

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ZHUHAI COSMX BATTERY CO., LTD.,
Petitioner

v.

NINGDE AMPEREX TECHNOLOGY LTD.,
Patent Owner

IPR2025-00431
Patent 11,799,131

PATENT OWNER'S SUR-REPLY

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2001	Second Amended Complaint, <i>Ningde Amperex Tech. Ltd. v. Zhuhai CosMX Battery Co.</i> , Case No. 2:24-cv-00728-JRG, ECF No. 23 (E.D. Tex. Jan. 28, 2025)
2002	Scheduling Order, <i>Ningde Amperex Tech. Ltd. v. Zhuhai CosMX Battery Co.</i> , Case No. 2:24-cv-00728-JRG, ECF No. 27 (E.D. Tex. Feb. 6, 2025)
2003	CosMX Invalidity Contentions Cover Pleading, <i>Ningde Amperex Tech. Ltd. v. Zhuhai CosMX Battery Co.</i> , Case No. 2:24-cv-00728-JRG (E.D. Tex. Jan. 7, 2025)
2004	Summons to attend oral proceedings in German Case No. 3 Ni 12/23 (EP) (“Germany Order 1”)
2005	Summons to attend oral proceedings in German Case No. 3 Ni 12/24 (EP) (“Germany Order 2”)
2006	Docket Navigator Statistics for Judge Rodney Gilstrap (accessed May 5, 2025)
2007	Docket, <i>Ningde Amperex Tech. Ltd. v. Zhuhai CosMX Battery Co.</i> , Case No. 2:22-cv-00232 (E.D. Tex.)
2008	Joint Motion for Entry of Protective Order, <i>Ningde Amperex Tech. Ltd. v. Zhuhai CosMX Battery Co.</i> , No. 2:24-cv-00728-JRG, ECF No. 30 (E.D. Tex. Feb. 11, 2025)
2009	Amended Final Judgment, <i>Ningde Amperex Tech. Ltd. v. Zhuhai CosMX Battery Co.</i> , Case No. 2:22-cv-00232, ECF No. 427 (E.D. Tex.)

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2010	Article, <i>Lithium battery manufacturer ATL won injunction against its Chinese rival COSMX in German Court</i> , China IP Today (April 6, 2024)
2011	General Docket, <i>Ningde Amperex Tech. Ltd. v. Zhuhai CosMX Battery Co.</i> , No. 25-1037 (CAFC)
2012	U.S. Patent No. 10,833,363 (“the ‘363 Patent”)
2013	Darts IP Reports: CN109301326, CN104466097, CN206490141, CN108352492 (May 6, 2025)
2014	Dec. 20, 2021 memo titled “New PE2E Search Tool Using AI Search Features” by Acting Deputy Director Andrew Hirshfeld
2015	Declaration of Dean R. Wheeler, Ph.D.
2016	<i>Curriculum Vitae</i> of Dean R. Wheeler, Ph.D.
2017	Sigma-Aldrich Safety Data Sheet, “Lithium hexafluorophosphate solution in ethylene carbonate-d ₄ (99 atom % D) and ethyl-d ₅ methyl-d ₃ carbonate (98 atom % D), 1.0 M LiPF ₆ in EC-d ₄ /EMC-d ₈ =3:7 (v/v), battery grade”, dated July 11, 2016
2018	Safety Data Sheet, “Lithium Hexafluorophosphate in EC/EMC 3:7”, dated September 2018
2019	Sigma-Aldrich Product Specification, “Lithium hexafluorophosphate solution - in ethylene carbonate and diethyl carbonate, 1.0M LiPF ₆ in EC/DEC=50/50 (v/v), battery grade”
2020	Sigma-Aldrich Product Specification, “Lithium hexafluorophosphate solution - in diethyl carbonate, 1.0M LiPF ₆ in DEC, battery grade”

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2021	Sigma-Aldrich Product Specification, “Lithium hexafluorophosphate solution - in ethylene carbonate and dimethyl carbonate, 1.0M LiPF ₆ in EC/DMC=50/50 (v/v), battery grade”
2022	Chinese Patent Application No. CN104051787A to Yongjun et al. (including English translation, translation affidavit, and copy of original document in Chinese)
2023	Wenbo Zhang et al., <i>Interfacial processes and influence of composite cathode microstructure controlling the performance of all-solid-state lithium batteries</i> , 9 ACS Applied Materials & Interfaces 17835–17845 (2017).
2024	BYU DIPPR® (Design Institute for Physical Properties) Thermophysical Properties Laboratory Data Information Sheet for n-Propyl Propionate
2025	2016 Batteries Conference GRC, available at: https://www.grc.org/batteries-conference/2016/ (accessed on 12 May 2025).
2026	<i>Hubs – Department of Energy</i> , available at: https://www.energy.gov/hubs (accessed on 12 May 2025)
2027	<i>DOE Energy Innovation Hubs</i> , available at: https://science.osti.gov/bes/Research/DOE-Energy-Innovation-Hubs (accessed on 12 May 2025)
2028	Amir-Sina Hamed, Fezzeh Pouraghajan, Fei Sun, Mojdeh Nikpour, & Dean R. Wheeler, <i>Interplay of Electrode Heterogeneity and Lithium Plating</i> , 169 J. Electrochem. Soc. 020551 (2022)
2029	Fei Sun and Dean R. Wheeler, <i>The Effects of Lithium Ions and pH on the Function of Polyacrylic Acid Binder for Silicon Anodes</i> , 170 J. Electrochem. Soc. 080502 (2023)

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2030	Fezzeh Pouraghajan, Andrea I. Thompson, Emilee E. Hunter, Brian Mazzeo, Jake Christensen, Ram Subbaraman, Michael Wray, & Dean Wheeler, <i>The Effects of Cycling on Ionic and Electronic Conductivities of Li-ion Battery Electrodes</i> , 492 J. of Power Sources 229636 (2021)
2031	Amir-Sina Hamedi, Edmund M. Shumway, & Dean R. Wheeler, <i>Electrode-Level Modeling of Silicon Anodes for Improved Cell Design</i> , 171 J. Electrochem. Soc. 120539 (2024)
2032	Jerome Workman, Jr., <i>A Comprehensive Review of Spectroscopic Techniques for Lithium-Ion Battery Analysis</i> , 39 Spectroscopy 6 (2024), https://doi.org/10.56530/spectroscopy.ii3689u3
2033	Anup Barai et al., <i>A Comparison of Methodologies for the Non-Invasive Characterisation of Commercial Li-Ion Cells</i> , 72 Progress in Energy and Combustion Science 1-31 (2019)
2034	<i>Lithium-ion Battery Design: Effects of Optimal Compaction Density</i> , available at: https://www.neware.net/news/lithium-ion-battery-design-effects-of-optimal-compaction-density/230/83.html (accessed on May 23, 2025)
2035	Shu Lu, et al., <i>Binder-Free LiCoO₂/Carbon Nanotube Cathodes for High-Performance Lithium Ion Batteries</i> , 24 Adv. Mater. 2294-2298 (2012)
2036	Lei-Lei Lu, et al., <i>Wood-Inspired High-Performance Ultrathick Bulk Battery Electrodes</i> , Adv. Mater. 1706745 (2018)
2037	Yasuhiko Takahashi, et al., <i>Structure and electron density analysis of electrochemically and chemically delithiated LiCoO₂ single crystals</i> , 180 Journal of Solid State Chemistry 313-321 (2007), https://doi.org/10.1016/j.jssc.2006.10.018

Exhibit Number	Description
2038	<i>Carbon Black</i> , Available at: https://pubchem.ncbi.nlm.nih.gov/compound/carbon%20black , (accessed on May 23, 2025)
2039	Sankar Mandal, et al., <i>The Role of Carbon Black in LiMn₂O₄-Based Composites as Cathodes for Rechargeable Lithium Batteries</i> . 148 J. Electrochem. Soc. A24-A29 (2001)
2040	<i>Ethylene Carbonate</i> , https://www.m-chemical.co.jp/en/products/departments/mcc/c2/product/1200981_7910.html (accessed on June 8, 2025)
2041	<i>Declaration of Brady Cox in Support of Patent Owner's Notice of Intent to Designate Provisionally Recognized PTAB Attorney Under 37 C.F.R. § 42.10(c)(2)</i>
2042	Deposition Transcript of Brett Lucht, Ph.D., dated September 13, 2022, IPR2021-01440
2043	Declaration of Dr. Brett Lucht, dated September 15, 2023, IPR2023-01016
2044	<i>Reserved</i>
2045	Alison L. Michan, et al., <i>Fluoroethylene Carbonate and Vinylene Carbonate Reduction: Understanding Lithium-ion Battery Electrode Additives and Solid Electrolyte Interphase Formation</i> , Chemistry of Materials 2016 28 (22), 8149-8159
2046	Sha Tan, et al., <i>Review on Low-Temperature Electrolytes for Lithium-Ion and Lithium Metal Batteries</i> , Electrochemical Energy Reviews (2023) 6:35, https://doi.org/10.1007/s41918-023-00199-1
2047	Supplemental Declaration of Dean R. Wheeler, Ph.D. in support of Patent Owner Response

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2048	Lidan Xing et al., <i>Deciphering the Ethylene Carbonate–Propylene Carbonate Mystery in Li-Ion Batteries</i> , 51 Accounts of Chemical Research 282-289 (2018), https://doi.org/10.1021/acs.accounts.7b00474
2049	Academic Press Dictionary of Science and Technology (Christopher Morris ed., 1992)
2050	Deposition Transcript of Brett Lucht, Ph.D., dated October 22, 2025, and executed Errata Sheet IPR2025-00431
2051	Claim Construction Order, Ningde Amperex Tech. Ltd. v. Zhuhai CosMX Battery Co., Case No. 2:24-cv-00728-JRG, ECF No. 171 (E.D. Tex. Feb. 17, 2026)
2052	Deposition Transcript of Brett Lucht, Ph.D., dated April 2, 2026 IPR2025-00431

Petitioner's Reply fails to cure the deficiencies in its Petition and Petitioner has not met its burden of proving unpatentability by a preponderance of evidence. Further, the '131 Patent is no longer asserted in district court as of March 17, 2026, so the Board should deinstitution this proceeding. *Coretronic Corp. v. Maxell, Ltd.*, IPR2025-00941, Paper 10 at 3 (Director Sept. 26, 2025).

I. GROUNDS 1-8: ZENG AND SUNOSE

A. Zeng's Disclosure Is Too Ambiguous to Establish the Claimed Y/Z Ratio

When a prior art's disclosure is ambiguous, Petitioner cannot meet its burden of proving unpatentability by a preponderance of the evidence by making assumptions and simply challenging PO to disprove them. *See Wasica Fin. GmbH v. Cont'l Auto. Sys., Inc.*, 853 F.3d 1272, 1284 (Fed. Cir. 2017). The alleged ambiguity of Zeng itself is fatal to Petitioner's case as its now-relied-upon "typographical error" precludes Petitioner from satisfying its burden.

PO does not read "[a] phrase in isolation." Reply, 1. PO relies on Zeng's actual words—that LiPF_6 "of a concentration of 1.0 mol/L is slowly added to the mixed solution"—which describes adding a 1.0 M LiPF_6 solution, not solid LiPF_6 . Ex. 1006 ¶[0037]. Zeng's language is not an obvious error and does not invite correction. Ex. 1045, 58:15-21. Only in his second deposition did Petitioner's expert assert this language was a "*typographical error*," which Petitioner never argued in the Petition.

Ex. 2052, 37:11-38:21, 92:2-93:11. Petitioner dismisses Zeng's method as "unworkable" (Reply, 2), but Zeng explicitly states that "lithium hexafluorophosphate *of a concentration of 1.0 mol/L* is slowly added to the mixed solution." Ex. 1006 ¶[0037]. These words indisputably describe adding a liquid LiPF₆ solution, and Petitioner's attempts to now suggest errors in its *own* certified translation fail to meet its burden.

Petitioner's "every reference of record" argument is misdirected. Reply, 2. Petitioner cites other references for the proposition that "a POSITA would have added solid LiPF₆ to reach a 1.0M concentration." Reply, 2; Ex. 1044 ¶¶14, 18–19. But the Petition did not make this argument and, at best, these authorities show only that 1.0M is one possible molarity, not that Zeng *necessarily* adds solid LiPF₆. Commercially available 1.0M LiPF₆ solutions were commonly purchasable, confirming Zeng could use such a solution. PO's point remains: Petitioner's Y/Z calculation depends on unsupported *assumptions* about how LiPF₆ is introduced. Reply, 2, 4; *see also* POR, 8-13; Pet., 21-22; Ex. 1045, 53:6–21.

PO does not "manufacture" uncertainty—Petitioner has attempted to manufacture uncertainty by relying on an alleged "error" in Zeng's express disclosure that contradicts what Petitioner needs Zeng to teach. Reply, 2-3. Petitioner's expert admits that, on its face, Zeng fails to disclose the amount of LiPF₆ solution that is added. Zeng's actual language also does not specify the solvent in

which its LiPF_6 is dissolved before adding or the volume of LiPF_6 solution added. Ex. 1006 ¶[0037]. Thus, PO simply reads the reference as written and as a POSITA would have understood it without being infected by hindsight bias. Ex. 2004, 3-5; POR, 8-10.

The fact that Dr. Lucht's interpretation may lead to "information that a POSITA could have employed with confidence" (Reply, 3, citing Decision, 28) is irrelevant to the question of what Zeng *actually discloses*. The question is not whether Petitioner's preferred interpretation could work; the question is whether Zeng *discloses* it. Petitioner's interpretation requires rewriting Zeng's language—replacing "of a concentration of 1.0 mol/L" with "to reach a concentration of 1.0 mol/L." Ex. 1006 ¶[0037]; Reply, 2. That Dr. Lucht's attempted rewrite of Zeng may be more convenient for Petitioner's obviousness theory cannot overwrite what Zeng teaches.

PO's interpretation does not contradict the fact that battery chemistry is "complex and unpredictable." Reply, 3. Zeng's language describes adding a pre-mixed LiPF_6 solution, but because Zeng does not specify the solvent or volume (caring about neither), the final electrolyte composition—and therefore the Y/Z ratio—is *unknown* to the POSITA. POR, 11-12. These missing parameters illustrate the inventive aspects of the claims. The unpredictability both parties acknowledge makes this ambiguity fatal to Petitioner's case: because electrolyte interactions are

complex and unpredictable, a POSITA cannot intuit the missing parameters needed to calculate the claimed Y/Z ratio from Zeng's incomplete disclosure.

Dr. Wheeler's testimony that adding an unknown amount of LiPF_6 solution "would be unpredictable to a POSITA" (Ex. 1045, 50:11-51:16) supports—not undermines—PO's position. Dr. Wheeler explains that Zeng's final composition would be unpredictable with respect to the elements claimed by the '131 Patent, but Zeng was predictable for the additive ratios that it was focused on. *Id.* This is precisely why Petitioner cannot calculate the Y/Z ratio from Zeng's disclosure. Petitioner bears the burden of proving the Y/Z ratio is disclosed, but the Y/Z ratio is a construct of the '131 Patent that requires knowing the total electrolyte weight—a parameter that Zeng was unconcerned with and therefore never disclosed.

Petitioner argues a POSITA "is not an automaton who blindly follows inexact wording," citing *KSR*, *Randall Mfg.*, and *LG Electronics*. Reply, 4. These cases are inapposite. *LG Electronics* applies where a reference contains an *obvious* error that is self-evidently wrong—not where the language is internally consistent and describes a well-known practice (adding pre-mixed 1.0 mol/L LiPF_6 solution). *LG Electronics* does not permit disregarding exact language merely because a different reading would be more convenient. Petitioner's "typographical error" theory that presupposes a solid salt ignores that Zeng may simply have omitted the volume and solvent for its pre-mixed solution. Ex. 2052, 39:14-41:8.

Zeng’s language is not “inexact” or “errant”; it is precise. Reply, 4. The terms “of a concentration” and “mol/L” are indisputably present and necessitate adding a solution. Ex. 2047 ¶33; Ex. 1006 ¶[0037]; Ex. 1005 ¶[0037] (original Chinese application showing “mol/L”). Petitioner itself concedes that Zeng’s language may “suggest adding a . . . LiPF₆ solution.” Reply, 4. A disclosure that Petitioner admits facially “suggests” adding a solution is not an “obvious misprint” that a POSITA would “mentally disregard.” *Id.* Instead, a POSITA would follow the reference’s instructions as written—particularly where, as here, pre-mixed 1.0M LiPF₆ solutions were commercially available. Ex. 2015 ¶¶110, 115.

Petitioner’s admission that Zeng’s language may “suggest adding a . . . LiPF₆ solution” is significant. Reply, 4. Petitioner does not dispute that the natural reading describes adding LiPF₆ *as a solution*, but argues a POSITA would override this based on “context.” Reply, 3-4. Petitioner’s italicization of “*translated*” implies its own certified translation is deficient. Reply, 4. But Petitioner submitted that translation as its own exhibit (Ex. 1006) and has provided no new translation or declaration suggesting error. Ex. 2050, 92:4-93:6. Petitioner cannot rely on the certified translation while casting doubt on its veracity when the plain language supports PO.

Petitioner’s italicization of “*translated*” introduces a new theory, absent from the Petition, that Zeng’s express language should be discounted due to an inaccurate

or erroneous translation. That new argument raised for the first time in the Reply is improper and underscores that Petitioner lacks intrinsic support in Zeng for its solid-LiPF₆ assumption. Furthermore, Zeng's original Chinese application shows the units "mol/L," which necessarily refers to a *liquid* concentration. Ex. 1005 ¶[0037].

Zeng unambiguously teaches adding a *pre-mixed solution* that already has a concentration of 1.0 mol/L. POR, 8-12. The final electrolyte concentration depends on the volume of that solution added, which Zeng does not disclose. POR, 8-10; Ex. 2047 ¶33. The fact that the final concentration is indeterminate under PO's interpretation is not a defect in PO's reading; it is a defect in Zeng's disclosure. And that indeterminacy is precisely why Petitioner cannot calculate the claimed Y/Z ratio from Zeng, and now asserts that the language of Zeng Petitioner previously asserted was clear is instead a "typographical error."

Petitioner's characterization of Zeng as an "otherwise precisely specified formulation" undermines its own position. Reply, 5. If Zeng's mixed solvent formulation is "precisely specified," then the precise language Zeng chose to describe its slow addition of an LiPF₆ solution "of a concentration of 1.0 mol/L" must also be given effect, not dismissed as imprecise translation without evidence. *Id.*

Petitioner has failed to prove that its reinterpretation and self-adopted correction of Zeng's alleged "typographical error" is correct.

B. Criticality of Y/Z

Petitioner argues that “Zeng’s Y/Z ratio falls entirely within the claimed range” such that “‘criticality’ is irrelevant.” Reply, 5-6. Although Petitioner tries to set an upper limit to the purported Y/Z range of Zeng, such argument is nothing more than a conclusory statement with unverified assumptions. Petition, 39; Reply 6. As PO has demonstrated, Zeng’s Y/Z ratio is indeterminate because Zeng’s disclosure does not provide sufficient information to calculate Z, making the entire upper-bound analysis irrelevant. POR, 11-13.

Petitioner does not dispute that Table 2 of the ’131 Patent illustrates improvements in DC internal resistance within the claimed Y/Z ratio range, nor that the mechanism by which those improvements are achieved is the ’131 Patent’s discovery of a protective film, which is not easily decomposed on the surface of the cathode at a high potential in this particular range—a mechanism that effectively inhibits the increase in DC resistance. Ex. 1001, 1:55-62, 28:59-64; Ex. 2047 ¶40; Ex. 2052 15:5-9. Petitioner’s citation of *In re Geisler* is misplaced—the differences in DC internal resistance from using Y/Z ratio values within this range by creating this stable protective film are improvements in both kind *and* degree, and the unexpected discovery of this “great” inhibition effect from a long-lasting film created by using this claimed ratio goes beyond mere “optimization.” Reply, 6.

Petitioner argues that the claimed Y/Z range is not critical because Table 2's examples do "not hold other formulation variables constant, so any observed performance improvements cannot be definitively attributed to Y/Z." Reply, 8. Notably, Petitioner and Dr. Lucht failed to address PO's specific controlled comparisons, which did hold the confounding variables constant to isolate the effect of Y/Z. In S2-2 and D2-3, both examples have Z=10 wt% and X=4 wt%, and the only difference is Y (1 wt% vs. 5 wt%), which changes the Y/Z ratio. Ex. 1001, Table 2; Reply, 7-8. Similarly, in S2-5 and D2-4, both examples have Z=50 wt% and X=4 wt%, and again, the only difference is Y (1 wt% vs. 0.1 wt%) and Y/Z. *Id.* Dr. Lucht confirmed each of these facts. Ex. 2052, 11:19-17:16. These are the most controlled comparisons available in Table 2, and they confirm the specification's statements that the claimed Y/Z ratio was found to drive the observed performance difference.

Petitioner's focus on fresh battery DC internal resistance is inapposite. Reply, 7-8. The criticality of the claimed Y/Z range concerns "a better inhibition effect on the increase in DC internal resistance" over multiple cycles. Ex. 1001, 28:59-64. The '131 Patent explains that the electrolyte forms "a firm protective film which is not easily decomposed on the surface of the cathode at a high potential," which "effectively inhibit[s] the increase in DC internal resistance." *Id.*, 1:55-62. This protective effect manifests over repeated cycling, not at the fresh battery stage. The

relevant metric is DC internal resistance after cycling, where in-range examples consistently outperform out-of-range examples at 400 cycles: S2-2 (95.7 mΩ) vs. D2-3 (111.3 mΩ), and S2-5 (98.3 mΩ) vs. D2-4 (109.4 mΩ). *Id.*, Table 2.

C. Compaction Density

Petitioner tries to salvage Sunose by cherry-picking Examples 2-4 as having “reasonable” density values. Reply, 9-10. Dr. Lucht admitted he cherry-picked embodiments with “reasonable” values while ignoring the physically impossible ones and without understanding why some values are reasonable and others impossible, though he agrees all the values were calculated in the same way. Ex. 2050, 116:20-117:8. But the impossible values are not random, isolated outliers or bad data points; rather, they reveal a *systematic* methodological flaw that undercuts the enablement of the reference as a whole. POR, 19-23.

Petitioner’s retreat from Examples 2-4 to only Examples 3 and 4 is a significant concession. Reply, 9-10 (conceding Example 2’s D1 value of 5.0 g/cm³ exceeds the theoretical maximum of 4.5 g/cm³). But that a value falls below an unachievable theoretical ceiling does not make it physically possible. The 4.5 g/cm³ figure represents the maximum at *zero* porosity—which Dr. Wheeler testified is “not realistically achievable in any battery context.” Ex. 1045, 76:16-77:2, 143:6-12. Example 3’s M value of 4.4 g/cm³ would imply approximately 2% porosity—which is unachievable without severe electrode damage. Ex. 2015 ¶141.

Dr. Lucht admitted he never calculated the porosity Sunose's 4.4 g/cm³ value would imply, does not know whether that porosity is achievable or desirable, and does not know what porosity levels a POSITA would have considered typical. Ex. 2052, 25:8-27:2, 62:15-63:2, 79:2-80:15. His attempt to justify Sunose's 4.0 and 4.4 g/cm³ values by referencing the '131 Patent's claimed cathode D2 range is *post hoc* rationalization. *Id.*, 63:18-64:2. Dr. Lucht admitted he is "not sure" whether Sunose and the '131 Patent use the same material ratios. *Id.*, 64:3-65:11. Different composition ratios yield different theoretical maximum densities.

Critically, Dr. Lucht confirmed that he does not "know if [Sunose's] method of calculating the active material density ratio is wrong or not". Ex. 2050, 119:21-120:8. But there are no differences between how Sunose calculated the density values for his "reasonable" embodiments versus those Dr. Lucht concedes are physically impossible. Ex. 2052, 66:22-67:6. Nor could Dr. Lucht explain whether or how the impossible values were calculated incorrectly. *Id.*, 65:20-66:4. If Petitioner's own expert cannot identify the source of the error that results in impossible values, he cannot assure the Board that the same calculation error does not infect the remaining Sunose values relied upon.

Petitioner identifies no teaching that would lead a POSITA to selectively credit certain Sunose values while disregarding others calculated by the same undisclosed methodology. Reply, 9-14. A POSITA confronted with multiple,

physically impossible values (5.7, 6.5, and 8.0 g/cm³) would question the entire dataset's reliability—not selectively credit remaining portions. POR, 17-18. If the same methodology produced both impossible and “reasonable” values, a POSITA would distrust all of Sunose's density data and any ratios derived therefrom. POR, 18, 23; Ex. 2015 ¶144; Ex. 2047 ¶61.

Given that multiple of Sunose's M values exceed the crystalline or true density of LCO (a physical impossibility for compaction density, even assuming zero porosity) (Ex. 2015 ¶¶45, 136-142), Sunose must either be incorrect or calculating *something else*; perhaps a target value, a calculated parameter, or a different physical property entirely. Whatever it is, it cannot be directly compared to the claimed compaction density ratio.

Petitioner's newly proposed explanation—that Sunose reports “compaction densities” calculated from a mass of coating material and a fixed distance between rollers at the point of highest pressure—does not rehabilitate Sunose. Reply, 11-12. Rather, it confirms why a POSITA would discount all of Sunose's reported values, including those that superficially appear “reasonable.” If the calculated densities rely on attempting to force more active material into a fixed compaction volume than can physically be accommodated at atmospheric pressure, yielding density values that exceed the crystalline density of LCO, then Sunose's technique itself is fundamentally flawed. POR, 18. A calculation method that produces physically

impossible results is not selectively reliable simply because some outputs fall within a physically possible range.

Petitioner's theory that Sunose's impossible values are merely *calculated* densities based on fixed compaction volume *confirms* PO's position. Reply, 11-12; Ex. 2052, 56:10-17. If Sunose's "densities" are calculations rather than measurements, they cannot be compared to the claimed D1/D2 ratio, which is defined by values of physical electrodes. Ex. 1001, 20:54-64. Under Petitioner's theory, Sunose calculates what was *intended*, not what was made, rendering the dataset incommensurable with the claims. Reply, 13-14. Electrodes can elastically deform after exiting high-pressure rollers, so final density is not dictated by gap size alone. Ex. 1045, 86:13-89:18; Ex. 2052, 53:8-54:7. Determining final density requires post-rolling measurements. Ex. 1045, 99:6-100:14. Petitioner's attempt to explain Sunose's impossible values proves PO's point: a POSITA would question whether "reasonable" values reflect actual physical densities or merely artifacts of the same defective assumptions and calculation. Ex. 1045, 88:20-89:18.

Petitioner's Reply raises, for the first time, a new "overlap" theory: that Sunose's general N/M ratio range of $0.7 < N/M < 1.0$ is "the reciprocal of the claimed D1/D2 ratio, so Sunose's desired ratio is about $1.0 < D1/D2 < \text{about } 1.43$," which "overlaps the claimed range, rendering it obvious." Reply, 12-13. The Petition relied exclusively on the specific Example values—D1/D2 ratios of 1.25, 1.1, and 1.0 for

Examples 2-4—to argue with respect to limitation [1.6] that these values fell within the claimed range. Pet., 33-34. This new “overlap” theory is an impermissible new argument raised for the first time in Reply in violation of 37 C.F.R. § 42.23(b). The Board should disregard it.

Petitioner argues that “Sunose need not be enabled for obviousness,” citing *Amgen*. Reply, 13. But Petitioner’s argument ignores the critical fact that it relies *solely* upon Sunose to meet the D1/D2 compaction density ratio—the very limitation Sunose fails to enable. In *Raytheon Technologies Corp. v. General Electric Co.*, 993 F.3d 1374 (Fed. Cir. 2021), the Federal Circuit explained that while “a prior art reference asserted under § 103 does not necessarily have to enable its own disclosure, *i.e.*, be ‘self-enabling,’ to be relevant to the obviousness inquiry,” there is a critical limitation: “In the absence of such other supporting evidence to enable a skilled artisan to make the claimed invention, a standalone § 103 reference must enable the portions of its disclosure being relied upon.” *Id.*, 1380-1381. Further, “if an obviousness case is based on a non-self-enabled reference, and no other prior art reference or evidence would have enabled a skilled artisan to make the claimed invention, then the invention cannot be said to have been obvious.” *Id.*, 1377. Here, Sunose is the sole reference Petitioner relies upon for the claimed D1/D2 limitation. Under *Raytheon*, that reliance requires enablement of that limitation, which Sunose lacks.

Sunose fails to provide sufficient direction or guidance for how much “coating amount” or “active material coat weight” or even at what thickness a POSITA would apply such coating amount to the respective single-sided coated portions of Embodiments 2-4 or Comparative Examples 2-3, and only supplies a “coating amount” for the single-sided coated portion of Embodiment 1 that is erroneous on its face and off by a factor of roughly 10,000. Reply, 13-14; *see also* Ex. 1010 ¶¶[0029]-[0034], [0041]; Ex. 2047 ¶54. Indeed, Embodiment 1’s coating amount produces a physically impossible density of 5.7 g/cc. Ex. 1010 ¶[0041]; Ex. 2015 ¶¶45, 136-142; Ex. 2047 ¶¶48, 58, fn26, fn27. A POSITA cannot use a known incorrect starting point to derive correct values for other embodiments. A POSITA would not be able to replicate any of the examples of Sunose, which fails to provide a single working example of an electrode with accurate or listed coating amounts AND physically possible compaction densities. Ex. 1010 ¶¶[0029]-[0034], [0041]. Petitioner’s new “simple algebra” argument that “coating amount = (target compaction density) × (fixed volume)” —fails because every variable in that equation is erroneous and/or undisclosed in Sunose. Reply, 13-14; Ex. 1010 ¶¶[0029]-[0034], [0041]. Petitioner claims the “fixed volume” is known from “roller gap × electrode plate surface area.” Reply, 14. But Sunose discloses neither the roller gap height nor the electrode plate surface area. Nor does Sunose disclose thickness

measurements for any of its embodiments or comparative examples, evidencing a “systematic” failure in its experiments and data. Ex. 1045, 95:1-9.

Petitioner’s argument that criticality is irrelevant (Reply, 14) incorrectly presupposes that Sunose’s density values are reliable and correspond to the claimed electrode compaction density. Moreover, the data in Table 7 does not show trivial differences in degree, but rather an accelerating trend: the performance gap between in-range and out-of-range examples *widens* with cycling (from ~3 points at 200 cycles to ~6 points at 400 cycles), indicating that the protective stable film enabled by the claimed D1/D2 range becomes increasingly important over the battery’s lifetime. Ex. 1001, Table 7. This is consistent with the specification’s teaching that the claimed combination “facilitate[s] the reduction of the electrode interface resistance and the reduction of the cell polarization” (*id.*, 31:53-57) such that the protective effect manifests and compounds over repeated cycling.

Further, Petitioner’s Reply never explains *why* a POSITA would select a rolled configuration (Reply, 15-18, n4), and Petitioner’s assertion that “[o]ne test would suffice” to confirm compatibility between Zeng and Sunose is contrary to Dr. Lucht’s testimony that “typically you would do a whole bunch of testing,” and that both small and large changes can result in large differences. POR, 25, citing Ex. 2050, 62:18-64:5.

Finally, Dr. Lucht confirmed he was “not sure” whether Zeng’s electrolyte solution would work with the extremely low porosity implied by Sunose’s relied-upon M values, and did not know what porosity levels a POSITA would have found acceptable. Ex. 2052, 63:10-64:2, 80:11-15.

II. GROUNDS 2, 4, 6, 8: MATSUOKA

A. Matsuoka Is Fundamentally Incompatible with Zeng

Petitioner dismisses PO’s arguments against Matsuoka as “distractions.” Reply, 19. But PO’s arguments go to the heart of the obviousness inquiry: *why* would a POSITA consult Matsuoka? POR, 31-32. Matsuoka’s entire framework is designed around acetonitrile-based electrolytes, but Zeng contains *zero* acetonitrile. *Id.* 33-36. Matsuoka’s acetonitrile solvent, organic lithium salt requirement, and LUMO/HOMO framework are the essential context in which its PP weight percentages were developed. POR, 36. Matsuoka’s non-nitrile additives are selected for their LUMO/HOMO energies relative to acetonitrile—a rationale with no application to Zeng’s fundamentally different carbonate/ester system. *Id.* 35-36.

Petitioner’s characterization of Ground 2 as relying on Matsuoka “solely for an express disclosure of an appropriate weight for PP” (Reply, 18) is a distinction without a difference. Whether Matsuoka is cited to *select* PP or supply its *weight percentage*, Petitioner extracts a data point from an acetonitrile/organic-lithium-salt system and transplants it into Zeng’s fundamentally different carbonate/inorganic-

salt system, without evidence of relevance outside its original framework. Petitioner has never answered the fundamental question: why would a POSITA working with Zeng's carbonate-based, inorganic-salt electrolyte consult Matsuoka's acetonitrile-based system? Reply, 19.

B. Petitioner Ignores Matsuoka's Essential Requirements

PO's statement that "Zeng already provides the POSITA with the necessary amount of PP to include in a relative mass ratio of the base solvent mixture" (Reply, 18-19, citing POR, 31-32) refers to the *solvent mixing step*—not the total electrolyte. The claimed Y/Z ratio requires knowing the weight percentage of PP based on the *total weight of the electrolyte* (after adding LiPF₆ and all additives), which Zeng does not disclose and is unconcerned with. Ex. 2047 ¶¶69; POR, 31-32.

Although Petitioner need not demonstrate bodily incorporation, Matsuoka must be considered in its entirety. Petitioner fails to explain how a POSITA would apply Matsuoka's required acetonitrile and organic lithium salt teachings to Zeng. *Takeda Chem. Indus. v. Alphapharm Pty., Ltd.* 492 F.3d 1350, 1356-1357 (Fed. Cir. 2007).

Zeng uses *only* an inorganic lithium salt, LiPF₆. POR, 37-38. Matsuoka teaches that if an inorganic lithium salt is present, "it is preferable for the organic lithium salt to be present in a molar amount 1-20 times more than the inorganic lithium salt." Ex. 2047 ¶¶90 (citing Ex. 1007 ¶¶[0031]-[0032]). A POSITA following

Matsuoka would need to add substantial organic lithium salt to Zeng—fundamentally altering Zeng’s electrolyte system. Petitioner cherry-picks PP percentages while ignoring Matsuoka’s other essential requirements for acetonitrile and organic lithium salt.

Petitioner seeks to extract Matsuoka’s “non-nitrile additive” weight percentage ranges and apply them to Zeng’s PP content. Reply, 18-20. But Matsuoka’s PP teachings are inextricably linked to its specific electrolyte system (acetonitrile solvent, organic lithium salt, LUMO/HOMO framework). This selective reading (extracting one teaching while ignoring the rest) is what *Takeda* prohibits.

Petitioner’s approach—selectively extracting Matsuoka’s PP weight percentages while ignoring Matsuoka’s acetonitrile-based system—is hindsight reconstruction. Reply, 18-20; POR, 30. Petitioner’s characterization of its combination as “minimal” is possible only because Petitioner already knows what the ’131 Patent claims. Reply, 20; *Leo Pharm. Prods., Ltd. v. Rea*, 726 F.3d 1346, 1355-56 (Fed. Cir. 2013). Petitioner works backward from the claims to find a reference that mentions PP weight percentages, then characterizes the combination as “minimal.” *Id.* Neither Zeng nor Matsuoka discusses the trinitrile-to-PP ratio; the Y/Z ratio is a construct of the ’131 Patent.

Indeed, Petitioner’s own admission reveals hindsight. Reply, 18. Petitioner concedes it “cites Matsuoka solely for an express disclosure of an appropriate weight for PP—a compound Zeng’s electrolytes already have.” *Id.* (citing Pet., 50-52). Dr. Lucht confirms Matsuoka was only relied on because “it specifically refers to propyl propionate as a total weight percentage,” not for relevance to Zeng’s system. Ex. 2052, 81:21-82:2. Petitioner searched for anything disclosing a PP weight percentage, regardless of applicability. Petitioner selected Matsuoka because it needed something to supply the claimed Z value that Zeng does not.¹ *See TQ Delta*, 942 F.3d 1352, 1361 (Fed. Cir. 2019).

Petitioner did not establish reasonable expectation of success. Matsuoka’s weight percentages were optimized for acetonitrile/organic lithium salt systems.

¹ Indeed, Petitioner’s Ground 1 position dooms these other Grounds. Petitioner argues Zeng’s “specific electrolyte compositions alone refute[] PO’s argument” (Reply, 2), and Dr. Lucht asserts Zeng’s “very specific electrolyte solutions . . . ***should not be altered*** by the addition of an unknown amount of an unknown solvent.” Ex. 1044, ¶13 (emphasis added). Yet Ground 2 proposes exactly that—altering Zeng by grafting Matsuoka’s acetonitrile-based additive framework onto Zeng’s “very specific” electrolyte in a naked attempt to supply a missing PP wt% limitation. That is impermissible hindsight reconstruction, not obviousness.

Applying those percentages to Zeng's completely different solvent/salt system would be unpredictable. POR, 33-38. The nonlinear interactions between electrolyte components mean that what works in Matsuoka's system provides no reliable guidance for Zeng's system. *Id.*

III. GROUNDS 3, 4, 7, 8, 10, 12: KIM

Petitioner's reliance on Kim fails because the Petition never articulated any motivation to combine Kim with the other references nor evaluated reasonable expectation of success. Reply, 21; POR, 39-40; *L.A. Biomedical Rsch. Inst. at Harbor-UCLA Med. Ctr. v. Eli Lilly & Co.*, 849 F.3d 1049, 1064 (Fed. Cir. 2017).

Setting aside the procedural defect, Petitioner's Reply fails to rebut PO's evidence showing that Kim does not teach what Petitioner claims it teaches. Reply, 21-22. For example, Kim's Examples 1 and 2 differ in more than trinitrile and PP by substituting ethyl propionate (EP) solvent into Example 1, meaning the examples do not isolate Y/Z as a variable of interest and instead draw the POSITA's attention if any, to the ratio of PP to EP. POR, 44-45; EX. 2015, 206. Petitioner does not rebut PO's evidence that Kim's Examples 1 and 2 are devoid of diethyl carbonate (DEC), while Kim's Comparative Examples 1 and 2 contain DEC at high volume percentages. POR, 45; Ex. 2047 ¶¶96-97. Neither Kim nor Petitioner addresses the reasonable inference that DEC—rather than the presence or proportion of trinitrile and PP—may be driving the reported performance differences. Petitioner's silence

confirms that Kim would at most teach removal of DEC from Zeng's carefully balanced solvent system, not optimization of Y/Z within it. POR, 45. Nor does Petitioner's Reply address Kim's FIG. 7, which directly contradicts Petitioner's claim that Kim teaches improved performance when both trinitrile and PP are present. POR, 45; Ex. 2047 ¶98; Ex. 1008, FIG. 7.

Petitioner invokes the rule that a reference is prior art "for whatever is disclosed therein," yet fails to address PO's evidence of what Kim actually discloses. Reply, 21. Petitioner's failure to address this evidence is dispositive.

IV. GROUNDS 5-8, 11-12: SU

In its Petition, Petitioner relied on Su for anode D2 values and Sunose for cathode D1/D2 ratios. Pet., 44-48, 75-76. The Petition stated that "Sunose describes a rolled electrode configuration and focuses primarily on the positive electrode (cathode), leaving out anode implementation details," and added Su specifically to supply "anode implementation details, including appropriate compaction densities for the single- and double-sided coating portions." Pet., 46. Petitioner's failure to present evidence in the Petition that the claimed anode D1/D2 ratio would be satisfied when incorporating Su's anode is fatal.

Petitioner now argues that Sunose's cathode teachings apply to anodes—directly contradicting the Petition's rationale for adding Su. Reply, 22; Pet., 45 ("While Zeng and Sunose do not focus on anodes, Su does."). This new theory—

that Sunose’s D1/D2 ratio teachings apply to anodes because “Sunose’s invention is not cathode-specific” and the problem is “geometric/structural, not chemical”—was never presented in the Petition and violates 37 C.F.R. § 42.23(b). The Board should disregard it.

V. GROUNDS 9-12: ZHOU AND SUNOSE

A. A POSITA Would Not Have Implemented Example 8

PO does not merely argue that Example 8 is “not the best” Zhou example or even that Example 8 must rise to the level of teaching away from other examples. Reply, 23-24. Multiple factors would have dissuaded a POSITA from selecting Example 8. *Arctic Cat v. Bombardier Recreational Products*, 876 F.3d 1350, 1360 (Fed. Cir. 2017) (citing authorities) (“prior art need not explicitly ‘teach away’ to be relevant to the obviousness determination”). Indeed, Zhou itself teaches that the carboxylic acid esters (which includes ethyl acetate) used in its Examples 1-8 “often do not participate in the formation of the SEI film,” while the ’131 Patent teaches propyl propionate *does*. Ex. 1014 ¶58; Ex. 1001, 1:55-69.

Petitioner’s Reply failed to rebut PO’s evidence regarding “reasonable expectation of success.” POR, 51-52. FIG. 3 of Zhou is the *only* figure reporting high-temperature cycling performance, Zhou identifies HTCN as particularly preferred for such performance, and neither Example 4 nor Example 8 (the only trinitrile-containing examples) is included in FIG. 3. POR 51–52; Ex. 1014, FIG. 3.

Petitioner's Reply ignores FIG. 3 entirely, relying exclusively on FIG. 1 (room-temperature discharge capacity) and FIG. 4 (AC impedance)—metrics irrelevant to Petitioner's purported reason for expecting success. Reply, 23-25. Because Zhou provides no high-temperature data for trinitrile-containing examples, PO's evidence that Zhou fails to support a reasonable expectation of success for implementing Example 8 in this context remains unrebutted.

B. A POSITA Would Not Have Substituted PP for EA

Petitioner's argument improperly conflates a generic disclosure that certain esters may be used with a teaching that a specific substitution in a specific example would predictably work for the claimed purpose. Reply, 25-27. That overreach is not supported.

A statement of optional components is not a teaching that a POSITA would substitute PP for EA in Example 8 and expect success, particularly where Zhou never tests PP in any example, never evaluates its effect on the performance metrics relied upon by Petitioner, and never identifies PP as preferred for the functions Petitioner attributes to it. Reply, 25. A reference is prior art "for what it teaches," but this does not permit Petitioner to impute untested performance outcomes or to transform a permissive list into a concrete design rule. *Martin* does not hold otherwise. *Id.*; *Geo. M. Martin Co. v. All. Mach. Sys. Int'l LLC*, 618 F.3d 1294, 1302-03 (Fed. Cir. 2010).

Petitioner assumes a simple 1:1 weight percentage substitution (20 wt% PP for 20 wt% EA), but Petitioner never explains why a weight-based substitution is appropriate and this ignores fundamental principles of chemistry. Reply, 26-27; Pet., 67-70; Ex. 1045, 146:18-147:4. This is not a trivial question as it goes to whether the substitution would even achieve the same functional effect Zhou intends. POR, 54-55; Ex. 1045, 143:17-144:22.

Even if a POSITA *wanted* to substitute PP for EA, such a substitution cannot be made in isolation in a multi-component system with complex chemical interactions. POR, 55-58. The formulation would need rebalancing for PP's different properties, requiring substantial experimentation. *Id.*; Ex. 2015 ¶¶271-275; Ex. 2047 ¶¶127-135; Ex. 1045, 145:6-146:17. But Petitioner proposes a simple drop-in replacement without any adjustment. Petitioner also never explains why a POSITA would substitute PP for EA in *that particular* example alone, and Zhou teaches that that the carboxylic acid esters (like EA) used in its Examples 1-8 “often do not participate in the formation of the SEI film.” Ex. 1014 ¶58.

Petitioner claims Dr. Wheeler “admitted he predicted the result of substituting EA for PP” and that the solvents are “pure” components with well-understood properties. Reply, 26, n.7. But Dr. Wheeler expressly distinguished between properties of *pure* components and predicting mixture behavior—precisely the uncertainty that defeats Petitioner's purported reasonable expectation of success. Ex.

1045, 134:21-135:20. Dr. Lucht’s testimony that the substitution “might” change characteristics of the combined solution confirms this unpredictability. Ex. 2052, 88:13-89:2, 9:2-6.

Petitioner dismisses PO’s reliance on Kim’s data showing that substituting EP with PP decreases recovery capacity, arguing the examples “differ in other ways.” Reply, 27, n.8 (citing Ex. 1044, 82, n.5). Kim’s Example 2 also contains 10 vol % more propylene carbonate than Example 1, but Petitioner’s response to Kim concedes unpredictability in simple substitutions. POR, 57-58. If 10 vol% compositional differences materially affect performance, then changes in solvent composition, such as substituting EA with PP in Zhou, can produce non-intuitive results, defeating any asserted reasonable expectation of success. *Id.*

C. Sunose

See Section I.C *supra*.

VI. GROUNDS 1-12: CLAIMS 14-17

Petitioner’s Reply ignores that they cannot satisfy Rule 42.104(b)(3) when asserting an interpretation of a claim they “expressly disagree” with. *Hologic, Inc. v. Enzo Life Sciences, Inc.*, IPR2018-00019, Paper 21 (PTAB Nov. 28, 2018). Because Petitioner asserted in this proceeding that the interpretation of claims 14-17 it applied to Sunose and Su *is incorrect*, it failed to meet its burden for those claims. Paper 8 at 3-4 (arguing this art meets claims 14-17 under an allegedly *incorrect*

interpretation of claim 14). Adopting instead Petitioner's alleged "correct" interpretation, Petitioner failed to show the art meets the limitations of claim 14. The Board must address this discrepancy.

Dated: April 9, 2026

Respectfully submitted,

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CERTIFICATION UNDER 37 C.F.R. §42.24

Pursuant to 37 C.F.R. §42.24(d), I certify that the foregoing Patent Owner's Sur-Reply complies with the type-volume limits of 37 C.F.R. §42.24(c)(4) because it contains **5599** words, according to the word-processing system used to prepare the Patent Owner's Sur-Reply, excluding the parts of the Patent Owner's Sur-Reply that are exempted by 37 C.F.R. §42.24(c) (including a table of contents, a table of authorities, a listing of facts which are admitted, a certificate of service or this certificate word count, and appendix of exhibits).

Dated: April 9, 2026

By: /Christopher TL Douglas/
Christopher TL Douglas

CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. §42.6(e), the undersigned hereby certifies that true and correct copies of the foregoing **PATENT OWNER’S SUR-REPLY** and **NINGDE AMPEREX TECH. EXHIBIT 2052** were served on April 9, 2026, in their entirety, by filing these documents through the PTAB’s P-TACTS Filing System as well as delivering a true and correct copy by electronic mail on Petitioner’s lead and backup counsel at the following email addresses (as agreed by counsel for Petitioner):

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