

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

AMPEREX TECHNOLOGY LTD.
Petitioner,

v.

SEMICONDUCTOR ENERGY LABORATORY CO., LTD.,
Patent Owner

Case IPR2023-01349
Patent No. 11,043,660

**PATENT OWNER'S SUR-REPLY TO
PETITIONER'S PRELIMINARY REPLY TO
PATENT OWNER'S PRELIMINARY RESPONSE**

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PATENT OWNER'S EXHIBIT LIST

EXHIBIT-2001	Declaration of Dr. Brett Lucht
EXHIBIT-2002	<i>Curriculum Vitae</i> of Dr. Brett Lucht
EXHIBIT-2003	Glinski et al., <i>Catalytic Activity of High-Surface-Area Amorphous MgO Obtained from Upsalite</i> , Catalysts, 11, 1338 MDPI (2021)
EXHIBIT-2004	Zhang et al., <i>Oxygen Loss in Layered Oxide Cathodes for Li-Ion Batteries: Mechanisms, Effects, and Migration</i> , ACS Chemical Reviews, 2021
EXHIBIT-2005	He et al., <i>The intrinsic behavior of lithium fluoride in solid electrolyte interphases on lithium</i> , PNAS, Vol. 117 (1) 73-79, Jan. 7, 2020
EXHIBIT-2006	Xu et al., <i>Lithium transport through lithium-ion battery cathode coatings</i> , J. Mater. Chem. A. 3, 17248–72 (2015)
EXHIBIT-2007	Chauque et al., <i>Lithium titanate as anode material for lithium ion batteries: Synthesis, posttreatment and its electrochemical response</i> , J. of Electroanalytical Chem., 799 (2017) 142-155
EXHIBIT-2008	Ahaliabadeh et al., <i>Extensive comparison of doping and coating strategies for Ni-rich positive electrode materials</i> , J. Power Sources 540, 1–23 (2022)
EXHIBIT-2009	Zhu et al., <i>Epitaxial growth of an atom-thin layer on a $\text{LiNi}_{0.5}\text{Mn}_{1.5}\text{O}_4$ cathode for stable Li-ion battery cycling</i> , 13 Nature Commc'n. 13:1565 (2022)
EXHIBIT-2010	Pagani et al., <i>Epitaxial Thin Films as a Model System for Li-Ion Conductivity in $\text{Li}_4\text{Ti}_5\text{O}_{12}$</i> , ACS Appl. Mater. Interfaces, 10, 44494–44500 (2018)
EXHIBIT-2011	International Publication No. WO2010/139404 (“Ellenwood”)

- EXHIBIT-2012 Lettieri et al., *Critical issues in the heteroepitaxial growth of alkaline-earth oxides on silicon*, 20 J. Vacuum Sci. Tech. A, 20, 1332 (2002)
- EXHIBIT-2013 Shim et al., *Effects of MgO Coating on the Structural and Electrochemical Characteristics of LiCoO₂ as Cathode Materials for Lithium Ion Battery*, 26 Chem. Mater. 2537-2543 (2014) (“Shim 3”)
- EXHIBIT-2014 U.S. Patent No. 6,514,640 to Armand et al.
- EXHIBIT-2015 U.S. Patent No. 9,871,246 to Kim et al.
- EXHIBIT-2016 RESERVED
- EXHIBIT-2017 Guo et al., *Ultra-low voltage control of magnetic properties in amorphous MgO*, 111 Appl. Phys. Lett. 192402 (2017)
- EXHIBIT-2018 U.S. Publication No. 2012/0258358 (“Yura”)
- EXHIBIT-2019 Shim et al., *Characterization of Spinel Li_xCo₂O₄-Coated LiCoO₂ Prepared with Post-Thermal Treatment as a Cathode Material for Lithium Ion Batteries*, 27 Chem. Mater. 27, 3273-3279 (2015)
- EXHIBIT-2020 Ohring et al., *Chapter 8: Epitaxy*, in “Materials Science of Thin Films, Deposition and Structure,” 2nd Edition, 419-494 (2002)
- EXHIBIT-2021 Pohler et al., *Seed layer stimulated growth of crystalline high Al containing (Al,Cr)₂O₃ coatings deposited by cathodic arc evaporation*, Thin Solid Films 550, 95-104 (2014)
- EXHIBIT-2022 Board Email Authorizing Preliminary Reply and Sur-Reply Briefing (Jan. 18, 2024), and Petitioner’s Email Requesting Same (Jan. 15, 2024)

Petitioner's Reply fails to cure multiple deficiencies of the Petition exposed in the POPR.¹ For each reason described in the POPR, institution should be denied.

I. THE REPLY FAILS TO REFUTE PO'S SHOWING THAT THE PETITION'S GROUNDS ARE DEFICIENT

A. The Prior Art's Pertinent Teachings are Inconsistent with the Petition's Obviousness Theories

Petitioner contends that the POPR "misrepresents cited references by limiting them to specific embodiments and ignoring others identified by the Petition." Reply, 1. Not so. The POPR highlighted some of the prior art's most pertinent disclosures—i.e., disclosures that squarely undermine the mappings and obviousness theories set forth in the Petition. Indeed, regarding Blangero, the Reply never squarely confronts PO's showing that "it would not have been obvious to a POSITA that MgO[, LTO or LiF] is present in Blangero's coating"—particularly since Blangero expressly concedes that it "*could not indisputably establish*" and therefore could only "*speculate[]*" about its surface composition. Ex. 1005, [0062]; POPR, 22-23, 28. The Reply instead attempts to brush aside the fact that Blangero's disclosure is merely "speculat[ive]" by casting the disclosure as a "suggestion" that is supposedly

¹ PO observes that Section E also plainly exceeds the scope of authorized briefing. Ex. 2022. The Board should disregard this argument. *See Commscope Techs. LLC v. Dali Wireless, Inc.*, IPR2022-01242, Paper 24 at 58-59 (PTAB Mar. 17, 2023).

“more than enough to show obviousness.” Reply, 1-2. But speculation is not a “suggestion,” and Petitioner’s conflation of the two is wrong. *See Star Scientific, Inc. v. R.J. Reynolds Tobacco Co.*, 655 F.3d 1364, 1376 (Fed. Cir. 2011) (reversing denial of JMOL on the basis that claims were not obvious where the prior art’s “speculative and tentative disclosure of what ‘might’ or ‘may’ lead to” the claimed invention “does not sufficiently direct or instruct one of skill in this art.”).

To be sure, the cases that Petitioner cites only underscore the flaws in Petitioner’s position. For example, in *Bradium Technologies v. Iancu*, the Federal Circuit upheld the Board’s finding that two algorithms in a prior art reference disclosed a prioritization step, as required by the claims, and therefore, although no distinct prioritization value was expressly disclosed in the references, its existence was nevertheless sufficiently “suggest[ed]” to render the claimed feature obvious. 923 F.3d 1032, 1049 (Fed. Cir. 2019). To the extent *Bradium* is relevant at all, it is notable insofar as the court recognized the existence of a straightforward “suggestion” for obviousness purposes only where there was seemingly no doubt that the claimed feature (e.g., a prioritization value) was present in the disclosed prior art scheme. But this is a far cry from the facts at hand where the record reveals meaningful doubt as to whether the specific surface compounds relied upon by Petitioner (e.g., MgO and TiO₂) would form at the surface of Blangero’s PEAM at

all. POPR, 21-31. Unlike *Bradium*, Blangero admits to “speculat[ion]” and provides a laundry list of “possible” oxides—none of which conclusively form on the PEAM at all (“possible forms, but not limited to...”). Ex. 1005, [0062]. Petitioner’s argument that Blangero’s speculative disclosure is analogous to the type of straightforward obviousness-rendering “suggestion” in *Bradium* is incorrect.

Petitioner’s reliance on the *Novo Nordisk* decision is similarly inapposite. Reply, 1-2 (citing *Novo Nordisk Pharms. v. Bio-Technology Gen.*, 424 F.3d 1347, 1355 (Fed. Cir. 2005)). While *Novo Nordisk* acknowledges that “anticipation does not require actual performance of suggestions in a disclosure,” the decision emphasizes that the suggestions in a prior art reference must still be enabled. *Id.* But here, the record not only fails to demonstrate that oxides such as MgO and TiO₂ would “indisputably” form on Blangero’s surface, it also fails to establish that a POSITA would even be capable of sufficiently controlling formation of the laundry list of surface oxides identified in paragraph [0062] of Blangero.

To this point, the only evidence offered that the Reply cites to elevate Blangero’s paragraph [0062] disclosure beyond mere speculation is Blangero’s single sentence that its “assumptions are supported by the XPS experiments where the chemical shifts observed for Co, Mg and Ti are typical[.]” Reply, 2 (citing Ex. 1005, [0062]). At most, however, this sentence indicates that the compounds listed

in paragraph [0062] are consistent with the chemical shifts observed in XPS experiments, and their formation could not be ruled out. But this disclosure does not reasonably establish the existence of any of Petitioner's cited compounds, nor does it disturb Blangero's concession that the chemical nature of the oxides at the surface "could not [be] indisputably establish[ed]." Ex. 1005, [0062]. In any event, Petitioner failed to rely on any additional evidence regarding Blangero's "XPS experiments" with its Petition, leaving only the possibility that the oxides listed in paragraph [0062] *might* have formed or could not be ruled out. That speculation is insufficient. *Star Scientific*, 655 F.3d at 1376.

The Reply's assertion that "PO fails to mention Blangero's ¶ [0094]" is false given PO's showing that, for multiple reasons, "it would not have been obvious to a POSITA" that compounds such as LTO would be present on Blangero's surface. POPR, 28-29. Blangero's speculative disclosure and its lack of "an example with [LTO] present in the surface layer" coupled with Petitioner's picking and choosing are telling in this regard. *Id.*

The Reply also misleadingly argues that "Blangero actually *claimed*...LiF in the coating layer," but its disclosure would not have rendered the invention obvious because Blangero teaches that LiF coatings are undesirable and, therefore, should be avoided. *See* Ex. 1005, [0006] ("LiF protective coatings" are associated with the

“problem” of “lower[ing] reversible capacity”); cl. 37 (claim reciting that a “surface layer...comprises *less than* 2000 ppm of...LiF”); POPR, 12; Ex. 2001, ¶ 48; Ex. 1005, cls. 37, 62. Moreover, Blangero fails to enable the inclusion of LiF coatings on its surface, proposing that such coatings “*not be necessary at all* to achieve high voltage stability.” Ex. 1005, [0007]; see *Raytheon Techs. Corp. v. Gen. Elec. Co.*, 993 F.3d 1374, 1381 (Fed. Cir. 2021) (“[I]f neither any item of prior art, nor the background knowledge of one with ordinary skill ... would enable one to arrive at an invention, that invention would not be obvious.”).

Finally, with respect to Cho and Kim, as with Blangero, Petitioner plucks magnesium and titanium from a list of fifteen elements in Cho without explanation. See Reply, 2-3 (citing Pet. 68-69, citing Ex. 1008, 9:59-10:2). This arbitrary selection does not amount to a “fair suggestion” of using at least these two elements for the purposes of establishing obviousness. *Bradium Techs.*, 923 F.3d at 1049.

B. The Petition Failed to Meet Inherency’s High Bar

Petitioner purports to have relied upon the knowledge of a POSITA rather than inherency to demonstrate obviousness of claim features that are plainly missing from the prior art. Reply, 3-5. But even if that were true (which it is not for reasons described below), Petitioner’s arguments would still fail because the Petition does not offer the requisite motivations or analysis of whether a POSITA would have

reasonably expected success implementing the features that are alleged to be known to a POSITA in the specific context of Blangero and Cho. For example, Petitioner alleges that “the Petition explains that a POSITA would have understood Cho’s particle would include fluorine due to a POSITA’s knowledge of electrolyte decomposition” (Reply, 4-5), even though the Petition fails to provide any evidence that fluorine is in fact deposited, or that it, if deposited, it would form the claimed crystal structure and alignment, (POPR, 47-48). Reliance on a POSITA’s knowledge does not obviate the ordinary requirements of an obviousness analysis, which were not adequately addressed in the Petition. In this context, the POPR correctly identified multiple instances where the Petition did not proffer a proper obviousness analysis and therefore must rely instead on inherency. POPR, 24-31, 47-48.

Furthermore, Petitioner’s arguments fall under the high bar required by inherency. *See, e.g., PersonalWeb Techs., LLC v. Apple, Inc.*, 917 F.3d 1376, 1382-83 (Fed. Cir. 2019) (reversing obviousness determination because it was only “possible” that the prior art contained an inherent limitation—and “mere possibility is not enough”). For example, the POPR cited evidence that compounds such as MgO, LiF, and LTO can have varying crystal structures, depending on the conditions under which they are deposited. *See e.g.*, POPR, 23-25, 27-29. The Petition, however, fails to address why these compounds—to the extent they exist at all in the

underlying references—have the *claimed* crystal structure when deposited on the PEAM, rather than, for example, an unclaimed amorphous crystal structure. *Id.*

Although Petitioner alleges that its evidence regarding the crystal structure in Blangero stands unrebutted, (Reply, 4), that is not accurate. PO’s expert, Dr. Lucht, explained that the compounds Petitioner relies upon can also be found in amorphous form, and explained why a POSITA would reasonably expect those amorphous forms to result when applying Petitioner’s prior art. *See* Ex. 2001, ¶¶ 65-66, 69-70, 73. For example, with respect to Petitioner’s theory that fluorine will deposit on the surface as a decomposition product from the electrolyte solution, Dr. Lucht explained that such deposition would be highly unlikely to be crystalline, but rather would be expected to be amorphous, thus not meeting the claim limitations. Ex. 2001, ¶¶ 69-70. In this context, the principle articulated in *Unwired Planet v. Google* (see Reply at 4) is readily distinguishable since that case involved a claimed method that was performed at least “sometimes” in the prior art. 841 F.3d 995, 1002 (Fed. Cir. 2016). Here, by contrast, the evidence fails to establish that the requisite crystalline structures would ever result under the disclosed deposition conditions.

The Reply also mischaracterizes arguments and evidence from the Petition. For example, Petitioner states that “[t]hat is exactly what the Petition shows: as to Blangero, it explained rock-salt structures were known to form ‘under typical

environmental conditions.’” Reply, 5. This is not correct, however, as the Petition only refers to these “typical environmental conditions” in its background discussion of “Rock-Salt and Layered Rock-Salt Crystal Structures” and not in connection with Blangero. Pet., 15. Likewise, Petitioner argues that Kim does not teach preventing the formation of an SEI layer, (Reply, 5), but ignores that the main purpose of Kim is to prevent the SEI layers from forming, as these layers inhibit electron and lithium transport, (Ex. 1009, 2). *See also* POPR, 45-46; Ex. 2001, ¶¶ 98-99.

C. Petitioner’s Belated Arguments About How Shim and Blangero Would be Combined Should Have Been in the Petition and are Waived

Petitioner argues that its obviousness case does not rely on bodily incorporation with respect to combining Yamamoto with Cho or Blangero, but rather relies upon “appl[ying] Yamamoto’s well-praised MgO coating and EDX analysis to Cho or Blangero’s PEAM.” Reply, 6. But Petitioner still fails to explain in any detail how Yamamoto’s coating and EDX analysis would actually be applied to Cho or Blangero. *Id.* To the extent Petitioner now argues that Yamamoto’s coating would be applied to the exterior of Cho’s or Blangero’s PEAM as-is, that argument was not evident from the Petition and should be disregarded. Petitioner should not be permitted to backfill its arguments now to correct deficiencies in its original Petition.

II. PETITIONER’S NEW THEORIES AND EVIDENCE REGARDING PUBLIC ACCESSIBILITY ARE IMPROPER

Section 312(a) sets forth requirements for *the petition* to “identif[y], *in writing and with particularity*,...the grounds on which the challenge to each claim is based and *the evidence* that supports the grounds for the challenge to each claim.” 35 U.S.C. § 312(a) (emphasis added). *Hulu* clarifies that the petition must present “the prior art ... and evidence that it qualifies as such.” IPR2018-01039, Pap. 29, 13.

As detailed in the POPR, Petitioner chose not to address *any* evidence that Yamamoto or Kim were publicly accessible before the Critical Date. POPR, 60-63; Pet., 4-5. The public accessibility theories and evidence submitted with the Reply are therefore all new and improper. *Microsoft Corp. v. ThroughPuter, Inc.*, IPR2023-00852, Paper 15 at 6 (Oct. 11, 2023) (“Petitioner’s intended reply brief and evidence would, in essence, set forth from scratch Petitioner’s contentions for qualifying [the reference] as prior art ... We find this situation to be more aligned with a wholly new approach by Petitioner than with merely ‘respond[ing]’ to [PO’s] arguments by elaborating on existing arguments and evidence.”); *see also id.*, 6 at n. 5 (explaining that “the incorporation of arguments [into the petition] arising from” librarian declarations is prohibited by 37 C.F.R. § 42.6(a)(3) to “eliminate abuses”).

III. DENIAL IS WARRANTED UNDER 35 U.S.C. § 325(d)

Petitioner’s allegation that Blangero and Shim were “overlooked” (*see* Reply, 8) fails to address that Blangero and Shim, along with Yamamoto, Cho, and Kim,

are cumulative to art cited during prosecution, including Yura —i.e., “[t]he closest prior art of record”—in addition to Liu and Gao. POPR, 68; Ex. 1002, 1363, 277.

The Reply then contends that Petitioner’s art is not cumulative because Yura allegedly “does not teach a second region comprising titanium, magnesium, fluorine, and oxygen.” Reply, 8. But the Reply fails to address whether Petitioner’s art is cumulative to Liu and Gao. Indeed, Petitioner fails to address that the claims were found patentable over Liu’s PEAM “compris[ing] titanium, magnesium, fluorine, and oxygen”—i.e., the very limitation Petitioner contends was missing from Yura. Reply, 8; Ex. 1002, 277-278 (citing Liu (*id.*, 317-340)); POPR, 69-70.

IV. THE BOARD NEED NOT RESOLVE CLAIM CONSTRUCTIONS

The POPR does not require a construction of “second region compris[ing] a rock-salt crystal structure” meaning that “the second region can *only* be a rock-salt structure and/or that the claimed titanium, magnesium, fluorine, and oxygen must all have rock-salt structure.” Reply, 9. Since the Reply points to no substantive argument where PO relied on the alleged construction to distinguish the prior art, the Board need not construe the “second region” limitation to deny institution. *See Wellman Inc. v. Eastman Chem. Co.*, 642 F.3d 1355, 1361 (Fed. Cir. 2011) (“[C]laim terms need only be construed to the extent necessary to resolve the controversy”).

Respectfully submitted,

Date: February 8, 2024

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CERTIFICATE OF SERVICE

Pursuant to 37 CFR § 42.6(e), the undersigned certifies that on February 8, 2024, complete and entire copies of this PATENT OWNER'S SUR-REPLY TO PETITIONER'S PRELIMINARY REPLY TO PATENT OWNER'S RESPONSE provided via email to the Petitioner by serving the correspondence address of record as follows:

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