

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

CHINA LITHIUM BATTERY TECHNOLOGY CO., LTD.,
Petitioner,

v.

CONTEMPORARY AMPEREX TECHNOLOGY CO., LIMITED,
Patent Owner.

PGR2022-00008
Patent 10,930,932 B2

Before JO-ANNE M. KOKOSKI, KRISTINA M. KALAN, and
AVELYN M. ROSS, *Administrative Patent Judges*.

KOKOSKI, *Administrative Patent Judge*.

DECISION
Denying Institution of Post-Grant Review
35 U.S.C. § 324, 37 C.F.R. § 42.4

I. INTRODUCTION

China Lithium Battery Technology Co., Ltd. (“Petitioner”) filed a Petition requesting post-grant review of claims 1–19 (“the challenged claims”) of U.S. Patent No. 10,930,932 B2 (“the ’932 patent,” Ex. 1001). Paper 1 (“Pet.”). Contemporary Amperex Technology Co., Limited (“Patent Owner”) filed a Preliminary Response. Paper 7 (“Prelim. Resp.”).

Post-grant review is available for patents that issue from applications that at one point contained at least one claim with an effective filing date on or after March 16, 2013. *See Leahy-Smith America Invents Act*, Pub. L. No. 112-29, 125 Stat. 284 (2011) (“AIA”), §§ 3(n)(1), 6(f)(2)(A). Under 35 U.S.C. § 324(a), a post-grant review may be instituted only if “the information presented in the petition . . . demonstrate[s] that it is more likely than not that at least 1 of the claims challenged in the petition is unpatentable.” After considering the Petition, the Preliminary Response, and the evidence of record, for the reasons set forth below, we deny the Petition and do not institute a post-grant review.

A. Real Parties in Interest

Petitioner identifies China Lithium Battery Technology Co., Ltd., CALB Technology Co., Ltd., China Lithium Battery (Luoyang) Technology Co., Ltd., China Lithium Battery (Jiangsu) Technology Co., Ltd., China Lithium Battery (Xiamen) Technology Co., Ltd., China Lithium Battery (Chengdu) Technology Co., Ltd., China Lithium Battery (Wuhan) Technology Co., Ltd., and China Lithium Battery (Hefei) Technology Co., Ltd. as the real parties in interest. Pet. 84. Patent Owner identifies itself as the real party in interest. Paper 6, 2.

B. Related Matters

The parties indicate that there are no related matters “within the United States.” Pet. 85; Paper 6, 2.

C. The '932 Patent

The '932 patent, titled “Positive Electrode Plate and Battery,” relates to positive electrode plates that have “smaller swelling and excellent dynamics performance” and batteries that have “high safety performance, excellent dynamics performance and long life cycle at the same time.” Ex. 1001, codes (54), (57). The '932 patent explains that “swelling easily occurs during cycle process of the battery, the electrolyte inside the battery cannot uniformly infiltrate the electrode plate, battery polarization increases, and lithium is easily precipitated on the surface of the negative electrode plate.” *Id.* at 1:26–30. The '932 patent further explains that this is not only a safety hazard, but also deteriorates the performance of the battery, causing the battery to rapidly decay. *Id.* at 1:30–33.

To address these problems, the '932 patent describes a positive electrode plate that comprises a positive current collector with a positive film, which is in turn comprised of a positive active material, provided on at least one side thereof. Ex. 1001, 2:13–18. “[T]he positive active material comprises a layered lithium-containing compound, and an OI value of the positive film represented by C_{OI} is less than or equal to 150.” *Id.* at 2:18–21. The '932 patent explains that

[t]he OI value of the positive film is defined as $C_{OI}=C_{003}/C_{110}$, where C_{003} represents a characteristic diffraction peak area of (003) crystal plane in X-ray diffraction pattern of the positive electrode plate, [and] C_{110} represents a characteristic diffraction peak area of (110) crystal plane in X-ray diffraction pattern of the positive electrode plate.

Id. at 2:22–27.

According to the '932 patent, “[g]enerally, there is a stronger c-axis orientation (that is (003) crystal plane orientation) in the layered lithium-containing compound, which will affect deintercalation and intercalation of lithium ions, and in turn affect the dynamics performance of the positive electrode plate.” *Id.* at 2:29–32. In a layered lithium-containing compound, “an angle between (003) crystal plane and (110) crystal plane is 90°” and “ C_{003}/C_{110} may reflect the orientation degree of the layered lithium-containing compound.” *Id.* at 2:32–36. The '932 patent teaches that the OI value of the positive film “may reflect the orientation degree of the stacked layered lithium-containing compound particles in the positive film” and “the actual capability of deintercalation and intercalation of the lithium ions of the positive film.” *Id.* at 2:48–52. The '932 patent further teaches that when the OI value of the positive film is less than or equal to 150,

the positive active particles are prone to be randomly distributed in the positive film, the lithium ions may be quickly deintercalated from and intercalated into the positive electrode plate, the residual stress inside the positive film is smaller, the swelling of the positive electrode plate during cycle process is smaller, thereby avoiding the unfavorable effects on the performance of the battery caused by the swelling of the positive electrode plate, and thus the battery can have high safety performance, excellent dynamics performance, and long cycle life at the same time.

Id. at 3:50–62.

The '932 patent states that “the layered lithium-containing compound may be one or more selected from a group consisting of LiCoO_2 , LiNiO_2 , LiMnO_2 , $\text{LiNi}_x\text{CO}_{1-x}\text{O}_2$ ($0 < x < 1$), $\text{LiNi}_x\text{Co}_y\text{Mn}_{1-x-y}\text{O}_2$ ($0 < x < 1$, $0 < y < 1$, $0 < x + y < 1$), $\text{LiNi}_x\text{Co}_y\text{Al}_{1-x-y}\text{O}_2$ ($0 < x < 1$, $0 < y < 1$, $0 < x + y < 1$) and modified compounds of the aforementioned compounds.” Ex. 1001, 4:11–17. “[A]t

least part of the positive active material is single particle (it means non-agglomerated single particle).” *Id.* at 5:21–24. The ’932 patent also teaches that “an average particle size D50 of the positive active material and an OI value of a powder of the positive active material represented by G_{OI} will affect the OI value of the positive film represented by C_{OI} to an extent” and, “therefore, the desired C_{OI} may be obtained by changing values of D50 and G_{OI} .” *Id.* at 7:11–17. “Preferably, the average particle size D50 of the positive active material is 1 μm ~20 μm ” and the “OI value of the powder of the active material represented by G_{OI} is 1~15.” *Id.* at 7:27–28, 7:55–56.

D. Illustrative Claim

Petitioner challenges claims 1–19 of the ’932 patent. Claim 1, the only independent claim, is illustrative of the challenged claims and is reproduced below.

1. A battery comprising a positive electrode plate, the positive electrode plate comprising a positive current collector and a positive film, the positive film being provided on at least one surface of the positive current collector and comprising a positive active material,

wherein the positive active material comprises a layered lithium-containing compound, and an OI value of the positive film represented by C_{OI} is 5~100;

wherein $C_{OI}=C_{003}/C_{110}$, where C_{003} represents characteristic diffraction peak area of (003) crystal plane in X-ray diffraction pattern of the positive film, and C_{110} represents characteristic diffraction peak area of (110) crystal plane in X-ray diffraction pattern of the positive film.

Ex. 1001, 13:27–40.

E. Prior Art and Asserted Grounds

Petitioner asserts that claims 1–19 would have been unpatentable based on the following grounds:

Claims Challenged	35 U.S.C. §	Reference(s)/Basis
1–5, 7, 9, 11–16, 19	102	Battery #1 ¹
1–3, 9, 11–16, 9	102	Battery #2
1–3, 9–11, 13–16, 19	102	Battery #3
1–3, 7, 9, 11, 18, 19	102	Battery #4
1–3, 9–16, 19	102	Battery #5
1, 2, 4–10, 17, 19	102	Battery #6
1–3, 13, 14, 17, 19	102	Battery L
1–3, 9, 10, 13–14	102	Battery M
1, 3, 13, 14, 19	102	Battery S
1, 3, 19	102	Jiang ²
1, 3–6, 19	103	Jiang
1–10, 19	103	Jiang, Gallagher ³
1, 3–6, 15, 16, 19	103	Jiang, Lim ⁴
1, 3–6, 11, 12, 17, 19	103	Jiang, Sun ⁵
1, 3–6, 13, 14, 19	103	Jiang, Ueki ⁶
1, 3–6, 18, 19	103	Jiang, Schaefer ⁷
1–19	112(a)	Lack of written description support
1–19	112(a)	Lack of enablement
13, 14	112(d)	Failure to further limit

¹ Petitioner argues that the challenged claims “are anticipated by the prior art use and sale of lithium-ion batteries,” relying on tests performed on nine lithium-ion batteries (Batteries #1–6, L, M, and S) that Petitioner asserts were publicly available prior to the earliest effective filing date of the ’932 patent. Pet. 20–42.

² Jiang, CN 107403905 A, published Nov. 28, 2017 (Ex. 1009; Ex. 1010 (certified English translation)).

³ Gallagher, *Optimizing Areal Capacities Through Understanding the Limitations of Lithium-Ion Electrodes*, J. ELECTROCHEM. SOC. 163(2):A138–A149 (2016) (Ex. 1046).

⁴ Lim, *Analysis of geometric and electrochemical characteristics of lithium cobalt oxide electrode with different packing densities*, J. POWER SOURCES 328:46–55 (2016) (Ex. 1047).

⁵ Sun, CN 101847722 A, published Sept. 9, 2010 (Ex. 1025, with certified English translation).

⁶ Ueki, JP P2001-23639A, published Jan. 25, 2001 (Ex. 1011, Ex. 1012 (certified English translation)).

⁷ Schaefer, US 2013/0052492 A1, published Feb. 28, 2013 (Ex. 1033).

Pet. 3–4, 22–42. Petitioner relies on the Declarations of Daniel Steingart, Ph.D. (“Steingart Declaration,” Ex. 1004), Ulrich von Sacken, Ph.D. (“von Sacken Declaration,” Ex. 1006), and Troy A. Hayes, Ph.D., P.E. (“Hayes Declaration,” Ex. 1008) in support of its contentions. Patent Owner submits the Declarations of Dale W. Schaefer, Ph.D. (Ex. 2001) and Ralph E. White, Ph.D. (Ex. 2003) in support of its Preliminary Response.

II. ANALYSIS

A. Post-Grant Review Eligibility

As a threshold issue, we must determine whether the ’932 patent is eligible for post-grant review. There are two requirements that must be met for post-grant review eligibility. First, post-grant review is only available if the petition is filed within nine months of the issuance of the challenged patent. 35 U.S.C. § 321(c). Here, the Petition was filed on November 23, 2021, which is within nine months of the ’932 patent’s February 23, 2021 issue date. Paper 4, 1; Ex. 1001, code (45).

Second, post-grant review is available only for patents that issue from applications that at one point contained at least one claim with an effective filing date of March 16, 2013 or later. *See* AIA §§ 3(n)(1), 6(f)(2)(A). The “effective filing date” for a claim is either the application’s actual filing date or the filing date of the earliest application that supports the claim. 35 U.S.C. § 100(i) (2018). Petitioner has the burden of establishing eligibility for post-grant review. *See Mylan Pharms. Inc. v. Yeda Res. & Dev. Co.*, PGR2016-00010, Paper 9 at 10 (PTAB Aug. 15, 2016).

The earliest claimed priority date of the ’932 patent is after March 13, 2016. Ex. 1001, codes (22), (30). Moreover, Petitioner “certifies that the ’932 patent is available for PGR,” and Patent Owner does not dispute

Petitioner's certification. Pet. 84; *see generally* Prelim. Resp. Accordingly, we determine that the '932 patent is eligible for post-grant review.

B. Level of Ordinary Skill in the Art

Petitioner contends that a person having ordinary skill in the art would have had “at least a post-graduate (e.g., MS or PhD) or equivalent degree from an accredited institution in material science and engineering, mechanical engineering, chemical engineering, or another discipline covering principles of lithium ion battery, electrode material, [and] crystallography” and “working knowledge and experience for 3 to 5 years in lithium ion battery technology, battery electrode materials, and battery performance characterization.” Pet. 11. Petitioner further contends that such a person “would have experience using X-Ray Diffraction (XRD) analysis.” *Id.* (citing Ex. 1004 ¶¶ 85–87).

Patent Owner contends that a person having ordinary skill in the art “would have had a post-graduate (e.g., MS or PhD) or equivalent degree in material science and engineering, chemical engineering, or a related field, as well as working experience for 3 to 5 years in battery electrode materials and X-Ray Diffraction (XRD) analysis.” Prelim. Resp. 14. Patent Owner further contends that “[a]dditional industry experience may suffice in lieu of the academic credentials, and vice versa.” *Id.* (citing Ex. 2001 ¶¶ 64–68; Ex. 2003 ¶¶ 39–42).

We agree with the parties that a person having ordinary skill in the art would have had a post-graduate or equivalent degree in material science and engineering, mechanical engineering, chemical engineering, or a related field, and three to five years of work experience lithium ion battery technology, battery electrode materials, and experience with XRD analysis, which is consistent with the level of skill in the art at the time of the

invention as reflected in the prior art in this proceeding. *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)). Although we do not fully adopt either party’s definition of the person having ordinary skill in the art, our determination regarding Petitioner’s challenge does not turn on the differences between Petitioner’s and Patent Owner’s definitions, and we note that our conclusions would be the same under either definition.

C. Claim Construction

We construe each claim “in accordance with the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent.” 37 C.F.R. § 42.100(b) (2019). Under this standard, claim terms are generally given their plain and ordinary meaning as would have been understood by a person of ordinary skill in the art at the time of the invention and in the context of the entire patent disclosure. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1313 (Fed. Cir. 2005) (en banc). Only those terms in controversy need to be construed, and only to the extent necessary to resolve the controversy. *Realtime Data LLC v. Iancu*, 912 F.3d 1368, 1375 (Fed. Cir. 2019).

The parties propose constructions for the terms “layered lithium-containing compound” recited in claim 1 and “monocrystal particles” recited in claim 17. Pet. 11–14; Prelim. Resp. 13–14. For purposes of this Decision, based on the record before us, we determine that no claim term requires an explicit construction.

D. Anticipation by Batteries #1–6, L, M, and S

Petitioner contends that claims 1–19 are anticipated by the prior art use and sale of Batteries #1–6, L, M, and S. Pet. 20. Petitioner contends that each of Batteries #1–6, L, M, and S are prior art under 35 U.S.C. § 102(a) based on the date of purchase/acquisition or the date stamped on the battery as follows:

Battery	Identification	Source and Date
#1	LG B4 18650	Purchased from BatterySpace.com on Oct. 20, 2016 ⁸
#2	Sanyo NCR18650GA	Purchased from Illumn.com on Feb. 20, 2018 ⁹
#3	Sanyo UR18650NSX	Purchased from Illumn.com on Feb. 20, 2018 ¹⁰
#4	LG HB7 18650	Contained in Black & Decker Cordless Lithium Handheld Vacuum purchased from Target on April 14, 2018 ¹¹
#5	Samsung SDIEM 20R 18650	Contained in a DeWalt 20V MAX XR Lithium Ion Battery Pack purchased from eBay; year code “2017” printed on the body of the battery ¹²
#6	ATL 1320 mAh pouch battery	Contained in an Amazon Kindle Voyage E-Reader purchased from Amazon.com on Dec. 20, 2017 ¹³
L	Lithium ion battery	Acquired by Dr. von Sacken no later than 2017 ¹⁴

⁸ Pet. 22 (citing Ex. 1008 ¶¶ 20, 21, Figs. 1, 2; Ex. 1086; Ex. 1006 ¶ 88).

⁹ Pet. 24–25 (citing Ex. 1008 ¶ 33, Figs. 11, 12; Ex. 1087; Ex. 1006 ¶ 110).

¹⁰ Pet. 27 (citing Ex. 1008 ¶ 22, Figs. 21, 22; Ex. 1087; Ex. 1006 ¶ 131).

¹¹ Pet. 29–30 (citing Ex. 1008 ¶ 59, Fig. 31; Ex. 1006 ¶ 185; Ex. 1038 ¶¶ 1–5; Ex. 1041; Ex. 1042; Ex. 1049 ¶¶ 2, 3).

¹² Pet. 32 (citing Ex. 1008 ¶ 76, Fig. 40; Ex. 1006 ¶ 204; Ex. 1049 ¶¶ 4, 5; Ex. 1020; Ex. 1021).

¹³ Pet. 35 (citing Ex. 1008 ¶ 86, Figs. 49, 50; Ex. 1006 ¶ 225; Ex. 1039 ¶¶ 2, 3; Ex. 1043; Ex. 1044).

¹⁴ Pet. 37 (citing Ex. 1006 ¶¶ 51–53, 120).

Battery	Identification	Source and Date
M	Lithium ion battery	Makita power tool pack purchased by Dr. von Sacken prior to 2017 ¹⁵
S	Lithium ion battery	Acquired by Dr. von Sacken no later than 2017 ¹⁶

Petitioner contends that each of Batteries #1–6, L, M, and S are batteries containing a positive electrode plate, a positive current collector, and a positive film comprising a positive active material provided on at least one side of the current collector, as required by the independent claim 1. Pet. 22–23, 25, 27–28, 30–31, 33, 36, 38, 40–42. Petitioner relies on the results of testing reported in the Hayes and von Sacken Declarations to support its contention that Batteries #1–6, L, M, and S meet the other limitations of the challenged claims. *Id.* at 22–42. Petitioner provides the following chart that compares their results to the corresponding limitations of each claim, wherein the “[h]ighlighted cells indicate results in the range of the patent claim” and “/” indicates that the claim was not evaluated for the battery. *Id.* at 22.

Comparison of Prior Art Batteries #1-6, L, M and S to
Claims 1-19 in U.S. Patent No. 10,930,932

Claim	Description	#1	#2	#3	#4	#5	#6	M	L	S
1	C_{OI} : 5~100	15	6	6	5-10	6	47	7	6	5 / 6
2	$C_{OI} \times \rho$: 0.05~2 g/cm ²	0.36	0.17	0.08	0.11- 0.22	0.08	0.94	0.10	0.08	0.05
3	Composition	NMC	NCA	NCA	NMC + LMO	NMC	LCO	NCA + LMO	NMC	NCA

¹⁵ Pet. 39 (citing Ex. 1006 ¶¶ 52, 53, 120).

¹⁶ Pet. 41 (citing Ex. 1006 ¶¶ 51–53, 120).

4	C_{OI} : 10~70	15	6	6	5-10	6	47	7	6	5 / 6
5	C_{OI} : 15~70	15	6	6	5-10	6	47	7	6	5 / 6
6	C_{OI} : 35~70	15	6	6	5-10	6	47	7	6	5 / 6
7	$C_{OI} \times \rho$: 0.2~1.5 g/cm ²	0.36	0.17	0.08	0.11- 0.22	0.08	0.94	0.10	0.08	0.05
8	$C_{OI} \times \rho$: 0.4~0.98 g/cm ²	0.36	0.17	0.08	0.11- 0.22	0.08	0.94	0.10	0.08	0.05
9	ρ : 0.014~0.03 g/cm ²	0.024	0.029	0.014	0.022	0.014	0.02	0.014	0.013	0.009
10	ρ : 0.014~0.02 g/cm ²	0.024	0.029	0.014	0.022	0.014	0.02	0.014	0.013	0.009
11	1~12 μ m	7	8	9	9	4	/	/	/	/
12	4~8 μ m	7	8	9	9	4	/	/	/	/
13	G_{OI} : 1~15	3	3	4	/	3	/	4	8	3
14	G_{OI} : 3~10	3	3	4	/	3	/	4	8	3
15	3.1~3.6 g/cm ³	3.3	3.4	3.5	2.8	3.3	/	2.6	2.9	3.1
16	3.3~3.6 g/cm ³	3.3	3.4	3.5	2.8	3.3	/	2.6	2.9	3.1
17	Mono-crystals?	/	/	/	/	/	Y	/	Y	/
18	Spinel or polyanion?	N	N	N	Spinel	N	N	Spinel	N	N
19	Neg. electrode and sep.?	Y	Y	Y	Y	Y	Y	Y	Y	Y

Pet. 20–21 (citing Ex. 1006 § VIII, ¶ 49; Ex. 1008 ¶ 3, Table 1). Dr. Hayes testifies that the testing of Batteries #1–6 was done under his direction and control (Ex. 1008 ¶ 1), and Dr. von Sacken testifies that he conducted, or directed outside laboratories to conduct, measurements on Batteries L, M, and S (Ex. 1006 ¶¶ 49, 51).

Patent Owner responds, *inter alia*, that “Petitioner asserts that these purported ‘prior art’ batteries existed before June 29, 2018 (the effective filing date of the ’932 Patent), and then presents data from testing done in

late 2021, years later.” Prelim. Resp. 20 (citing Ex. 2003 ¶¶ 44–51) (emphasis omitted). Patent Owner argues that the Petition does not “establish that the values Petitioner’s experts obtained from purported testing in 2021 would be the same, had the batteries been tested before the patent’s priority date (assuming any of those batteries actually existed [then]).” *Id.* In particular, Patent Owner argues that Petitioner “fails to establish that the state and properties of the batteries would remain unchanged over the years.” *Id.* at 29 (citing Ex. 2003 ¶¶ 72–84).

Patent Owner argues that “[o]ver time, storage and/or usage could materially alter the OI values of the batteries’ cathodes” and “the Petition and related declarations say absolutely nothing about how each battery was stored over the years.” Prelim. Resp. 29 (citing Ex. 2003 ¶¶ 73–77; Ex. 2017, 4–5, Fig. 4; Ex. 2018, 7, Figs. 7, 8; Ex. 2019, 2, 4–5, Figs. 2, 4; Ex. 2020, 7, Fig. 6; Ex. 2021; Ex. 2022; Ex. 2023). Patent Owner further argues that “[s]welling or deterioration of lithium-ion batteries may be caused by overcharging, deep discharging, or exposure of heat, among other reasons,” which “could lead to altered OI values of the cathode.” *Id.* at 30 (citing Ex. 2003 ¶¶ 73, 74). Patent Owner also argues that the “two images of the cathode extracted from Battery M” provided in the von Sacken Declaration “show that the cathode was in very poor condition . . . with significant portions of the positive film missing or delaminated from the current collectors—suggesting significant deterioration of the battery over time.” *Id.* (citing Ex. 2003 ¶¶ 78–83). According to Patent Owner, “[n]either Petitioner nor its witnesses provide any explanation for these apparent defects of the extracted cathode,” and that the condition of Battery M’s cathode “is consistent with literature reports that the state of cathodes change over time upon storage or cycling.” *Id.* at 30–31 (citing Ex. 2003

¶¶ 73–77, 83; Ex. 2017, 4–5, Fig. 4; Ex. 2018, 7, Figs. 7, 8; Ex. 2019, 2, 4–5, Figs. 2, 3; Ex. 2020, 7, Fig. 6; Ex. 2021; Ex. 2022; Ex. 2023).

On this record, we are not persuaded that Petitioner sufficiently establishes that Batteries #1–6, L, M, and S meet the “positive active material comprises a layered lithium-containing compound, and an OI value of the positive film represented by C_{OI} is 5~100” limitation of claim 1.

Specifically, we are not persuaded that Petitioner establishes that the results of the tests relied on by Petitioner are representative of the properties of Batteries #1–6, L, M, and S prior to the June 29, 2018 effective filing date of the ’932 patent.¹⁷ In that regard, we credit Dr. White’s testimony, which is supported by objective evidence of record, that the condition of lithium-ion batteries can change over time upon storage or usage, and that such changes could lead to changes in the OI values of the positive film.

Ex. 2003 ¶ 73 (citing Ex. 2017, 617–618, Fig. 4; Ex. 2018, 418, Figs. 7, 8; Ex. 2019, 2737, 2739–40, Figs. 2, 3; Ex. 2020, 33, Fig. 6). We further credit Dr. White’s testimony, also supported by objective evidence of record, that “overcharging, deep discharging, or exposure to heat, among other things” can cause swelling and deterioration of the batteries, which “in turn could lead to altered structure and OI values of the cathode.” *Id.* ¶ 74 (citing Ex. 2021; Ex. 2022; Ex. 2023).

¹⁷ Patent Owner also argues that Petitioner does not establish that Batteries #1–6, L, M, and S were sold or used before June 29, 2018. Prelim. Resp. 22–29. Because we determine that Petitioner does not establish that it is more likely than not that the challenged claims are anticipated by Batteries #1–6, L, M, and S, it is not necessary for us to determine whether Batteries #1–6, L, M, and S qualify as prior art to the ’932 patent for purposes of this Decision.

Petitioner, however, provides little evidence regarding the storage and usage of the prior art batteries between their acquisition and testing. For example, Petitioner contends that Batteries #2 and #3 were purchased by Exponent¹⁸ employees and have been “in the possession of and stored at Exponent” without disassembly and with minimal use since the purchase until the time they were prepared for analysis for the Petition. Pet. 24–25, 27 (citing Ex. 1008 ¶¶ 33, 46). Dr. Hayes¹⁹ testifies that Batteries #2 and #3 were “occasionally used to calibrate channels on a battery cyler where it was estimated to have experienced less than a total of 10 equivalent cycles.” Ex. 1008 ¶¶ 33, 46. Neither Petitioner nor Dr. Hayes, however, adequately addresses whether the storage or use of Batteries #2 and #3 caused any changes to the condition of the batteries that could alter the OI value of the positive film. Petitioner’s evidence with respect to Batteries #1, 4–6, L, M, and S suffer from the same deficiencies. *See* Pet. 22, 29–30, 32, 35, 37, 39, 41; Ex. 1006 ¶¶ 52, 53; Ex. 1008 ¶¶ 20, 21, 59, 73, 86.

Because the record establishes that conditions of use and storage of lithium-ion batteries could lead to altered OI values of the cathode, we are not persuaded that Petitioner sufficiently establishes that the properties of Batteries #1–6, L, M, and S in 2021 are representative of the properties of Batteries #1–6, L, M, and S before June 29, 2018. Accordingly, we are not persuaded that Petitioner establishes that Batteries #1–6, L, M, and S disclose the “positive active material comprises a layered lithium-containing compound, and an OI value of the positive film represented by C_{OI} is 5~100”

¹⁸ Exponent Engineering & Scientific Consulting (“Exponent”) was retained on behalf of Petitioner “to conduct testing on lithium ion battery cell components.” Ex. 1008 ¶ 1; Ex. 1007, 1.

¹⁹ Dr. Hayes is a principal engineer at Exponent. Ex. 1007, 1.

limitation of claim 1, and we determine that Petitioner does not establish that it is more likely than not that claim 1, and claims 2–19 that depend therefrom, are anticipated by Batteries #1–6, L, M, and S.

E. Anticipation by Jiang

Petitioner contends that claims 1, 3, and 19 are anticipated by Jiang. Pet. 43–46.

1. Overview of Jiang

Jiang “relates to a lithium-ion battery positive electrode sheet and a method of preparing same.” Ex. 1010 ¶ 1. Jiang describes a method of preparing a lithium-ion battery positive electrode sheet that includes evenly distributing an electrode slurry containing a positive electrode active material on a positive electrode current collector, using a solvent to apply a soak treatment to the positive electrode sheets, then subjecting the dried positive electrode sheets to a second cold pressing to make lithium-ion battery positive electrode sheets. *Id.* ¶¶ 11–15. Jiang teaches that the positive electrode active material is one or more of lithium cobalt oxide, lithium nickel manganese cobalt oxide, lithium nickel cobalt aluminum oxide, lithium manganese oxide, and lithium nickel oxide. *Id.* ¶ 20. Jiang further teaches that the XRD peak intensity ratio 003/110 of the positive electrode active material declines 5–50% following the soak treatment compared to a positive electrode active material that has not undergone a soak treatment. *Id.* ¶ 21.

2. Analysis

Petitioner contends that Jiang discloses all of the elements of independent claim 1. Pet. 43–45. In particular, Petitioner points to Jiang’s Embodiments 14 and 16 where the positive active materials are lithium nickel cobalt aluminum oxide and lithium manganese oxide, respectively, as

meeting the “positive active material comprises a layered lithium-containing compound” limitation of claim 1. *Id.* at 44 (citing Ex. 1010 ¶¶ 20, 68, 69, 72, 73, Table 1; Ex. 1004 ¶¶ 93, 94). Petitioner contends that the ’932 patent identifies lithium cobalt aluminum oxide ($\text{LiNi}_x\text{Co}_y\text{Mn}_{1-x-y}\text{O}_2$) and lithium manganese oxide (LiMnO_2) as layered lithium-containing compounds. *Id.* (citing Ex. 1001, 4:11–17). Petitioner also contends that Jiang’s reported measurements of the (003) and (110) crystal planes confirms that Embodiment 14 and 16 include a layered lithium-containing compound. *Id.* (citing Ex. 1010, Table 1 (C003/C110 ratio); Ex. 1004 ¶¶ 93, 94).

Patent Owner responds that Petitioner does not establish that Jiang teaches a positive active material that comprises a layered lithium-containing compound. Prelim. Resp. 33. Patent Owner argues that Petitioner does not cite to any portion of Jiang that “says anything about a ‘layered’ lithium-containing compound.” *Id.* (citing Pet. 44; Ex. 1010 ¶¶ 20, 68, 69, 72, 73, Table 1; Ex. 2001 ¶¶ 75–79). Patent Owner also argues that the lithium cobalt aluminum oxide in Jiang’s Embodiment 14 and the lithium manganese oxide in Jiang’s Embodiment 16 “may or may not be the same as the $\text{LiNi}_x\text{Co}_y\text{Al}_{1-x-y}\text{O}_2$ and LiMnO_2 described in the ’932 Patent, because Jiang does not specify the relative ratios of lithium or other metals and to oxygen in its ‘lithium nickel cobalt aluminum oxide’ and ‘lithium manganese oxide.’” *Id.* at 36 (citing Ex. 2001 ¶ 83). Patent Owner also argues that even if Jiang’s lithium nickel cobalt aluminum oxide and lithium manganese oxide “have the same chemical composition as the examples described in the ’932 Patent specification, this does not necessarily establish that Embodiments 14 and 16 contain ‘layered’ compounds in terms of their 3-dimensional crystal structure.” *Id.* at 36–37 (citing Ex. 2001 ¶¶ 76–79, 84) (emphases omitted).

Having considered the parties' arguments, we are not persuaded, on this record, that Petitioner sufficiently establishes that Jiang discloses a positive active material that comprises a layered lithium-containing compound as required by the challenged claims.

Jiang states that the positive electrode active material in Embodiment 14 is lithium nickel cobalt aluminum oxide, but does not provide the relative amounts of each element in the composition. Ex. 1010 ¶ 69. The '932 patent, however, specifically discloses $\text{LiNi}_x\text{Co}_y\text{Al}_{1-x-y}\text{O}_2$ ($0 < x < 1$, $0 < y < 1$, $0 < x + y < 1$) as an example of a layered lithium-containing compound. Ex. 1001, 4:11–17. Similarly, Jiang identifies lithium manganese oxide as the positive electrode active material in Embodiment 16, but does not provide its chemical formula or indicate that it is a layered lithium-containing compound. Ex. 1010 ¶ 73. Although the '932 patent identifies LiMnO_2 as an exemplary layered-lithium containing compound, the '932 patent also describes lithium manganese oxide (LiMn_2O_4) that has a spinel (instead of layered) structure. Ex. 1001, 4:11–17, 5:5–10; *see* Ex. 2001 ¶ 78. Therefore, that the '932 patent identifies certain lithium nickel cobalt aluminum oxide and lithium manganese oxide compounds as layered lithium-containing compounds is not sufficient to establish that the lithium nickel cobalt aluminum oxide in Jiang's Embodiment 14 and the lithium manganese oxide in Jiang's Embodiment 16 are layered lithium-containing compounds as required by claim 1.

Petitioner also argues that Jiang confirms that Embodiments 14 and 16 contain layered lithium-containing compounds because Jiang measures “their (003) and (110) crystal planes.” Pet. 44 (citing Ex. 1010, Table 1; Ex. 1004 ¶¶ 93–94). We agree with Patent Owner, however, that “Petitioner

does not explain why or how the existence of C003 to C110 ‘peak intensity’ ratios for Embodiments 14 and 16 shows that these embodiments necessarily include ‘layered’ lithium-containing compounds.” Prelim. Resp. 37.

Although Petitioner points to the Steingart Declaration in support of this contention, Dr. Steingart testifies only that Jiang “further confirms that” the lithium nickel cobalt aluminum oxide in Embodiment 14 and the lithium manganese oxide in Embodiment 16 “have (003) and (110) crystal planes,” without further explanation of the significance of the existence of such planes. Ex. 1004 ¶ 94. Neither Petitioner nor Dr. Steingart, however, sufficiently demonstrate that a lithium-containing compound having (003) and (110) crystal planes is necessarily and invariably layered. *See In re Montgomery*, 677 F.3d 1375, 1379–80 (Fed. Cir. 2012) (“A reference may anticipate inherently is a claim limitation that is not expressly disclosed ‘is necessarily present, or inherent, in the single anticipating reference.’” (quoting *Verizon Servs. Corp. v. Fibernet Va., Inc.*, 602 F.3d 1325, 1336 (Fed. Cir. 2010))). Dr. Steingart’s conclusory testimony is insufficient to meet Petitioner’s burden of establishing that Jiang discloses a “layered lithium-containing compound” as required by claim 1.

Accordingly, we determine that the Petition does not establish that it is more likely than not that claim 1, and claims 3 and 19 that depend therefrom, are anticipated by Jiang.

F. Obviousness Based on Jiang

Petitioner contends claims 1, 3–6, and 19 would have been obvious over Jiang, relying on its contentions with respect to its anticipation challenge of claim 1 with respect to all of the limitations of claim 1 except for the claimed OI value. Pet. 46–50. Petitioner’s arguments do not address

the deficiencies identified above with respect to the Petitioner's allegation that Jiang anticipates claim 1. *See id.*

Petitioner also contends that (1) claims 1–10 and 19 would have been obvious over the combined teachings of Jiang and Gallagher; (2) claims 1, 3–6, 15, 16, and 19 would have been obvious over the combined teachings of Jiang and Lim; (3) claims 1, 3–6, 11, 12, 17, and 19 would have been obvious over the combined teachings of Jiang and Sun; (4) claims 1, 3–6, 13, 14, and 19 would have been obvious over the combined teachings of Jiang and Ueki; and (5) claims 1, 3–6, 18, and 19 would have been obvious over the combined teachings of Jiang and Schaefer. Pet. 51–64. Petitioner does not rely on Gallagher, Lim, Sun, Ueki, or Schaefer to remedy the deficiencies identified above with respect to Petitioner's allegation that claim 1 is anticipated by, or obvious over, Jiang. *Id.*

Accordingly, we determine that Petitioner does not establish that it is more likely than not that claims 1–19 would have been obvious over Jiang alone or in combination with Gallagher, Lim, Sun, Ueki, or Schaefer.

G. Written Description Support

To satisfy the written description requirement under 35 U.S.C. § 112(a), the specification must “reasonably convey[] to those skilled in the art that the inventor had possession” of the claimed invention as of the filing date. *Ariad Pharms., Inc. v. Eli Lilly & Co.*, 598 F.3d 1336, 1351 (Fed. Cir. 2010) (en banc). An adequate description does not require any particular form of disclosure or that the specification recite the claimed invention *in haec verba*, but must do more than render the claimed invention obvious. *Id.* at 1352. In evaluating the adequacy of the disclosure, a court may consider “the existing knowledge in the particular field, the extent and content of the prior art, the maturity of the science or technology, [and] the

predictability of the aspect at issue.” *Capon v. Eshhar*, 418 F.3d 1349, 1359 (Fed. Cir. 2005) (cited with approval in *Ariad*, 598 F.3d at 1352); *see also Boston Sci. Corp. v. Johnson & Johnson*, 647 F.3d 1353, 1366 (Fed. Cir. 2011) (holding that because the assessment for written description is made from the perspective of a person having ordinary skill in the art, in some instances, a patentee can rely on information that is “well-known in the art” to satisfy written description).

Petitioner contends that the challenged claims “are directed to a battery comprising a positive film comprising an open-ended genus of ‘layered lithium-containing compound[s]’ and having a claimed OI value,” and that the ’932 patent “fails to convey possession of the full claim scope.” Pet. 64 (emphasis omitted). In particular, Petitioner contends that “layered lithium-containing compounds” as that term is used in the ’932 patent “includes many different genera and species,” but the majority (30 out of 34) of the patent’s examples focus on $\text{LiNi}_{0.8}\text{Co}_{0.1}\text{Mn}_{0.1}\text{O}_2$. *Id.* at 65 (citing Ex. 1001, Table 1, 11:43–44). Petitioner contends that “[t]he Patent also does not provide any examples or data for at least three compositions, *i.e.*, LiNiO_2 , LiMnO_2 , and $\text{LiNi}_x\text{Co}_{1-x}\text{O}_2$ ($0 < x < 1$)” that are expressly described in the specification, and that the OI ranges reported for the examples in the specification do not support the claimed range of 5~100. *Id.* at 66–67.

On this record, we are not persuaded that Petitioner sufficiently establishes that it is more likely than not that the challenged claims lack written description support in the ’932 patent. The written description for a claimed genus requires the disclosure of “either a representative number of species falling within the scope of the genus or structural features common to the members of the genus so that one of skill in the art can ‘visualize or recognize’ the members of the genus.” *Ariad Pharms., Inc. v. Eli Lilly &*

Co., 598 F.3d 1336, 1350 (Fed. Cir. 2010) (en banc). Here, the '932 patent describes the structural features of the layered lithium-containing compound, teaches how to measure the OI value, and identifies several species that fall within the scope of the claimed layered lithium-containing compound. *See, e.g.*, Ex. 1001, 2:22–3:3, 3:50–4:17, 4:66–5:4. The '932 patent also teaches that the layered lithium-containing compound can be modified by doping and/or coating, and describes the doping elements and the coating layers that can be used. *Id.* at 4:17–65. The '932 patent additionally provides several examples of batteries prepared in accordance with the method described therein, and describes the tests conducted to evaluate the dynamics of the batteries. *Id.* at 9:31–13:12.

In light of the disclosures in the '932 patent, and the relatively high level of skill in the art, we are not persuaded that Petitioner sufficiently establishes that the '932 patent specification does not reasonably convey to those skilled in the art that the inventor had possession of the claimed invention as of the filing date thereof. Accordingly, we determine that Petitioner does not show that it is more likely than not that the challenged claims lack written description support.

H. Enablement

To show that a claim is invalid for lack of enablement, a challenger must show “that a person of ordinary skill in the art would not be able to practice the claimed invention without undue experimentation.” *Enzo Life Sciences, Inc. v. Roche Molecular Sys., Inc.*, 928 F.3d 1340, 1345 (Fed. Cir. 2019). “[A] patent specification complies with the statute even if a ‘reasonable’ amount of routine experimentation is required in order to practice a claimed invention” *Enzo Biochem, Inc. v. Calgene, Inc.*, 188 F.3d 1362, 1371 (Fed. Cir. 1999). Whether undue experimentation is

needed is not a single, simple factual determination, but rather is a conclusion reached by weighing many factual considerations. *In re Wands*, 858 F.2d 731, 737 (Fed. Cir. 1988). These factors, referred to as the Wands factors, include: (1) the quantity of experimentation necessary, (2) the amount of direction or guidance presented, (3) the presence or absence of working examples, (4) the nature of the invention, (5) the state of the prior art, (6) the relative skill of those in the art, (7) the predictability or unpredictability of the art, and (8) the breadth of the claims. *Id.*

Petitioner contends that the '932 patent “does not enable the full claim scope without undue experimentation” because “there is insufficient guidance on how to obtain the claimed OI values” and “practicing these claims would require undue experimentation to obtain if the claimed values were obtained.” Pet. 68. In particular, Petitioner contends that the claimed OI values “are broad but guidance in the specification is limited to generic statements, the Patent’s working examples are incomplete and inconsistent, and the art showed unpredictability not resolved by the Patent.” *Id.* (citing Ex. 1006 ¶¶ 238–281).

Patent Owner responds that claimed “C_{OI} and D50 parameters are production details which, once their numerical values had been disclosed in the '932 Patent, can be prepared by a skilled person following the guidance in the '932 Patent without undue experimentation.” Prelim. Resp. 68 (citing Ex. 2001 ¶¶ 168–174). Patent Owner argues that the '932 patent provides detailed instructions for preparing a positive electrode with the claimed OI values, including “properties for selecting active materials, the identity and mass ratio for mixing the active material, conductive agent, and binder, guidance on coating and the optional magnetic field inducing, cold pressing, or calendering, drying temperature and steps, and cutting to shape.” *Id.*

(citing Ex. 2001 ¶¶ 170–173). Patent Owner also argues that the '932 patent provides “over thirty different working examples” that “show how different parameters affect C_{OI} values.” *Id.* at 71. Patent Owner further argues that Petitioner does not substantively analyze “a majority of the *Wands* factors,” and overlooks that the relative skill of those in the art is high. *Id.* at 76–78.

On this record, we are not persuaded that Petitioner sufficiently establishes that it is more likely than not that the challenged claims are not enabled by the '932 patent specification for largely the same reasons discussed above with respect to Petitioner's written description analysis. In particular, we agree with Patent Owner that the '932 patent provides instructions on how to prepare a battery that meets the claimed limitations and “sets forth precise numerical values of certain production parameters to further assist a skilled person in following those directions.” Prelim. Resp. 68 (citing Ex. 1001, 6:66–8:44, 9:31–10:30, Table 1; Ex. 2001 ¶¶ 170–173). The '932 patent also provides a number of working examples that show, for example, the influence of D50 and G_{OI} on the C_{OI} value of the positive film, and the impact of pressing density on C_{OI} . Ex. 1001, 9:31–10:30, Table 1; Ex. 2001 ¶¶ 177–181. Moreover, as set forth above with respect to Petitioner's written description argument, we disagree with Petitioner that the claims are overly broad.

In light of the disclosures in the '932 patent, and the relatively high level of skill in the art, we are not persuaded that Petitioner sufficiently establishes that the '932 patent specification does not enable those skilled in the art to practice the claimed invention without undue experimentation. Accordingly, we determine that Petitioner does not show that it is more likely than not that the '932 patent fails to enable the challenged claims.

I. Failure to Further Limit

Petitioner contends that claims 13 and 14 are unpatentable under 35 U.S.C. § 112(d) “for not ‘further limit[ing]’ the claims from which they depend.” Pet. 83 (alteration in original). Claim 13 depends from claim 1, and further requires “an OI value of a powder of the positive active material represented by G_{OI} is 1~15.” Ex. 1001, 14:24–26. Claim 14 depends from claim 13 and recites that the G_{OI} is 3~10. *Id.* at 14:27–29. Petitioner contends that, “[w]hile powders are used as raw material to fabricate electrodes, there is no ‘powder in the claimed battery once the electrodes are prepared and assembled.” Pet. 83 (citing Ex. 1006 ¶¶ 300–302). According to Petitioner, because “none of claims 1, 13, and 14 recite that the claimed battery comprises any powder,” and claims 13 and 14 are directed to an OI value of a powder that is not an element of claims 13 and 14, claims 13 and 14 “fail to further narrow the scope of claim 1.” *Id.* at 84.

Patent Owner responds that Petitioner misrepresents claims 13 and 14. Prelim. Resp. 79. Patent Owner argues that “the source ‘positive active material’ of the battery has two distinct properties: G_{OI} , measured when the source material is in powder form (i.e., before electrode fabrication), and C_{OI} , measured from a ‘positive film’ after the fabrication process has been completed.” *Id.* (citing Ex. 2001 ¶ 86). Patent Owner argues that “[a] skilled person would understand to select the positive active material with the appropriate G_{OI} values when preparing for manufacturing the claimed electrode film.” *Id.* (citing Ex. 2001 ¶¶ 186–187). Patent Owner also argues that “a battery that is prepared with ‘positive active material’ having any G_{OI} value could fall within the scope of independent claim 1 if it meets all of the limitations of that claim,” and “claims 13–14 further limit independent claim 1 by requiring that the battery of claim 1 ‘meet the additional requirement

that it be prepared with ‘positive active material’ having the claimed properties’ in claims 13 and 14, *i.e.*, the specific GOI values therein.” *Id.* at 80 (citing Ex. 2001 ¶ 187) (emphasis omitted).

We agree with Patent Owner. Claim 1 recites “a positive film . . . comprising a positive active material, wherein the positive active material comprises a layered lithium-containing compound.” Ex. 1001, 13:29–33. Claims 13 and 14 further limit the properties of the positive active material to those in which G_{OI} is 1~15 and 3~10, respectively. *Id.* at 14:26–29. Petitioner acknowledges that “powders are used as raw material to fabricate electrodes,” and the ’932 patent teaches that the positive electrode plate is prepared by mixing the positive active material with a binder and a solvent to obtain a slurry that becomes the positive film. Pet. 83; Ex. 1001, 9:35–41.

For these reasons, we are not persuaded that Petitioner sufficiently establishes that claims 13 and 14 do not further limit the claims from which they depend. Accordingly, we determine that Petitioner does not establish that claims 13 and 14 are more likely than not unpatentable under 35 U.S.C. § 112(d) for failing to further limit the claims from which they depend.

III. CONCLUSION

Based on the arguments in the Petition and the Preliminary Response, and the evidence of record, we determine that Petitioner has not established that it is more likely than not that claims 1–19 of the ’932 patent are unpatentable.

IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that the Petition is *denied* and no trial is instituted.

PGR2022-00008
Patent 10,930,932 B2

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