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Paper 76
Entered: October 5, 2015

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

LG CHEM, LTD.,
Petitioner,

v.

CELGARD, LLC,
Patent Owner.

Case IPR2014-00692
Patent 6,432,586 B1

Before FRANCISCO C. PRATS, DONNA M. PRAISS, and CHRISTOPHER L. CRUMBLEY, *Administrative Patent Judges.*

PRAISS, *Administrative Patent Judge.*

FINAL WRITTEN DECISION
35 U.S.C. § 318(a) and 37 C.F.R. § 42.73

I. INTRODUCTION

A. Statement of the Case

LG Chem, Ltd. ("Petitioner" or "LG Chem") filed a Petition (Paper 4, "Pet.") to institute an *inter partes* review of claims 1–12 of U.S. Patent No. 6,432,586 B1 (Ex. 1001, "the '586 patent") pursuant to 35 U.S.C. §§ 311–319. A Preliminary Response was filed by Celgard, LLC ("Patent Owner" or "Celgard") on August 1, 2014. Paper 8. On October 8, 2014, we instituted an *inter partes* review of claims 1–12 on the following grounds:

Claims Challenged	Basis[1]	Reference(s)
1–3, 5, 6, and 11	§ 102(b)	Tojo[2]
4, 7–10, and 12	§ 103(a)	Tojo
1–6 and 11	§ 103(a)	Tobishima[3] and Tojo

Paper 13 ("Dec. to Inst.").

After trial was instituted, Patent Owner filed a Response on February 6, 2015. Paper 32 ("PO Resp."). On May 4, 2015, Petitioner filed a Reply. Paper 52 ("Reply").

Petitioner supports its challenges with a Declaration, executed April 25, 2014, by Kuzhikalail M. Abraham, Ph.D. ("Abraham Decl.") (Ex. 1003). Patent Owner relies on a Declaration executed by Ralph E. White, Ph.D., P.E., on February 6, 2015 ("White Decl.") (Ex. 2002), a Declaration

[1] The application which issued as the '586 patent was filed on April 10, 2000. Ex. 1001, cover page. Accordingly, the versions of §§ 102 and 103 in effect before the Leahy-Smith America Invents Act (AIA) apply to the claims of the '586 patent. *See* AIA, Pub. L. No. 112-29, § 3, 125 Stat. 284, 288 (2011).
[2] JP 11-80395 (pub. Mar. 26, 1999) (Ex. 1010) (as translated, Ex. 1004).
[3] JP 5-190208 (pub. July 30, 1993) (Ex. 1013) (as translated, Ex. 1005).

executed by C. Glen Wensley, Ph.D., on February 6, 2015 ("Wensley Decl.") (Ex. 2015), and a Declaration executed by William J. Paulus on February 6, 2015 ("Paulus Decl.") (Ex. 2915).

Both parties filed Motions to Exclude Evidence. Paper 58; Paper 64.

Both parties filed Oppositions to the Motions to Exclude Evidence. Paper 69; Paper 70. Both parties filed Replies to the Oppositions to the Motions to Exclude Evidence. Paper 72; Paper 73.

An oral hearing was held on June 29, 2015. A transcript of the oral hearing is included in the record. Paper 75 ("Tr.").

We have jurisdiction under 35 U.S.C. § 6(b). This Final Written Decision is issued pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. For the reasons that follow, we determine that Petitioner has shown, by a preponderance of the evidence, that claims 1–11 of the '586 patent are unpatentable.

B. Related Proceedings

The '586 patent has been asserted in the U.S. District Court for the Western District of North Carolina in *Celgard, LLC v. SK Innovation Co., Ltd.*, No. 3:13-cv-00254 and *Celgard, LLC v. LG Chem, Ltd.*, No. 3:13-cv-00043. Pet. 1.

Concurrent with this proceeding, the '586 patent claims were subject to *inter partes* review in IPR2014-00679 and IPR2014-00680 (Paper 7). Final decisions in both of those proceedings recently issued, on September 25, 2015. The '586 patent claims were also challenged in IPR2014-00524 (Pet. 1), which was recently terminated after settlement between the parties. Previously, the '586 patent was subject to an *inter partes* review, IPR2013-

00637, which was terminated by agreement of the parties before any decision on whether to institute proceedings issued. *Id*. at 1–2.

C. The '586 Patent (Ex. 1001)

The '586 patent discloses that commercializing lithium containing high-energy rechargeable batteries has been difficult, mainly because of "dendrite growth that occurs after repetitive charge-discharge cycling." Ex. 1001, 1:21–22. Specifically, "[w]hen lithium dendrites grow [from the lithium-containing anode] and penetrate the separator [between the electrodes], an internal short circuit of the battery occurs (any direct contact between anode and cathode is referred to as 'electronic' shorting, and contact made by dendrites is a type of electronic shorting)." *Id*. at 1:27–31. "Some shorting . . . may result in thermal runaway of the lithium battery, a serious safety problem for [a] lithium rechargeable battery." *Id*. at 1:31–35.

To address those issues, the '586 patent describes an improved electrode separator for a high-energy rechargeable lithium battery. *Id.* at 1:40–53. The separator includes two specific layers: "[1] at least one ceramic composite layer and [2] at least one polymeric microporous layer." *Id*. at 1:46–47.

The '586 patent explains that the ceramic composite layer "is, at least, adapted for preventing electronic shorting (e.g. direct or physical contact of the anode and the cathode) and blocking dendrite growth." *Id*. at 2:54–57.

The '586 patent explains that the ceramic composite layer is composed of a mixture of two types of components: "[1] a matrix material having [2] inorganic particles dispersed therethrough." *Id*. at 3:9–10 (drawing reference numerals removed). The '586 patent explains that the "[c]eramic composite layer is nonporous (it being understood that some

pores are likely to be formed once in contact with an electrolyte, but ion conductivity of [that] layer is primarily dependent upon choice of the matrix material and particles)." *Id*. at 3:10–14 (drawing reference numerals removed).

The '586 patent explains that, although the matrix material may also perform the function of carrying the battery electrolyte, the matrix material is "that component of a separator which, in part, prevents electronic shorting by preventing dendrite growth." *Id*. at 3:18–20.

The '586 patent explains that the matrix component of the ceramic composite layer can be "any gel forming polymer suggested for use in lithium polymer batteries or in solid electrolyte batteries." *Id*. at 3:32–34. The '586 patent discloses that a variety of inorganic particles may be used in the ceramic composite layer, including, "for example, silicon dioxide (SiO_2), aluminum oxide (Al_2O_3), calcium carbonate ($CaCO_3$), titanium dioxide (TiO_2), SiS_2, SiPO4, and the like, or mixtures thereof. The preferred inorganic particle is SiO_2, Al_2O_3, and $CaCO_3$." *Id*. at 3:53–57.

Turning to the polymeric microporous layer of the '586 patent's separator, the patent explains that that layer "is, at least, adapted for blocking (or shutting down) ionic conductivity (or flow) between the anode and the cathode during the event of thermal runaway." *Id*. at 2:58–60.

In contrast to the substantially non-porous ceramic composite layer discussed above, the '586 patent explains that the polymeric microporous layer "consists of any commercially available microporous membranes (e.g. single ply or multi-ply), for example, those products produced by Celgard Inc. of Charlotte, North Carolina, Asahi Chemical of Tokyo, Japan, and Tonen of Tokyo, Japan." *Id*. at 3:60–64.

D. Illustrative Claims

Claims 1, 7, and 12, which are the only independent claims of the '586 patent, and which are reproduced below, are illustrative of the claims at issue:

> 1. A separator for a high energy rechargeable lithium battery comprises:
>
> at least one ceramic composite layer, said layer including a mixture of inorganic particles in a matrix material; said layer being adapted to at least block dendrite growth and to prevent electronic shorting; and
>
> at least one polyolefinic microporous layer, said layer being adapted to block ionic flow between an anode and a cathode.
>
> 7. A separator for a high energy rechargeable lithium battery comprises:
>
> at least one ceramic composite layer or coating, said
>
> layer including a mixture of 20–95% by weight of inorganic particles selected from the group consisting of SiO_2, Al_2O_3 , $CaCO_3$, TiO_2, SiS_2, $SiPO_4$, and mixtures thereof, and 5–80% by weight of a matrix material selected from the group consisting of polyethylene oxide, polyvinylidene fluoride, polytetrafluoroethylene, copolymers of the foregoing, and mixtures thereof; and
>
> at least one polyolefinic microporous layer having a porosity in the range of 20–80%, an average pore size in the range of 0.02 to 2 microns, and a Gurley Number in the range of 15 to 150 sec.
>
> 12. A separator for an energy storage system comprises:
>
> at least one ceramic composite layer or coating, said
>
> layer including a mixture of 20–95% by weight of inorganic particles selected from the group consisting of SiO_2, Al_2O_3, $CaCO_3$, TiO_2, SiS_2, $SiPO_4$, and mixtures thereof, and 5–80% by weight of a matrix material selected from the group consisting of polyethylene oxide, polyvinylidene fluoride,

> polytetrafluoroethylene, copolymers of the foregoing, and mixtures thereof, said layer being adapted to at least block dendrite growth and to prevent electronic shorting; and
>
> at least one polyolefinic microporous layer having a porosity in the range of 20–80%, an average pore size in the range of 0.02 to 2 microns, and a Gurley Number in the range of 15 to 150 sec, said layer being adapted to block ionic flow between an anode and a cathode.

II. ANALYSIS

A. Claim Interpretation

As a first step in our analysis, we determine the meaning of the claims, for purposes of this decision, using the "broadest reasonable construction in light of the specification of the patent in which [they] appear[]." 37 C.F.R. § 42.100(b). Under that standard, claim terms "are . . . given their ordinary and customary meaning," as would be understood by one of ordinary skill in the art in the context of the entire disclosure. *In re Translogic Tech. Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007) (quoting *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312 (Fed. Cir. 2005) (en banc)).

In the Decision to Institute, we concluded that the broadest reasonable construction of the claim recitation, "ceramic composite layer . . . adapted to at least block dendrite growth" (Ex. 1001, 4:41–44 (claim 1), 6:9–19 (claim 12)), encompasses any such layer capable of blocking dendrite growth with any degree of effectiveness. Dec. 6–7.

Patent Owner contends that our construction is unreasonably broad, and proposes instead that we construe the claim term to mean "ceramic composite layer . . . capable of preventing dendrites from growing all the way through the ceramic composite layer during the specified, stated, or

intended number of repetitive charge-discharge cycles of a rechargeable battery." PO Resp. 15.

Patent Owner contends that its construction is consistent with the language in the claims, as well as an ordinary artisan's understanding of the claimed invention. *Id*. Specifically, Patent Owner contends that the separator, as claimed, must be suitable for use in a high energy rechargeable lithium battery, and such a battery, by definition, must be capable of undergoing a certain number of charge-discharge cycles without experiencing an electrical short, as shown by extrinsic evidence of industry standards. *Id*. at 18–19 (citing Ex. 1005 ¶¶ 16–18, Fig. 2; Ex. 2002 ¶ 55 (White Decl.), Ex. 2009, 21:12–22:13 (Deposition of Kuzhikalail M. Abraham, Ph.D. ("Abraham Depo.")); Ex. 2500, 3; Ex. 2501).

Patent Owner contends that its proposed construction is consistent also with the Specification of the '586 patent, because the primary goal of the '586 patent is to improve prior art separators by manufacturing them such that they block dendrite formation and prevent electronic shorting. *Id*. at 15–16. Patent Owner contends that, given the '586 patent's focus on solving the dendrite problem in rechargeable lithium batteries, "it is reasonable to consider blocking dendrites in the context of what would result in a useful rechargeable battery that could remain effective throughout the type of repetitive charge-discharge cycling that can cause dendrites." *Id*. at 17–18.

Petitioner, on the other hand, contends that Patent Owner's proposed construction is not supported by either the Specification or extrinsic evidence of what a person of ordinary skill in the art would understand the

claim term to mean. Reply 2–3 (citing Ex. 2002 ¶ 77; Ex. 1030, 82:15–16; Ex. 1031 ¶ 7).

We agree with Petitioner that Patent Owner's proposed construction is not supported by the trial record.

We acknowledge, as noted above in our discussion regarding the '586 patent disclosure, that the objective of the '586 patent is to eliminate electronic shorts caused by lithium dendrite formation. We acknowledge also Patent Owner's evidence that an ordinary artisan would have understood that a primary goal of the '586 patent would have been to ensure that no dendrite-caused electronic shorting occurs during the specified, stated, or intended number of charge-discharge cycles of a rechargeable battery.

Our reviewing court, however, has "cautioned against reading limitations into a claim from the preferred embodiment described in the specification, even if it is the only embodiment described, absent clear disclaimer in the specification." *In re Am. Acad. of Sci. Tech. Ctr.*, 367 F.3d 1359, 1369 (Fed. Cir. 2004).

Patent Owner does not direct us to any specific disclosure in the Specification of the '586 patent clearly limiting or defining dendrite blocking as impeding dendrite growth for the entire intended life of a rechargeable battery. Accordingly, because the '586 patent does not clearly disclaim the scope of dendrite blocking in the manner Patent Owner advances, we are not persuaded that we should limit the claims to the asserted primary goal, or preferred result, of the '586 patent. We, therefore, decline to adopt Patent Owner's proffered claim construction.

Although we decline to read limitations from the Specification into the claims, we must, nonetheless, take into account the relevant disclosures in the Specification in determining the reasonable scope of the claims.

The claim language at issue appears in independent claims 1 and 12, and recites, in full, that the ceramic composite layer must be "adapted to at least block dendrite growth and to prevent electronic shorting." Ex. 1001, 4:43–44 (claim 1), 6:18–19 (claim 12).

As noted above, the Specification of the '586 patent discloses that dendrite growth, which results in electronic shorting, occurs after repetitive charge-discharge cycling of the battery. *Id*. at 1:20–31.

The '586 patent does not explain with any specificity, however, what structural or functional properties, for example hardness, must be possessed by a ceramic composite layer that is "adapted to" block dendrite growth. Nor does the Specification of the '586 patent require any particular degree of effectiveness in that respect. Nonetheless, as noted above, the '586 patent does disclose that a ceramic composite layer which is nonporous except for pores resulting from electrolyte contact, and which is composed of inorganic particles dispersed in a polymeric matrix, is adapted to block dendrite growth and prevent electronic shorting. *See id*. at 3:9–59.

In addition to the Specification, "dictionary definitions are also pertinent" in determining the broadest reasonable meaning of claim terms. *In re Trans Texas Holdings Corp*., 498 F.3d 1290, 1299 (Fed. Cir. 2007). The ordinary meaning of "to block," is "to obstruct by placing obstacles in the way," and the ordinary meaning of "to obstruct," in turn, is "to hinder, interrupt, or delay the passage, progress, course, etc. of." Random House Webster's College Dictionary 144, 916 (2d ed. 2000).

Accordingly, based on the evidence before us, we conclude that the broadest reasonable construction of a ceramic composite layer, adapted to at least block dendrite growth and prevent electronic shorting, encompasses any such layer capable of hindering, interrupting, or delaying the passage, progress, or course of dendrite growth, with any degree of effectiveness sufficient to prevent electronic shorting.

Patent Owner contends that, by construing the language at issue to encompass dendrite blocking to any degree of effectiveness, we effectively rewrite the claim. PO Resp. 16. We are not persuaded. As noted above, we apply to the claims before us the broadest reasonable construction an ordinary artisan would give, in light of the Specification. In the instant case, as discussed above, Patent Owner does not direct us to any clear or specific disclosure in the Specification describing a minimum degree of dendrite growth blocking, other than electronic short prevention, to which an ordinary artisan would understand the claim to be limited.

Patent Owner contends that it is "unreasonable to have a construction that could be met by some slowing of dendrites, but would allow others to grow through and short out the battery potentially causing a fire or explosion." *Id*. at 17. As is evident, however, claims 1 and 12 expressly require the ceramic composite layer to prevent electronic shorting. The claims, therefore, do not encompass a ceramic composite layer that allows a dendrite to grow through the separator unhindered and cause a short.

In sum, for the reasons discussed, based on the evidence before us, we conclude that the broadest reasonable construction of a ceramic composite layer, adapted to at least block dendrite growth encompasses any such layer capable of hindering, interrupting, or delaying the passage, progress, or

course of dendrite growth, with any degree of effectiveness sufficient to prevent electronic shorting.

B. Claims 1–3, 5, 6, and 11: Anticipation by Tojo

Petitioner contends that claims 1–3, 5, 6, and 11 of the '586 patent are unpatentable under 35 U.S.C. § 102(b) as anticipated by Tojo. Pet. 14–26.

Patent Owner contends that Tojo does not anticipate those claims because Tojo does not describe a separator with a ceramic composite layer "adapted to at least block dendrite growth and to prevent electronic shorting" as recited in claim 1, and required by its dependent claims 2, 3, 5, 6, and 11. PO Resp. 1, 21; *see also id*. at 27 ("The only issue presented in Ground 1 on claims 1–3, 5–6 and 11 is whether the teaching of Tojo discloses a ceramic composite separator layer that is inherently adapted to block dendrite growth.").

For the reasons below, we agree with Patent Owner that Petitioner has not shown by a preponderance of the evidence that Tojo describes a separator including that feature.

Tojo addresses issues facing separators used in high energy density lithium batteries, the type of battery recited in claims 1 and 11 of the '586 patent. Ex. 1004 ¶ 3. As required by claim 1, Tojo discloses that its separator includes two layers, a "surface protection layer" composed of a polyolefin, such as polypropylene or polyethylene, and a composite coating layer which includes "inorganic microparticles of aluminum oxide, silicon dioxide, or the like and a resin that acts as a binder." *Id*. at 1.

As required by claim 1, the composite layer of Tojo's separator includes inorganic particles, which may be aluminum oxide or silicon dioxide. *Id*. ¶ 18. As claim 1 also requires of its ceramic composite layer,

the composite layer of Tojo's separator includes a matrix material, termed a "binder," which is "not particularly limited if it is one that has been used conventionally, and, for example, various polyesters, various polyolefins, various rubbers, various acrylic resins, and the like can be used alone or as mixtures." *Id.* ¶ 22.

To show that Tojo meets claim 1's dendrite-blocking requirement, Petitioner directs us to Tojo's disclosure that its separators have high surface hardness and mechanical strength, which inhibit tearing and penetration by microparticles of electrode material produced during manufacture or storage, ultimately resulting in a reduced internal short circuit rate. Pet. 16 (citing Ex. 1004 ¶ 8). Petitioner relies on paragraph 43 of the Abraham Declaration to support its position that the high mechanical strength of Tojo's composite layer, which is not prone to being penetrated by microparticles, means that it is capable of blocking dendrite growth and preventing electronic shorting. *Id*. at 15 (citing Ex. 1003 ¶ 43). The Abraham Declaration states:

> By including a layer with inorganic materials that is not prone to being penetrated by microparticles, Tojo provides a layer that is not prone to being penetrated by dendrite growth. That is, the microparticles that are blocked by Tojo's separator layer include[] dendrites.

Ex. 1003 ¶ 43 (citation omitted).

As Patent Owner contends, however (PO Resp. 21, 25–27), Tojo describes its ceramic composite layer as "porous" and having "open holes." Ex. 1004 ¶¶ 8, 25.

Tojo discloses that the surface protection layer can be formed "by screen printing so that it has open holes in the manner of a mesh or the like." *Id*. ¶ 25. Alternatively, Tojo discloses:

> [P]ores matching the porous structure of the substrate can be formed in the surface protection layer by performing an ultrasonic treatment on the resin constituting the surface protection layer in the presence of a poor solvent . . . .

Id. ¶ 26. Tojo discloses further that pores may be produced by "extracting, stretching, adding a foaming agent." *Id*. ¶ 27. Tojo exemplifies using ultrasonication to produce pores in its ceramic composite layer. *Id*. ¶¶ 43, 46.

Regarding the size of the open holes, Tojo discloses:

> The size of the open holes is not particularly limited, but taking into account the electroconductive particle size that causes internal short-circuiting when the surface protection layer is used as a separator for a cell, 0.1 μm to 1 mm is adequate, and 5 μm to 20 μm is preferred. The open holes preferably take up about 40 to 80% of the entire surface area in the surface of the surface protection layer.

Id. at ¶ 25.

Patent Owner argues that the ability of Toro's separator to stop hard particles is not sufficient to establish that Tojo inherently discloses the ability to block dendrites. PO Resp. 32. Patent Owner contends that dendrites do not have common characteristics with the microparticles Tojo sought to block. *Id*. at 25. According to Patent Owner, dendrites are smaller, softer, and "can adapt in size and shape over multiple cycles, whereas foreign object debris, such as electrode microparticles or burrs, introduced during cell manufacture have a fixed size and shape." *Id*. at 24 (citing Ex. 2002 ¶¶ 47, 48, 102); *see id*. at 22–23.

Moreover, Patent Owner contends, "there is greater current density where ionic flow occurs through pores, and dendrite growth will be created by and likely follow that current." *Id*. at 28–29 (citing Ex. 2002 ¶¶ 44–47,

104, 107, Ex. 2009 at 41:13–42:2). While dendrite growth through a separator is less likely to occur through highly tortuous pores, Patent Owner asserts that the embodiment in Tojo that provides detail about the holes in its surface hardness layer "is likely to result in holes straight through the layer with little or no tortuosity." *Id*. at 29 (citing Ex. 1004 ¶ 25, Ex. 2002 ¶ 106). Patent Owner contends that a hole straight through the separator will not necessarily block dendrite growth. *Id*. (citing Ex. 2002 ¶ 106).

Given Dr. White's experience in the field of battery technology, we credit his testimony on this issue. Ex. 2002 ¶¶ 3–16 (White Decl.); Ex. 2003 (Curriculum Vitae of Dr. White). Moreover, to support his opinion, Dr. White cites (Ex. 2002 ¶ 47) to the Handbook of Battery Materials (Ex. 2007, "the Handbook"), a reference to which Petitioner's expert, Dr. Abraham, also cites (Ex. 1003 ¶ 43 (citing Ex. 1026)).

The Handbook discloses:

> Even these small pores [in microporous separators] cannot prevent the formation of so-called "microshorts", arising by metal deposition (e.g., dendrites) from the solution phase. The pores of modern separators have a diameter of about 0.1 μm, equal to 100 nm, while metal ions have a diameter of few angstroms, equal to 0.5–1 nm. On an atomic scale even micropores are barn doors!

Ex. 2007, 247.

As Patent Owner contends (PO Resp. 32), the opinion of Petitioner's expert, Dr. Abraham, regarding whether dendrites could grow through Tojo's porous ceramic composite layer, is based on equating the ability of a separator to block hard microparticles with the ability to block soft dendrites:

> Q. So if I understand the opinion that you just gave about Tojo and microparticles and dendrites, you're saying the surface

> hardness of a separator would have to be harder to block or prevent tearing from microparticles than it would be to block a dendrite?
>
> . . .
>
> A. No, that's not what I said. What I said was that the surface hardness of the Tojo separator was able to stop penetration of microparticles of hard metals, so if they are able to stop penetration of microparticles of hard metals then they should definitely be able to stop microparticles of soft metals which are also metallic particles. So if something can stop a hard particle, then I would think it is easier to stop soft particles, softer metal particles.

Ex. 2009, 141:1–20.

As discussed above, the broadest reasonable construction of a ceramic composite layer, adapted to at least block dendrite growth and prevent electronic shorting, encompasses any such layer capable of hindering, interrupting, or delaying the passage, progress, or course of dendrite growth, with any degree of effectiveness sufficient to prevent electronic shorting. As also discussed above, Tojo discloses that the pores in its ceramic composite layer can range from 0.1 μm to 1 mm in size. Ex. 1004 ¶ 25.

Viewing the record as a whole, including the testimony of Dr. White and Dr. Abraham, as well as the Handbook's disclosure that separator pores as small as 0.1 μm are effectively barn doors, which cannot prevent electronic shorts caused by dendrite growth, Patent Owner persuades us that Tojo's porous ceramic composite layer is not capable of hindering, interrupting, or delaying the passage, progress, or course of dendrite growth, with any degree of effectiveness that prevents electronic shorting. That is, Patent Owner persuades us that Tojo's separators do not include a ceramic composite layer that is adapted to at least block dendrite growth and to prevent electronic shorting, as recited in claim 1 of the '586 patent.

Petitioner does not persuade us that the preponderance of the evidence supports a contrary finding.

As noted above, Petitioner bears the burden of proving unpatentability by a preponderance of the evidence. 35 U.S.C. § 316(e). In the instant case, Petitioner contends that Tojo necessarily describes a ceramic composite layer adapted to at least block dendrite growth, and that Tojo's ceramic composite layer inherently blocks dendrite growth, despite the pores discussed above. Reply 6–10. Petitioner asserts that the prevention of dendrite growth "is a distinct possibility" from Tojo's teaching of preventing "adverse events." *Id*. at 6. Petitioner further asserts that Tojo is not limited to straight-through pores because Tojo teaches methods of making the porous surface protection layer that "are widely used in industry to create pore structures that are highly tortuous." *Id*. at 7. Petitioner further asserts that blocking dendrite growth is the natural result of combining polymeric matrix materials with inorganic particles of the type and proportion described in the '586 patent because "the '586 patent requires no other feature for achieving this property." *Id*. at 9.

"It is well settled that a prior art reference may anticipate when the claim limitations not expressly found in that reference are nonetheless inherent in it. 'Under the principles of inherency, if the prior art necessarily functions in accordance with, or includes, the claimed limitations, it anticipates.'" *In re Cruciferous Sprout Litig*., 301 F.3d 1343, 1349 (Fed. Cir. 2002). Given the evidence discussed above that the pores in Tojo's ceramic composite layer would allow dendrite growth, Petitioner does not persuade us that, because Tojo's ceramic composite layer contains the inorganic particles and matrix material required by claim 1, Tojo necessarily

teaches that its ceramic composite layer is adapted to block dendrite growth. *See* Pet. Reply 8–10. Moreover, even assuming for argument's sake that larger dendrites would be blocked by Tojo's pores (*see id*. at 5), Petitioner does not dispute that dendrites may grow at an atomic scale (*id*.; Ex. 1031 ¶ 10), and the evidence discussed above supports a finding that Tojo's pores would not block dendrites of that size from producing an electronic short.

As Petitioner argues (Reply 7), and as noted above, Tojo discloses that the ceramic composite layer may be made "by extracting, stretching, adding a foaming agent" in addition to a screen printing process. Petitioner asserts that this means that "Tojo describes tortuous pores" (*id*. at 8) because "[s]uch methods are widely used in industry to create pore structures that are highly tortuous." *Id*. at 7 (citing Ex. 1004 ¶ 27, Ex. 1031 ¶¶ 17–20). Petitioner reasons that "[b]ecause Tojo describes tortuous pores, it would block dendrite growth by PO's own admission." *Id*. at 8 (citing Ex. 1033, 40:2–14, Ex. 2002 ¶ 221).

Petitioner does not direct us, however, to any clear or specific evidence suggesting that the "highly tortuous" pore structures allegedly produced by known methods would be in any way comparable to, or predictive of, highly tortuous pores in Tojo's porous ceramic composite layer made by extracting, stretching, or adding a foaming agent.

We acknowledge Petitioner's argument that Dr. White's testimony in one of the related district court proceedings is inconsistent with his testimony in the instant proceeding. Reply 8 n.1 (citing Ex. 1040). As noted above, however, his testimony here, that dendrites can grow through Tojo's porous ceramic composite layer (*see*, e.g. Ex. 2002 ¶ 106), is supported by

the Handbook, a reference upon which Petitioner's expert also relies. Ex. 1003 ¶ 43 (citing Ex. 1026).

Petitioner also does not persuade us (Reply 7–8) that Dr. White's deposition testimony establishes that Tojo's alternative methods of forming the ceramic composite layer would necessarily produce pores with a tortuosity sufficient to block dendrite growth.

As to the use of evaporation of a solvent to form pores, Dr. White testified as follows:

> Q. Okay. How would one create tortuous pores in a ceramic composite layer?
>
> . . .
>
> THE WITNESS: I think we talked about the formation of pores before the break. And I mentioned that it was possible to form such pores by evaporation of a solvent that had been used to form the paste that was used to form the ceramic composite layer on the micropore separator.

Ex. 1033, 81:12–21.

As to whether tortuous pores would block dendrite growth, Dr. White testified as follows:

> Q. Okay. Under what circumstances would a separator having pores be able to block a dendrite from growing through the pores?
>
> A. The answer to that question would depend upon the characteristics of the separator as a whole. If the separator as a whole has characteristics such that the path for the dendrite through the pores and the separator would be long and tortuous, for example, it could be a very thick separator, it could be a separator with pores that are not straight-through pores, then it would be possible for such a separator to block dendrite growth.

Id. at 40:2–14.

Thus, Dr. White's deposition testimony advanced by Petitioner establishes, at best, that it is possible that tortuous pores could form using Tojo's technique, and that it is also possible under the proper circumstances that those pores could be sufficiently tortuous to block dendrite growth. As discussed above, however, inherency must necessarily, not possibly, result from the prior art disclosure. *In re Cruciferous Sprout Litig.*, 301 F.3d at 1349.

In sum, for the reasons discussed, Petitioner does not persuade us that it has shown, by a preponderance of the evidence, that Tojo describes inherently a separator with a ceramic composite layer adapted to at least block dendrite growth and prevent electronic shorting, as claim 1 requires. Because we determine that Petitioner has not shown that Tojo describes a separator having all of the features required by claim 1 and its dependent claims 2, 3, 5, 6, and 11, we find that Petitioner has not established that claims 1–3, 5, 6, and 11 are unpatentable under 35 U.S.C. § 102(b) as anticipated by Tojo.

C. Claims 4, 7–10, and 12: Obviousness over Tojo

Petitioner challenged claims 4, 7–10, and 12 of the '586 patent in the Petition as either anticipated or obvious over Tojo. Pet. 14. We instituted trial as to claims 4, 7–10, and 12 based on Petitioner's obviousness challenge to those claims under 35 U.S.C. § 103(a) over Tojo. Dec. to Inst. 30.

When evaluating claims for obviousness, "the scope and content of the prior art are to be determined; differences between the prior art and the claims at issue are to be ascertained; and the level of ordinary skill in the pertinent art resolved." *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 406

(2007) (quoting *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966)). Secondary considerations, if present, also must be considered. *Id*.

We take into consideration both parties' assertions regarding the level of ordinary skill when evaluating the parties' contentions regarding the scope and content of the prior art, and the differences between the prior art and the challenged claims. In that regard, both experts generally agree that an ordinarily skilled artisan at the critical time would have had a degree in chemistry, physics, material science, or chemical engineering, at least three years of experience in the battery industry or research and development of lithium batteries, and knowledge of the components and problems of lithium batteries, including dendrite growth, electronic shorting, and separators. Ex. 1003 ¶¶ 18–20 (Abraham Decl.); Ex. 2002 ¶ 76 (White Decl.). We note also that the level of ordinary skill in the art may be evidenced by the cited references. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001).

Claim 4 depends from claim 1 and includes claim 1's requirement that the separator be adapted to at least block dendrite growth and prevent electronic shorting. Claim 12 recites that limitation expressly. Ex. 1001, 6:18–20.

As discussed above, Petitioner does not persuade us that it has established that Tojo's separator includes that feature, because of the pores in Tojo's ceramic composite layer. Because Petitioner relies on this limitation being inherently present in Tojo as argued with respect to claim 1 (Pet. 19, 23), Petitioner does not provide any evidence to support the obviousness of this limitation. In the context of an obviousness analysis, inherency "'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.'" *In re Oelrich*, 666 F.3d 578, 581 (C.C.P.A. 1981) (quoting *Hansgirg v. Kemmer*, 102 F.2d 212, 214 (CCPA 1939)). An inherent disclosure is one that is "sufficient to show that *the natural result flowing* from the operation as taught would result in the performance of the questioned function." *Id*.; *Par Pharm., Inc. v. TWI Pharm., Inc*., 773 F.3d 1186, 1195 (Fed. Cir. 2014) ("[T]he concept of inherency must be limited when applied to obviousness, and is present only when the limitation at issue is the 'natural result' of the combination of prior art elements.") (quoting *In re Oelrich*, 666 F.2d at 581). As discussed above, the preponderance of the evidence leads us to conclude that Tojo's disclosure would not necessarily produce pores with a tortuosity sufficient to block dendrite growth. Thus, even if an ordinary artisan were to find it obvious to try one of the specific matrix materials recited in dependent claim 4 (*id*. at 19), the resulting ceramic composite layer required by both claim 4 and claim 12 would, nonetheless, have the pores that Tojo teaches should be present in that layer. Therefore, a preponderance of the evidence does not support a finding that it would have been obvious that the separator disclosed by Tojo would result in a separator having the dendrite-blocking feature required by claims 4 and 12.

Accordingly, because Petitioner has not shown that Tojo teaches or suggests all of the features required by claims 4 and 12, we conclude that Petitioner has not established by a preponderance of the evidence that claims 4 and 12 are unpatentable under 35 U.S.C. § 103 as obvious over Tojo.

Regarding independent claim 7, and claims 8–10 which depend therefrom, Petitioner relies upon the structural limitations of the ceramic composite layer, the polyolefinic microporous layer, and the inorganic

particles shown to be present in Tojo with regard to claims 1–3. Pet. 20; *see id*. at 14–18. Regarding the matrix materials specified by claims 7 and 10, Petitioner asserts they would have been obvious (*id*. at 18–19) over Tojo's disclosure that resin binders are "used conventionally" (Ex. 1004 ¶ 22), "not particularly limited" (*id*.), and the specifically identified "urethane" (*id*. ¶ 31) and "rubbers" (*id*. ¶ 22). Petitioner argues that one of ordinary skill in the art would envisage polyethylene oxide (recited in claims 7 and 10) from Tojo's disclosure of "various rubbers." Pet. 18, 21 (citing Ex. 1004 ¶ 22, Ex. 1003 ¶¶ 52–53). Regarding the matrix material taught by Tojo, the Abraham Declaration states "Tojo provides that the resin binder is not restricted" and that polyethylene is an "example[] of rubber or rubber type polymers." Ex. 1003 ¶¶ 52–53. Petitioner also relies upon the Abraham Declaration to demonstrate that Tojo discloses overlapping ranges with the porosity, average pore size, and Gurley Number ranges claimed in claims 7 and 8. Pet. 21–22 (citing Ex. 1004 ¶¶ 15, 29; Ex. 1003 ¶¶ 54–58, 60–63).

Patent Owner contends that one of ordinary skill in the art would not envisage polyurethane from the disclosure of urethane in Tojo because urethane is not mixed with inorganic particles in the embodiment disclosed in paragraph 31 of Tojo. PO Resp. 35–36 (citing Ex. 2002 ¶¶ 127–129). Patent Owner also contends that polyethylene oxide and polyacrylonitrile are neither rubbers nor "conventionally used as binders for combination with inorganic microparticles" in the battery industry in 2000. *Id*. at 36 (citing Ex. 2002 ¶¶ 127–131, Ex. 2015 ¶¶ 29–30). Patent Owner further argues that it would not have been obvious to try the claimed matrix materials in Tojo's separator because "[t]he selection of a polymer for use in a cell is not a simple matter." *Id*. at 36–37. Citing the Declaration of C. Glen Wensley,

Ph.D. (Ex. 2015 ¶¶ 18–22), Patent Owner asserts that multiple material properties are involved in the selection of a binder and that Petitioner has not explained why one skilled in the art would have been led to the particularly claimed binders other than the identified species/genus relationship. PO Resp. 37–38.

Patent Owner does not point to any clear or specific evidence supporting its assertion that one of ordinary skill in the art would understand Tojo's disclosure of resin materials to be so restrictive that a resin in an embodiment that does not include inorganic particles would not be an obvious choice for use as a resin in the embodiment containing inorganic particles. Tojo explicitly states that the resin in its embodiment with inorganic particles preferably acts as a binder and the binder "is not particularly limited." Ex. 1004 ¶ 22. Regarding polyethylene oxide in particular, which is recited in claims 7 and 10, Dr. Wensley states

> Under certain circumstances polyethylene oxide may be blended with or grafted to different kinds of rubbers, such as butyl rubbers. Although those blended or grafted materials would be considered rubbers, polyethylene oxide on its own would not be considered a rubber.

Ex. 2015 ¶ 29. Patent Owner does not assert on this record that such rubber type polymers are not resins, conventionally used as binders, or used in lithium batteries. The evidence in the trial record is that polyethylene oxide was being used in lithium batteries in the 2000 time frame, but not in a commercial product. Ex. 1030, 100:3–101:17. Petitioner asserts that the prosecution history of the '586 patent confirms polyethylene oxide, polyvinylidene fluoride, polytetrafluoroethylene, and polyurethane were in use as matrix materials in the prior art. Reply 11–12 (citing Ex. 1002; Ex. 1039, 4:1–19).

Based on the trial record, the preponderance of the evidence establishes that it would have been obvious to select the matrix material claimed in claims 7 and 10 in view of Tojo's broad disclosure of suitable resins and various rubbers, in particular. In a determination of obviousness, a reference may be relied upon for all that it would have reasonably suggested to one having ordinary skill in the art. *Merck & Co., Inc. v. Biocraft Labs., Inc.*, 874 F.2d 804, 807 (Fed. Cir. 1989). It is not limited to specific examples contained in its disclosure. *In re Mills*, 470 F.2d 649, 651 (CCPA 1972).

Patent Owner does not dispute the calculations presented by Dr. Abraham concerning the porosity, average pore size, and Gurley Number ranges disclosed by Tojo overlapping with the ranges claimed in claims 7 and 8. Given Dr. Abraham's qualifications and experience (Ex. 1003 ¶¶ 3–17), we credit his testimony on this issue (*id*. ¶¶ 54–63, 65).

In sum, having considered the prior art advanced by Petitioner in light of Patent Owner's arguments and evidence regarding its teachings, we find that the preponderance of the evidence is that an ordinarily skilled artisan would have been prompted to use known polymers for the matrix materials broadly described by Tojo in the ceramic composite layer. Accordingly, on this record, we conclude that an ordinary artisan would have had reason to prepare a separator having all of the features of claims 7–10.

D. Claims 1–6 and 11: Obviousness over Tobishima and Tojo

Petitioner challenged claims 1–12 of the '586 patent in the Petition as obvious over the combination of Tobishima and Tojo. Pet. 26. We instituted trial as to claims 1–6 and 11. Dec. to Inst. 30.

Patent Owner contends that there is no reason to combine Tojo with Tobishima because the references propose different solutions to different problems. PO Resp. 41. Patent Owner argues further that addition of Tojo's inorganic particles to Tobishima's separator would reduce the conductivity of the separator by displacing the electrolyte in the separator's impregnated polymer layer (*id*. at 43), as well as inhibiting the crosslinking of Tobishima's gel-like film (*id*. at 46).

For the reasons below, we conclude that Petitioner has shown by a preponderance of the evidence that the combination of Tobishima and Tojo describes a separator and battery that encompass all of the limitations in claims 1–6 and 11.

Tobishima describes a separator in a rechargeable lithium battery that has a two-layered structure:

> (1) a porous polyolefin polymer film with a melting point of 180ºC or lower, a thickness of 20 to 100 μm and a porosity of 30% or greater is used in combination with
> (2) a 20 to 150 μm thick polymer film having a polymer matrix allowing trapping and impregnation of nonaqueous solvent and ion dissociative lithium salt.

Ex. 1005 ¶ 6 (paragraphing added). Tobishima discloses that the minimum thickness of the polymer matrix film is 20 μm in order to prevent internal shorts due to "penetration by dendritic lithium." *Id*. ¶ 11. The preferred maximum thickness of 150 μm is in view of the design condition that "too great a thickness will lead to the problem of reducing the charge capacity of the cathode and anode of the cell and lowering the energy of the cell." *Id*. The stated advantages of the cell are:

> (A) [it] does not develop internal shorts due to dendritic lithium deposition even when charging and discharging are repeated over a long period of time, making it possible to

> achieve a long charge/discharge cycle life and also making it possible to avoid risks such as ignition due to internal shorts; and
> (B) in the event of external shorts or charging with excessive current, in order to avoid the dangerous situation where lithium melts inside the cell, the component materials of the separator melt rapidly at a temperature below the melting point of lithium (180ºC), and thus function to cause clogging and block electric current, making it possible to avoid further temperature increase.

Id. ¶ 8 (paragraphing added).

Petitioner contends that Tobishima teaches all of the features required by claim 1 except for the microparticles in the matrix material. Pet. 26–31. Petitioner further contends that it would have been obvious to one of ordinary skill in the art to combine the microparticles of Tojo with the polymeric matrix material of Tobishima because Tobishima "suggests the need of increasing the mechanical strength of the electrolyte solution impregnated polymer layer . . . providing a motivation for combining with the strength-enhancing microparticles of Tojo" (*id*. at 28 (citing Ex. 1005 ¶ 11; Ex. 1003 ¶ 84)). Petitioner further asserts that the microparticles of Tojo are combinable with Tobishima's polymeric matrix "because Tojo teaches any conventional binders—including 'various polyesters, various polyolefins, various rubbers, and various acrylic resins[']—may be mixed with the microparticles." *Id*. (citing Ex. 1004 ¶¶ 22, 31, Ex. 1003 ¶¶ 82–84).

Regarding claim 2, which is directed to the weight percent in the mixture of inorganic particles and matrix material, Tojo teaches a mixture weight ratio of 500 parts or less of binder to 100 parts of inorganic microparticles. Ex. 1004 ¶ 22; Pet. 32. Regarding claim 3, Tojo teaches aluminum oxide, silicon dioxide, and titantium dioxide as examples of the

inorganic microparticles. Ex. 1004 ¶ 18; Pet. 32. Regarding the matrix materials of claim 4, Tobishima discloses polyacrylonitrile, polyethylene oxide, and polymethacrylate. Ex. 1005 ¶ 11. Regarding claims 5 and 6, which are directed to the microporous layer, Tobishima discloses polyolefinic films including a polyethylene film. *Id.* ¶¶ 10, 12, 16; Pet. 33.

Regarding the rechargeable lithium battery of claim 11 that requires any one of the separators of claims 1 through 10, Tobishima discloses a rechargeable lithium battery having an anode, a cathode, and an electrolyte solution. Ex. 1005, Abstr., ¶ 2; Pet. 36–37.

Patent Owner asserts that modifying Tobishima's polymer matrix with Tojo's inorganic particles for the reason of improving mechanical strength of the separator presumes Tojo and Tobishima are referring to the same meaning of mechanical strength. PO Resp. 44 (citing Ex. 2002 ¶¶ 139–140; Ex. 2016, 534–35). According to Patent Owner, the mechanical strength that Tobishima describes being improved by polymer crosslinking would be "thought of as mechanical stability or dimensional stability, such that a film made of the compound would be free standing." *Id*. (citing Ex. 1005 ¶ 11). Patent Owner contends that Tojo, on the other hand, "is not at all concerned with enhancing the dimensional stability of an electrolyte impregnated polymer film" but, rather, "the hardness of the surface protection layer" which is improved by adding inorganic particles that are preferably hard. *Id*. at 46 (citing Ex. 1004 ¶ 18).

Patent Owner also asserts that "simply adding inorganic particles to a gel polymer does not in all cases improve mechanical strength of the gel polymer" and may even make a film "fragile" if too little or too much is added. *Id*. at 45 (citing Ex. 2002 ¶¶ 141–142; Ex. 1027, 1252). Patent

Owner also argues that a person of ordinary skill in the art would not add inorganic particles to a polymer before crosslinking because crosslinking would be inhibited. *Id*. (citing Ex. 2002 ¶¶ 141–143). Patent Owner further argues that the addition of inorganic particles to Tobishima's gel-like film "would result in a substance similar to wet glue with sand in it." *Id*. at 46 (citing Ex. 2002 ¶ 141).

Both Tobishima and Tojo refer to "mechanical strength" as a property to be optimized in the polymer matrix of their respective separators. Ex. 1005 ¶ 11; Ex. 1004 ¶ 7. Tobishima provides crosslinking of the polymer as an optional means for increasing mechanical strength; Tojo provides a separator having a mixture of inorganic particles in a resin as another means for improving mechanical strength. *Id*. Patent Owner lists many aspects of mechanical strength of a polymer that can be tested, affected, and improved. PO Resp. 44 (citing Ex. 2016, 534–35). Even if one skilled in the art reading Tobishima would understand "crosslinking" to teach or suggest mechanical stability or dimensional stability specifically, the term "mechanical strength" itself has a broader meaning according to Patent Owner. Moreover, Tobishima provides crosslinking as one way the polymer material "may be modified." Ex. 1005 ¶ 11 ("to increase mechanical strength, the polymer materials used may be modified to have a cross-linked structure.") Thus, Tobishima is not limiting in terms of how the mechanical strength of the polymer may be increased nor does it require crosslinking as a necessary step.

Regarding the issue of adding inorganic particles to a polymer in an amount that is too little or too much to improve mechanical strength, the person having ordinary skill in the art must be regarded as skillful and

ordinarily creative, not as a mere literalistic automaton. *Transocean Offshore Deepwater Drilling, Inc. v. Maersk Contractors USA, Inc.*, 617 F.3d 1296, 1304 (Fed. Cir. 2010); *In re Sovish*, 769 F.2d 738, 742 (Fed. Cir. 1985). Moreover, the article that Patent Owner cites for showing various effects caused by the addition of inorganic particles acknowledges that the addition of inorganic particles affects whether the combination yielded a free standing film. Ex. 1027, 1253 ("The use of ceramic makes it possible to prepare a highly conductive, freestanding film . . . .").

In sum, having considered the prior art advanced by Petitioner in light of Patent Owner's arguments and evidence regarding the cited references' teachings, we find that an ordinarily skilled artisan would have been prompted to combine Tojo's inorganic particles in the polymer matrix of Tobishima. Accordingly, the preponderance of the evidence on this trial record shows that an ordinary artisan would have had reason to prepare a separator having all of the features of claims 1–6 and a battery having all of the features of claim 11.

E. Secondary Considerations

Before concluding whether the challenged claims would have been obvious, in addition to the teachings in the prior art, the objective indicia of nonobviousness must be considered "as part of all the evidence, not just when the decision maker remains in doubt after reviewing the art." *Eurand, Inc. v. Mylan Pharms. Inc. (In re Cyclobenzaprine Hydrochloride Extended–Release Capsule Patent Litig.)*, 676 F.3d 1063, 1076–77 (Fed. Cir. 2012) (citation omitted).

Although Petitioner bears the ultimate burden of persuasion under 35 U.S.C. § 316(e), as Petitioner contends (Reply 18), "[f]or objective

evidence to be accorded substantial weight, its proponent [Patent Owner] must establish a nexus between the evidence and the merits of the claimed invention." *In re GPAC Inc*., 57 F.3d 1573, 1580 (Fed. Cir. 1995). In particular, the objective indicia "must be tied to the novel elements of the claim at issue" and must "'be reasonably commensurate with the scope of the claims.'" *Institut Pasteur & Universite Pierre Et Marie Curie v. Focarino*, 738 F.3d 1337, 1347 (Fed. Cir. 2013) (quoting *Rambus Inc. v. Rea*, 731 F.3d 1248, 1257 (Fed. Cir. 2013)).

As noted above, the prior art evidence of obviousness teaches or suggests separators having all of the features required by claims 1–11. Accordingly, we consider the objective evidence of nonobviousness as it relates to claims 1–11.

Patent Owner contends that objective evidence of nonobviousness shows that the claimed separator solved a long-felt need (PO Resp. 48–50), was copied by Petitioner, the alleged infringer in one of the copending district proceedings (*id*. at 50–53), achieved wide industry acceptance (*id*. at 53–56), and experienced significant commercial success (*id*. at 56–60).

Petitioner replies, essentially, that Patent Owner has failed to establish adequately a nexus between the objective indicia advanced by Patent Owner and the subject matter recited in the claims. Reply 21–25. Petitioner also contends that Patent Owner has incorporated excessive argument into its Response from its supporting documents. *Id*. at 15–16.

As to incorporation by reference, 37 C.F.R. § 42.6(a)(3) states that "[a]rguments must not be incorporated by reference from one document into another document."

To show a nexus between the claims and the objective evidence of nonobviousness, Patent Owner relies on testimony by Dr. White from one of the copending district court proceedings noted above, to show that Petitioner's allegedly infringing product contains all of the features of the claims. *See* PO Resp. 53, 57. Specifically, in addition to the Declaration by Dr. White prepared for this proceeding (Ex. 2002), Patent Owner cites to a Declaration by Dr. White submitted in support of Patent Owner's motion for preliminary injunction in the copending district court litigation (Ex. 2903 ("White PI Declaration")). PO Resp. 53, 57.

As Petitioner contends, Patent Owner cites to numerous paragraphs of the White Declaration prepared for this proceeding, but does not, in its Response, discuss with any specificity the information and arguments presented in that Declaration. *See* PO Resp. 53 (citing Ex. 2002 ¶¶ 166–209); *id*. at 57 (same). The White Declaration itself, in turn, cites extensively to additional evidence, including a Declaration by Premanand Ramadass (Ex. 2907), which was also prepared to support Patent Owner's motion for preliminary injunction in the copending infringement proceeding. Ex. 2002 ¶¶ 188, 190–95, 201.

Patent Owner also cites to Exhibits 13, 17, and 21 of the White PI Declaration (Ex. 2903). PO Resp. 53, 57. Exhibits 13, 17, and 21 of the White PI Declaration contain extensive claims charts and analysis. *See* Ex. 2903, Exhibit 13, 1–8; *id*. at Exhibit 17, 1–11; *id*. at Exhibit 21, 1–20. As to claims 1–11 at issue here, only claims 1, 4, and 7 are discussed, which occurs at pages 1–7 of Exhibit 13 of the White PI Declaration, at pages 1–7 of Exhibit 17 of the White PI Declaration, and at pages 1–13 of Exhibit 21 of the White PI Declaration.

In its Patent Owner Response, however, Patent Owner does not discuss with any specificity the information or arguments presented in the two Declarations by Dr. White, the accompanying claim charts, or the accompanying Declaration by Mr. Ramadass. Accordingly, Patent Owner's Response improperly incorporates by reference the arguments and claims analysis from both of Dr. White's Declarations, as well as the Declaration by Mr. Ramadass.

Even disregarding the procedural infirmities in Patent Owner's Response, however, Petitioner persuades us that the evidence of secondary considerations is not entitled to substantial weight, because Patent Owner has not established a sufficient nexus between the merits of the claimed subject matter and that evidence. Petitioner persuades us also that the evidence of secondary considerations is not reasonably commensurate in scope with the claimed subject matter.

Patent Owner relies on the district court's order granting a preliminary injunction to show that Petitioner's allegedly infringing product, on which Patent Owner bases most of its contentions regarding secondary considerations of obviousness, includes all of the features of the challenged claims. PO Resp. 57 (citing (Ex. 2904 ("PI Order")).

The PI Order mentions only claim 1 of the '586 patent. *See* Ex. 2904, 8 ("Having reviewed [the] description of the claims detailed [in] the claim charts, it appears likely that the SRS [safety reinforced separators] sold, offered for sale, used, and imported into this country by defendants infringes at least claim 1 of the '586 patent."). As noted above, the objective evidence of nonobviousness is pertinent to claims 1–11. Moreover, on appeal of the PI Order, the Federal Circuit found that the district court had

not made adequate findings of fact regarding infringement, and remanded the case back to the district court. *Celgard, LLC v. LG Chem, Ltd*., No. 2014-1675, 2015 WL 4757745, at *3, *6 (Fed. Cir. Aug. 12, 2015).

As to the issue of long-felt but unsolved need, Patent Owner focuses entirely on the problem of dendrite growth. PO Resp. 48–50. Patent Owner acknowledges two proposed solutions existed, Tobishima (Ex. 1005) and Song[4] (Ex. 2011), but asserts "there is no evidence that either works." PO Resp. 50 (citing Ex. 2002 ¶ 149). Song, however, states "[t]he use of continuous or non-porous polymeric membranes which provide few or no continuous free paths for electrolyte solution in which lithium dendrites propagate has been one of several successful approaches to suppressing the problem of dendrite growth." Ex. 2011, 1. The White Declaration does not refute that the Song approach was successful at blocking dendrite growth. Instead, Dr. White states that the solution proposed by Song does not "suggest[] applying a ceramic coating to solve the dendrite issue." Ex. 2002 ¶ 149.

Accordingly, we agree with Petitioner that Patent Owner has not shown a sufficient nexus between the claimed subject matter and the evidence of long-felt but unsolved need in view of an existing solution to the problem of dendrite growth that claims 1–6 also solve. In addition, Patent Owner has not explained adequately how the separators recited in claims 7–11 meet that need, given that none of those claims requires the separator to be capable of blocking dendrite growth. Thus, Patent Owner has not

[4] J.Y. Song et al., *Review of gel-type polymer electrolytes for lithium-ion batteries*, 77 J. POWER SOURCES 183–197 (1999) (Ex. 2011) .

advanced evidence adequate to support a finding that claims 1–11 of the '586 patent solved a long-felt, unsolved need.

Regarding the issue of copying, Patent Owner contends that it had a business relationship with Petitioner, in which Patent Owner provided base separator material to Petitioner, and Petitioner applied a ceramic coating to that material, thereby practicing the claimed invention. PO Resp. 52–53 (citing Ex. 2915 ¶¶ 6–10, 12, 15, 16 (Paulus Decl.)). Patent Owner contends that, after switching to a different base film supplier, "[r]ather than develop a new product, [Petitioner] merely copied its old SRS products it developed with [Patent Owner] and which infringe the '586 patent. Thus, this secondary consideration favors a finding of non-obviousness." *Id*. at 53.

As to Patent Owner's contentions regarding copying, we find that Petitioner has the better position. The Federal Circuit has explained that "[n]ot every competing product that arguably falls within the scope of a patent is evidence of copying; otherwise, 'every infringement suit would automatically confirm the nonobviousness of the patent.'" *Wyers v. Master Lock Co*., 616 F.3d 1231, 1246 (Fed. Cir. 2010) (quoting *Iron Grip Barbell Co. v. USA Sports, Inc*., 392 F.3d 1317, 1325 (Fed. Cir. 2004)). Rather,

> copying requires evidence of efforts to replicate a specific product, which may be demonstrated through internal company documents, direct evidence such as disassembling a patented prototype, photographing its features, and using the photograph as a blueprint to build a replica, or access to the patented product combined with substantial similarity to the patented product.

Id.

Further, as Petitioner argues, Patent Owner did not provide a ceramic coated separator to Petitioner (product, prototype, or otherwise), but, rather,

Petitioner provided its separator technology to Patent Owner. Reply 18–19 (citing Ex. 2907 ¶ 4; Ex. 1043 ¶ 8–10). Petitioner also argues that meetings with Patent Owner concerned only Patent Owner's base film, not a ceramic coated separator. *Id*. at 19 (citing Ex. 1043 ¶ 11). Patent Owner's evidence of receiving "customized specifications" and "production requirements" from Petitioner is consistent with Petitioner's argument that the supply of technology went from Petitioner to Patent Owner rather than the other way around. *See* Ex. 2915 ¶¶ 9–10.[5]

Moreover, in testifying that the product asserted as infringing claims 1, 4, and 7 includes all of the claimed features, Dr. White noted that the ceramic composite layer of the allegedly infringing product is expressly described as being porous. Ex. 2903, Exhibit 17, 1, 3 (White PI Decl.). In contrast, as noted above, the '586 patent describes its ceramic composite layer as nonporous, except for some pores that may result from contact with electrolyte. Ex. 1001, 3:10–12.

Given this significant difference in the description of the ceramic composite layer of the '586 patent, as compared to that of Petitioner's allegedly infringing product, Petitioner persuades us that Patent Owner has not advanced evidence adequate to support a finding that Petitioner copied the product described in the '586 patent.

[5] In reaching our decision, we have considered the evidence set forth in Patent Owner's Motion for Observation on the Cross-Examination of Petitioner's Reply Witness Jongmoon Chin (Paper 63) and Petitioner's Response (Paper 67). At best, Patent Owner's observations characterize Mr. Chin's deposition testimony as identifying potential opportunities where information about Celgard's separator know-how could have been obtained. In addition, we agree with Petitioner that Patent Owner's observations are argumentative and that they assume evidence not in the record.

As to the issue of industry praise and acceptance, Patent Owner advances the testimony of Mr. Paulus as evidence that, as of 2013, about 46% of all plug-in electric vehicles in the United States used batteries with ceramic coated separators, that that figure was 70.8% when calculated by megawatt hour, that about 56% of all plug-in electric vehicles sold in the United States having a ceramic-coated battery separator were supplied by Petitioner, LG Chem, and that Petitioner, LG Chem, supplies batteries to 26% of all plug-in vehicles sold in the United States that use a lithium-ion battery. PO Resp. 54 (citing Ex. 2915 ¶¶ 21–24 (Paulus Decl.)). Moreover, Patent Owner contends, "[i]ndustry participants have adopted advertising materials touting the benefits of and importance of ceramic coating on safety and more specifically in the prevention of dendrite growth." *Id*. at 55–56 (citing Ex. 2002 ¶¶ 160, 162, 216–222; Ex. 2901; Ex. 2902; Ex 2903 at Exhibit 11; Ex. 2912).

As Petitioner contends (Reply 23–24), certain of the advertising documents advanced by Patent Owner point to numerous features, aside from the dendrite blocking and short prevention, as desirable properties of the advertised lithium ion batteries. *See* Ex. 2903, Exhibit 11 (LG Chem website noting that the "lithium-ion batteries of LG Chem's Mobile Battery Division have outstanding competitiveness in terms of high capacity, ultra slimness, and safety"); Ex. 2912, 1–2 (LG Chem Power Inc. website noting the reliability, cost, power density, energy density, light weight, and environmental friendliness of its lithium-ion batteries). Moreover, as noted above, claims 7–11 do not require the ceramic composite layer to be adapted to at least block dendrite growth and prevent electronic shorting, the safety features that Patent Owner contends provide the basis for the cited

advertising documents, as well as the alleged industry praise and acceptance. Accordingly, viewing the totality of the record on this issue, Patent Owner has not advanced evidence adequate to establish a sufficient nexus, or commensurateness of scope, between the subject matter recited in claims 1–11, and the evidence of industry praise and acceptance.

As to commercial success, Patent Owner again relies on evidence relating to its relationship with Petitioner LG Chem. Specifically, Patent Owner contends, Patent Owner saw "a huge increase in sales once [Petitioner] started practicing the '586 patent." PO Resp. 57. More specifically, Patent Owner contends, before its relationship with Petitioner, Patent Owner sold only $10,000,000 worth of base separator material, whereas from 2009 to mid-2013, Patent Owner sold $100,000,000 worth of separator material to Petitioner for ceramic coating and use in electric vehicles. *Id*. (citing Ex. 2915 ¶ 21 (Paulus Decl.)). Patent Owner contends that Petitioner has stated that it annually sells approximately $2.4 billion of infringing batteries worldwide. *Id*. at 58 (citing Ex. 2002 ¶ 213–14; Ex. 2910; Ex. 2911). Patent Owner reiterates its contentions, noted above, regarding Petitioner's share of the plug-in hybrid battery market. *Id*. (citing Ex. 2915 ¶¶ 23, 24).

Patent Owner contends that the asserted commercial success of Petitioner's allegedly infringing products "is attributable, at least in part to the novel feature of the '586 patent — the ability of the ceramic layer to block dendrite growth." *Id*. As evidence, Patent Owner directs us to marketing and other statements by Petitioner, which Patent Owner contends advertise the safety of Petitioner's separators. *Id*. (citing Ex. 2002 ¶¶ 216–222; Ex 2903, Exhibit 11; Ex. 2912; Ex. 2913). Moreover, Patent Owner

contends, "that the commercial success of [Petitioner's] products is attributable at least in part to the SRS technology is shown by the fact that the ceramic coating increases cost of the total battery and adds mass to the battery and thus decreases driving range," which are negatives that [Petitioner] would not add to its separators absent some economic benefit. *Id*. at 60 (citing Ex. 2002 ¶¶ 223–24; Ex. 2915 ¶ 26).

As Petitioner contends (Reply 24–25), the advertising documents advanced by Patent Owner point to a number of features, aside from dendrite blocking and short prevention, as desirable properties of the advertised lithium ion batteries which are not claimed by the '586 patent. *See* Ex. 2903, Exhibit 11(LG Chem website noting that the "lithium-ion batteries of LG Chem's Mobile Battery Division have outstanding competitiveness in terms of high capacity, ultra slimness, and safety"); Ex. 2912, 1–2 (LG Chem Power Inc. website noting the reliability, cost, power density, energy density, light weight, and environmental friendliness of its lithium-ion batteries). Petitioner also advances evidence that Patent Owner's commercial success analysis is flawed because additional economic and market factors are responsible for the success of its lithium ion batteries, including the increased demand for electric vehicles and lithium ion batteries generally, the ability to leverage earnings from business divisions to expand its battery business, financial assistance from federal and local governments, marketing, and supply chain relationships. Reply 25 (citing Ex. 1047 ¶¶ 16–23).

Moreover, Patent Owner does not explain with any specificity how or why claims 7–11 require the recited separators to contain ceramic particles of the type and concentration required to provide the dendrite-blocking

functionality asserted as the basis for Petitioner's commercial success. *See* PO Resp. 59 (citing Ex. 2002 ¶ 221[6]) ("The extremely high amount of nanoceramic used in . . . [Petitioner's] SRS products leads to tiny, tortuous pores and a layer that is adapted to block dendrite growth—a key element for safe lithium-ion batteries.").

In sum, viewing the totality of the record on this issue, we agree with Petitioner that Patent Owner has not advanced evidence adequate to establish a sufficient nexus, or commensurateness of scope, between the subject matter recited in claims 1–11, and the evidence of commercial success.

F. Conclusion on Obviousness

As discussed above, having considered the prior art advanced by Petitioner in light of Patent Owner's arguments and evidence regarding the cited references' teachings, Petitioner persuades us, based on the teachings in Tojo alone and in combination with Tobishima, that an ordinary artisan would have been prompted to prepare a separator having all of the features of claims 1–11. As also discussed above, having considered Patent Owner's evidence and arguments regarding objective indicia of nonobviousness, Petitioner persuades us that Patent Owner's evidence does not show a sufficient nexus, or commensurate scope, between the subject matter recited in claims 1–11 and the objective indicia.

Accordingly, under these circumstances, taking into consideration the record as a whole, we conclude that Petitioner has shown by a preponderance of the evidence that an ordinary artisan would have

[6] We understand Patent Owner's citation to paragraph 2221 of the White Declaration (Ex. 2002) to refer to paragraph 221 instead.

considered the separators recited in claims 1–6 as obvious in view of Tobishima and Tojo, the separators recited in claims 7–10 as obvious in view of Tojo, and the battery recited in claim 11 as obvious in view of Tobishima and Tojo.

III. MOTIONS TO EXCLUDE

A. Petitioner's Motion to Exclude

Petitioner moves to exclude all or portions of Exhibit 2002 (White Declaration), Exhibit 2015 (Wensley Declaration), and Exhibit 2915 (Paulus Declaration) for lacking personal knowledge under FRE 602. Petitioner further objects to Exhibit 2002 as lacking relevance to Dr. White's expertise under FRE 702 and 703 and constituting improper patent law testimony under 37 C.F.R. § 42.65. Petitioner also moves to exclude Exhibits 2008, 2009, 2900–2902, 2905–2907, 2910, 2912–2914, and 2916 as inadmissible hearsay under FRE 801 and 802 and Exhibits 2500, 2501, 2904–2906, 2908–2914, and 2916 as irrelevant under FRE 401 and 402 as not cited or relied upon by Patent Owner in this proceeding. Paper 58, 1. As the movant, Petitioner has the burden of proof to establish that it is entitled to the requested relief. *See* 37 C.F.R. § 42.20(c). For the reasons stated below, Petitioner's Motion to Exclude is *denied*.

1. Exhibit 2002 (White Declaration)

Petitioner seeks to exclude the White Declaration or paragraphs 56, 58, 59, 61, 63–65, 147, 157, 159, 161, 202, 210, 216, 221, 223, and 224 of the White Declaration because Dr. White lacks personal knowledge of the matters asserted therein. Paper 58, 2–3. Petitioner also asserts that Dr. White is not qualified to evaluate financial data or determine whether a product has experienced commercial success to provide the opinions

expressed in paragraphs 210, 216, and 224. *Id*. at 4. Petitioner further asserts that paragraphs 150, 152, 153, 156, 163, 165, 167, 206, 207, and 209 should be excluded because they relate to patent law practice (non-obviousness, infringement, and preliminary injunctions). *Id*. at 5.

Patent Owner contends that the cited paragraphs relay legal findings that provide context for Dr. White's opinions. Paper 70, 2–3. Patent Owner also contends that information relevant to the nexus between the claimed invention and the commercial success of Petitioner's separator product is consistent with Dr. White's role in this proceeding in connection with the issue of obviousness. *Id*. at 2.

We deny Petitioner's Motion to exclude the disputed testimony. Dr. White is not offered as a legal expert in this proceeding. We understand his testimony regarding the legal parameters as context in which he provides his opinions concerning the technology, and have given it the appropriate weight.

2. Exhibit 2015 (Wensley Declaration)

Petitioner seeks to exclude the Wensley Declaration, because Dr. Wensley lacks personal knowledge of the matters asserted in paragraphs 23, 24, and 26, as well as the corresponding paragraphs of Exhibit 2002 (¶¶ 118, 119, 121, 137, 143) and Patent Owner's Response (pages 34, 35, 37, 43).[7] Paper 58, 10–11.

Patent Owner contends that Dr. Wensley has extensive experience with a wide variety of membrane materials and polymers as set forth in his Declaration (Ex. 2015) and curriculum vitae (Ex. 2017). Paper 70, 8–9. On

[7] Petitioner cites Paper 34, which is the redacted version of Patent Owner's Response. The unredacted version is Paper 32.

this basis Patent Owner asserts that the identified evidence should not be excluded because Dr. Wensley has personal knowledge and his testimony is consistent with the role of an expert witness. *Id*.

Given Dr. Wensley's experience (*see* Ex. 2015 ¶¶ 2–7; Ex. 2017), we agree with Patent Owner that Dr. Wensley qualifies to testify as an expert regarding the subject matter at issue and, therefore, deny Petitioner's Motion to exclude his Declaration.

3. Exhibit 2915 (Paulus Declaration)

Petitioner seeks to exclude the Paulus Declaration because Mr. Paulus does not have personal knowledge of the matters asserted in paragraphs 6, 8, 12–15, 18–24, and 26 and includes speculative statements (¶¶ 6, 15, 18) inconsistent with FRE 602. Paper 58, 11–12.

Patent Owner contends that "in the ordinary course of performing his job, Mr. Paulus gained first-hand knowledge of the facts contained within the challenged paragraphs of his declaration" and he states in his declaration that he has "'personal knowledge of the matters set forth in [his] declaration, except where otherwise indicated.'" Paper 70, 9–10.

Petitioner provides no clear basis for refuting Mr. Paulus's express statement. That Mr. Paulus might not have provided documentary support for all of his testimony goes to his credibility and to the ultimate weight to be accorded to the disputed testimony, and is not an adequate basis for exclusion. Accordingly, we deny Petitioner's Motion to Exclude the Paulus Declaration.

4. Exhibits 2008, 2009, 2900–2902, 2905–2907, 2910, 2912–2914, and 2916 (Inadmissible Hearsay)

Petitioner seeks to exclude Exhibits 2008, 2009, 2900–2902, 2905–2907, 2910, 2912–2914, and 2916 as inadmissible hearsay because Dr.

White, Patent Owner, and/or Mr. Paulus relies upon them to provide the truth of the matters asserted therein. Paper 58, 7. Petitioner asserts that no hearsay exception applies because an expert such as Dr. White may testify to opinions based on inadmissible hearsay, but may not transmit hearsay to the Board. *Id*. at 10 (citing *Triboro Quilt Mfg. Corp. v. Luve LLC*, 2014 WL 1508606, at *7 (S.D.N.Y. Mar. 18, 2014)).

Patent Owner contends that Exhibits 2008, 2009, 2900–2902, 2905–2907, 2910, 2912–2914 and 2916 are not hearsay because it is proper for Dr. White, as an expert in this case, to rely upon inadmissible facts so long as experts in a particular field would reasonably rely on the same facts and Petitioner makes no argument that the exhibits are untrustworthy or inaccurate. Paper 70, 6. Regarding Exhibit 2907 (Ramadass Declaration), Patent Owner asserts that it does not constitute an out of court statement subject to exclusion as hearsay because a deposition of Mr. Ramadass was not secured by Petitioner. *Id*. at 6–7. Even if the Declaration is hearsay, Patent Owner argues that Exhibits A and B thereto fall into the exception of business records as confirmed in the Ramadass Declaration. *Id*. at 7. Regarding Exhibits 2905, 2906, 2910–2912, and 2914, Patent Owner asserts they are not hearsay because they are statements of a party-opponent under FRE 801 and are the sort of information commonly relied upon by experts under FRE 703. *Id*. at 8.

We agree with Patent Owner on this issue. As Patent Owner contends, FRE 703 allows the proponent of the expert opinion to disclose the evidence underlying an expert opinion to the jury if the "probative value in helping the jury evaluate the opinion substantially outweighs [its] prejudicial effect."

As evidenced by the discussion on the merits above, we find that these exhibits have substantial probative value in helping us to evaluate Dr. White's opinion. Moreover, because the Board is not a lay jury, and has significant experience in evaluating expert testimony, the danger of prejudice in this proceeding is considerably lower than in a convention district court trial.

In sum, for the reasons discussed, we deny Petitioner's Motion to Exclude Exhibits 2008, 2009, 2900–2902, 2905–2907, 2910, 2912–2914, and 2916.

5. Exhibits 2500, 2501, 2904–2906, 2908–2914, and 2916 (Relevance)

Petitioner seeks to exclude these exhibits as unrelated to the technology at issue and/or the patent at issue. Paper 58, 5–6.

Patent Owner contends that Exhibits 2904–2906, 2908–2914, and 2916 are directly relevant to secondary considerations of non-obviousness because they are supporting evidence to the district court's decision concerning infringement and Petitioner advances no argument of prejudice. Paper 70, 3–4. Patent Owner also asserts that Exhibits 2500 and 2501 are not specifically argued in Petitioner's motion to exclude, but are also relevant to the understanding of one of ordinary skill in the art at the time of the invention. *Id*. at 4 n.2.

Because Dr. White attests that he reviewed Exhibits 2904–2906 and 2908–2913 in reaching the opinions he expressed in this case, Petitioner has not shown that they are irrelevant under FRE 401 and 402. Because Exhibits 2914 and 2916 also relate to the marketing of Petitioner's lithium ion battery, Petitioner also has not shown adequately that they are irrelevant. Accordingly, we decline to exclude Exhibits 2904–2906, 2908–2914, and

2916. Regarding Exhibits 2500, and 2501, because Petitioner bears the burden on its Motion to Exclude these exhibits and fails to explain why they are not relevant, we also decline to exclude Exhibits 2500 and 2501.

B. Patent Owner's Motion to Exclude

Patent Owner moves to exclude all or portions of Exhibit 1003 (Abraham Declaration), Exhibit 1031 (Second Abraham Declaration), and Exhibit 1047 (Vander Veen Declaration) under FRE 402, 403, 602, 702, 703, 801, and 802.[8] Patent Owner also moves to exclude Exhibits 1004 (Tojo translation) and 1033–1037 as unfairly prejudicial under FRE 402 and 403 (as well as FRE 901 with regard to the reliability of the Tojo translation). Paper 64, 1. As the movant, Patent Owner has the burden of proof to establish that it is entitled to the requested relief. *See* 37 C.F.R. § 42.20(c). For the reasons stated below, Patent Owner's Motion to Exclude is *denied*.[9]

1. Exhibits 1003 and 1031 (Abraham Declarations)

Patent Owner seeks to exclude Exhibits 1003 and 1031 on the basis that Dr. Abraham did not "perform a correct legal analysis in providing his opinions on anticipation and obviousness related to claims 1-6 and 11-12 of the '586 patent" (Paper 64, 2) and "because he has no legal foundation for his analysis or conclusions that claims 1-12 of the '586 patent are obvious" (*id*. at 5). Patent Owner contends that Dr. Abraham did not apply or explain

[8] We have considered the evidence set forth in Patent Owner's Motions for Observation on the Cross-Examinations of Drs. Abraham and Vander Veen (Papers 61 and 62) in reaching our decisions on Patent Owner's Motion to Exclude as they relate to the Abraham and Vander Veen Declarations..

[9] Because we deny Patent Owner's motion on the merits, we decline to decide whether Patent Owner's objections were identified with sufficient particularity. *See* Paper 69, 1–3.

the meaning of claim constructions for the '586 patent. *Id*. at 3–5. Patent Owner also contends that Dr. Abraham "improperly looks to the'586 patent as support for his combination" and "does not explain why a POSITA would use certain compounds." *Id*. at 7. Patent Owner further asserts that Dr. Abraham did not apply properly secondary considerations of non-obviousness nor the correct legal standards for inherency. *Id*. at 9–10.

Petitioner asserts that Patent Owner failed to preserve its objections because it failed to provide notice with "sufficient particularity" in accordance with 37 C.F.R. § 42.64. Paper 69, 1. Petitioner contends that listing the applicable Federal Rule of Evidence with a parenthetical describing its purpose is insufficient notice. *Id*. at 2 (quoting Ex. 2934). Petitioner also asserts that Patent Owner's argument goes to the weight of Dr. Abraham's testimony, rather than its admissibility. *Id*. at 3. Petitioner further asserts that Dr. Abraham's testimony was consistent with the Board's conclusion on claim construction and that his testimony is properly based on technical issues in the case. *Id*. at 3–5. Regarding the reason to combine the prior art, Petitioner points to Dr. Abraham's Declaration and deposition testimony as showing the reason for combining comes from the prior art itself and not the '586 patent. *Id*. at 6. (citing Ex. 1003 ¶¶ 78–84; Ex. 2929, 185:12–15).

We deny Patent Owner's Motion to Exclude Dr. Abraham's Declarations (Exhibits 1003 and 1031). We are not persuaded that any potential deficiency in Dr. Abraham's understanding of the legal concepts of unpatentability warrants excluding his testimony entirely. *See Nutrition 21 v. United States*, 930 F.2d 867, 871 n.2 (Fed. Cir. 1991) ("An expert's opinion on the ultimate legal conclusion is neither required nor indeed

'evidence' at all.") (citation omitted). Patent Owner also does not persuade us that Dr. White's alleged failure to apply a claim construction consistent with the Board's warrants exclusion of his testimony. Indeed, Patent Owner does not explain adequately how adoption of a particular claim construction would have changed the technical aspects of his testimony. Moreover, the alleged deficiencies in Dr. Abraham's analysis go to the weight to be accorded his testimony rather than its admissibility. Lastly, as noted above, because the Board, unlike a lay jury, has significant experience in evaluating expert testimony, the danger of prejudice in this proceeding is considerably lower than in a conventional district court trial.

In sum, for the reasons discussed, we deny Patent Owner's Motion to Exclude Dr. Abraham's testimony.

2. Exhibit 1047 (Vander Veen Declaration) and Exhibits 1048–1061

Patent Owner seeks to exclude the Vander Veen Declaration on the basis that it is conclusory and is disconnected from any issue in the case because it did not consider the factors of commercial success, did not analyze the '586 patent or claims, and Dr. Vander Veen did not understand the issue of whether there is a nexus between the patented technology and LG Chem's success. Paper 64, 12–14. Patent Owner further asserts that the Vander Veen Declaration should be excluded as untimely because evidence pertaining to commercial success and other objective indicia of nonobvious was available to Petitioner at the time it filed its Petition. *Id*. at 14. Patent Owner also argues that Exhibits 1048–1061 should be excluded as inadmissible hearsay because they are not authenticated. *Id*.

Petitioner contends that the Vander Veen Declaration noted Dr. Abraham's opinions on the lack of nexus, set forth factors analyzed by

economists to determine commercial success, and analyzed those factors to the available data. Paper 69, 9 (citing Ex. 1047 ¶¶ 27, 11–32). Regarding Exhibits 1048–1067, Petitioner asserts that Patent Owner fails to show that any are not of a type reasonably relied upon by experts in Dr. Vander Veen's field. *Id*. at 11. Petitioner further asserts that the exhibits are self-authenticating because they bear the appearance, contents, substance and circumstances to support a finding that the thing is what its proponent claims it is, such as Exhibit 1048, which is Dr. Vander Veen's curriculum vitae. *Id*. at 12 (citing FRE 901(a)).

We agree with Petitioner and deny Patent Owner's Motion to Exclude Dr. Vander Veen's Declarations and Exhibits 1048–1067 thereto.

3. Exhibit 1004 (Tojo Translation)

Patent Owner seeks to exclude, under FRE 402, 403, and 901, the Tojo translation and Dr. Abraham's reliance on it because the translation materially differs from the translation in co-pending IPR2014-00679 (Ex. 2011). Paper 64, 10–12.

The translation of Tojo in the instant proceeding was accompanied by the required translator affidavit, as Petitioner contends. Paper 69, 7–8; Ex. 1004.[10] The fact that certain terms might not have been translated in precisely the same manner in the co-pending proceeding does not persuade us that the translation of record in this proceeding is substantively inaccurate. Patent Owner does not direct us to any specific evidence, other than the differences in the translations, suggesting that the translation is

[10] Petitioner incorrectly cites Ex. 1015, which is a certified translation of JP 11-67273 not JP 11-80395.

inaccurate. Accordingly, we deny Patent Owner's Motion to Exclude the Tojo translation (Ex. 1004).

4. Exhibits 1033–1037 (Unfairly Prejudicial)

Patent Owner seeks to exclude Exhibit 1033 because it is a deposition transcript of Patent Owner's expert taken in a separate proceeding, its use in this proceeding is outside the agreement of the parties, and it is irrelevant to this proceeding. Paper 64, 15. Patent Owner also seeks to exclude Exhibits 1034–1037 as exceeding the scope of a reply because it introduces new evidence with Dr. Abraham's second Declaration (Ex. 1031) to demonstrate the knowledge of a POSITA, which should have been presented previously at the time of the Petition. *Id*. at 14–15 (citing Ex. 1003 ¶¶ 49, 52–53; Ex. 1031 ¶ 27).

Petitioner contends that the deposition transcript of Dr. White is appropriate for a reply because it contradicts his previously-made Declaration. Paper 69, 13. Petitioner further asserts that Patent Owner made Exhibit 1033 publicly available in a co-pending proceeding and cannot control the use of publicly available documents. *Id*. at 14. Petitioner also contends that Exhibits 1034–1037 are responsive to Dr. White's declaration (Ex. 2002) concerning the conventional use of PEO and PVDF as gel polymer electrolyte separators. *Id*. at 12 (citing Ex. 1035 ¶ 27).

We agree with Petitioner and deny Patent Owner's Motion to Exclude Exhibit 1033.

IV. CONCLUSION

Petitioner has shown, by a preponderance of the evidence, that claims 1–11 of the '586 patent are unpatentable on the following grounds:

(1) Claims 7–10 under 35 U.S.C. § 103(a) as obvious over Tojo; and

(2) Claims 1–6 and 11 under 35 U.S.C. § 103(a) as obvious over Tobishima and Tojo.

Petitioner has not shown, by a preponderance of the evidence, that claims 1–6, 11, and 12 of the '586 patent are unpatentable based on the following grounds:

(1) 1–3, 5, 6, and 11 under 35 U.S.C. § 102(b) as anticipated by Tojo; and

(2) Claims 4 and 12 under 35 U.S.C. § 103(a) as obvious over Tojo.

V. ORDER

In consideration of the foregoing, it is

ORDERED that claims 1–11 of the '586 patent are determined to be *unpatentable*;

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

FURTHER ORDERED that Patent Owner's Motion to Exclude is *denied*; and

FURTHER ORDERED that, because this is a Final Written Decision, 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.

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