

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

A123 SYSTEMS, LLC,
Petitioner,

v.

LONG HUA TECHNOLOGY CO., LTD.,
Patent Owner.

IPR2021-00894
Patent 7,803,484 B2

Before CHRISTOPHER L. CRUMBLEY, KRISTINA M. KALAN, and
AVELYN M. ROSS, *Administrative Patent Judges*.

KALAN, *Administrative Patent Judge*.

DECISION
Denying Institution of *Inter Partes* Review
35 U.S.C. § 314

I. INTRODUCTION

A123 Systems, LLC (“Petitioner”) filed a Petition (Paper 3, “Pet.”) requesting *inter partes* review of claims 1–19 of U.S. Patent No. 7,803,484 B2 (Ex. 1001, “the ’484 patent”). Long Hua Technology Co., Ltd. (“Patent Owner”) filed a Preliminary Response to the Petition (Paper 9, “Prelim. Resp.”).

To institute *inter partes* review, we must determine that the information presented in the Petition shows “there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition.” 35 U.S.C. § 314(a). For the reasons discussed below, after considering the parties’ submissions and the evidence of record, we determine that Petitioner has not demonstrated a reasonable likelihood of prevailing with respect to any claim of the ’484 patent. Thus, we decline to institute *inter partes* review.

A. Related Proceedings

The parties identify *Long Hua Technology Co., Ltd. v. A123 Systems, LLC*, No. 1:20-cv-11887-RGS (D. Mass.) (“the District Court litigation”) as a related matter. Pet. 7; Paper 7, 2.

B. Real Parties-In-Interest

Petitioner identifies itself and its parent company, Wanxiang A123 Systems Asia Co., Ltd, as real parties-in-interest. Pet. 7. Patent Owner identifies itself as the real party-in-interest. Paper 7, 2.

C. The ’484 Patent

The ’484 patent is titled “High Rate Capability Design of Lithium Ion Secondary Battery.” Ex. 1001, code (54). The ’484 patent relates to a “lithium ion secondary battery” that “includes LiFePO_4 as a major

component of the positive electrode active material.” *Id.* at code (57). In the claimed lithium ion secondary battery, “an electrode layer of the positive electrode active material on a current collector” has “a ratio of its area to its thickness (A/t) greater than 1.2×10^6 mm, so that the layer has a reduced ionic impedance.” *Id.* at 2:6–22. The claimed lithium ion secondary battery has a high rate capability, namely, “the capacity at the discharge rate of 10C is greater than 80% of the capacity of the discharge rate at 1C.” *Id.* at 2:6–11; *see also id.* at 8:37–43, Fig. 3 (illustrating the relationship between area-to-thickness ratio and discharge capability).

D. Illustrative Claim

Claims 1 and 6 are independent claims; claim 1 is representative and is reproduced below:

1. A lithium ion secondary battery comprising a positive electrode; a negative electrode; a separating film that separates the positive electrode and the negative electrode; and an electrolyte forming a lithium ion channel between the positive electrode and the negative electrode, wherein the positive electrode comprises a current collector substrate; one single tab or a plurality of tabs connected to the current collector substrate; and an electrode layer of a positive electrode material on one surface of the current collector, wherein the positive electrode material comprises LiFePO_4 as a major component thereof, and the electrode layer of the positive electrode material has a ratio of its area to its thickness greater than 1.2×10^6 mm, and wherein the lithium ion secondary battery has a ratio of its capacity at discharge rate of 10C to its capacity at discharge rate of 1C is greater than 80%.

Ex. 1001, 8:59–9:6.

E. The Asserted Grounds of Unpatentability

Petitioner contends that claims 1–19 of the ’484 patent are unpatentable on the following grounds. Pet. 9–10, 21–59.

Ground	Reference(s)	Basis ¹	Claims Challenged
1	Hisamitsu ²	§ 102	1–19
2	Hisamitsu, general common knowledge	§ 103	1–19
3	Hisamitsu, Gozdz, ³ and general common knowledge	§ 103	1–19

In support of its unpatentability arguments, Petitioner relies on the declaration of Dr. Peter Khalifah. Ex. 1013.

II. ANALYSIS

A. Claim Construction

We apply the claim construction standard articulated in *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005). 37 C.F.R. § 42.100(b) (2020). Under *Phillips*, claim terms are afforded “their ordinary and customary meaning.” *Phillips*, 415 F.3d at 1312. The “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. Only terms that are in controversy need to be construed, and then only to the extent necessary to resolve the controversy. *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999).

¹ The Leahy-Smith America Invents Act, Pub. L. No. 112-29, 125 Stat. 284 (2011) (“AIA”), amended 35 U.S.C. §§ 102, 103. Because the ’484 patent has an effective filing date prior to the effective date of the applicable AIA amendments, we refer to the pre-AIA versions of §§ 102, 103.

² JP Pub. No. 2005-174691, published June 30, 2005 (Ex. 1002). Petitioner provides a certified English translation of Hisamitsu as part of Ex. 1002.

³ US Pub. No. 2005/0233219 A1 (Ex. 1003).

Regarding the limitation “wherein the lithium ion secondary battery has a ratio of its capacity at discharge rate of 10C to its capacity at discharge rate of 1C is greater than 80%,” Petitioner argues that it “carries no patentable weight because it is either inherent by Patentee’s own admission, or is an intended use or intended result.” Pet. 16.

Patent Owner argues that “Petitioner does not actually propose any claim construction, but merely advocates eliminating the battery capability limitation as having ‘unpatentable weight.’” Prelim. Resp. 17. Patent Owner further argues that the claimed 10C discharge capability “is a physical property readily measurable by one of ordinary skill in the art using a suitable instrument,” and should be given patentable weight. *Id.* at 19. Patent Owner proposes constructions for the terms “a positive electrode,” “a negative electrode,” “a separating film that separates,” and “a lithium ion channel.” *Id.* at 21–23.

We do not discern a discrete claim construction proposal from Petitioner vis-à-vis the claimed 10C discharge capability; rather, Petitioner’s argument is more of a discussion of whether this term should be given patentable weight. We discuss this term below, in the context of analyzing the individual grounds of unpatentability. We also determine that none of the claim terms discussed by Patent Owner are in controversy such that they require express construction. *Vivid Techs.*, 200 F.3d at 803. On this record, therefore, we decline to expressly construe any claim term.

B. Level of Ordinary Skill in the Art

Petitioner asserts that, at the time of filing of the ’484 patent, one of ordinary skill in the art “would be a chemist having at least a Bachelor’s degree with at least 5 years of experience in lithium ion battery chemistry.”

Pet. 19 (citing Ex. 1013 ¶¶ 13–15). Patent Owner asserts that one of ordinary skill in the art “would be a chemist or other material scientist having a doctoral degree, or at least a Bachelor’s degree with at least 5 years of experience in lithium ion battery development.” Prelim. Resp. 17. Petitioner’s definition and Patent Owner’s definition overlap significantly, and neither party asserts that adopting one definition or other would change the outcome. Considering the two proposals, we regard a fair hybrid definition of a person of ordinary skill in the art to be “a chemist or other material scientist having at least a Bachelor’s degree with at least 5 years of experience in lithium ion battery chemistry and development.” This level of ordinary skill in the art is also reflected by the prior art of record. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001).

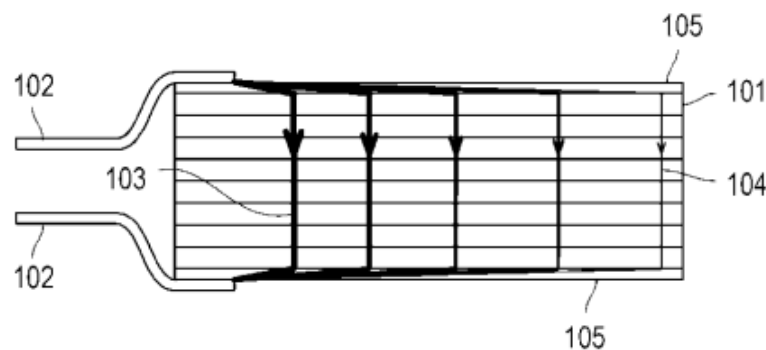
C. Asserted Anticipation over Hisamitsu (Ground 1)

Petitioner argues that claims 1–19 are anticipated by Hisamitsu. Pet. 21–37.

1. Hisamitsu (Ex. 1002)

Hisamitsu is a patent titled “Bipolar Battery.” Ex. 1002, code (54). Hisamitsu’s Figure 1 is reproduced below.

【 図 1 】



Hisamitsu's Figure 1 is a schematic diagram of the flow of current in the bipolar battery. Ex. 1002 ¶ 146. Figure 1 depicts current path 103 having lowest resistance around a connection part of tab 102, and path 104 having the highest resistance in a portion far from connection part of tab 102. *Id.* ¶ 16. Figure 1 also depicts intermediate layer cell 101 sandwiched between outermost layer collectors 105. *Id.* ¶ 15. Hisamitsu discloses a “bipolar battery formed by stacking a plurality of cells (cells) having a positive electrode layer formed on one side of a single collector, and a negative electrode layer formed on an opposite side of the collector such that the cells sandwich electrolyte layers.” *Id.* ¶ 5.

Hisamitsu's Figures 3A and 3B are reproduced below.

【 図 3 】

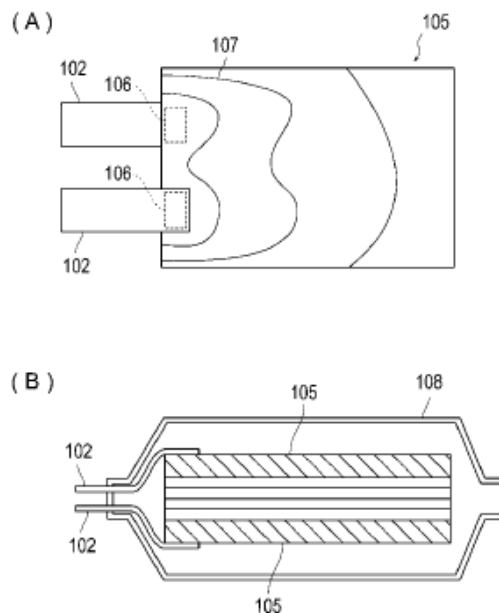


Figure 3(A) “is a planar view of the outermost layer collector of the inside of the bipolar battery,” and Figure 3(B) “is a cross-sectional schematic diagram of the bipolar battery.” *Id.* ¶ 146. In Figure 3(B), “a stack formed by stacking cells (cells) around electrolyte layers is stored in a battery case 108

by making tabs protrude out, the outermost layer collectors 105 are made thicker than the collectors of intermediate layer cells sandwiched between the outermost layer collectors 105.” *Id.* ¶ 19. Regarding the composition of the stack of intermediate layer cells, Hisamitsu provides:

A lithium-transition metal complex oxide, which is a complex oxide of a transition metal and lithium, may be suitably used as the positive electrode active material. Specifically, a Li/Co complex oxide such as LiCoO_2 , a Li/Ni complex oxide such as LiNiO_2 , a Li/Mn complex oxide such as spinel (LiMn_2O_4), a Li/Fe complex oxide such as LiFeO_2 , or a compound in which a portion of these transition metals are substituted with other elements may be used as the positive electrode active material. These lithium-transition metal complex oxides are low cost materials having excellent reactivity and cycle durability. Therefore, these materials are advantageous in that using them in electrodes forms a battery having excellent output characteristics. Other examples include: phosphates and sulfates of transition metals and lithium, such as LiFePO_4 ; transition metal oxides and sulfides such as V_2O_5 , MnO_2 , TiS_2 , MoS_2 , and MoO_3 ; PbO_2 ; AgO ; NiOOH ; and the like.

Id. ¶ 24.

2. *Claim 1*

i. *Petitioner’s Arguments*

Petitioner asserts that every element of claim 1 is found in Hisamitsu, as follows (numbering provided by Petitioner):

1.a. A lithium ion secondary battery comprising (Pet. 21 (relying on Ex. 1002 ¶¶ 117–124, 3–8));

1.b. a positive electrode; a negative electrode (Pet. 21 (relying on Ex. 1002 ¶¶ 14, 118, 119));

1.c. a separating film that separates the positive electrode and the negative electrode; and (Pet. 21–22 (relying on Ex. 1002 ¶ 121));

1.d. an electrolyte forming a lithium ion channel between the positive electrode and the negative electrode, (Pet. 22 (relying on Ex. 1002 ¶¶ 32–33, 124; Ex. 1003, Abstract, ¶ 87; Ex. 1013 ¶ 55));

1.e. wherein the positive electrode comprises a current collector substrate; (Pet. 22 (relying on Ex. 1002 ¶¶ 14, 118, 119));

1.f. one single tab or a plurality of tabs connected to the current collector substrate; and (Pet. 22–23 (relying on Ex. 1002 ¶¶ 121, Figs. 3(A)–3(B)));

1.g. an electrode layer of a positive electrode material on one surface of the current collector, (Pet. 23 (relying on Ex. 1002 ¶¶ 14, 118, 119));

1.h. wherein the positive electrode material comprises LiFePO_4 as a major component thereof, and (Pet. 23–25, 31–32 (relying on Ex. 1002 ¶¶ 24–25));

1.i. electrode layer of the positive electrode material has a ratio of its area to its thickness greater than 1.2×10^6 mm, and (Pet. 25–27, 32 (relying on Ex. 1002 ¶¶ 117–124, 24; Ex. 1013 ¶ 59));

1.j. wherein the lithium ion secondary battery has a ratio of its capacity at discharge rate of 10C to its capacity at discharge rate of 1C is greater than 80% (Pet. 27–32 (relying on Ex. 1002 ¶¶ 117–124; Ex. 1013 ¶¶ 70–73, 76)).

Regarding limitation 1.h., Petitioner argues that Hisamitsu’s finite list of materials that could be used as positive electrode active materials specifically includes LiFePO_4 . Pet. 24–25. Regarding limitation 1.i., Petitioner argues that Hisamitsu’s Example 1 “is directed to a battery including a positive electrode layer applied to a collector surface of an electrode having an area of 210 mm x 300 mm” where the “thickness of the positive electrode layer was 30 μm ” yielding a ratio of 2.1×10^6 mm. *Id.* at 26. Regarding limitation 1.j.,

Petitioner argues first that the “language of 1.j. is inherent” and also that the “language of 1.j. carries no patentable weight.” *Id.* at 27–31.

ii. Patent Owner’s Arguments

Patent Owner argues that Hisamitsu does not anticipate the challenged claims. Prelim. Resp. 29–45. More particularly, Patent Owner argues that Hisamitsu does not disclose limitations 1.c., 1.d., 1.f., 1.h., 1.i., and 1.j. *Id.* at 29–30. Patent Owner argues that Hisamitsu fails to disclose positive and negative electrodes because Hisamitsu’s intermediate layers (cells) “cannot reasonably correspond to the claimed positive and negative electrodes because they are neither positive nor negative and because no tabs are connected thereto,” and that any separating film (1.c.) is not located between positive and negative electrodes, and therefore cannot anticipate. *Id.* at 30–31. Patent Owner also argues that Hisamitsu discloses LiMn_2O_4 , not LiFePO_4 , (1.h.) in its examples, and the single mention of LiFePO_4 in Hisamitsu (Ex. 1002 ¶ 24) is insufficient to anticipate the claim. *Id.* at 31. Additionally, Patent Owner argues that the tables in Hisamitsu provide values for testing of bipolar batteries made with LiMn_2O_4 , not and because “no experimental result for LiFePO_4 is disclosed,” the limitations of 1.i. and 1.j. are not met. *Id.* at 31–32. Patent Owner provides a claim chart including a column titled “Defect and Patent Owner Explanation,” detailing the perceived deficiencies with Petitioner’s case. *Id.* at 33–45.

iii. Analysis

“A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference.” *Verdegaal Bros. Inc., v. Union Oil Co.*, 814 F.2d 628, 631 (Fed. Cir. 1987). To anticipate, a reference “must not only disclose all

elements of the claim within the four corners of the document, but must also disclose those elements ‘arranged as in the claim.’” *Net MoneyIN, Inc. v. VeriSign, Inc.*, 545 F.3d 1359, 1369 (Fed. Cir. 2008).

Petitioner relies on Hisamitsu’s “positive electrode layer being provided on one surface of a collector and a negative electrode layer being provided on an opposite surface of the collector” to anticipate the “positive electrode” and the “negative electrode” (1.b.) with a “separating film that separates the positive electrode and the negative electrode” (1.c.) arranged as in the claim. Pet. 21–22 (relying on Ex. 1002 ¶¶ 14, 118, 119, 121). One of the paragraphs of Hisamitsu Petitioner cites refers to a “*plurality of cells (cells)* having a positive electrode layer provided on one surface of a collector and a negative electrode layer provided on an opposite surface of the collector” (Ex. 1002 ¶ 14) (emphasis added), disclosing a plurality of bipolar electrodes having a negative surface and an opposing positive surface, arranged in a stack, each separated by its own film, resulting in multiple positive electrodes, multiple negative electrodes, and multiple films. Ex. 1002, Figs. 1, 3(B). Hisamitsu, therefore, appears to disclose a battery having multiple collectors: outermost layer collectors 105, as well as a plurality of internal cells in stack 101, each having its own collector. *Id.* It is unclear, and Petitioner does not explain, which of these multiple “sandwiching separators” between the multiple stacked bipolar electrode layers having a positive and a negative surface it is relying on to meet the claimed limitations of a positive electrode, a negative electrode, and a separating film. Pet. 21–22 (citing Ex. 1002 ¶ 121). As noted by Patent Owner, to “the extent Hisamitsu’s bipolar battery can be compared with the claimed lithium ion secondary battery, a POSITA would at best point to

Hisamitsu's outermost layer collectors 105 as corresponding to the claimed positive and negative electrodes." Prelim. Resp. 35. However, Petitioner does not specifically indicate that the outermost layer collectors 105 correspond to the claimed positive electrode and negative electrode, particularly in its arguments regarding limitations 1.b., 1.c., 1.d., 1.e., 1.g., or 1.i., and we decline to make and analyze that argument on Petitioner's behalf. If Petitioner intended to choose a single one of Hisamitsu's bipolar electrodes or sandwiching separators in stack 101 to furnish the anticipating elements, Petitioner has not sufficiently indicated or explained that, either.

Petitioner's lack of clarity regarding which of the plurality of collectors of Hisamitsu is the basis of its challenge is compounded by its mapping of limitations 1.e. and 1.f., "one single tab or a plurality of tabs connected to the current collector substrate" (1.f.) wherein "the positive electrode comprises a current collector substrate" (1.e.). Pet. 22. Petitioner argues that Hisamitsu's "tabs for extracting current" are "connected to outermost layer collectors 105 at connection parts 106," but this connection of the tabs to the outermost connection layer collectors 105 does not line up with Petitioner's apparent reliance elsewhere, such as in limitations 1.b., 1.c., 1.d., 1.e., 1.g., and 1.i., on the bipolar electrode layers in stack 101 as the claimed positive electrode and negative electrode. *Id.* at 22–23 (citing Ex. 1002 ¶¶ 14, 118, 119). With respect to limitation 1.e., for example, Petitioner relies on the "positive electrode layer being provided on one surface of a collector" on one side of one of Hisamitsu's plurality of collectors, which has a "negative electrode layer being provided on an opposite surface." *Id.* at 22 (citing Ex. 1002 ¶¶ 14, 118, 119). Although not specified by Petitioner, this appears to be a reference to one or more of the

plurality of stacked bipolar electrode layers 101, because only the collectors of the stack 101 have a positive electrode layer on one surface and a negative electrode layer on the other. Hisamitsu's outermost layer collectors 105 have only a positive electrode layer or a negative electrode layer, but not both. Ex. 1002 ¶ 45. On the other hand, the collectors of the stack 101 are not connected to the tabs for extracting current; they are sandwiched between outermost collection layers 105 as shown in Figure 1. Ex. 1002, Fig. 1. Hisamitsu's tabs 102 are connected to outermost layer collectors 105. *Id.* at Figs. 1, 3(B). Thus, Petitioner cannot have it both ways, relying on stacked bipolar electrode layers 101 in most of the limitations that include a positive and negative electrode, and then relying on outermost layer collectors 105 in limitation 1.f. *In re Arkley*, 455 F.2d 586, 587 (CCPA 1972) (an anticipatory reference must "clearly and unequivocally disclose" the claimed invention "without *any* need for picking, choosing, and combining various disclosures").

Hisamitsu's lack of specific use of LiFePO_4 in Example 1 also hampers Petitioner's case. As pointed out by Patent Owner, Hisamitsu's Example 1 results, shown in Table 1, refer "to the capacity retention rate of example bipolar batteries made by using *lithium manganate* (not LFP)" i.e., LiMn_2O_4 instead of LiFePO_4 "as the positive electrode material." Prelim. Resp. 32. Hisamitsu measured this LiMn_2O_4 -employing battery "before and after 1,000 cycles of *10C charge* and *10C discharge* (not the capacity ratio of 10C and 1C *discharges*)."
Id. Petitioner does not provide sufficient reasoning to support a conclusion that Hisamitsu would obtain the exact same capacity results with LiFePO_4 as with LiMn_2O_4 , or that a battery using LiFePO_4 would have the same area-to-thickness ratio as the layers disclosed

in Hisamitsu using LiMn_2O_4 . Even if Hisamitsu had conducted an experiment with LiFePO_4 , which Hisamitsu did not, Patent Owner correctly points out that Hisamitsu did not provide any experimental information on the capacity ratio of 10C and 1C discharges in Example 1. Prelim. Resp. 32. Without this data, it would be difficult to determine the Hisamitsu battery's "ratio of its capacity at discharge rate of 10C to its capacity at discharge rate of 1C" (1.j.).

Regarding Petitioner's argument that the ratio limitation 1.j. is either admittedly inherent, or an intended use, we find neither to be the case. Patent Owner stated in prosecution that the lithium ion secondary battery having a 10C discharge capability greater than 80% is a "unique property of the claimed lithium ion secondary batteries brought about by 'the electrode layer of the positive electrode material has [sic] a ratio of its area to its thickness greater than 1.2×10^6 mm.'" Ex. 1011, 6 (quoted in Pet. 28). Petitioner interprets the "brought about by" portion of this statement to mean that a battery having the claimed area-to-thickness ratio "would necessarily have the claimed 10C discharge capability." Pet. 28. We disagree. The "brought about by" language does not rise to the level of an unequivocal admission, as Petitioner would have us read it. Rather, this language appears to indicate that the area-to-thickness ratio is a contributor to the claimed capacity at discharge rate ratio, not that there is a 1:1 correlation between area-to-thickness ratio and capacity at discharge rate ratio. As Patent Owner notes, one of ordinary skill in the art "knows that parameters other than area and thickness could be modified to achieve the capacity ratio threshold," such as the "composition of the positive electrode material, concentration, or proportion of the LiFePO_4 material, the porosity and tortuosity of the

electrode structure, the type and amount of conductive additive, the type and amount of binder, and the composition/structure of the negative electrode.”

Prelim. Resp. 19.

We also do not find that limitation 1.j. is a “non-limiting aspect of how the device operates,” an “intended use,” or merely “informational,” as argued by Petitioner. Pet. 29. Rather, the language of limitation 1.j. sets forth a particular, quantifiable, physical property of the claimed battery that can be discerned and tested. Petitioner argues that limitation 1.j. is similar to the “providing information” limitation of *Praxair Distribution, Inc. v. Mallinckrodt Hospital Products IP Ltd.*, 890 F.3d 1024, 1029 (Fed. Cir. 2018), which was found to lack patentable weight. We disagree, because the limitation here sets forth measurable, numerical properties of the apparatus itself in terms of unit and ratio, rather than “ineligible information” or an “ineligible mental process.” *Praxair*, 890 F.3d at 1033.

Although limitation 1.j. is not inherent by admission, and although Petitioner has not persuaded us that it does not carry patentable weight, we nevertheless look to determine whether Petitioner has shown that the capacity at discharge rate ratio is an inherent property that follows from the area-to-thickness ratio. Pet. 32 (“the 10C discharge capability greater than 80% is an inherent property of the battery of Example 1 of Hisamitsu’s example 1”). Petitioner has not provided persuasive evidence that this property is inherent. *Id.* at 27–31, 32. Rather, Petitioner relies on the prosecution history statement above (Ex. 1011, 6) and language from the specification (Ex. 1001, 2:7–12) to argue that “Patentee has disclaimed any notion the 10C discharge capability is an additional structural feature.” Pet. 28. Having reviewed the prosecution history statement and the relied-upon

portion of the patent, we find that they do not support Petitioner's allegations of inherency. Moreover, Hisamitsu's lack of experimental information on the capacity ratio of 10C and 1C discharges in Example 1 to arrive at the claimed 80% is problematic, as is the lack of any specific results or support for the allegedly inherent properties of a positive electrode using LiFePO_4 ; these two factors, at least, render Petitioner's inherent anticipation case insufficient as to limitation 1.j.

On this record, Petitioner has not demonstrated a reasonable likelihood of prevailing on its case for anticipation of claim 1 by Hisamitsu.

3. Claims 2–19

Petitioner argues that Hisamitsu also discloses each limitation of claims 2–19. Pet. 33–37. Independent claim 6 contains substantially the same disputed limitations as claim 1, apart from specifying that the positive electrode element is “a lithium compound [which] has a conductivity of a level between 10^{-5} to 10^{-10} S/cm” instead of “ LiFePO_4 ” as in claim 1. Because Petitioner argues that this limitation is disclosed by Hisamitsu's disclosure of LiFePO_4 , we apply the same reasoning to claim 6 as to claim 1, addressed above. Pet. 34; Prelim. Resp. 45. Petitioner's remaining arguments relating to the dependent claims do not overcome the problems with the claim 1 and claim 6 arguments, and because each of the dependent claims depend directly or indirectly on claim 1 or claim 6, those problems are not cured by Petitioner's additional arguments directed to the dependent claims. Having reviewed Petitioner's arguments with respect to claims 2–19, we are not persuaded that Petitioner has demonstrated a reasonable likelihood of prevailing on its anticipation contentions as to these claims.

D. Asserted Obviousness Based on Hisamitsu and General Common Knowledge (Ground 2)

Petitioner asserts that claims 1–19 would have been obvious over Hisamitsu and general common knowledge. Pet. 38–49 (incorporating by reference the Hisamitsu anticipation ground).

With respect to limitation 1.h., Petitioner argues that “general knowledge supports that use at 80 to 90% [of LiFePO_4] of would be considered a major component.” *Id.* at 38 (citing Ex. 1003 ¶ 85, Ex. 1013 ¶ 61). Petitioner also argues that substituting LiFePO_4 for LiMn_2O_4 in Hisamitsu’s Example 1 would have been “obvious to try” in “order to produce a battery having excellent output characteristics,” with a reasonable expectation of success. *Id.* at 38–39 (citing Ex. 1013 ¶ 59–60). Regarding limitation 1.i., Petitioner argues that “it would be obvious that the positive electrode layer is in the claimed ratio” of area to thickness greater than 1.2×10^6 mm, because one of ordinary skill in the art “would consider it implausible that more than 40% of the current collector area” would be “free of the active material coating.” *Id.* at 40 (citing Ex. 1013 ¶¶ 65–66). Regarding limitation 1.j., Petitioner argues that one of ordinary skill in the art “would expect that LiFePO_4 batteries would exhibit a 10C discharge capability greater than 80%,” because that “was known in lithium ion secondary batteries having LiFePO_4 as the positive electrode active material.” *Id.* at 41 (citing Ex. 1003 ¶¶ 55, 84, 85). Petitioner further relies on Example 1 of Gozdz (Ex. 1003 ¶ 55) to evidence the general knowledge of one of ordinary skill in the art as to lithium ion secondary batteries having the claimed components and discharge capacity. Pet. 42–43.

Patent Owner argues that it would not be “obvious to try” a different positive electrode active material, such as LiFePO_4 , in Example 1, because it

was “well known in the art that the conductivity of LiFePO_4 is extremely low and using LiFePO_4 as the positive electrode material for Hisamitsu’s bipolar battery would render it to perform comparatively worse than using LiMn_2O_4 ” as in Hisamitsu. *Id.* at 46–47 (citing Pet. 39; “the ‘349 patent,” 1:17–22). Patent Owner also challenges Petitioner’s allegations of reasonable expectation of success, arguing that Hisamitsu teaches that lithium-transition metal complex oxides are advantageous, but that LiFePO_4 is not a lithium-transition metal complex oxide and therefore is not identified by Hisamitsu as “advantageous,” but, rather, as merely “one of the other examples.” *Id.* at 47–48 (citing Ex. 1002 ¶ 24). Regarding the discharge limitation, Patent Owner argues that Gozdz fails to “disclose any capacity ratio of the discharge rate capabilities.” *Id.* at 50. Regarding the area-to-thickness limitation, Patent Owner argues that “the cited references, taken alone or in combination, simply do not disclose the claimed area to thickness ratio being greater than 1.2×10^6 mm.” *Id.* at 51. Patent Owner presents its own claim chart to support its arguments that Petitioner’s ground does not meet the limitations of the challenged claims. *Id.* at 52–55.

As discussed above, we are not persuaded that Hisamitsu discloses, expressly or inherently, every element of claims 1–19. Petitioner’s reliance on general common knowledge does not fill in these gaps or cure these shortcomings in connection with the limitations not disclosed by Hisamitsu. Because these missing elements are not supplemented by general common knowledge, this ground falls for at least the same reasons articulated above.

It is also unclear how Petitioner arrives at the claimed ratio of area to thickness: “the minimum claimed area-to-thickness ratio in the ’484 patent is 1.2×10^6 mm which, when applied to Hisamitsu, is 57% of the nominal

collector area of Hisamitsu;” Petitioner also does not explain how it is “implausible that more than 40% of the current collector area of Hisamitsu collector would be free of the active material coating.” Pet. 40 (citing Ex. 1013 ¶ 66). The declaration provides no further clarity, without which we are unable to determine how Petitioner arrived at this calculation and how to interpret Petitioner’s arguments based on this calculation.

Finally, it is also unclear, based on Petitioner’s proffered reasoning, how general knowledge could supply the claimed capacity ratio. Although Petitioner argues that “general knowledge as further supported by the Declaration shows that it was known that LiFePO_4 when used in a lithium ion secondary battery would provide a 10C discharge capability in the claimed range,” this does not necessarily lead to the claimed ratio. Pet. 43, 49 (citing Ex. 1013 ¶ 84). Absent values for the necessary components of this calculation, which Petitioner has not identified, we are not certain how Petitioner’s obviousness-based ground mathematically arrives at a “ratio of its capacity at discharge rate of 10C to its capacity at discharge rate of 1C” of “greater than 80%.”

Petitioner refers back to its Ground 1 arguments to contend that claims 2–19 “are further considered obvious in view of the combination of Hisamitsu and general common knowledge, as provided in Section IX.A. [Ground 1].” Pet. 44; *see also* Prelim. Resp. 56–57 (arguing that Hisamitsu and general common knowledge cannot render claims 2–19 obvious). We refer back to the Ground 1 analysis to reiterate that Petitioner has not demonstrated a reasonable likelihood of prevailing on its contentions based on Hisamitsu, and we do not find that Petitioner’s additional arguments based on general common knowledge cure this lacking.

On this record, we are not persuaded that Petitioner has met its burden of demonstrating that claims 1–19 would have been obvious over the combination of Hisamitsu and general common knowledge.

E. Asserted Obviousness Based on Hisamitsu, Gozdz, and General Common Knowledge (Ground 3)

Petitioner asserts that claims 1–19 would have been obvious over Hisamitsu and Gozdz. Pet. 50–59 (incorporating by reference the Hisamitsu anticipation ground and the Hisamitsu-based obviousness ground).

1. Gozdz

Gozdz is a patent titled “Lithium Secondary Cell with High Charge and Discharge Rate Capability.” Ex. 1003, code (54). Gozdz “relates to a non-aqueous electrolyte secondary cell,” namely, “a battery having a fast charge and discharge rate capability and low rate of capacity fade during such high rate cycling.” *Id.* ¶ 3. Gozdz teaches forming its positive electrode using “88 g of doped LiFePO_4 ” in its positive electrode slurry. *Id.* ¶¶ 84–100.

2. Claim 1

Petitioner relies on Hisamitsu to meet most of the limitations of the challenged claims, and argues that Gozdz discloses “a lithium ion secondary battery including an electrolyte forming a lithium ion channel between a positive electrode and a negative electrode,” “a positive electrode material having LiFePO_4 as a major component thereof,” and “a 10C discharge capability being greater than 80%.” Pet. 50 (citing Ex. 1003, Abstract, ¶¶ 87, 85, 55). Petitioner reasons that one of ordinary skill in the art would have been motivated to combine Gozdz and Hisamitsu because “(i) Gozdz motivates advantages of LiFePO_4 as a positive electrode active material; and (ii) Hisamitsu discloses LiFePO_4 as one of a finite list of positive electrode

active materials.” *Id.* at 51. Petitioner further argues that both references teach the same “technical solution” and, therefore one of ordinary skill in the art “would readily combine their teachings.” *Id.* at 53.

Patent Owner restates its argument that Hisamitsu fails to disclose numerous critical elements of the challenged claims, and adds that Gozdz “also fails to cure the deficiencies of Hisamitsu.” Prelim. Resp. 57–58. Regarding the discharge limitation, Patent Owner reiterates that Gozdz “at best discloses the *fast charging* and *slow discharging* of a lithium ion secondary battery” over many charging and discharging cycles, but fails to teach or suggest a battery “having ‘a ratio of its capacity at **discharge** rate of 10C to its capacity at **discharge** rate of 1C is greater than 80%,’ as recited in claim 1.” *Id.* at 58–59. Patent Owner additionally argues that Gozdz fails to cure the deficiencies of Hisamitsu with respect to the ratio of area to thickness and the ratio of capacity at discharge rate. *Id.* at 59. Patent Owner presents its own claim chart to support its arguments that Petitioner’s ground does not meet the limitations of the challenged claims. *Id.* at 60–62.

As discussed above, we are not persuaded that Hisamitsu discloses, expressly or inherently, every element of claims 1–19. Petitioner’s reliance on Gozdz does not fill in these gaps or cure these shortcomings in connection with the limitations not disclosed by Hisamitsu or general common knowledge. Because these claimed limitations are not supplemented by Gozdz or general common knowledge, this ground falls for at least the same reasons articulated above.

Although Gozdz discloses using LiFePO_4 in its positive electrode, it is unclear that Gozdz satisfactorily discloses the required ratio of area to thickness and ratio of capacity at discharge rate. As argued by Patent

Owner, Gozdz “at best discloses” the fast charging (at 10C rate) and the slow discharging (at 1/10C rate) of a lithium ion secondary battery to compare its charging ability after many cycles to a new lithium ion secondary battery. Prelim. Resp. 58.

Petitioner also argues that “the 10C discharge capability is considered to be shown for a lithium ion secondary battery including a positive electrode active material having LiFePO_4 as a major component thereof,” but this does not necessarily lead to the claimed ratio. Pet. 58–59 (citing Ex. 1013 ¶ 93). Absent values for the necessary components of this calculation, which Petitioner has not identified, we are not certain how Petitioner’s obviousness-based ground mathematically arrives at the claimed “ratio of its capacity at discharge rate of 10C to its capacity at discharge rate of 1C is greater than 80%.”

Petitioner refers back to its Ground 1 arguments to contend that claims 2–19 “are further considered obvious in view of the combination of Hisamitsu and Gozdz, as provided in the claim chart of Section IX.A. [Ground 1].” Pet. 53; *see also* Prelim. Resp. 62–63 (arguing that Hisamitsu, Gozdz, and general common knowledge cannot render claims 2–19 obvious). We refer back to the analysis of Ground 1 and Ground 2 to reiterate that Petitioner has not demonstrated a reasonable likelihood of prevailing on its contentions based on Hisamitsu, or based on Hisamitsu and general common knowledge. We do not find that any of Petitioner’s additional arguments based on Gozdz cure this lacking.

On this record, we are not persuaded that Petitioner has met its burden of demonstrating that claims 1–19 would have been obvious over the combination of Hisamitsu, Gozdz, and general common knowledge.

F. Discretion Under 35 U.S.C. § 314(a)

Patent Owner argues that the Board should exercise its discretion to deny institution under 35 U.S.C. § 314(a) in view of the District Court litigation. Prelim. Resp. 63–66 (citing *Apple Inc. v. Fintiv, Inc.*, IPR2020-00019, Paper 11 (PTAB Mar. 20, 2020) (precedential)). Petitioner does not present arguments directed to whether we should exercise our discretion to deny institution under 35 U.S.C. § 314(a). *See generally* Pet. For the reasons stated above, we decline to institute *inter partes* review. Because we base our denial of institution on the merits of this case, it is unnecessary for us to analyze whether we should also discretionarily deny institution under 35 U.S.C. § 314(a).

III. CONCLUSION

For the reasons set forth above, we determine that Petitioner has not demonstrated a reasonable likelihood of prevailing with respect to at least one challenged claim of the '484 patent. Thus, we decline to institute *inter partes* review on the grounds asserted in the Petition.

IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that the Petition is *denied* and no *inter partes* review is instituted.

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