

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

AMPEREX TECHNOLOGY LTD.,
Petitioner,

v.

SEMICONDUCTOR ENERGY LABORATORY CO., LTD.,
Patent Owner.

IPR2023-01016
Patent 10,741,828 B2

Before DONNA M. PRAISS, JON B. TORNQUIST,
and CHRISTOPHER M. KAISER, *Administrative Patent Judges*.

KAISER, *Administrative Patent Judge*.

DECISION
Denying Institution of *Inter Partes* Review
35 U.S.C. § 314, 37 C.F.R. § 42.4

I. INTRODUCTION

A. *Background and Summary*

Amperex Technology Ltd. (“Petitioner”) filed a petition for an *inter partes* review (Paper 2 (“Pet.”)) challenging claims 1–8 of U.S. Patent No. 10,741,828 B2 (Ex. 1001 (“the ’828 patent”)). Semiconductor Energy Laboratory Co., Ltd. (“Patent Owner”) filed a Preliminary Response. Paper 6 (“Prelim. Resp.”). With our authorization, Petitioner filed a Preliminary Reply (Paper 7), and Patent Owner filed a Preliminary Sur-Reply (Paper 8).

We have authority to determine whether to institute an *inter partes* review. 35 U.S.C. § 314 (2018); 37 C.F.R. § 42.4(a) (2023). The standard for instituting an *inter partes* review is set forth in 35 U.S.C. § 314(a), which provides that an *inter partes* review may not be instituted “unless the Director determines . . . there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition.”

For the reasons set forth below, we determine the information presented in the Petition does not establish a reasonable likelihood that Petitioner would prevail with respect to at least one of the challenged claims. Accordingly, we do not institute an *inter partes* review.

B. *Real Parties-in-Interest*

Each party identifies itself as the real party-in-interest. Pet. 8; Paper 5, 1.

C. Related Matters

The parties identify *Amperex Technology Ltd. v. Semiconductor Energy Laboratory Co., Ltd.*, No. 1:23-cv-272 (E.D. Va.), as a related matter. Pet. 8–9; Paper 5, 1.

D. The '828 Patent

The '828 patent, titled “Positive Electrode Active Material Including Lithium Cobaltate Coated with Lithium Titanate and Magnesium Oxide,” issued on August 11, 2020. Ex. 1001, codes (45), (54). The '828 patent relates to “[a] positive electrode active material which can improve cycle characteristics of a secondary battery.” *Id.* at code (57). According to the '828 patent, “lithium-ion secondary batteries are essential as rechargeable energy supply sources for today’s information society,” and such batteries can benefit from “increased energy density, improved cycle performance, safe operation under a variety of environments, and longer-term reliability.” *Id.* at 1:43–49.

In one embodiment of the invention of the '828 patent, “a positive electrode active material,” referred to herein as “PEAM,” “includ[es] a first region, a second region, and a third region.” *Id.* at 2:37–39. “The first region is present inside the positive electrode active material,” and “[t]he second region and the third region are present in a superficial portion of the positive electrode active material,” with “[t]he third region [being] present in a region closer to a surface of the positive electrode active material than the second region is.” *Id.* at 2:39–44. “The first region contains an oxide of lithium and a first transition metal and has a layered rock-salt crystal structure.” *Id.* at 2:44–46. “The second region contains a non-stoichiometric compound containing an oxide of a second transition metal

and the non-stoichiometric compound has a rock-salt crystal structure.” *Id.* at 2:46–49. “The third region contains a compound of representative elements and the compound of representative elements has a rock-salt crystal structure,” and “the third region may contain fluorine.” *Id.* at 2:49–52, 2:57–58.

E. Illustrative Claim

Of the challenged claims, claims 1 and 5 are independent. Claim 1 is illustrative and reproduced below.

1. A lithium-ion secondary battery comprising a positive electrode active material layer comprising:

a positive electrode active material particle comprising a first transition metal, a second transition metal, a representative element, and fluorine,

wherein the representative element and the fluorine are present in a crack portion observed from a TEM image in the positive electrode active material particle.

Ex. 1001, 76:17–24.

F. Asserted Unpatentability Challenges

Petitioner asserts that claims 1–8 are unpatentable based on the following challenges:

Claims Challenged	35 U.S.C. §	Reference(s)/Basis
1, 4, 5, 8	103	Shim ¹
1, 4, 5, 8	103	Shim, Lee ²
2, 6	103	Shim, Yu ³
2, 6	103	Shim, Lee, Yu
3, 7	103	Shim, Lee
1, 4, 5, 8	103	Fujiki ⁴
2, 6	102	Fujiki, Yu
3, 7	103	Fujiki, Lee

Petitioner relies on the declaration of Troy A. Hayes, Ph.D., P.E. (Ex. 1003, “Hayes Declaration”).

II. ANALYSIS

A. Legal Standards

“In an [*inter partes* review], the petitioner has the burden from the onset to show with particularity why the patent it challenges is unpatentable.” *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016). The burden of persuasion never shifts to Patent Owner.

¹ Jae-Hyun Shim et al., *Synergistic effects of coating and doping for lithium ion battery cathode materials: synthesis and characterization of lithium titanate-coated LiCoO₂ with Mg doping*, 186 ELECTROCHIMICA ACTA 201, 201–08 (2015) (Ex. 1005).

² Hye Jin Lee & Yong Joon Park, *Interface characterization of MgF₂-coated LiCoO₂ thin films*, 230 SOLID STATE IONICS 86, 86–91 (2013) (Ex. 1006).

³ Jinpeng Yu et al., *The investigation of Ti-modified LiCoO₂ materials for lithium ion battery*, 262 JOURNAL OF POWER SOURCES 136, 136–139 (2014) (Ex. 1007).

⁴ US 9,105,926 B2 (Aug. 11, 2015) (Ex. 1008).

Dynamic Drinkware, LLC v. Nat'l Graphics, Inc., 800 F.3d 1375, 1378 (Fed. Cir. 2015).

A claim is unpatentable under 35 U.S.C. § 103 if “the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains.” 35 U.S.C. § 103. 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 present, objective evidence of nonobviousness. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

To show obviousness, it is not enough to merely show 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 requires the additional showing 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.* (citing *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 421 (2007)). “This is so because inventions in most, if not all, instances rely upon building blocks long since uncovered, and claimed discoveries almost of necessity will be combinations of what, in some sense, is already known.” *KSR*, 550 U.S. at 418–19. On the other hand, an obviousness analysis “need not seek out precise teachings directed to the specific subject matter of the challenged claim, for a court can take account of the inferences and creative steps that a person of ordinary skill in

the art would employ.” *Id.* at 418; *accord In re Translogic Tech., Inc.*, 504 F.3d 1249, 1259 (Fed. Cir. 2007). Nevertheless, “[a] factfinder should be aware, of course, of the distortion caused by hindsight bias and must be cautious of arguments reliant upon *ex post* reasoning.” *KSR*, 550 U.S. at 421.

B. Level of Ordinary Skill in the Art

Petitioner asserts that a person of ordinary skill in the art “would have had at least a bachelor’s degree in chemistry, chemical engineering, or materials science and at least five years of experience in the field of batteries and battery materials.” Pet. 33. According to Petitioner, “[i]ndividuals with different education and additional experience could still be of ordinary skill in the art if that additional experience compensates for a deficit in their education and experience.” *Id.* (citing Ex. 1003 ¶¶ 83–91). On the present record, Patent Owner does not contest Petitioner’s definition of a person of ordinary skill in the art. Prelim. Resp. 19–20.

In light of the record before us, and for purposes of this Decision, we adopt Petitioner’s proposal regarding the level of ordinary skill in the art. Based on our review of the ’828 patent and the prior art of record, we determine that the definition offered by Petitioner comports with the qualifications a person would have needed to understand and implement the teachings of the ’828 patent and the prior art. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001) (explaining that specific findings regarding ordinary skill level are not required “where the prior art itself reflects an appropriate level and a need for testimony is not shown”) (quoting *Litton Indus. Prods., Inc. v. Solid State Sys. Corp.*, 755 F.2d 158, 163 (Fed. Cir. 1985)).

C. Claim Construction

In an *inter partes* review, we construe claim terms according to the standard set forth in *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–17 (Fed. Cir. 2005) (en banc). 37 C.F.R. § 42.100(b) (2022). Under *Phillips*, claim terms are afforded “their ordinary and customary meaning.” *Phillips*, 415 F.3d at 1312. “[T]he ordinary and customary meaning of a claim term is the meaning that the term would have to a person of ordinary skill in the art in question at the time of the invention.” *Id.* at 1313. “Importantly, the person of ordinary skill in the art is deemed to read the claim term not only in the context of the particular claim in which the disputed term appears, but in the context of the entire patent, including the specification.” *Id.*

Petitioner argues that the term “crystal defect” should be construed as “defects which can be observed from a TEM image and the like, that is, a structure in which another element enters crystal, a cavity, and the like.” Pet. 33–34 (quoting Ex. 1001, 9:55–58). Alternatively, Petitioner argues that “crystal defect” could be construed as an “imperfection or interruption of [the] regular arrangement of atoms in a crystalline solid.” *Id.* at 34 (citing Ex. 1003 ¶¶ 92–93). According to Petitioner, “[t]he prior art renders the challenged claims obvious under either construction.” *Id.* Patent Owner argues that, because “the particular deficiencies in the Petition highlighted in [the Preliminary Response] do not turn on claim construction,” we need not construe any claim terms. Prelim. Resp. 20.

As explained more fully below, we need not construe any claim terms to determine that Petitioner fails to show sufficiently that the prior art teaches or suggests the subject matter of the challenged claims. Thus, after considering the arguments and information presented in the Petition and

Preliminary Response, we determine that we do not need to construe any terms expressly for purposes of this Decision. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (citing *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999) (“[O]nly those terms need be construed that are in controversy, and only to the extent necessary to resolve the controversy.”)).

D. Challenges Based on Shim

Petitioner contends claims 1, 4, 5, and 8 would have been obvious in view of Shim or in view of the combination of Shim and Lee. Pet. 11–12, 37–59. Petitioner also contends claims 2 and 6 would have been obvious in view of the combination of Shim and Yu or in view of the combination of Shim, Lee, and Yu. *Id.* at 11–12, 60–65. Finally, Petitioner contends claims 3 and 7 would have been obvious in view of the combination of Shim and Lee. *Id.* at 11–12, 66–68.

1. Shim

Shim relates to “[l]ithium titanates . . . as coating materials on the surface of [magnesium]-doped LiCoO₂.” Ex. 1005, 1. According to Shim, “several degradation mechanisms of . . . layered cathode materials have been proposed,” and these include “the dissolution of transition metal ions into the electrolytes when the electrode is delithiated,” “the MO₂ layer at the delithiated state shear[ing] from the electrode surface,” and “the mechanically vulnerable charged form of the materials with the expanded lattice suffer[ing] from oxygen loss and side reaction[s] with electrolytes at the highly oxidized surfaces.” *Id.* “Coating is one of the simplest as well as most effective methods to be considered for minimization of the degradation.” *Id.* In order to improve “lithium ion conduction” over older

coating materials, Shim discusses the use of “inorganic materials containing lithium ions” to coat the LiCoO_2 particles. *Id.* at 1–2. These materials include various lithium titanates, such as “ Li_2TiO_3 ” and “ $\text{Li}_4\text{Ti}_5\text{O}_{12}$.” *Id.* In addition to these coatings, Shim discloses doping the LiCoO_2 particles with magnesium. *Id.* at 2.

2. *Lee*

Lee relates to “ MgF_2 . . . as a new coating material to improve the electrochemical properties of the LiCoO_2 electrode.” Ex. 1006, 1. According to Lee, “[i]t is well known that acid (such as HCl and HF) can be generated from the reaction between water and salts (such as LiClO_4 and LiPF_6) in the electrolyte.” *Id.* at 3–4. When this happens, “[t]he acid-containing electrolyte attacks the surface of the cathode during cycling,” which “leads to dissolution of transition metals, such as Co , and forms an unwanted interface layer, which deteriorates the electrochemical properties of the ‘pristine’ cathode.” *Id.* at 4. “However, when the surface of the cathode is covered with a coating layer, the coating material serves as a protective layer, preventing direct contact with the reactive electrolyte.” *Id.* Lee discloses that “ MgF_2 was an effective coating layer for protecting the cathode surface from the reactive electrolyte on cycling.” *Id.* at 5.

3. *Yu*

According to Yu, “introducing a quite small amount of TiO_2 during preparation” causes “the performance of the LiCoO_2 material [to be] improved effectively.” Ex. 1007, 4. Yu characterizes various materials containing different relative amounts of lithium, cobalt, titanium, and oxygen. *Id.* at 1–2. Yu measures the relative concentrations of cobalt and titanium using “X-ray photoelectron spectroscopy.” *Id.* at 2.

4. *Analysis*

Claim 1 of the '828 patent recites a limitation requiring that “fluorine [be] present in a crack portion observed from a TEM image in the positive electrode active material particle.” Ex. 1001, 76:22–24. Claim 5 similarly recites a limitation requiring that “fluorine [be] present in a portion which include crystal defects observed from a TEM image in the positive electrode active material particle.” *Id.* at 76:49–52. Each claim of the '828 patent includes one of these limitations. 37 C.F.R. § 1.75(c) (“Claims in dependent form shall be construed to include all the limitations of the claim incorporated by reference into the dependent claim.”); Ex. 1001, 76:17–77:4. In arguing that the challenged claims are unpatentable on grounds based on Shim, Petitioner relies on Shim and a background reference, Fey,⁵ to teach or suggest these limitations. Pet. 55, 56, 59, 63, 65, 66, 68.

Petitioner argues that Fey teaches that, in a coated particle, portions of the coating will accumulate in cracks on the particle’s surface. *Id.* at 54. In particular, Petitioner argues that Fey states that “[P]articles of the coating material [] become ingrained in the crevices and cracks on the cathode surface.” *Id.* (quoting Ex. 1016, 4) (alterations in original). Dr. Hayes quotes Shim in the same way. Ex. 1003 ¶ 163. Because Fey teaches that particles of a coating material would end up lodged in cracks, Petitioner argues that Fey shows that the fluorine-containing coating material of Shim or of the combination of Shim and Lee would have become lodged in cracks. Pet. 55; Ex. 1003 ¶ 164. But Fey is considerably more equivocal than

⁵ George Ting-Kuo Fey et al., *MgAl₂O₄ spinel-coated LiCoO₂ as long-cycling cathode materials*, 146 JOURNAL OF POWER SOURCES 245, 245–49 (2005) (Ex. 1016).

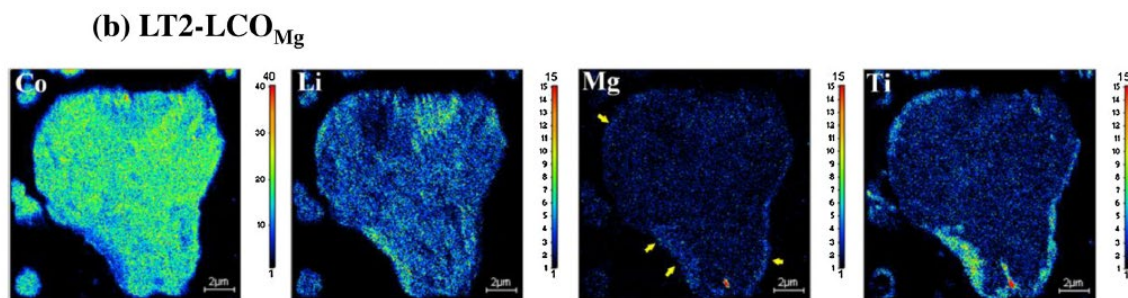
Petitioner and Dr. Hayes describe it. Rather than stating that “particles of the coating material [] become ingrained in the crevices and cracks on the cathode surface,” as Petitioner argues, Fey actually says that “changes in the surface texture resulting from the contraction and expansion of the lattice during the cycling process *could have enabled* the particles of the coating material to become ingrained in the crevices and cracks on the cathode surface.” Ex. 1016, 4 (emphasis added). Thus, Fey only suggests, rather than teaching unequivocally, that “particles of the coating material . . . become ingrained in the crevices and cracks on the cathode surface.” *Id.*

Regardless of the degree to which Fey might teach that coating particles became ingrained in cracks in a PEAM particle, Fey refers only to particles of its own coating, MgAl_2O_4 , which does not contain fluorine. *Id.* at 1, 4. Petitioner does not explain why a person of ordinary skill in the art would expect a fluorine-containing coating, such as Shim’s aluminum fluoride coating, a lithium fluoride film formed on Shim’s particle by the reaction of Shim’s LiPF_6 electrolyte with the metal of Shim, or Lee’s magnesium fluoride coating, to behave in the same fashion as Fey’s MgAl_2O_4 coating. Pet. 55. Both Petitioner and Dr. Hayes state that this would be the case for each of the identified Shim or Shim/Lee coatings, but neither provides reasoning to explain why it would. *Id.*; Ex. 1003 ¶ 164. In addition, Patent Owner and its declarant, Dr. Brett Lucht, direct us to evidence that both the choice of coating material and the choice of coating method can have dramatic effects on the physical and chemical properties of the resultant coating. Prelim. Resp. 24–25, 28–30; Ex. 2001 ¶¶ 68–69 (citing Ex. 1005, 2, 8; Ex. 1006, 1; Ex. 1016, 1–2; Ex. 2004, 2–5; Ex. 2005, Table 2; Ex. 2006, Table 1; Ex. 2007, 1–2; Ex. 2008, 5–6; Ex. 2009, 1;

Ex. 2010, 1). Thus, Petitioner does not explain sufficiently how Fey teaches or suggests the presence of fluorine, i.e., from the coating of a particle made according to the teachings of Shim or the teachings of the combination of Shim and Lee, within cracks in the particle.

Petitioner next argues that Shim's Figure 2(b) depicts a crack portion that a person of ordinary skill in the art would have understood was filled with material from Shim's particle coating (or the coating of the particle taught by the combination of Shim and Lee), which contains fluorine and which would "become ingrained into the crack portions of Shim's particle." Pet. 54, 55 (citing Ex. 1003 ¶¶ 164–165; Ex. 1005, Fig. 2(b)). Dr. Hayes testifies that Shim's Figure 2(b) "show[s] high magnesium and titanium concentrations in a crack portion" and that, "through the same mechanism that [Dr. Hayes] describe[s] with respect to magnesium . . . , fluoride in the coating layer would also become present in the 'crack portion' of the PEAM particle." Ex. 1003 ¶ 164. The process to which Dr. Hayes refers involves "a larger concentration of magnesium (lighter blue) at the edges of the particle . . . than in the bulk of the particle (dark blue)" as well as "an apparent crack in Shim's PEAM . . . , where the surface coating elements Mg and Ti are present along a seam extending from the surface into the core of the PEAM particle." *Id.* ¶ 162.

Petitioner's argument and Dr. Hayes's supporting testimony are best understood with reference to Shim's Figure 2(b), which is reproduced below:



Ex. 1005, Fig. 2(b). Shim’s Figure 2(b) depicts the “[e]lemental distributions of metals on the cross-section[] of . . . LT2-LCO_{Mg} particles obtained by nano SIMS.” *Id.* at 4. The four images in Figure 2(b) depict the concentrations of, from left to right, cobalt, lithium, magnesium, and titanium in the cross-section of coated particles, with different concentrations depicted in different colors, with concentration increasing as the color changes from dark blue, to lighter blue, to green, to yellow, to orange, and to red. *Id.* at 4, Fig. 2(b); Ex. 1003 ¶ 162 (explaining that lighter blue shows an increase in concentration over dark blue). Dr. Hayes refers to an area toward the bottom of the cross-sections in the magnesium and titanium images with concentrations shown in red as a crack portion filled with coating material. Ex. 1003 ¶ 162.

On the present record, we are not persuaded that Petitioner shows sufficiently how the high-concentration areas of magnesium and titanium in the area that Dr. Hayes identifies as a crack portion could have resulted from portions of the coating of Shim’s particle becoming ingrained in a crack. The material making up the coating of Shim’s particle has relatively low concentrations of magnesium and titanium, depicted in Shim’s Figure 2(b) in light blue, green, or yellow, but the concentration of magnesium and titanium in the identified crack portion is depicted in yellow, orange, and red. Ex. 1005, Fig. 2(b). This indicates a much higher concentration in the

crack portion than is present in the coating material itself. *Id.*; Ex. 2001 ¶ 76. Petitioner does not explain how portions of a low-concentration material can accumulate in such a way as to increase in concentration. Pet. 53–55. Accordingly, Petitioner does not explain sufficiently how Shim teaches or suggests the presence of fluorine from the coating of a particle made according to the teachings of Shim or the teachings of the combination of Shim and Lee within cracks in the particle.

In arguing for the obviousness of the challenged claims on grounds based on Shim, Petitioner also cites paragraph 165 of Dr. Hayes’s declaration, in which Dr. Hayes testifies that a person of ordinary skill in the art “would have found it obvious that fluorine-containing compounds would be found in Shim’s crack portions due to the reaction of newly exposed electrode surface areas (in other words, the walls of the crack) with the electrolyte.” Ex. 1003 ¶ 165 (citing Ex. 1003 ¶¶ 43–46); *see* Pet. 55 (citing Ex. 1003 ¶ 165). To the extent Petitioner intends its citation to this portion of the Hayes declaration to constitute an argument that a person of ordinary skill in the art would have known that fluorine would be present in the cracks in Shim’s particles due to the exposure of particle material on the crack surfaces to the electrolyte, we do not find the argument persuasive.

First, the argument in the Petition for obviousness on grounds based on Shim does not contain the argument that Dr. Hayes makes. Pet. 55 (repeating argument made by Dr. Hayes with respect to Shim and Fey teaching that coating material would become lodged in cracks, but not making any argument that electrolyte would react with crack surfaces to create fluorine-containing coating). Thus, the argument is incorporated by reference from Dr. Hayes’s declaration, which our rules prohibit. 37 C.F.R.

§ 42.6(a)(3) (“Arguments must not be incorporated by reference from one document into another document.”). Second, to the extent that Dr. Hayes refers back to earlier portions of his declaration as support for the argument that fluorine becomes present in crack portions via reaction of the crack walls and the electrolyte, those earlier portions rely on references that do not form part of Petitioner’s asserted ground of unpatentability. Ex. 1003 ¶¶ 43–46 (citing Ex. 1006, 3–4; Ex. 1010, 1–8; Ex. 1014; Ex. 1015; Ex. 1021, 6; Ex. 1023, 2; Ex. 1027, 1). The references cited by Dr. Hayes in the paragraphs of the declaration to which paragraph 165 refers include Wang, Jang, Bhattacharya, Dedyvère, Aurbach, and Sun. Pet. 4–6 (list of references, identifying Exhibits 1010, 1014, 1015, 1021, 1023, and 1027, respectively). Petitioner does not cite or discuss these references in the portion of the Petition addressing the presence of fluorine in the crack portions of the particles made according to Shim (or according to the combination of Shim and Lee). *Id.* at 55. Third, to the extent that Petitioner refers back to earlier portions of the Petition to provide the argument that fluorine becomes present in crack portions via reaction of the crack walls and the electrolyte, those earlier portions discuss only either (1) the presence of fluorine in or on the positive electrode active material particle, not within the crack portions of the particle or (2) the presence of a representative element, not fluorine, in the crack portions of the particle. *Id.* at 43–45, 52–55; see *id.* at 55 (citing *id.* at 43–45, 52–55). Fourth, to the extent Petitioner intends to rely on the citation to and discussion of Exhibits 1021–1030 in the “Technology Overview” section of the Petition to make the argument that fluorine would have formed on the exposed walls of the crack portions of Shim’s particles due to the exposure of those walls to Shim’s electrolyte, we

note that this portion of the Petition is not cited in Petitioner's discussion of its actual asserted ground of unpatentability. *Id.* at 55; see *id.* at 27–29.

Finally, to the extent that we are required to speculate to the degree this discussion reflects about the nature of Petitioner's argument, that requirement itself renders Petitioner's argument unavailing. 37 C.F.R. § 42.22(a)(2) ("Each petition . . . must include . . . [a] full statement of the reasons for the relief requested, including a detailed explanation of the significance of the evidence."); see *United States v. Dunkel*, 927 F.2d 955, 956 (7th Cir. 1991) ("Judges are not like pigs, hunting for truffles buried in briefs.").

With respect to claim 5 of the '828 patent and the claims that depend therefrom, Petitioner relies on the same arguments just discussed, with the crack portion of the particle forming the "portion which includes crystal defects" of the particle. Pet. 57–59. The arguments are no more persuasive with respect to claim 5 than they are with respect to claim 1.

Because Petitioner relies on Shim and Fey to show that a person of ordinary skill in the art would have understood that fluorine would be present in a crack portion of the Shim or Shim/Lee particle, because the requirement for fluorine to be present in a crack portion appears in all the challenged claims, and because Petitioner does not show sufficiently that Shim and Fey would have suggested the presence of fluorine in a crack portion, we determine that Petitioner has not shown a reasonable likelihood of prevailing with respect to any claim challenged on the basis of Shim.

E. Challenges Based on Fujiki

Petitioner contends claims 1, 4, 5, and 8 would have been obvious in view of Fujiki. Pet. 11–12, 69–80. Petitioner also contends claims 2 and 6

would have been obvious in view of the combination of Fujiki and Yu. *Id.* at 11–12, 80–84. Finally, Petitioner contends claims 3 and 7 would have been obvious in view of the combination of Fujiki and Lee. *Id.* at 11–12, 84–88.

1. *Fujiki*

Fujiki relates to “a positive electrode active material . . . with which a high capacity and excellent charge-discharge cycle characteristics are secured and in which deterioration during use in high-temperature environments is little.” Ex. 1008, 2:62–67. The material of Fujiki is made up of compound oxide particles that contain “a principal transition metal,” “a metallic element . . . different from [the] principal transition metal” that “is present at least at part of [the] surfaces of [the] compound oxide particles,” and “a compound of a metallic element . . . present in the state of coating (or being deposited on) the compound oxide particles.” *Id.* at 4:49–56. The principal transition metal can be cobalt. *Id.* at 4:58–63. The first metallic element can be titanium. *Id.* at 5:6–10. The second metallic element can be present in the form of a metallic fluoride. *Id.* at 5:46–49, 6:3–11.

2. *Analysis*

As noted above, each of the independent claims of the ’828 patent recites the presence of fluorine in a crack portion of a PEAM particle or in a portion of a PEAM particle that contains a crystal defect. Ex. 1001, 76:22–24, 76:49–52. In arguing that the challenged claims are unpatentable on grounds based on Fujiki, Petitioner relies on the same disclosure of Shim and Fey discussed above to show that a person of ordinary skill in the art would have understood that portions of Fujiki’s fluorine-containing coating

would be present in the crack portions of Fujiki's particles. Pet. 76–77 (citing Ex. 1003 ¶ 238; Ex. 1005, Fig. 2(b); Ex. 1016, 4). Dr. Hayes repeats the assertion, discussed previously with respect to the Shim ground, that a person of ordinary skill in the art “would have been aware that coating materials could become embedded or lodged inside . . . cracks.” Ex. 1003 ¶ 238 (citing Ex. 1005, Fig. 2(b); Ex. 1016, 4). As discussed above, neither Petitioner's arguments nor the testimony of Dr. Hayes explains sufficiently why a person of ordinary skill in the art would have believed that the metallic fluoride coating of Fujiki would behave in the same fashion as Fey's MgAl_2O_4 coating. *Id.*; Pet. 76–77. In addition, as also discussed above, neither Petitioner's arguments nor the testimony of Dr. Hayes explains sufficiently how low-concentration portions of Shim's coating could accumulate in crack portions in such a way as to increase in concentration. Pet. 76–77; Ex. 1003 ¶ 238.

Because Petitioner relies on Shim and Fey to show that a person of ordinary skill in the art would have understood that fluorine would be present in a crack portion of the Fujiki particle, because the requirement for fluorine to be present in a crack portion appears in all the challenged claims, and because Petitioner does not show sufficiently that Shim and Fey would have suggested the presence of fluorine in a crack portion, we determine that Petitioner has not shown a reasonable likelihood of prevailing with respect to any claim challenged on the basis of Fujiki.

III. CONCLUSION

Upon consideration of the Petition, the Preliminary Response, and the evidence presented, we determine that Petitioner has not shown a reasonable likelihood that it will prevail in showing that at least one of the challenged

claims is unpatentable. Accordingly, we do not institute an *inter partes* review of any challenged claim based on any ground asserted in the Petition.

IV. ORDER

For the reasons given, it is:

ORDERED that, pursuant to 35 U.S.C. § 314, the Petition is denied, and no *inter partes* review is instituted.

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