

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

APPLE INC.,
Petitioner,

v.

RJ TECHNOLOGY, LLC,
Patent Owner.

IPR2023-01350
Patent 7,749,641 B2

Before JON B. TORNQUIST, CHRISTOPHER M. KAISER, and
BRIAN D. RANGE, *Administrative Patent Judges*.

TORNQUIST, *Administrative Patent Judge*.

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

I. INTRODUCTION

Apple Inc. (“Petitioner”) filed a Petition requesting *inter partes* review of claims 5–14 of U.S. Patent No. 7,749,641 B2 (Ex. 1001, “the ’641 patent”). Paper 2 (“Pet.”). RJ Technology LLC (“Patent Owner”) filed a Preliminary Response to the Petition.¹ Paper 7. With authorization, Petitioner filed a Preliminary Reply (Paper 8, “Prelim. Reply”) and Patent Owner filed a Preliminary Sur-Reply (Paper 9, “Prelim. Sur-Reply”).

An *inter partes* review may not be instituted “unless . . . the information presented in the petition . . . shows that 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) (2018). Having considered the arguments and evidence presented by Petitioner and Patent Owner, we determine that the information presented in the Petition demonstrates a reasonable likelihood that Petitioner would prevail on at least one of the challenged claims of the ’641 patent. Accordingly, we institute an *inter partes* review as to all the challenged claims of the ’641 patent on all the grounds of unpatentability set forth in the Petition.

II. BACKGROUND

A. Related Matters

The parties indicate that the ’641 patent is at issue in *RJ Technology LLC v. Apple Inc.*, 8:22-cv-01874 (C.D. Cal., filed October 13, 2022) and *RJ Technology LLC v. Samsung Electronics Co., Ltd.*, 22-cv-00401 (E.D. Tex.,

¹ The Notice of Filing Date Accorded identifies Patent Owner as Xiaoping Ren. Paper 3. Patent Owner’s Mandatory Notices indicate that the ’641 patent has been assigned to RJ Technology LLC. Paper 4, 1.

filed October 13, 2022). Pet. 73; Paper 5, 1. The parties further note that the '641 patent is at issue in IPR2023-01183 (instituted). *Id.*

B. Real Parties-in-Interest

The parties identify themselves as the real parties-in-interest. Pet. 73; Paper 4, 1.

C. The '641 patent

The '641 patent discloses “a new method for improving capacity, average operating voltage and specific energy of a secondary lithium ion cell or battery.” Ex. 1001, code (57).

The '641 patent notes that the positive and negative electrode materials used in current secondary lithium ion batteries have high theoretical capacities, but a “lower actual utilization rate of said capacity.” *Id.* at 1:36–40. According to the '641 patent, the lower utilization rate is “mainly caused by the limitation of charge cut-off voltage commonly used in the art,” which is “no more than 4.2 V.” *Id.* at 1:44–47. The '641 asserts that the technical requirement that the charge cut-off voltage not exceed 4.2 V is “well accepted” in the industry and “all lithium ion batteries in the markets around the world are manufactured under this technical requirement.” *Id.* at 1:46–51.

Although it was known in the art that capacity could be improved by increasing the charge cut-off voltage, the '641 patent reports that the “opinions in the prior art research results and documents” were that “the positive electrode materials and negative electrode materials will undergo structure change, the electrolyte may decompose, and the recycle property of the cell will be adversely affected when the charge cut-off voltage is greater than 4.2 V.” *Id.* at 1:57–63.

The '641 patent reports that, after conducting “a large number of experiments and studies,” it was determined that “the efficacy of electrode active materials is greatly increased by increasing the charge cut-off voltage and proper[ly] adjusting the ratio of positive electrode material to negative electrode material of [a] single lithium ion cell.” *Id.* at 3:3–12. The '641 patent further reports that “[w]ithin a certain range of charge cut-off voltage,” it was determined that “the decomposition of little electrolyte solution brings about negligible effect on the recycle property of [the] cell.” *Id.* at 5:19–21

D. Illustrative Claim

Claim 5 is the only challenged independent claim of the '641 patent and is reproduced below.

5. A secondary lithium ion cell or battery, characterized in that the secondary lithium ion cell or battery has a charge cut-off voltage of greater than 4.2 V but less than 5.8 V, and a ratio of positive electrode material to negative electrode material of the secondary lithium ion cell or battery is from 1:1.0 to 1:2.5, as calculated by a theoretic capacity with a charge cut-off voltage set at 4.2 V.

Ex. 1001, 17:5–11.

E. Asserted Grounds of Unpatentability

Petitioner asserts the following grounds of unpatentability (Pet. 5):²

Claims Challenged	35 U.S.C. §	Reference(s)/Basis
5–8, 11–14	103(a)	Yamaki ³ , Sakamoto ⁴
9–10	103(a)	Yamaki, Sakamoto, Abraham
5–14	103(a)	Yasunami ⁵ , Koyama ⁶
9–10	103(a)	Yasunami, Koyama, Richardson ⁷

III. ANALYSIS

A. Legal Standard

A patent claim is unpatentable under 35 U.S.C. § 103(a) if the differences between the claimed subject matter and “the prior art are such that the subject matter, as a whole, would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying

² The relevant sections of the Leahy-Smith America Invents Act (“AIA”), Pub. L. No. 112–29, took effect on March 16, 2013. The ’641 patent issued July 6, 2010. Ex. 1001, code (45). Thus, we apply the pre-AIA version of §103.

³ JP Publ. No. 2001-167763, published June 22, 2001. Ex. 1004 (“Yamaki”).

⁴ JP Publ. No. H09-293536, published November 11, 1997. Ex. 1005 (“Sakamoto”).

⁵ JP Publ. No. H07-122298, published May 12, 1995. Ex. 1006 (“Yasunami”).

⁶ JP Publ. No. P2000-260472A, published September 22, 2000. Ex. 1007 (“Koyama”).

⁷ WO 01/29920 A1, published April 26, 2001. Ex. 1008 (“Richardson”).

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 in evidence, objective evidence of nonobviousness. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

B. Level of Ordinary Skill in the Art

In order to determine whether an invention would have been obvious at the time the application was filed, we consider the level of ordinary skill in the pertinent art. *Graham*, 383 U.S. at 17. In assessing the level of ordinary skill in the art, various factors may be considered, including the “type of problems encountered in the art; prior art solutions to those problems; rapidity with which innovations are made; sophistication of the technology; and educational level of active workers in the field.” *In re GPAC, Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995) (quotation omitted).

Petitioner contends a person of ordinary skill in the art, as of the earliest possible priority date for the ’641 patent, “would have held a Bachelor’s degree in chemistry or chemical engineering, with at least 4 years of experience in cell design, electrochemical techniques, and battery materials development.” Pet. 4. Petitioner further contends that a “Master’s Degree can substitute[] for some of the relevant experience,” and “[e]quivalent training with battery specific experience can accommodate other degreed fields.” *Id.*

Patent Owner does not dispute Petitioner’s definition, “except noting that other majors may provide equivalent education and experience designing, testing, and building lithium-ion batteries.” Prelim. Resp. 14.

Upon review of the prior art of record and the parties' arguments, we adopt Petitioner's unopposed definition of the person of ordinary skill in the art for purposes of this Decision. The parties may further address at trial whether "other majors" should be added to this definition, and whether such a modification would have any impact on the unpatentability analysis in this case.

C. Claim Construction

In an *inter partes* review proceeding, a patent claim is construed using the same claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. § 282(b). 37 C.F.R. § 42.100(b) (as amended Oct. 11, 2018). This rule adopts the same claim construction standard used by Article III federal courts, which follow *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc), and its progeny. Under this standard, the words of a claim are generally given their "ordinary and customary meaning," which is the meaning the term would have to a person of ordinary skill at the time of the invention, in the context of the entire patent including the specification. *See Phillips*, 415 F.3d at 1312–13.

Neither party contends any terms of the '641 patent require express construction. Pet. 4–5; Prelim. Resp. 13–14. And, for purposes of this decision, we agree that no claim terms require express construction. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999) ("[O]nly those terms need be construed

that are in controversy, and only to the extent necessary to resolve the controversy.”)).

D. Obviousness in view of Yamaki and Sakamoto

Petitioner asserts that the subject matter of claims 5–8 and 11–14 would have been obvious over the combined disclosures of Yamaki and Sakamoto. Pet. 6–30.

1. *Yamaki*

Yamaki discloses “a lithium secondary battery with high energy density and excellent cycle characteristics.” Ex. 1004 ¶ 1. The battery of Yamaki includes a positive electrode containing a Co-based oxide that includes “at least one element selected from Mg, Al, Mn, Ti, and Sr” and at least a surface layer that has an amorphous carbonaceous material. *Id.* ¶ 13. Yamaki explains that “[w]hen such a battery configuration is used, the maximum potential of the positive electrode during charging can be from 4.4 V to 4.8 V in terms of metallic Li while also suppressing deterioration in the reversibility of charging and discharging as more charging and discharging cycles are performed.” *Id.* ¶ 14. Yamaki reports that setting the maximum potential of the positive electrode during charging to 4.4 V or more improves “the discharge capacity of the positive electrode active material” and, “[a]s a result, the amount of positive electrode active material in the battery can be reduced, and the amount of negative electrode active material can be increased.” *Id.* ¶ 15. “Therefore, a lithium secondary battery with a higher energy density can be obtained in a limited battery volume.” *Id.*

2. *Sakamoto*

Sakamoto discloses a non-aqueous electrolyte secondary battery with “a highly reliable positive and negative electrode configuration with excellent charge-discharge cycle performance.” Ex. 1005 ¶ 1. Sakamoto notes that “if the reversible capacities of the positive and negative electrode are approximately equal, deposit of lithium occurs on the negative electrode during overcharge,” which “increases the amount of passive lithium, and leads to a decrease in battery capacity and to deterioration in cycle characteristics.” *Id.* ¶ 6. In order to solve these problems, Sakamoto sets “the reversible capacity balance of the positive electrode and the negative electrode” in the “range of $1.05 < \text{negative electrode/positive electrode} \leq 1.30$.” *Id.* ¶ 7. Sakamoto explains that “[i]f the reversible capacity balance is 1.05 or less, the reversible capacity balance may reach 1 or less locally in the electrode due to variations in electrode manufacturing, etc,” and “[i]f the reversible capacity balance is greater than 1.30, too much of the compound does not participate in charging and discharging.” *Id.* ¶ 8.

3. *Analysis—Claim 5*

Petitioner contends that in combination Yamaki and Sakamoto disclose every limitation of claim 5. Pet. 9–11, 15–30. In particular, Petitioner contends that Yamaki discloses selecting a charge cut-off voltage in the range of 4.4 V to 4.8 V and Sakamoto discloses a ratio of positive electrode material to negative electrode material that is greater than 1.05 and less than or equal to 1.30. *Id.* at 15–21 (citing Ex. 1004 ¶ 14; Ex. 1005 ¶ 7; Ex. 1003 ¶¶ 60–68, 71). Petitioner further contends that calculation of reversible capacity using theoretic capacity “was conventional in battery design,” and because Sakamoto describes reversible capacity balances for

batteries that have “a charge upper limit voltage” of 4.2 V, one of ordinary skill in the art would have understood that Sakamoto’s reversible capacities were calculated using a charge cut-off voltage set at 4.2 V. *Id.* at 20 (citing Ex. 1005 ¶ 16; Ex. 1003 ¶¶ 81–83).

Petitioner contends one of ordinary skill in the art would have used Sakamoto’s ratio of positive to negative electrode material in Yamaki’s battery because this combination would improve the cycle performance of Yamaki’s battery, create a “safer” battery that is resistant to overcharging, and provide “implementation details” that are missing from Yamaki. *Id.* at 11–13. Petitioner further contends that the proposed combination represents “merely the application of known techniques,” “by a known system,” to “yield predictable results.” *Id.* at 13 (citing *KSR*, 550 U.S. at 417; Ex. 1003 ¶ 46).

Patent Owner contends the ground based on Yamaki and Sakamoto fails because (a) Petitioner has not demonstrated that one of ordinary skill in the art would have had a reason to combine Yamaki and Sakamoto, and (b) Petitioner does not demonstrate that one of ordinary skill in the art would have had a reasonable expectation of success in combining Yamaki with Sakamoto. Prelim. Resp. 17–31. We address these arguments in turn.

a. Reason to Combine

Patent Owner contends that Petitioner’s asserted need for improved battery performance, including improved “cycle performance,” “safety,” and “resistance to overcharging,” “is precisely the type of *generic* need that the Federal Circuit has held insufficient to provide reason to combine *specific* prior art references to practice a *specific* claimed invention.” Prelim. Resp.

17 (citing *Forest Labs, LLC v. Sigmapharm Labs, LLC*, 918 F.3d 928, 935 (Fed. Cir. 2019)).

This argument is not persuasive. Contrary to Patent Owner’s arguments, the Federal Circuit has held that “generic” reasons to combine are not inherently suspect, and may reasonably include a desire to make a device “stronger, cheaper, cleaner, faster, lighter, smaller, more durable or more efficient.” *See Intel Corp. v. Qualcomm Inc.*, 21 F.4th 784, 797 (Fed. Cir. 2021) (quoting *DyStar Textilfarben GmbH v. C.H. Patrick Co.*, 464 F.3d 1356, 1368 (Fed. Cir. 2006)). Regardless, Petitioner’s asserted reasons to combine are *specific* (improved safety and less deterioration after repeated charging and discharging cycles), as is the proposed combination (implementing Sakamoto’s range of ratios for the positive and negative electrode materials in Yamaki’s lithium ion battery). Pet. 9–12. Identification of *specific* benefits that are tied to *specific* elements of *specific* prior art references is sufficient to support an obviousness ground. *See Intel*, 21 F.4th at 797.

Patent Owner asserts that the inquiry is not whether one of ordinary skill in the art “‘with two (and only two) references sitting on a table in front of him, would have been motivated to combine . . . the references in a way that renders the claimed invention obvious, [; rather, the] real question is whether that skilled artisan would have plucked’ those references out of the sea of prior art in order to combine them.” Prelim. Resp. 18–19 (quoting *WBIP, LLC v. Kohler Co.*, 829 F.3d 1317, 1337 (Fed. Cir. 2016) (bracketed modifications by Patent Owner)).

This argument is not persuasive. Petitioner’s combination starts with Yamaki’s battery, which is described as having “high energy density and excellent cycle characteristics.” Pet. 6–7 (quoting Ex. 1004, Abstract).

Petitioner then looks to Sakamoto, which describes a method for improving the cycle characteristics and safety of a lithium ion battery by setting the “reversible capacities of the positive electrode and the negative electrode” in a range between 1.05 and 1.30. *Id.* at 9 (citing Ex. 1005 ¶ 12). An argument for modifying an existing battery design (Yamaki), according to a known method in the art (Sakamoto), to achieve an improvement expressly identified in the art (improved cycle characteristics and safety), is precisely the type of rationale sanctioned in *KSR*. See *KSR*, 550 U.S. at 416 (“when a patent claims a structure already known in the prior art that is altered by the mere substitution of one element for another known in the art, the combination must do more than yield a predictable result.”). Thus, we see no structural deficiencies in Petitioner’s proffered reasons to combine Yamaki and Sakamoto.

Patent Owner further argues that Yamaki and Sakamoto “teach fundamentally incompatible approaches to battery design with respect to energy density.” Prelim. Resp. 19–20. In particular, Patent Owner contends that Yamaki increases the energy density of lithium-ion batteries by using materials capable of being charged to higher voltages, whereas Sakamoto reduces the energy density of a fixed volume lithium-ion battery in favor of safety by increasing the capacity of the anode relative to the cathode. *Id.* at 20.

Patent Owner’s argument does not dissuade us from instituting trial. First, contrary to Patent Owner’s argument that Yamaki would not reduce energy density by decreasing the amount of cathode material, Yamaki expressly discloses that by charging the battery at 4.4 V or more “the amount of positive electrode active material in the battery can be reduced, and the amount of negative electrode active material can be increased.”

Ex. 1004 ¶ 15. In such a configuration, Yamaki explains that the result is “a lithium secondary battery with a higher energy density . . . in a limited battery volume.” *Id.* Thus, on this record, we discern no incompatibility between the disclosures and goals of Yamaki and Sakamoto.

Second, Yamaki has two stated goals, “high energy density and excellent cycle characteristics,” and Petitioner contends the use of Sakamoto’s capacity ratios would further improve the cycle characteristics of Yamaki’s battery. Pet. 11; Ex. 1004, code (57). To the extent that Sakamoto’s capacity ratio would reduce energy density (as asserted by Patent Owner), we are presented with a material issue of fact as to whether this decrease in energy density would have led one of ordinary skill in the art to avoid the asserted improvement in cycle characteristics provided by Sakamoto’s capacity ratios. *See Medichem, S.A. v. Rolabo, S.L.*, 437 F.3d 1157, 1165 (Fed. Cir. 2006) (noting that “a given course of action often has simultaneous advantages and disadvantages, and this does not necessarily obviate motivation to combine”).

Patent Owner further argues that one of ordinary skill in the art would not have combined Yamaki and Sakamoto because Yamaki is directed to the cathode and Sakamoto is directed to the anode of a lithium ion battery. Prelim. Resp. 23. According to Patent Owner, Petitioner “has not articulated a rationale for which [a person of ordinary skill in the art] would seek to modify the claimed anode to cathode capacity ratio of the Yamaki battery, . . . let alone a rationale for which a [person of ordinary skill in the art] would attempt to modify Yamaki by looking to Sakamoto.” *Id.* at 25.

Contrary to Patent Owner’s arguments, Petitioner provides multiple rationales as to why one of ordinary skill in the art would have sought to implement Sakamoto’s disclosed ratios in the battery of Yamaki, including

improved cycle characteristics, improved safety, and resistance to overcharging. Pet. 11–12. Moreover, Patent Owner directs our attention to no requirement that two prior art references be directed to improving the same component of a device or battery before they can or would be combined. *See KSR*, 550 U.S. at 417 (“if a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill.”).

Patent Owner further argues that because Petitioner “contends that Yamaki already achieved a battery with excellent cycle life,” “a [person of ordinary skill in the art] would *not* have had reason to further adapt Yamaki by turning to Sakamoto’s teachings, particularly since Sakamoto teaches away from Yamaki’s stated approach and goal of increasing energy density.” Prelim. Resp. 26. On this record, Patent Owner’s arguments do not dissuade us from instituting trial. First, Petitioner’s reasons to combine Yamaki and Sakamoto are not limited to improved cycle life, but rather include improved safety and resistance to overcharging. Pet. 11–12. Thus, even if Yamaki “already achieved a battery with excellent cycle life,” Petitioner provides additional reasons for the proposed combination. Second, although Yamaki’s battery has excellent cycle life, Petitioner contends that this cycle life could be “further” improved by implementing Sakamoto’s capacity ratios. *Id.* at 11. Patent Owner provides no persuasive argument as to why one of ordinary skill in the art would not seek to provide further improvements to the cycle life of Yamaki’s battery.

Finally, Patent Owner contends that Petitioner relies on a single paragraph (paragraph 15) of Yamaki to provide a reason to combine with Sakamoto, but paragraph 15 of Yamaki does not call for additional

modifications, much less provide a reason for practicing the claimed capacity ratio range. Prelim. Resp. 27–28.

We do not understand Petitioner’s argument with respect to paragraph 15 to be that Yamaki expressly suggests adopting Sakamoto’s capacity ratios. Rather, we understand Petitioner to argue that, consistent with the disclosures of Sakamoto, Yamaki discloses increasing the amount of negative electrode active material as compared to the positive electrode active material, and that one of ordinary skill in the art would have looked to the art for guidance on how to successfully achieve this goal. Pet. 12–13. In any event, for the reasons discussed above, Petitioner provides sufficient additional reasons to combine beyond “implementation details” to support institution.

b. Reasonable Expectation of Success

Petitioner contends one of ordinary skill in the art would have had a reasonable expectation of success in combining Yamaki and Sakamoto to arrive at the claimed invention because Yamaki suggests increasing the relative amount of negative electrode active material in its battery in the context of using 4.4–4.8 V charge cut-off voltage. Pet. 13 (Ex. 1004 ¶¶ 14–15). Petitioner further contends that “both Yamaki and Sakamoto describe secondary lithium ion batteries with similar materials systems, as detailed by Hruska.” *Id.* at 14 (citing Ex. 1003 ¶¶ 50–54; Ex. 1004 ¶¶ 13, 16, 18, 20–23, 30, 33, Abstract; Ex. 1005 ¶¶ 12–13, 15). And, according to Petitioner, secondary lithium ion batteries were known to operate with a charge cut-off voltage of greater than 4.2 V, as were batteries in which there is more negative than positive electrode capacity. *Id.* (citing Ex. 1007 ¶ 6; Ex. 1012,

1; Ex. 1020, 5; Ex. 1021, 11; Ex. 1023, 1:25–35; Ex. 1024, 40:3–14; Ex. 1025, 2:63–3:3; Ex. 1003 ¶ 55).

Patent Owner contends that “the batteries of Sakamoto are strictly limited to a conventional system, where the charge cutoff voltage is limited to 4.2 V,” whereas “Yamaki’s batteries are purportedly not so limited.” Prelim. Resp. 29 (citing Ex. 1005 ¶ 16). “Further,” according to Patent Owner, “Yamaki and Sakamoto are silent as to whether their respective batteries are suitable to be combined.” *Id.* at 29–30. Thus, Patent Owner contends Petitioner’s “expectation of success rests on the assertion that a [person of ordinary skill in the art] would *assume* that the two types of batteries could be combined.” *Id.* at 30 (Patent Owner’s emphasis). Patent Owner contends this assumption is incorrect because “methods and improvement that may be suitable for traditional 4.2V battery systems cannot be presumed to be equally applicable or successful in high-voltage systems.” *Id.*

Patent Owner’s arguments do not dissuade us from instituting trial. Mr. Hruska testifies that given the similar materials used in Yamaki’s and Sakamoto’s batteries, including similar anode and cathode materials and electrolytes, one of ordinary skill in the art would have had a reasonable expectation of success in combining the two disclosures to arrive at the claimed invention. Ex. 1003 ¶¶ 50–54. Patent Owner’s assertions to the contrary—based entirely on attorney argument—are not sufficient to refute Mr. Hruska’s testimony.

c. Conclusion—Claim 5

Petitioner identifies where Yamaki and Sakamoto disclose every limitation of claim 5. Petitioner also provides rationales, supported by

factual underpinnings, to explain why one of ordinary skill in the art would have combined the disclosures of Yamaki and Sakamoto to arrive at the claimed invention with a reasonable expectation of success. Accordingly, Petitioner demonstrates a reasonable likelihood that claim 5 would have been obvious in view of Yamaki and Sakamoto.

4. Analysis—Claims 6–8 and 11–14

Petitioner also contends Yamaki and Sakamoto disclose every limitation of claims 6–8 and 11–14. Pet. 21–30. In particular, Petitioner contends the charge cut-off voltage range of Yamaki falls within the ranges recited in claims 6 and 7 and the ratio of positive electrode material to negative electrode material disclosed in Sakamoto falls within the range recited in claim 8. *Id.* at 21–22. With respect to claims 11–14, Petitioner contends that these claims recite features that do not further limit the structure of the battery of claim 5, but to the extent these claims are found limiting, each would have been obvious in view of the combined teachings of Yamaki and Sakamoto. *Id.* at 23–30.

Patent Owner does not address Petitioner’s arguments with respect to claims 6–8 and 11–14, apart from its arguments regarding independent claim 5. Prelim. Resp. 15 n.1.

Upon review of the parties’ arguments and evidence, we determine that Petitioner demonstrates a reasonable likelihood that claims 6–8 and 11–14 would have been obvious over the combined disclosures of Yamaki and Sakamoto.

E. Obviousness of claims 9 and 10 over Yamaki, Sakamoto, and Abraham

Claim 9 depends from claim 5 and further requires that the cell or battery “has a first overcharging protection voltage of greater than 4.35 V, and an overcharging protection release voltage of greater than 4.15 V.”

Ex. 1001, 17:24–28. Claim 10 depends from claim 9 and further requires that the “battery has a first overcharging protection voltage of greater than 4.45 V, and an overcharge protection release voltage of greater than 4.25 V.” *Id.* at 17:29–18:3.

Petitioner contends that the subject matter of claims 9 and 10 would have been obvious over the combined disclosures of Yamaki, Sakamoto, and Abraham. Pet. 31–38.

1. *Abraham*

Abraham discloses “the use of redox reagents, dissolved in non-aqueous electrolytes, to provide overcharge protection for cells having lithium metal or lithium-ion negative electrodes (anodes).” Ex. 1009, code (57). Abraham explains its invention as follows:

A redox shuttle offers the best approach to cell overcharge protection. In this scheme, a material with an appropriate oxidation potential is dissolved in the electrolyte where it remains unreactive until the cell is charged fully. At a potential slightly above the cell charge limit (upper cutoff voltage), the redox shuttle is activated by its electrochemical conversion. The cell potential during overcharge is fixed at the oxidation potential of the redox shuttle. This process is supported by diffusion of the oxidized products to the anode where they recombine to form the starting material. Once the reformed material diffuses back to the cathode, it is oxidized and the cathode potential is maintained indefinitely at the oxidation potential of the redox reagent, until the time that charging is terminated.

Abraham notes that in the preferred embodiment thianthrenes are used to protect lithium and lithium-ion secondary cells from the effects of overcharge. *Id.* at 3:20–22. Abraham further notes that “[j]udicious selection of the particular thianthrene will allow the overcharge protection agent to be tailored to the appropriate cell voltage.” *Id.* at 3:52–54.

2. Analysis

Petitioner contends one of ordinary skill in the art would have sought to include the overcharging protection of Abraham in the battery of Yamaki and Sakamoto in order to “avoid degradation of battery performance,” “to mitigate safety risks associated with overcharging,” and to avoid the need for “electronic overcharge controllers,” which lower energy density and increase costs. Pet. 33–34. Petitioner further contends that one of ordinary skill in the art considering the disclosures of Abraham would have selected an overcharging protection voltage for the battery of Yamaki and Sakamoto that is “slightly higher than” a voltage that is between 4.4 and 4.8V, which is greater than the 4.35V and 4.45V limits recited in claims 9 and 10, respectively. *Id.* at 37–38.

Patent Owner does not address Petitioner’s arguments with respect to Abraham, apart from its arguments with respect to the combination of Yamaki and Sakamoto. Prelim. Resp. 15 n.1.

Upon review of Petitioner’s arguments and supporting evidence, we determine that Petitioner demonstrates a reasonable likelihood that claims 9 and 10 would have been obvious over the combined disclosures of Yamaki, Sakamoto, and Abraham.

F. Obviousness over Yasunami and Koyama

Petitioner contends the subject matter of claims 5–14 would have been obvious over the combined disclosures of Yasunami and Koyama. Pet. 39–63.

1. *Yasunami*

Yasunami is directed to “a charging and discharging method for a non-aqueous secondary battery that has improved charge/discharge cycle characteristics.” Ex. 1006 ¶ 1. The negative electrode of Yasunami’s battery may be a lithium containing transition metal oxide represented by Li_xMO_j , where M is at least one transition metal selected from the group of Ti, V, Mn, Co, Fe, Ni, Nb, and Mo, x is in the range from 0.17 to 11.25, and j is in the range from 1.6 to 4.1. *Id.* ¶ 7. The positive electrode active material is “a lithium-containing transition metal oxide represented by Li_yNO_z (where N represents at least one transition metal selected from Co, Mn, Ni, V, and Fe, y is in the range from 0.2 to 1.2, and z is in the range from 1.4 to 3).” *Id.* The “end-of-charge voltage” of the battery “is from 3.5 to 4.7 V.” *Id.*

Yasunami explains that “[t]here are no particular restrictions on the use ratio for the positive electrode active material and the negative electrode active material, but the ratio is preferably set so that the effective equivalents of each are equal (an effective equivalent is the equivalent that can substantially maintain cycle performance).” *Id.* ¶ 19. According to Yasunami, “either the positive electrode active material or the negative electrode active material” may be increased. *Id.*

With respect to the end-of-charge voltage, Yasunami explains that the voltage is preferably in the range of 3.5 to 4.7 V, and even more preferably

from 3.8 to 4.4 V. *Id.* ¶ 34. According to Yasunami, if the end-of-charge voltage “is lower than 3.5 V, the battery voltage will be low, and if it is higher than 4.7 V, the positive electrode active material and the electrolyte may decompose.” *Id.*

2. *Koyama*

Koyama discloses a secondary battery “wherein the capacity ratio (B/A) between the electrode capacity A of the positive electrode and the electrode capacity B or the negative electrode is $1.3 < (B/A) \leq 2.5$.”

Ex. 1007 ¶ 6. Koyama explains that the positive electrode active material may be “Li-containing transition metal oxides such as Li_xMO_y (where M includes at least one transition metal such as Co, Mn, Ni, V, and Fe),” and the negative electrode active materials may include metal oxides such as Li_xMO_y , where M includes at least one transition metal such as Ti, V, Mn, Co, and Fe. *Id.* ¶¶ 8–9.

According to Koyama, by using the disclosed capacity ratio range “the nonaqueous electrolyte secondary battery can obtain excellent charging characteristics.” *Id.* ¶ 10.

3. *Analysis—Claim 5*

Petitioner contends that Yasunami and Koyama disclose every limitation of claim 5. In particular, Petitioner contends that Yasunami discloses a secondary lithium ion battery that has a charge cut-off voltage of 3.5 to 4.7, which overlaps the claimed range of greater than 4.2 V but less than 5.8 V. Pet. 48–51. Petitioner further contends that the ratio of positive to negative electrode material of Koyama is between 1.3 and 2.5, which falls entirely within the claimed range of 1:1.0 and 1:2.5. *Id.* at 54–55. Finally, Petitioner contends one of ordinary skill in the art would have understood

that the theoretic capacity would be calculated using a charge cut-off voltage set at 4.2 V. *Id.* at 53–54.

Petitioner contends one of ordinary skill in the art would have sought to use the capacity ratio range of Koyama in the battery of Yasunami in view of the advantages recited in Koyama for such a range, and also in view of the known increase in safety and cycle life characteristics that are provided when there is more capacity in the negative electrode than in the positive electrode. *Id.* at 43–45. Petitioner further contends that the proposed combination merely represents the application of known techniques, to a known system, to yield predictable results. *Id.* at 45 (citing *KSR*, 550 U.S. at 417). Petitioner further argues that a person of ordinary skill in the art would have had a reasonable expectation of success in combining the teachings of Yasunami and Koyama because selecting material to meet performance objectives is consistent with Yasunami’s disclosure, because the two references describe similar systems and materials, and because operation of batteries with a charge cut-off voltage of greater than 4.2 V was well known in the art. *Id.* at 45–47.

Patent Owner contends Petitioner’s combination based on Yasunami and Koyama fails because Petitioner has not demonstrated that one of ordinary skill in the art would have sought to combine these references with a reasonable expectation of success. Prelim. Resp. 31–40. We address both issues below.

a. *Reason to Combine*

Patent Owner contends that, as a threshold matter, Petitioner’s “generic goal of battery performance improvement is insufficient” to show one of ordinary skill in the art would have had reason to combine Yasunami

and Koyama. Prelim. Resp. 31. We disagree. Petitioner provides specific reasons why it contends the use of Koyama's capacity ratio would have improved the battery of Yasunami, including improved safety and cycle life characteristics. These specific rationales are sufficient to support an obviousness ground.

Patent Owner also argues that Yasunami expressly teaches against decreasing cathode capacity, as well as the use of carbonaceous materials as the anode active material, and in each disclosed example Koyama decreases cathode capacity and uses carbonaceous materials in its anode. Prelim. Resp. 32–34. On this record, we are not persuaded by Patent Owner's arguments. First, although Koyama contemplates the use of carbonaceous materials in its anode materials, it also expressly contemplates using transition metal oxides for the negative electrode active material, and Petitioner's proposed combination uses Yasunami's negative anode material, which may be a lithium-containing transition metal oxide. Ex. 1007 ¶ 9; Pet. 41. As such, arguments regarding the use of carbonaceous materials in the negative anode material do not appear to be relevant to the proposed combination.

Second, Yasunami expressly states that there are “no particular restrictions on the use ratio of the positive electrode active material and the negative electrode active material” and “either the positive electrode active material or the negative electrode active material is preferably increased.” Ex. 1006 ¶ 19. As such, on this preliminary record, we are not persuaded that Yasunami teaches away from increasing the relative capacity of the anode.

Patent Owner argues that Petitioner's translation of Yasunami is incorrect, with Yasunami actually disclosing that the ratio of positive to

negative electrode active materials “can be set **arbitrarily** according to the type of active materials to be combined.” Prelim. Resp. 36–37 (citing Ex. 2001 ¶ 32) (Patent Owner’s emphasis). And, given that the ratio could be arbitrarily set, Patent Owner contends that “Yasunami teaches that the capacity ratio does not impact battery performance but is only affected by the battery active materials.” *Id.* at 37.

Patent Owner’s arguments do not dissuade us from instituting trial. Patent Owner’s attorney argument as to how one of ordinary skill in the art would have interpreted Yasunami’s disclosures runs counter to the teachings of the prior art, including Koyama, which consistently demonstrates that the capacity ratio may have a significant impact on battery performance. Ex. 1005 ¶¶ 6–7; Ex. 1007 ¶ 3; Ex. 1018 ¶ 33 (noting that the when the ratio is below 1 the holding sites on the negative electrode become insufficient, resulting in the formation of branch-shaped or needle-shaped crystals); Ex. 1003 ¶ 38. As such, Patent Owner presents, at most, a material issue of fact as to the proper interpretation of Yasunami that is best resolved on a complete trial record.

b. Reasonable Expectation of Success

Patent Owner contends the mere fact that the batteries of Yasunami and Koyama contemplate the use of similar materials “is insufficient to show, let alone establish, that a [person of ordinary skill in the art] combining the two systems would enjoy a reasonable expectation of success.” Prelim. Resp. 37. Patent Owner further contends that one of ordinary skill in the art would understand that Yasunami and Koyama disclose “materially different battery systems.” *Id.* at 38. According to Patent Owner, Yasunami teaches that its anode material is “fundamentally

different” from conventional anode materials, whereas Koyama discloses that its anode materials may be conventional anode materials that “Yasunami explicitly excludes from its list of compatible materials.” *Id.* at 38–39.

Patent Owner’s arguments do not dissuade us from instituting trial. Even if Koyama contemplates the use of some conventional materials, the combination recited in the Petition is not based on the use of those conventional materials. Rather, the combination recited in the Petition uses the anode and cathode materials of Yasunami, and Mr. Hruska testifies that these materials are “consistent with” certain anode and cathode materials contemplated for use in Koyama. Ex. 1003 ¶¶ 164–166 (citing Ex. 1007 ¶¶ 8–9, 15; Ex. 1006 ¶¶ 7, 21, 48–51). Patent Owner’s attorney argument is not sufficient to call this testimony into question.

Patent Owner also contends that Koyama’s battery system is limited to a charge cut-off value no higher than 4.2, and “[w]ithout any specific rationale for concluding that the methods disclosed in Yasunami and Koyama may be compatible when employed *in tandem*,” a person of ordinary skill in the art would not have a reasonable expectation of success. Prelim. Resp. 39.

Mr. Hruska testifies that the materials used to construct the batteries of Yasunami and Koyama, including the anode, cathode, and electrolyte, are “consistent” (at least with respect to the materials selected for use in the combination). Ex. 1003 ¶¶ 164–166. Mr. Hruska also testifies that one of ordinary skill in the art would have had a reasonable expectation of success in combining Yasunami and Koyama because their use of a “similar materials system” “is an indication that the teachings of Koyama are compatible with, and applicable to, the battery described in Yasunami.” *Id.*

¶¶ 178–181. Although Patent Owner disagrees with Mr. Hruska’s conclusions, its attorney argument raises, at most, a material issue of fact that is best resolved on a complete trial record.

c. Conclusion

Petitioner identifies where Yasunami and Koyama disclose each limitation of claim 5. Petitioner also provides multiple rationales, supported by factual underpinnings, to explain why one of ordinary skill in the art would have combined Yasunami and Koyama to arrive at the subject matter of claim 5 with a reasonable expectation of success. Accordingly, Petitioner demonstrates a reasonable likelihood that claim 5 would have been obvious over Yasunami and Koyama.

4. Analysis—Claims 6–14

Petitioner contends Yasunami and Koyama teach or suggest every limitation of claims 6–14. Pet. 55–63. In support of its arguments, Petitioner provides citations to both references to show where it contends each limitation is disclosed. *Id.*

Patent Owner does not address Petitioner’s arguments with respect to these claims, other than its arguments directed to independent claim 5, from which each claim ultimately depends. Prelim. Resp. 15 n.1.

Upon review of Petitioner’s arguments and supporting evidence, we determine that Petitioner demonstrates a reasonable likelihood that claims 6–14 would have been obvious over the combined disclosures of Yasunami and Koyama.

G. Claims 9 and 10 over Yasunami, Koyama, and Richardson

Petitioner contends that the subject matter of claims 9 and 10 would have been obvious over the combined disclosures of Yasunami, Koyama,

and Richardson. Pet. 63–69.

Patent Owner does not directly address Petitioner’s arguments with respect to this ground, apart from its arguments with respect to independent claim 5. Prelim. Resp. 15 n.1.

Upon review of Petitioner’s arguments and supporting evidence, we determine that Petitioner demonstrates a reasonable likelihood that claims 9 and 10 would have been obvious over Yasunami, Koyama, and Richardson.

H. Discretion under 35 U.S.C. § 325(d)

Pursuant to 35 U.S.C. § 325(d), “the Director may elect not to institute a proceeding if the challenge to the patent is based on matters previously presented to the Office.” *Advanced Bionics, LLC v. MED-EL Elektromedizinische Geräte GmbH*, IPR2019-01469, Paper 6 at 7 (February 13, 2020) (precedential). A two-part framework is applied in determining whether institution should be denied under § 325(d):

- (1) whether the same or substantially the same art previously was presented to the Office or whether the same or substantially the same arguments previously were presented to the Office;
- and (2) if either condition of [the] first part of the framework is satisfied, whether the petitioner has demonstrated that the Office erred in a manner material to the patentability of challenged claims.

Id. at 8.

Patent Owner contends the Petition should be denied under § 325(d) because Petitioner relies on prior art that is substantially similar to the art considered by the Examiner during prosecution and Petitioner does not demonstrate that the Office erred in allowing the challenged claims. Prelim. Resp. 40–41.

During prosecution, the pending claims were rejected over the combination of Idota (US 5,260,148), which was asserted to describe a battery having a specific ratio of positive to negative electrode material, and Tanaka (US 5,487,960) or Kobayashi (US 6,558,848), which were asserted to describe a charge cut-off voltage higher than 4.2V. *Id.* at 40; Ex. 1002, 23. Petitioner contends that the question that arose during prosecution was whether it would have been obvious to increase the charge cut-off voltage of a battery that already has the claimed ratio of positive/negative electrode materials. Pet. 71; Prelim. Resp. 41. In contrast to the combination addressed during prosecution, Petitioner contends its proposed combination starts with a battery that is already using a charge cut-off voltage higher than 4.2 V and then implements this battery with a ratio of positive to negative electrode materials that are within the claimed range. Pet. 71; Prelim. Reply 3. According to Petitioner, this is a “***substantively distinct***” argument from the one made during prosecution. Pet. 71 (Petitioner’s emphasis); Prelim. Reply 3–4.

Patent Owner contends Petitioner merely takes issue with the order in which the prior art references are considered, not with the substance of those references. Prelim. Resp. 41; Prelim. Sur-Reply 2. According to Patent Owner, “[t]hese are not substantially different arguments,” but rather “the same arguments repackaged with a different designation of ‘primary reference’ and ‘secondary reference.’” Prelim. Resp. 41. Patent Owner also argues that the “Petition makes no showing of any material error in the Examiner’s determination of non-obviousness based on the substantially identical teachings of the prior art.” *Id.* at 42.

We agree with Petitioner that it presents similar, but distinct, arguments from those presented during prosecution. One teaching of

particular importance to the Examiner during prosecution was that of JP 2001-176559 (JP '559), which the applicant and the Examiner characterized as showing that “the cycle property of a cell drastically decreases when the charging voltage increases beyond 4.2V.” Ex. 1002, 23–24 (“JP '559 teaches that life property of a cell drastically decreases when the charging voltage increases beyond 4.2V.”), 47. The art presented by Petitioner states, however, that the newly-disclosed combination of materials overcomes the limitations of the prior art and allows charging from 4.4 V to 4.8 V, “while also suppressing deterioration in the reversibility of charging and discharging as more charging and discharging cycles are performed.” Ex. 1004 ¶ 14; *see id.* ¶ 1 (noting that the disclosed lithium ion battery has “high energy density and excellent cycle characteristics”); Ex. 1006 ¶ 34, Abstract (disclosing a battery with a charge cut-off voltage of 3.5 to 4.7 V “and good charge/discharge cycle characteristics”). Accordingly, although the asserted prior art is similar to that addressed by the Examiner during prosecution, it also contains specific, distinct disclosures that tend to overcome the Examiner’s concerns regarding degraded cycle properties of a cell when the charging voltage increases beyond 4.2 V. Ex. 1002, 23–24; Pet. 71 (noting that in the proposed combinations the battery that is modified is already an operable battery with a charge cut-off voltage within the claimed range).

Because the art and arguments presented in the Petition are not substantially the same as those previously presented to the Office, we decline to exercise our discretion under § 325(d) to deny the Petition.

IV. CONCLUSION

For the foregoing reasons, we determine that there is a reasonable likelihood that Petitioner would prevail with respect to at least one of the claims challenged in the Petition. We, therefore, institute an *inter partes* review.

V. ORDER

For the foregoing reasons, it is:

ORDERED that, pursuant to 35 U.S.C. § 314(a), *inter partes* review of claims 5–14 of the '641 patent is instituted on all ground of unpatentability set forth in the Petition; and

FURTHER ORDERED that, pursuant to 35 U.S.C. § 314(a) and 37 C.F.R. § 42.4, notice is given of institution of trial commencing on the entry date of this Decision.

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Patent 7,749,641 B2

PETITIONER:

W. Karl Renner
Hyun Jin In
Gretchen DeVries
FISH & RICHARDSON P.C.
axf-ptab@fr.com
in@fr.com
devries@fr.com

PATENT OWNER:

James Carmichael
Stephen McBride
Minghui Yang
CARMICHAEL IP, PLLC
jim@carmichaelip.com
stevemcbride@carmichaelip.com
mitch@carmichaelip.com