

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

POSCO FUTURE M CO., LTD.,

Petitioner,

v.

CAMX POWER LLC,

Patent Owner.

Case IPR2024-01229

Patent No. 9,391,317 B2

PATENT OWNER'S PRELIMINARY SUR-REPLY

Patent Owner's Preliminary Response ("POPR") established that Grounds 1 and 2 of the Petition are deficient because, among other things, the Petition fails to show that the Lampe-Onnerud reference necessarily teaches a polycrystalline (grain-boundary-containing) material, as required by all challenged claims. (POPR at 22-28.)¹ Petitioner's Preliminary Reply fails to remedy this deficiency in the Petition.

First, the Reply reads as if the burden is on *Patent Owner* to show that Lampe-Onnerud *does not* teach a polycrystalline material. However, the burden is on *Petitioner* to present evidence that Lampe-Onnerud *does* teach such a material. Petitioner has not met this burden. It concedes that Lampe-Onnerud itself never mentions grain boundaries. (Pet. at 19.) What, then, is Petitioner's proof that grain boundaries are present in Lampe-Onnerud? As Petitioner's Reply confirms, the only support the Petition offers for this assertion is the conclusory testimony from Petitioner's expert that the material used in Lampe-Onnerud's particle "core" is "known to be [polycrystalline]." (Reply at 1-2 (quoting Ex. 1002 at ¶¶ 110, 124).) However, the expert cites no source that supports this assertion. The only source he cites at all is Zheng, which he says describes a polycrystalline lithium-metal-oxide cathode material. (Ex. 1002 at ¶ 111 (citing Ex. 1011).) But, as previously explained

¹ As explained by Patent Owner, Grounds 1 and 2 also fail for the separate reason that, even to the extent Lampe-Onnerud teaches a material with grain boundaries, Petitioner has not shown that applying Lampe-Onnerud's process to such a material will inherently produce *cobalt-enriched* grain boundaries. (POPR at 28-34, 38-39.)

(POPR at 27-28 n.11), the fact that one reference (Zheng) teaches a polycrystalline cathode material obviously does not prove that *all* cathodes are polycrystalline; on the contrary, the record shows that lithium-ion battery cathodes are also made from single-crystal materials (*i.e.*, materials with no grain boundaries).² (POPR at 23-24.)

Moreover, Exhibit 2003 (Song) confirms that single-crystal materials were being used in the field around the time of Lampe-Onnerud's invention in 2002, further rebutting any notion that Lampe-Onnerud's particle "core" *must have been* polycrystalline. (POPR at 23-24.) In fact, it is the only contemporaneous evidence that has been cited by either party showing the particle morphology of lithium-metal-oxide cathode materials being prepared at or near Lampe-Onnerud's filing date. Petitioner has cited no contemporaneous evidence to refute Patent Owner's showing that the use of single-crystal materials dates back to that time. Its only rebuttal to Song is a suggestion that Song's SEM images are supposedly not clear enough to "differentiate between single-crystal and polycrystalline morphologies." (Reply at 4.) But these images, which show a loose collection of individual crystals (with no grain boundaries in sight), speak for themselves. (POPR at 24.) Petitioner does not

² Petitioner's reliance on Zheng—published in 2011, nine years after Lampe-Onnerud's filing date—is rather ironic, given that Petitioner criticizes some of the references that Patent Owner has cited for general background on single-crystal and polycrystalline cathode materials (Exhibits 2001, 2002, and 2004) on the basis that they are not sufficiently contemporaneous with Lampe-Onnerud. (Reply at 2.)

explain how they could plausibly be interpreted as showing grain boundaries.

Second, Petitioner claims that Patent Owner’s other exhibits somehow support the notion that Lampe-Onnerud’s “core” must have been polycrystalline. (Reply at 2-4.) Not so. Even read in the light most favorable to Petitioner, these exhibits (2001, 2002, and 2004) suggest that, at most, single-crystal cathode materials have attracted a growing interest in recent years. (*See, e.g.*, Ex. 2002 at 1 (observing in 2020 that “[s]ingle-crystal cathode materials . . . have attracted increasing interest”).) But this does not mean that a POSITA was unfamiliar with such materials at the time of Lampe-Onnerud’s 2002 filing date. In fact, as noted above, Song confirms that single-crystal materials were being utilized in lithium-ion battery cathodes around that time, which alone is sufficient to defeat Petitioner’s assertion that a POSITA would have necessarily assumed Lampe-Onnerud’s “core” material to be polycrystalline. In effect, Petitioner is arguing inherency, but inherency requires “the missing descriptive material [to be] ‘necessarily present,’ not merely probably or possibly present, in the prior art.” *Trintec Indus., Inc. v. Top-U.S.A. Corp.*, 295 F.3d 1292, 1295 (Fed. Cir. 2002) (internal citation omitted).

Third, Petitioner argues that Lampe-Onnerud’s “core” material must have been polycrystalline because, supposedly, Patent Owner’s exhibits suggest that the problem Lampe-Onnerud was trying to solve—improving the cycling stability of the battery cathode material, including by minimizing the occurrence of “gassing” (*i.e.*,

the release of gases from the battery)—is unique to polycrystalline materials. (Reply at 4-5.) However, Petitioner’s suggestion that only polycrystalline materials can suffer from diminished cycling stability, and from “gassing” issues in particular, amounts to attorney argument that finds zero support in the cited evidence.

For example, Exhibit 2002 clearly states that “[a]fter being cycled at high voltages . . . **single-crystal** materials exhibit severe structural instability and capacity fade.” (Ex. 2002 at 1 (emphasis added); *see also id.* at 2 (explaining that, after being cycled at higher voltages, “single-crystal” materials “display[] decreased stability”).) Similarly, Exhibit 2004 confirms that “single crystalline” cathode material can exhibit reduced “electrochemical performance,” including reduced “cycle stability,” due to “severe planar gliding, particle cracking and irreversible phase transition.” (Ex. 2004 at 1.) Thus, while recent literature suggests that single-crystal cathode materials perhaps have better cycling stability compared to polycrystalline materials, this does not mean that improving cycling stability is a concern that is unique to polycrystalline materials (let alone that this was thought to be the case around the time of Lampe-Onnerud’s 2002 filing date).

The specific “gassing” issue is also not unique to polycrystalline materials. Petitioner defines “gassing” as the release of oxygen from a battery, which it claims occurs due to cracking at the grain boundaries of a polycrystalline cathode material. (Reply at 5.) But Petitioner’s Reply itself confirms that “gassing” occurs with

single-crystal as well as polycrystalline materials. Thus, Petitioner quotes the statement in Exhibit 2002 that, “without grain boundaries in particles, single-crystal electrodes were theorized to provide increased oxygen loss resistance . . . when compared with polycrystalline materials.” (Ex. 2002 at 2.) On its face, this statement suggests that, at most, single-crystal materials may have “*increased oxygen loss resistance*” relative to polycrystalline materials—meaning single-crystal materials are *not*, in fact, impervious to this phenomenon. And, indeed, the authors of Exhibit 2002 proved that such materials can suffer from cracking *even despite the absence of grain boundaries*. (*Id.* at 6 (“Significant amounts of cracks in single-crystalline particles [after cycling] indicate that the integrity of the original microstructural morphology has been destroyed.”); *see also* Ex. 2004 at 1 (observing that single-crystal materials can suffer from “particle cracking”).)

In sum, Lampe-Onnerud’s desire to improve the cycling stability of the cathode material, and in particular to reduce “gassing,” does not prove that its invention was directed to polycrystalline, as opposed to single-crystal, materials.

Patent Owner’s GEMX[®] patent portfolio, including the ’317 Patent, has been licensed by almost all of the top battery manufacturers and battery materials producers in the world, including in Korea and Japan. It has thus withstood intense scrutiny by many of the leading scientists and experts working in the field. The Petition fails to show that Patent Owner’s fundamental invention is unpatentable.

Dated: December 10, 2024

Respectfully submitted,

/s/ Weston R. Gould

Weston R. Gould

Reg. No. 59,142

Dinsmore & Shohl LLP

101 Arch Street, Suite 1800

Boston, MA 02110

T: (860) 415-8001

E: weston.gould@dinsmore.com

Attorney for Patent Owner

CERTIFICATE OF SERVICE

I hereby certify that a true and correct copy of the foregoing PATENT OWNER'S PRELIMINARY SUR-REPLY was served on December 10, 2024 by email on the following counsel of record for Petitioner:

Michael A. Oblon (moblon@jonesday.com)
Matthew Johnson (mwjohnson@jonesday.com)
Haytham Soliman (hsoliman@jonesday.com)
Tova Werblowsky (twerblowsky@jonesday.com)

Dated: December 10, 2024

Respectfully submitted,

/s/ Weston R. Gould
Weston R. Gould
Reg. No. 59,142
Attorney for Patent Owner