, Samsung does not address the merits of the Shimura anticipation ground, other than the question of whether Shimura is prior art. PO Resp. 39–57; Pet. Reply 22–23 (noting lack of opposition). Based on our review of the record, we find that APM's contentions regarding the disclosure of Shimura are supported by a preponderance of the evidence, and adopt them as our findings herein. We conclude that claims 1–5 and 13–17 are anticipated by Shimura.

E. Obviousness Over Fujii and Yamada

Although we have already concluded that all challenged claims are unpatentable as anticipated by Shimura, we will proceed to address another of APM's proposed grounds of unpatentability, namely obviousness over the combined disclosures of Fujii and Yamada. Because both Fujii and Yamada are prior art to the '057 patent even if it is entitled to claim priority to the filing date of the provisional application, our analysis on this ground is entirely independent of the Shimura anticipation ground.

APM contends that claims 1–5 and 13–17 would have been obvious over the combined disclosures of Fujii and Yamada. Pet. 56–65. We begin by addressing the portions of the disclosures APM relies upon, followed by an analysis of the arguments for obviousness.

1. Fujii

Fujii discloses a nonaqueous electrolyte solution for a secondary battery, wherein the solution may contain a compound having 2 to 4 cyano groups. Ex. 1006, Abstract, ¶ 70. Specifically, APM directs us to Fujii's formula 3, which recites a compound having the formula $\text{NC}-(\text{X})_n-\text{CN}$, wherein X is selected from a group including CH_2 and CHR, R may be a cyano group, and n is an integer of 1 or more. *Id.* ¶ 71. Fujii discloses that its compound may be present in an amount of 0.001% to 10% by weight. *Id.* ¶ 68.

In particular, APM notes Fujii's disclosure of 1,3,5-pentanecarbonitrile as an exemplary compound. Pet. 57 (citing Ex. 1006, claim 6). Although 1,3,5-pentanecarbonitrile does not meet the challenged claims' requirements of asymmetry or the values of k, l, and m, APM contends that a person of ordinary skill in the art would have had reason to

modify 1,3,5-pentanecarbonitrile to arrive at the claimed 1,3,6-HTCN.
Pet. 58–60.

2. *Yamada*

Yamada discloses a nonaqueous electrolyte for a battery comprising a nitrile additive. Ex. 1026, Abstract. According to Yamada, increasing the number of carbon atoms in the nitrile compound increases the boiling point, which is advantageous for suppressing gas production. *Id.* ¶ 42. But Yamada also states that increased carbon atoms cause a decrease in the concentration of the nitrile group. *Id.* Thus, Yamada discloses that the nitrile compound preferably contains 2 to 4 carbon atoms, excluding the carbon atoms of the nitrile group. *Id.*

3. *Reason to Modify*

APM contends that a person of ordinary skill in the art, provided with Fujii's disclosure of the use of 1,3,5-pentanecarbonitrile in an electrolyte, would have had reason to modify the 1,3,5-pentanecarbonitrile by adding a single CH₂ group to arrive at 1,3,6-HTCN as claimed in the '057 patent. Pet. 58–60. Noting the close structural similarity of 1,3,5-pentanecarbonitrile and 1,3,6-HTCN, APM argues that this similarity establishes a *prima facie* case of obviousness. *Id.* at 60 (citing *In re Payne*, 606 F.2d 303 (CCPA 1979); MPEP 2144.09). In its Reply, APM contends that Samsung has failed to rebut the presumption of obviousness based on the close structural similarity of the compounds. Pet. Reply 24 n.7 (citing *Valeant Pharms. Int'l Inc. v. Mylan Pharms.*, 955 F.3d 25 (Fed. Cir. 2020)).

APM also contends that Yamada provides an express reason to modify Fujii's compound, because it is concerned with the same problem as Fujii, namely suppressing gas generation in nonaqueous electrolytes. *Id.*

at 58. APM focuses on Yamada's statement that "the boiling point of the nitrile compound itself increases as the number of carbon atoms in the nitrile group-containing hydrocarbon increases. This is advantageous in terms of suppressing gas production." Ex. 1026 ¶ 42. According to APM, this statement would have provided a person of ordinary skill with reason to increase the number of carbons in Fujii's 1,2,3-propanecarbonitrile in order to further suppress gas production. Pet. 59. Specifically, APM proposes that the skilled artisan would have added a single methylene group to the chain of 1,2,3-pentanecarbonitrile, to result in 1,2,6-HTCN. *Id.* According to Dr. Lucht, there would have been a reasonable expectation of success in making this modification, because Yamada's examples show that nitriles having carbon chains of 3, 4, or 6 carbons have similar performance. Ex. 1002 ¶¶ 77, 107 (citing Ex. 1026, Table 1).

In response, Samsung does not attempt to rebut APM's assertion of a presumption of obviousness, or address at all the close structural similarity between Fujii's additive and the 1,3,6-HTCN claimed. Instead, Samsung focuses on the disclosure of Yamada, specifically the portion immediately following the passage on which APM relies: "On the other hand, increased carbon atoms cause a relative decrease in the concentration on the nitrile group. Thus, the nitrile group-containing hydrocarbon compound preferably contains 2 to 4 carbon atoms, excluding the carbon atoms of the nitrile group." PO Resp. 68 (quoting Ex. 1026 ¶ 42). Samsung suggests that this passage teaches away from the modification proposed by APM, because 1,3,6-HTCN contains more than the 4 carbon atoms indicated by Yamada as preferable. *Id.* at 68–69. According to Samsung, while Yamada discloses certain nitrile compounds having up to 6 carbon atoms, those compounds exhibit decreased high-temperature performance. *Id.* at 69 (citing Ex. 1026,

Table 2). Samsung also argues that Fujii discloses that its 1,3,5-pentanecarbonitrile already suppresses electrolyte decomposition, so a person of ordinary skill in the art would have no reason to modify it, especially given Yamada's disclosure that doing so would lead to decreased performance. *Id.* at 74.

Upon evaluation of the parties' arguments in light of the full record, we agree with APM that a person of ordinary skill in the art, reviewing Fujii's disclosure of the use of 1,3,5-pentanecarbonitrile in electrolytes, would have had reason to modify the compound by adding a single methyl group, resulting in the claimed invention. We consider the close structural similarity of Fujii's 1,3,5-pentanecarbonitrile to the claimed 1,3,6-HTCN especially relevant, as well as the fact that both compounds are members of the same homologous series of tricarbonitriles. *See In re Wilder*, 563 F.2d 457, 458 n.7 (C.C.P.A. 1977) ("A 'homologous series' is a series of compounds whose structures differ regularly by the successive addition of the same chemical group. . . . The family of alkanes, from which alkyl groups are derived, forms such a homologous series, the structure of the members varying by the successive addition of CH₂ groups."). Indeed, 1,3,6-HTCN is the "next adjacent homolog" to Fujii's 1,3,5-pentanecarbonitrile, differing by the addition of a single CH₂ group. *See id.* In cases of adjacent homologs, the argument for a presumption of obviousness is strengthened. *See In re Henze*, 181 F.2d 196, 201 (C.C.P.A. 1950); *see also In re Dillon*, 919 F.2d 688, 696 (Fed. Cir. 1990) (en banc) ("The cases of *Hass* and *Henze* established the rule that, unless an applicant showed that the prior art compound lacked the property or advantage asserted for the claimed compound, the presumption of unpatentability was not overcome.")). In other words, "the greater the structural similarity

between the compounds, the greater the motivation to combine and reasonable expectation of success” *Anacor Pharms., Inc. v. Iancu*, 889 F.3d 1372, 1385 (Fed. Cir. 2018). Here, the claimed 1,3,6-HTCN has a high degree of structural similarity to Fujii’s 1,3,5-pentanecarbonitrile, leading us to conclude that there is a substantial reason to modify Fujii’s compound to reach the claimed one.

Not only are the compounds of Fujii and the ’057 patent structurally similar, they are functionally similar. Both compounds have utility as an electrolyte additive, and lead to improvement in high-temperature battery performance. “When compounds share significant structural and functional similarity, those compounds are likely to share other properties.” *Valeant Pharms.*, 955 F.3d at 33; *see also In re Payne*, 606 F.2d at 314 (“Because of the close structural similarity between the claimed compounds at issue here and the [prior art] compounds, and because those prior art compounds possess pesticidal activity, we conclude that the required motivation is present here.”).

In sum, we conclude that the close structural and functional similarity between 1,3,5-pentanecarbonitrile and 1,3,6-HTCN leads to a presumption of obviousness of the latter over the former. Samsung does not address these similarities, or attempt to rebut the *prima facie* case of obviousness by, for example, indicating that 1,3,6-HTCN leads to unexpected results.

Our conclusion is strengthened by the disclosure of Yamada, which at the very least would have suggested to a person of ordinary skill in the art that increasing the boiling point of a nitrile compound by increasing the number of carbon atoms is “advantageous in terms of suppressing gas production,” which is the exact problem addressed by the ’057 patent. Ex. 1026 ¶ 42. While Samsung correctly notes that this statement is

followed by a countervailing consideration—that increasing carbon atoms decreases the concentration of a nitrile group—the fact that there are countervailing forces at work does not lead to the conclusion that a person of ordinary skill in the art would focus on the second half of Yamada’s paragraph to the exclusion of the first half, and abandon attempts to modify Fujii’s compound entirely. Indeed, Yamada describes 2-to-4 carbon atom nitriles as “preferabl[e],” not mandatory. *Id.* An expressed preference for certain embodiments cannot be read as a teaching away from other, non-preferred embodiments. *See Medichem, S.A. v. Rolabo, S.L.*, 437 F.3d 1157, 1165 (Fed. Cir. 2006) (explaining that “a given course of action often has simultaneous advantages and disadvantages,” and the skilled artisan weighs “the benefits, both lost and gained” when determining whether to modify the teachings of the prior art.).

Finally, Samsung’s argument that the only “deficiency” APM identifies in Fujii is the fact that it does not include the claimed compound (PO Resp. 74) lacks merit. A prior art reference does not need to have an identified deficiency before the person of ordinary skill in the art has reason to modify it. While a deficiency noted in a prior art’s teaching may be one reason to make a modification, it is not required—the motivation may also be provided by, as discussed above, close structural and functional similarities, because the skilled chemist is aware that closely related compounds are likely to have similar properties. We do not find the alleged absence of an identified “deficiency” in Fujii to be probative of obviousness here.

For all of the preceding reasons, we find that a person of ordinary skill would have had reason to modify the 1,3,5-pentanecarbonitrile electrolyte

additive of Fujii by adding a single methyl group, resulting in the 1,3,6-HTCN claimed in the challenged claims of the '057 patent.

4. *Claims Analysis*

APM provides analysis setting forth how the disclosure of Fujii, as modified by Yamada, allegedly teaches each element of the challenged claims, and supports its analysis with the testimony of Dr. Lucht. Pet. 56–65; Ex. 1002 ¶¶ 103–111. For example, APM discusses how Fujii's 1,3,5-pentanecarbonitrile, as modified to 1,3,6-HTCN as discussed above, would fall within the genus of compounds described by Chemical Formula 1 as set forth in claims 1 and 13, as well as the narrower genera of the dependent claims. Pet. 61–65. Samsung does not contest APM's claims analysis beyond the reason to modify Fujii. PO Resp. 72–74. We find APM's analysis to be supported by the record and adopt it as our own, and conclude that Fujii as modified by Yamada discloses all elements of the challenged claims.

5. *Objective Indicia of Nonobviousness*

Samsung attempts to counter APM's evidence of obviousness with objective indicia of nonobviousness. PO Resp. 75–78. Primarily, Samsung relies on APM's marketing of its own product, named Trinohex Ultra, which is an electrolyte additive comprising 1,3,6-HTCN. *Id.* at 75 (citing Ex. 2019). Samsung contends that APM's website “extols the benefits of 1,3,6-HTCN as an electrolyte additive,” leading to improved results as “improved first-cycle open-circuit voltage drop,” “improved first-cycle columbic efficiency,” and “greatly reduced gas formation.” *Id.* (citing Ex. 2036, 7–8).

Samsung argues that these statements by APM are “industry praise of the inventions of the ’057 patent” that are evidence of nonobviousness. *Id.* at 76. According to Samsung, a battery having 1 wt% Trinohex Ultra as an electrolyte additive would embody all challenged claims of the ’057 patent, leading to a presumption of nexus with any evidence of objective indicia of nonobviousness. *Id.* (citing *Fox Factory, Inc. v. SRAM, LLC*, 944 F.3d 1366, 1373 (Fed. Cir. 2019)).

APM counters that Samsung has not demonstrated a nexus between the challenged claims and the praise of Trinohex Ultra, because the claims are directed to a battery while Trinohex Ultra is merely an electrolyte additive. Pet. Reply 27. Furthermore, APM argues that the third-party testing of Trinohex Ultra relied on by Samsung reports on varying performance results based on a number of factors other than the presence of 1,3,6-HTCN. *Id.* at 28. And finally, APM notes that Trinohex Ultra is only one species of electrolyte additive within the broad genus claimed under Chemical Formula 1, so Samsung’s evidence of industry praise is not commensurate with the scope of the challenged claims. *Id.*

After reviewing Samsung’s evidence of objective indicia, we find it to be of questionable utility in evaluating the obviousness of the challenged claims. We note that while Samsung categorizes its evidence as “industry praise,” APM’s own marketing materials for its own product is not the type of evidence normally considered under that category of objective indicia. Industry praise of an invention is typically praise *of the invention*; in other words, it is usually peer recognition of the inventors’ achievement, by award or other praise, that demonstrates that the invention is an advancement that addressed an existing problem or met a recognized need in the field. *See, e.g., Muniauction v. Thomson Corp.*, 532 F.3d 1318, 1328 (Fed. Cir. 2008)

(“an ‘Innovations in American Government’ award to the City of Pittsburgh for its use of the [inventor’s] system”); *Lectrosonics, Inc. v. Zaxcom, Inc.*, IPR2018-01129, Paper 33 (Jan. 24, 2020) (precedential) (citing inventor’s Technical Achievement Award from the Academy of Motion Picture Arts and Sciences and the Emmy award from the Academy of Television Arts and Sciences). Such evidence is probative of nonobviousness because it shows that skilled artisans considered the inventor’s work worthy of praise. By contrast, Samsung has presented us with APM’s marketing materials praising its own product. There is little noteworthy about a company marketing its own product by touting its virtues, and does not lead to the conclusion that what the inventors did was significant or nonobvious. In other words, we would expect APM to “extol the virtues” of Trinohex Ultra, no matter whether its development was obvious over existing electrolyte additives, or an unexpected advance over the prior art.

For this reason, while we have taken into account Samsung’s evidence of objective indicia of nonobviousness, we accord it little weight, and do not find that it outweighs the countervailing evidence supporting a conclusion of obviousness.

6. Conclusion as to Obviousness

We have evaluated the full record in light of the parties’ arguments regarding obviousness over Fujii and Yamada, and find that a person of ordinary skill in the art at the time of the invention would have found the subject matter of the challenged claims obvious.

F. Remaining Grounds of Unpatentability

Because we have determined that all challenged claims of the ’057 patent are unpatentable for the reasons articulated in two independent

grounds advanced by APM, we need not consider the other grounds on which trial was instituted.

V. CONCLUSION

Based on the evidence and arguments, we find that APM has met its burden as to the unpatentability of claims 1–5 and 13–17. In summary:

Claims	35 U.S.C. §	Reference(s)	Claims Shown Unpatentable	Claims Not shown Unpatentable
1–5, 13–17	102(b)	Shimura	1–5, 13–17	
1–4, 13–16	102(b)	Kotani		
1–5, 13–17	103(a)	Kotani, Yamada		
1–5, 13–17	103(a)	Fujii, Yamada	1–5, 13–17	
1–5, 13–17	103(a)	Michot		
1–5, 13–17	103(a)	Michot, Sakata		
1–5, 13–17	103(a)	Michot, Takahashi		
Overall Outcome			1–5, 13–17	

VI. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that APM’s Motion to Exclude is *denied-in-part* and *dismissed-in-part*;

FURTHER ORDERED that Samsung’s Motion to Exclude is *granted-in-part* and *dismissed-in-part*;

FURTHER ORDERED that claims 1–5 and 13–17 of U.S. Patent No. 9,819,057 B2 are *unpatentable*; and

FURTHER ORDERED that, because this Decision is final, a party to the proceeding seeking judicial review of the Decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

IPR2020-00349
Patent 9,819,057 B2

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