

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ZHUHAI COSMX BATTERY CO., LTD.,
Petitioner

v.

NINGDE AMPEREX TECHNOLOGY LIMITED,
Patent Owner

Case IPR2025-0431
U.S. Patent No. 11,799,131

SUPPLEMENTAL DECLARATION OF BRETT LUCHT, PH.D.

TABLE OF CONTENTS

I.	INTRODUCTION	4
II.	GROUND 1: ZENG AND SUNOSE	6
A.	Zeng Discloses or Suggests the Claimed Y/Z Ratio	6
1.	A POSITA would interpret Zeng as adding solid LiPF ₆ , not an unspecified LiPF ₆ Solution	6
2.	The Doctrine of “Criticality” Does Not Apply, Nor Does the ’131 Patent Demonstrate Criticality of the Claimed Y/Z Range	12
a.	Zeng’s Y/Z values fall inside the claimed Y/Z range, so criticality is irrelevant	12
b.	The ’131 Patent does not show the claimed Y/Z range is critical.....	12
B.	Zeng and Sunose Render Obvious the Claimed D1, D2, and the D1/D2 Range.....	16
C.	A POSITA Would Have Combined Sunose with Zeng.....	25
III.	GROUND 2: MATSUOKA	28
IV.	GROUND 3, 4, AND 10: KIM	31
V.	GROUND 5-8.....	32
VI.	GROUND 9: ZHOU AND SUNOSE.....	34
A.	A POSITA Would Have Selected Zhou.....	34
B.	A POSITA Would Have Selected Zhou’s Example 8	35
C.	A POSITA Would Have Substituted PP for Ethyl Acetate Because Zhou Teaches Doing So.....	36
D.	Ground 9: Zhou and Sunose.....	39

VII. GROUND 10: ZHOU, SUNOSE, AND KIM.....39

VIII. GROUNDS 11-12.....39

IX. CONCLUSION.....40

I, Brett Lucht, Ph.D., declare as follows:

I. INTRODUCTION

1. I have been retained by Zhuhai CosMX Battery Co. Ltd as a technical expert for Zhuhai CosMX Battery Co., Ltd. (“CosMX” or “Petitioner”), who is the Petitioner in the above-referenced proceeding before the Patent Trial and Appeal Board (PTAB) of the United States Patent and Trademark Office involving U.S. Patent No. 11,799,131 (“the ’131 Patent,” EX1001) assigned to Patent Owner Ningde Amperex Technology Limited (“PO”).

2. I previously submitted a Declaration (EX1003) in this proceeding in support of Petitioner’s Petition (Paper 1) for *Inter Partes* Review of the ’131 Patent.

3. I understand that the PTAB granted institution of review of the ’131 Patent in an Institution Decision (Paper 15). I further understand that prior to institution, PO filed a Preliminary Response (Paper 11), supported by a Declaration of its technical expert, Dean R. Wheeler, Ph.D. (EX2015). Following institution, I understand PO filed a Patent Owner Response (Paper 28), supported by a Supplemental Declaration of Dr. Wheeler (EX2047).

4. I have reviewed the Patent Owner’s Preliminary Response (Paper 11), and the first Wheeler Declaration (EX2015), the Board’s Institution Decision (Paper 15), the Patent Owner Response (Paper 28), the Supplemental Wheeler Declaration (EX2047), and the documents cited in those filings.

5. I have been asked by counsel for Petitioner to consider and respond to the arguments and opinions set forth in Patent Owner's Response and in Dr. Wheeler's Supplemental Declaration.

6. After reviewing these materials, my opinions have not changed. It remains my opinion that the Challenged Claims of the '131 Patent would have been obvious to a person of ordinary skill in the art (POSITA) at the time of the alleged invention for the reasons set forth in my original Declaration (EX1003), and as further explained below. I expressly incorporate by reference the content of my original Declaration in its entirety, including my background and qualifications, understanding of the relevant legal standards, analysis of the '131 Patent and prior art, and my opinions demonstrating obviousness of the Challenged Claims.

7. To the extent necessary, this Supplemental Declaration elaborates on and responds to specific arguments raised by PO and Dr. Wheeler. My opinions in this Supplemental Declaration are offered from the perspective of a POSITA as defined in my original Declaration (EX1003), which I understand Patent Owner has adopted, and are based on my education, training, and experience as well as my review of the materials identified above.

8. Although I am being compensated at my usual rate of \$600 per hour for the time I spend on this matter, no part of my compensation depends on the outcome

of this proceeding or the content of my testimony in this Supplemental Declaration. I have no financial interest in any of the parties. I have no affiliation with either party in this case besides having been retained as an independent consultant in this matter.

9. I have personal knowledge of the facts and matters in this Supplemental Declaration and believe them to be true.

II. GROUND 1: ZENG AND SUNOSE

A. Zeng Discloses or Suggests the Claimed Y/Z Ratio

10. It remains my opinion that Zeng discloses lithium-ion battery electrolytes containing both Y (trinitrile) and Z (propyl propionate, PP).

11. I understand that PO and Dr. Wheeler contend that one cannot determine the amount of Zeng's PP content because Zeng instructs the POSITA to add an unknown volume of an unspecified 1.0 M LiPF₆ solvent solution—not solid LiPF₆—to Zeng's already-specified EC/PC/DEC/FB/EP/PP solvent recipe. POR, 8-13; EX2015, ¶¶98-105, 107-119; EX2047, ¶¶29-30, 33-36. It is my opinion that PO and Dr. Wheeler are incorrect.

1. A POSITA would interpret Zeng as adding solid LiPF₆, not an unspecified LiPF₆ Solution

12. In my opinion, PO's and Dr. Wheeler's argument hinges on a single phrase from Zeng—divorced from its context, a POSITA's knowledge, and common sense: LiPF₆ “of a concentration of 1.0 mol/L is slowly added to the mixed [solvent]

solution.” POR, 8 (quoting EX1006, ¶[0037]); EX2015, ¶107; EX2047, ¶29. Reading that phrase in isolation, PO contends that a POSITA would understand Zeng to require adding an undisclosed volume of a further undisclosed solvent in which LiPF_6 has already been dissolved to 1.0 M. POR, 8-9; EX2015, ¶¶107-109; EX2047, ¶¶30, 33. In my opinion, that interpretation is unworkable and contrary to Zeng’s disclosure and standard practice.

13. First, as I stated in my original Declaration, Zeng already specifies a mass ratio for the EC/PC/DEC/FB/EP/PP base solvent mixture in which LiPF_6 is dissolved. Pet., 21; EX1003, ¶80. In this situation, a POSITA would add solid LiPF_6 to the specified solvent mixture—not introduce an unknown volume of a superfluous, unspecified solvent pre-mixed with LiPF_6 . Pet., 21-22, n.4; EX1003, ¶80, n.6. Indeed, Zeng’s title—“Wide-temperature-range homogeneous non-aqueous electrolyte solution”—and focus on specific electrolyte compositions alone refute PO’s argument that Zeng requires adding an unknown volume of some unknown solution to its electrolytes. A POSITA would understand that this Zeng teaches very specific electrolyte solutions that should not be altered by the addition of an unknown amount of an unknown solvent.

14. Moreover, the prior art of record teaching an LiPF_6 electrolyte concentration—including the other Zeng patent that PO cites for its incorrect

interpretation—supports my common-sense reading that a POSITA would have mixed LiPF_6 to a 1.0 M concentration in Zeng’s specified solvent. *See*, EX1023, ¶¶[0237], [0245], [0255]; EX1024, ¶[0048], EX1025, ¶[0090]; Decision, 26-27 (finding EX2022 supports Petitioner’s position). Dr. Wheeler testified he has never prepared an electrolyte in the manner PO attributes to Zeng—pouring an unknown volume of premixed 1.0 M LiPF_6 solvent solution into an already-specified solvent recipe. EX1045, 55:4-8. This is consistent with my own experience and my knowledge within the field.

15. Second, as the Board recognized, PO and Dr. Wheeler unnecessarily manufacture uncertainty by interpreting Zeng as failing to disclose (1) what predetermined solvent the LiPF_6 is mixed in and (2) how much of that predetermined solution is added to what amount of Zeng’s already-specified solvent. Decision, 25-26. As the Board observed, “[a]dding 1.0 liter of the [1.0 M] LiPF_6 solution ... to 1.0 liter of the electrolyte solvent would result in a composition [0.5 mol/L] vastly different from that [0.01 mol/L] created by adding 1.0 liter of 1.0 M LiPF_6 solution to 99.0 liters of electrolyte solvent.” Decision, 26. The Board is correct.

16. But it is my opinion that there is no uncertainty in Zeng because, as the Board found, I offer the only sensible and workable interpretation: “Dr. Lucht’s interpretation of Zeng’s disclosure leads to information that a POSITA could have

employed with confidence to produce Zeng's Embodiments." *Id.*, 28. A POSITA would interpret Zeng in my manner because it is the only manner that is workable and that makes sense.

17. Third, PO's and Dr. Wheeler's interpretation contradicts its own position that "chemical interactions and effects of combinations of various compounds in electrolyte solutions are complex and unpredictable." POR, 54; EX2015, ¶¶266-268; EX2047, ¶¶127-135. Throughout this proceeding, PO and Dr. Wheeler have maintained that lithium-ion battery chemistry is too complex and unpredictable to permit a POSITA even minimal deviation from a prescribed formulation. *See, e.g.*, POPR, 29, 54-56; POR, 12, 54-56; EX2015, ¶¶113-117, 178-191, 266-275; EX2047, ¶¶127-135. Yet PO selectively departs from that position for Zeng, reading the reference as freely authorizing the addition of any volume of any solvent containing LiPF_6 to otherwise precisely specified electrolyte recipes. Dr. Wheeler conceded that following PO's interpretation of Zeng would cause unpredictable interactions between the unknown solvent and the other electrolyte components. EX1045, 50:11-51:16. I agree with Dr. Wheeler that adding an unknown amount of an unknown solvent could have unpredictable interactions with Zeng's electrolyte. This further confirms that PO and Dr. Wheeler's interpretation of Zeng is wrong.

18. In my opinion, the logical and obvious interpretation is a POSITA would simply have added solid LiPF_6 to the specified EC/PC/DEC/FB/EP/PP solvent mixture until reaching a concentration of 1.0 M because that's conventional practice with an already-specified solvent recipe. *See, e.g.*, EX1023, ¶¶[0237], [0245], [0255]; EX1024, ¶[0048], EX1025, ¶[0090]; EX1008, ¶[0091]; EX1015, ¶¶[0034]-[0036]; EX1047, ¶¶[171], [176]; EX2022, ¶¶[0030], [0057] While the *translated* language of Zeng may—if read in isolation without any knowledge of lithium-ion battery composition—suggest adding a superfluous LiPF_6 solution, a POSITA would not have done so given their knowledge, experience, and Zeng's surrounding context of teaching very specific electrolyte formulas.

19. PO and Dr. Wheeler agree with me that a POSITA would have had an advanced degree and years of experience in the field. POR, 5 (citing Pet., 16); EX2015, ¶¶54-56; EX2047, ¶¶20-22. Such a person—possessing knowledge in the art and a mind willing to understand Zeng in context—would interpret Zeng as mixing solid LiPF_6 into the specified solvent mixture to a concentration of 1.0 M. It was common knowledge, as evidenced by every prior art reference of record teaching lithium salt concentration, that lithium-ion battery electrolytes typically contain around 1.0 M LiPF_6 . *See, e.g.*, EX1023, ¶¶[0237], [0245], [0255]; EX1024, ¶[0048], EX1025, ¶[0090]; EX1008, ¶[0091]; EX1015, ¶¶[0034]-[0036]; EX1047,

¶¶[171], [176]; EX2022, ¶¶[0030], [0057]. I understand that Dr. Wheeler admitted in his deposition that 0.8 to 1.2 M is typical (EX1045, 38:11-22), and his own battery modeling research simulates molecular dynamics in electrolytes with the very standard “1 molar LiPF_6 .” EX1043, 1. As the Board found, however, PO’s and Dr. Wheeler’s proposed interpretation of Zeng would not yield that concentration. Decision, 25-26. In my opinion, the Board is correct. This further supports that PO and Dr. Wheeler’s interpretation of Zeng is incorrect.

20. PO and Dr. Wheeler argue that the existence of commercially available 1.0 M LiPF_6 solutions supports its interpretation. POR, 10; EX2015, ¶110. In my opinion, it does not. Off-the-shelf LiPF_6 solutions serve a different purpose: providing a convenient base for researchers who simply want to add additives without crafting a particular base electrolyte mixture. Zeng does the opposite—it specifies a certain base solvent recipe to achieve certain performance characteristics. A POSITA would not ignore that context and introduce an unknown volume of unknown solvent.

21. In my opinion, PO’s and Dr. Wheeler’s interpretation elevates form over substance, unnecessarily introducing multiple unknown variables into what is otherwise a precisely specified formulation—which cannot have been Zeng’s intent. Rather, it is my opinion that a POSITA would reach the same conclusion as the

Board: my straightforward interpretation provides sufficient information to “produce a resulting electrolyte solution that had a LiPF_6 concentration of 1.0 mol/L,” and a POSITA would have read Zeng accordingly. Decision, 28.

2. The Doctrine of “Criticality” Does Not Apply, Nor Does the ’131 Patent Demonstrate Criticality of the Claimed Y/Z Range

22. I understand that PO argues that the Y/Z range is “critical.” Based on my understanding of the applicable legal standards, it is my opinion that the Y/Z range is not critical.

a. Zeng’s Y/Z values fall inside the claimed Y/Z range, so criticality is irrelevant

23. It is my understanding that the doctrine of criticality applies only when the prior art teaches a range that *overlaps* or *encompasses* the purportedly “critical” range. But in my opinion, Zeng discloses or suggests a Y/Z ratio falling entirely within the claimed range. Pet., 39 (citing EX1003, ¶¶133-134).

b. The ’131 Patent does not show the claimed Y/Z range is critical

24. It is my understanding that in order to be “critical,” the recited Y/Z range must produce a new and unexpected result which is different in kind and not merely in degree from the results of the prior art. By contrast, mere discovery of an improved—i.e., a “better”—range by routine experimentation is not inventive.

25. PO and Dr. Wheeler argue that the claimed Y/Z range results in better inhibition of the rise in DC internal resistance. But in my opinion, any such result shown in the '131 Patent is a result that differs merely in *degree*, not in *kind*. PO's and Dr. Wheeler's cited comparisons confirm this: after 400 cycles, in-range example S2-2 had an internal resistance of 95.72 mΩ while out-of-range example D2-3 had an internal resistance of 111.3 mΩ—a 16% improvement. POR, 14 (citing EX1001, Table 2); EX2015, ¶¶120, 123-124, 127; EX2047, ¶¶37-40. Likewise, the cited in-range example S2-5 had a resistance of 98.3 mΩ while out-of-range example D2-4 had a resistance of 109.4 mΩ—an 11% improvement. *Id.* In my opinion, improvements of 11% and 16% are incremental and unsurprising.

26. Further, it is my opinion that the Table 2 tests results relied on by PO and Dr. Wheeler do not even clearly show what PO contends—the claimed Y/Z range is “better” for suppressing DC internal resistance rise.

27. **Low end:** Out of range example D2-4 at Y/Z = 0.0025 has a fresh battery resistance (53.2 mΩ) *identical* to in-range example S2-7 (53.2 mΩ) at Y/Z = 0.01, and *better* than in-range examples S2-2 (60.3 mΩ) at Y/Z = 0.1, S2-3 (56.1 mΩ) at Y/Z = 0.05, S2-5 (56.3 mΩ) at Y/Z = 0.02, S2-6 (64.3 mΩ) at Y/Z = 0.3, and D2-1 (72.1 mΩ) at Y/Z = 0.25. At 200 cycles, D2-4 (89.3 mΩ) performed *better* than in-range examples D2-2 (100.1 mΩ) at Y/Z = 0.017, D2-1 (108.5 mΩ) at Y/Z = 0.25,

and S2-6 (89.5 mΩ) at $Y/Z = 0.3$ and comparable to in-range example S2-1 (85.2 mΩ) at $Y/Z = 0.2$. And at 400 cycles, example D2-4 performed *better* than in-range examples D2-1 (118.9 mΩ) at $Y/Z = 0.25$ and D2-2 (113.9 mΩ) at $Y/Z = 0.017$. EX1001, Table 2.

28. **High end:** Out-of-range Example D2-3 at $Y/Z = 0.5$ had *lower* fresh resistance (62.3 mΩ) than in-range examples S2-1 (68.7 mΩ) at $Y/Z = 0.2$, S2-6 (64.3 mΩ) at $Y/Z = 0.3$, and D2-1 (72.1 mΩ) at $Y/Z = 0.25$, and comparable resistance to in-range example S2-2 (60.3 mΩ) at $Y/Z = 0.1$. At 200 cycles, D2-3 (85.4 mΩ) also had *lower* resistance than in-range example S2-6 (89.5 mΩ) at $Y/Z = 0.3$ and comparable resistance to in-range examples S1-1 (84.3 mΩ) at $Y/Z = 0.03$, S2-1 (85.2 mΩ) at $Y/Z = 0.2$, and S2-7 (84.3 mΩ) at $Y/Z = 0.01$. And at 400 cycles, D2-3 (111.3 mΩ) had *lower* resistance than in-range examples D2-2 (113.9 mΩ) at $Y/Z = 0.017$ and D2-1 (118.9 mΩ) at $Y/Z = 0.25$.

29. **Inside range:** Moreover, the in-range Y/Z examples were inconsistent across the claimed range. For instance, in-range example D2-1 ($Y/Z = 0.25$) performed the worst of all in-range examples across all three metrics, with resistance of 72.1, 108.5, and 118.9 mΩ at fresh, 200 cycles, and 400 cycles, respectively. And in-range example D2-2 ($Y/Z = 0.017$), despite having the best fresh resistance in the entire table at 42.0 mΩ, deteriorated sharply after cycling to 100.1 and 113.9 mΩ at

200 and 400 cycles. *See* EX1001, Table 2. This variability within the claimed range undercuts any claim that $Y/Z = 0.01\text{--}0.3$ is critical to improved DC resistance. EX1001, Table 2.

30. **Other variables:** Finally, Table 2 cannot show that Y/Z is critical because it does not hold other formulation variables constant. For example, within the claimed Y/Z band, Example S2-1 ($Y/Z = 0.2$) has $X = 4$, $Y = 1$, and $Z = 5$, so $X+Y = 5$ and $X/Y = 4$. But Example S2-6 ($Y/Z = 0.3$) has $X = 4$, $Y = 3$, and $Z = 10$, so $X+Y = 7$ and $X/Y = 1.33$. Example S2-7 ($Y/Z = 0.01$) has $X = 4$, $Y = 0.5$, and $Z = 50$, so $X+Y = 4.5$ and $X/Y = 8$. And Example S2-4 ($Y/Z = 0.025$) has $X = 4$, $Y = 1$, and $Z = 40$, so $X+Y = 5$ and $X/Y = 4$. Thus, across the in-range examples, Z varies from 5 to 50 wt%, Y varies from 0.5 to 3 wt%, $X+Y$ varies from 4.5 to 7, and X/Y varies from 1.33 to 8. Because these other claimed variables the '131 Patent identifies as important change substantially among “in-range” examples, any observed performance improvements cannot be definitively attributed to Y/Z alone. EX1001, 1:43-3:26, 21:10-46, 27:21-51 (performance depends on combinations of X , Y , Z , $X+Y$, X/Y , Y/Z , $D1$, $D2$, and $D1/D2$).

31. In my opinion, the evidence aligns with claimed Y/Z range being expressly approximate—“*about* 0.01” to “*about* 0.3”—which permits $\pm 10\%$ variation and “should be understood flexibly.” EX1001, 4:17-31. Indeed, I note that

the related '910 Patent recites a Y/Z range with a low-end numerical limit two-times greater than the '131 Patent—"about 0.02" to "about 0.3." EX1048, 34:29. This permitted variation in the Y/Z range contradicts PO and Dr. Wheeler's claim that the claimed Y/Z range is critical.

B. Zeng and Sunose Render Obvious the Claimed D1, D2, and the D1/D2 Range

32. Petitioner and I rely on Examples 2-4 of Sunose, which disclose the claimed D1, D2, and D1/D2 range. Pet., 33; EX1003, ¶115. It remains my opinion that these examples render obvious the claimed D1, D2, and D1/D2 range.

33. PO and Dr. Wheeler argue that certain compaction-density values reported in Sunose are "physically impossible," so Sunose's entire disclosure should be discarded. POR 15-17; EX2015, ¶¶71, 133-145, 153; EX2047, ¶¶46-48, 51-52, 54-55. I understand the Board rejected that argument because Patent Owner does not dispute that Sunose's Examples 2-4—the examples Petitioner relies on—report compaction densities below the purported crystalline density of Sunose's active material, lithium cobalt oxide (LCO). Decision 35-36. I agree with the Board's reasoning.

34. Sunose's Examples 2-4 all report compaction densities below the value PO cites as crystalline density of LCO—5.1 g/cm³. Pet., 33-34 (citing EX1010,

¶¶[0031]-[0033], [0040], Table 1); EX1003, ¶¶115-117. Accordingly, none of the Sunose Examples I relied on have impossible density values.

35. I further understand that PO and Dr. Wheeler believe that the maximum density of the composite electrode active material is 4.5 g/cm³. While I have not confirmed Dr. Wheeler's calculations, it is unnecessary to do so because Sunose Examples 3 and 4 report compaction densities—D1=4.4 and D2=4.0 and D1=4.0 and D2=4.0, respectively—below Dr. Wheeler's calculated maximum composite density. Thus, even accepting Dr. Wheeler's calculation, Sunose Examples 3 and 4 report plausible compaction densities. EX2050, 99:17-18, 114:16-115:1, 117:4-8, 119:10-14, 127:1-5, 127:9-13.

36. PO and Dr. Wheeler argue that packing density or active material density in Sunose must refer to something other than compaction density, without offering an alternative explanation for what it might be. POR, 18; EX2047, ¶¶50, 52, 56. It is my opinion that Sunose is referring to compaction density. I understand that Dr. Wheeler testified that he agrees that Sunose at least “thought they meant [compaction density], because they use the term density, and they use the terms that have units of density, grams per centimeter cubed[.]” EX1045, 78:18-79:2.

37. In my opinion, Sunose clearly describes the meaning of packing/active material density: the density of the active material after “performing a fixed-size

press using a rolling machine.” EX1010, ¶[0016]; *see also id.*, ¶¶[0028], [0031]; Pet., 34; EX1003, ¶¶116-117. And Dr. Wheeler agrees that Sunose describes a rolling process that would compact the electrode active material. EX1045, 79:14-83:10. This confirms my opinion that Sunose is referring to compaction density of the active material.

38. I understand that PO and Dr. Wheeler argue that the compaction densities of Sunose “quantitatively” differ from those of the ’131 Patent. POR, 17; EX2015, ¶144; EX2047, ¶¶49-50, 52. But density is simply mass divided by volume. As I explain in my original Declaration, the ’131 Patent’s “compaction density” and Sunose’s “compaction density” refer to the same quantity—the mass of the active material divided by the volume of the active material after compaction. Pet., 34; EX1003, ¶¶116-117.

39. PO and Dr. Wheeler argue that compaction density can *only* be determined by disassembling a finished product and directly measuring the weight and thickness of the active material. POR, 16; EX2015, ¶143; EX2047, ¶55. In my opinion, that is incorrect. As PO and Dr. Wheeler acknowledge, Sunose’s reported compaction-density values (and density ratio) have “some physical origin.” Decision 35–36. In my opinion, that physical origin is Sunose’s disclosed manufacturing technique: Sunose compacts a known mass of electrode active material (coat weight)

into a known volume using a fixed-gap roll press, from which the resulting compaction densities follow.

40. When a known mass of active material is applied over a known electrode area and then calendared/pressed to a known target thickness, compaction density can be calculated directly (mass $\div$ volume) without any disassembly or direct measurement of the finished electrode. That is what Sunose describes: “by varying the thickness ... during the application of the active material and performing a fixed-size press ... the prescribed active material density ratio is obtained.” EX1010 ¶[0016]. I understand Dr. Wheeler admitted that the information needed to determine compaction density in Sunose is either known or readily knowable: the mass of material coated on the electrode plate, the area of the electrode plate, and the height of the fixed roll press gap. EX1045, 85:3-86:20; *see also* EX1010, ¶¶[0029]-[0030] (providing coat weights for the single- and double-sided coatings). With those inputs, it is my opinion that a POSITA could have readily calculated compaction density.

41. In my opinion, Sunose’s technique explains why some reported compaction-density values may appear unusually high or impossible: in some examples, Sunose attempted to compact too much active material through the fixed roll press gap. A known mass of coating material and a known compaction volume

yield a determinate compaction density—even if the electrode plate could not physically be rolled.

42. For example, Comparative Example 3—which had the highest reported compaction density—broke because Sunose tried to compact more active material than the fixed compaction volume could physically accommodate. EX1010, ¶[0041] (Table 1). As Sunose explains, the electrode plate “could not undergo a bending test *due to breakage of the active material layer occurring on the single-side active material portion when rolling using a roll press machine.*” EX1010, ¶[0040]. I understand that Dr. Wheeler “agree[d] that the language here appears to state that the breakage occurred during the rolling process, and so they aborted the experiment that would normally follow that rolling process.” EX1045, 92:20-93:22.

43. Accordingly, in my opinion, Sunose and the ’131 Patent use the same compaction-density metric, and Sunose’s manufacturing technique supplies the information needed to determine compaction density and explains why some reported values may appear unusually high.

44. Regardless, it is my opinion that a POSITA would take away from Sunose more than just certain compaction density values of its handful of examples. Sunose recognized a problem in electrode manufacturing where the rolling process applies uneven pressure to the single and double-sided coatings because of the

thickness difference between the two portions. Either too much pressure is applied to the double-sided portion, causing decreased strength or breakage, or too little pressure is applied to the single-sided portion, causing insufficient rolling and decreased adhesion of the active material layer to the current collector. EX1010, ¶¶[0007]-[0010]. Sunose's solution is to vary the coating thicknesses of the two portions to control the ratio of compaction densities for the single-sided (M) and double-sided (N) active material layers such that "the ratio of the density of active material [is] $0.7 < N / M < 1.0$." EX1010, ¶¶[0012]-[0014]; Pet., 33; EX1003, ¶114. This is the reciprocal of the '131 Patent's $D1/D2$ ratio, so Sunose's desired ratio is about $1.0 < D1/D2 < \text{about } 1.43$. Pet., 33, n.7; EX1003, ¶115, n.9. This overlaps the claimed range, which I understand is deemed to render it obvious.¹ Sunose's Examples are just that: examples that do not limit the scope of Sunose's teachings.

45. I understand that PO and Dr. Wheeler argue that Sunose is not enabled. POR, 19-23; EX2047, ¶¶57-60. But counsel has informed me that Sunose need not be enabled for purposes of obviousness, and that all that is required is that a POSITA

¹ The claimed range is "*about* $0.8 \leq D1/D2 \leq \text{about } 1.2$ ". EX1001, claims 1 and 14. The specification defines "about" to include "less than or equal to $\pm 10\%$ of the stated value[.]" *Id.*, 4:12-31. Therefore, the upper limit of the range is at least 1.32.

would have been able to make the claimed invention based on the combined teachings of Zeng and Sunose. It is my opinion that a POSITA would be able to make the claimed invention based on the combined teachings of Zeng and Sunose.

46. PO and Dr. Wheeler essentially complain that that Sunose does not explicitly disclose coating amounts of active material for each of the examples, and that it is “beyond the skill of the POSITA” to determine amounts without undue experimentation. POR, 19-20; EX2047, ¶¶57-58. In my opinion, they underestimate a POSITA’s capabilities.

47. As I explained, Sunose obtains the “prescribed active material density” by “varying the thickness” of the active material and “performing a fixed-size press.” EX1010, ¶[0016]. Specifically, Sunose controls the packing/compaction densities by adjusting the coating amounts of active material (“varying the thickness”) on the single- and double-sided portions of the electrode plate while compacting both portions of active material to the same fixed and known volume (“fixed-size press”). *Id.*, ¶¶[0016], [0029]-[0034].

48. Sunose’s fixed-press compacts both active material coatings to a fixed volume equal to the known surface area of the electrode plate $\times$ (the known fixed gap between the rollers – the known electrode plate thickness). With that fixed volume known, a POSITA need only apply simple algebra: coating amount = (target

compaction density) $\times$ (fixed volume). This is exactly what my students and I have done in my lab—no undue experimentation needed. And to the extent results deviate from the formula, it is my opinion that any adjustment would just routine fine-tuning, not undue experimentation. Thus, in my opinion, Sunose provides sufficient guidance for a POSITA to determine the coat weight for a specified compaction density without undue experimentation.

49. But it is even simpler than that. Sunose expressly teaches a desired range for the ratio of compaction densities between the single-sided and double-sided portions that improves manufacturability. EX1010, ¶[0014]. Under Sunose's nomenclature, an N/M ratio of 0.7 means the total coating weight of the double-sided portion is 70% the total coating weight of the single-sided portion. And an N/M ratio of 1.0 is simpler still: the total coating weights of the single-sided and double-sided portions are equal. A POSITA would have readily understood this and applied Sunose's disclosed ratios to select appropriate coat weights during electrode manufacture. *Id.*

50. It is my understanding that PO and Dr. Wheeler also contend that the claimed D1/D2 range is critical. Based on my understanding of the applicable legal standards, the claimed D1/D2 range is not critical.

51. First, the cited Sunose Examples fall completely inside the claimed D1/D2 range. Pet., 33; EX1003, ¶114. And I have been informed that it only potential matters whether a claimed range is critical if the prior art discloses an overlapping or encompassing range, which is not the case with Sunose's N/M range.

52. Second, it is my opinion that the '131 Patent does not demonstrate criticality of the D1/D2 range. The claims recite "*about* $0.8 \leq D1/D2 \leq$ *about* 1.2," so the claim language itself permits variation that undercuts PO's and Dr. Wheeler's assertion that the numerical endpoints are critical. Likewise, the '131 Patent attributes the claimed range to mere "good" performance, while describing narrower, unclaimed ranges as "improved" over the claimed range. *See* EX1001, 21:10-24. That framing confirms there is no "critical" range—only incremental optimization.

53. Further, based on my review, the '131 Patent did not meaningfully test performance outside the claimed D1/D2 range. EX1001, Table 7. The lowest and highest tested ratios were 0.7 and 1.3—effectively at or within the +/-10% "about" tolerance that extends the endpoints to 0.72 (rounding to 0.7) and 1.32. EX1001, Table 7. And one data point at each end is statistically insignificant. In my opinion, without further testing, one cannot conclude that the claimed range is critical or exhibits unexpected results compared to D1/D2 values outside the claimed range.

54. Regardless, the two outside-the-range data points do not show an unexpected performance cliff at either endpoint. At the low end, decreasing D1/D2 from 0.8 to 0.7 reduced capacity retention by only 3.3 points after 200 cycles (93.8% to 90.5%, a 3.5% relative drop) and 6.6 points after 400 cycles (89.3% to 82.7%, a 7.4% relative drop). EX1001, Table 7. At the high end, increasing D1/D2 from 1.2 to 1.3 reduced capacity retention by only 2.5 points after 200 cycles (93.7% to 91.2%, a 2.7% relative drop) and 5.2 points after 400 cycles (88.8% to 83.6%, a 5.9% relative drop). EX1001, Table 7. At most, these data suggest minor improvement in degree, not in kind.

C. A POSITA Would Have Combined Sunose with Zeng

55. It remains my opinion that a POSITA would have combined Sunose with Zeng for at least the reasons stated in my original Declaration. EX1003, ¶¶120-127.

56. PO and Dr. Wheeler cite my statement that there is a “need to use some rolled electrode configuration in Zeng’s batteries.” POR, 25 (citing EX1003, ¶123) (emphasis omitted). They misinterpret my testimony. The “need” stems from the real-world necessity to use standard commercial electrode structures. As I explained, commercial lithium-ion cells generally have one of two principal electrode configurations—spiral/wound/jelly roll (like Sunose) and

stacked/laminated/prismatic. EX2050, 149:11–18; *see also* EX1046, ¶[0004] (explaining that electrode assemblies are classified as jelly roll, stacked, or a combination of the two). Thus, as a practical matter, batteries need to be manufactured in these two types of form factors.

57. Because Zeng is neutral on electrode structure, it is my opinion that a POSITA wanting a spiral/wound electrode cell (e.g., for any application using a cylindrical form factor) would have paired Zeng’s electrolyte with a spiral/wound electrode configuration like Sunose’s. This is consistent with my prior testimony in the other ’131 Patent IPR: “Zeng does not specify a particular physical embodiment for its batteries,” and therefore “a POSITA would have needed to choose a battery/electrode embodiment to implement Zeng’s electrolyte solutions.” IPR2025-00722, EX1003, ¶112.²

58. PO and Dr. Wheeler also claim that Sunose’s solution is unique to the particular compaction equipment used by Sunose. POR, 26; EX2015, ¶¶65-73, 150-151, 154, 157-158; EX2047, ¶¶49-50, 52. In my opinion, that is wrong. The problem

² To the extent that a POSITA wished to make a laminated/stacked battery, it remains my opinion that a POSITA would have combined Zeng with such an electrode structure reference. But that is irrelevant here.

identified by Sunose would be applicable to any roller/calendaring machine for electrodes that have both single- and double-sided coatings due to the pre-compaction thickness difference between the two coatings. Sunose explains that the issue applies to both fixed gap and fixed pressure presses. EX1010, ¶[0007]. Notably, Dr. Wheeler does not identify any alternative equipment or why that equipment would avoid the problem addressed by Sunose, so his opinion is conclusory.

59. Regardless, I identified other motivations for combining Zeng and Sunose. *See* Pet., 36-38; EX1003, ¶¶120-127 (needing electrode implementation details generally, maximizing electrode area, improving adhesion/reducing breakage). In my opinion, these would have motivated a POSITA to combine Zeng and Sunose separately from the problem addressed by Sunose.

60. PO and Dr. Wheeler argue that “extensive testing” would be required to ensure compatibility between Zeng’s electrolyte and Sunose’s electrode configuration. POR, 25–26; EX2015, ¶¶65-73, 150-151, 154, 157-158; EX2047, ¶¶44, 49-50, 52. In my opinion, this is wrong. First, PO and Dr. Wheeler offer no support for this assertion. Second, in his deposition, I understand Dr. Wheeler admitted that Zeng is electrode-structure-neutral and Sunose is electrolyte-composition-neutral, and that neither reference teaches away from the combination.

EX1045, 119:11-121:10. I agree. And as I have previously testified, an electrolyte that “works well in one” configuration generally “works well in the other ones.”

EX2050, 148:1–12. In general, a battery’s electrochemical performance depends on the active materials’ energy density, their effective electrochemically active area, and the electrolyte/electrode interface. The particular form factor—whether the electrodes are wound into a spiral or cut, stacked/laminated, and interconnected—does not, by itself, meaningfully determine performance. There is certainly nothing to suggest that Zeng’s electrolyte would not work with Sunose electrode structure solely because of an electrode form-factor issue.

61. Moreover, even if the combination required *some* testing, in my opinion any such testing would not be “extensive,” much less “undo.” In fact, a single test could confirm compatibility—e.g., injecting Zeng’s electrolyte(s) into Sunose’s battery to confirm the battery works.

III. GROUND 2: MATSUOKA

62. In my opinion, PO and Dr. Wheeler fundamentally mischaracterize Ground 2 by suggesting that I rely on Matsuoka to select PP as a component of Zeng’s electrolytes. POR, 27-30; EX2015, ¶¶163-169, 176; EX2047, ¶¶64-65, 70-77. This mischaracterizes my opinion. As the Board recognized, “Petitioner relies on Zeng’s disclosure to include PP in the solvent, not Matsuoka, and alternatively

relies on Matsuoka in addition to Zeng for an appropriate amount of PP.” Decision, 44.³ That is, Petitioner and I cite Matsuoka solely for an express disclosure of an appropriate *weight* for PP—a compound Zeng’s electrolytes already have—in the total electrolyte. Pet., 50-52; EX1003, ¶¶165-177.

63. PO and Dr. Wheeler offer several arguments against Matsuoka, but they are all distractions: critiques of Matsuoka’s purportedly different “additive” terminology, use of mononitriles, discussion of low-temperature performance, and further inclusion of organic lithium salt are all irrelevant. POR, 31-32; EX2015, ¶¶160-162, 167, 170-178. None of these bears on whether a POSITA would consult Matsuoka for a disclosure of an example weight percentage of PP in an electrolyte that *already contains PP*. While Matsuoka may provide other teachings supporting other propositions that are not at issue here—one valid takeaway is its disclosure of a weight percentage for PP in a lithium-ion battery electrode.

64. I have proposed a combination that is minimally-intrusive to Zeng’s electrolytes: citing Matsuoka only for an amount by weight of a compound already in Zeng’s electrolytes. At most, this would require only an incremental adjustment,

³ Even though it was unnecessary, I identified motivation to select PP from Matsuoka. EX1003, ¶¶170-177.

if any. Not only do Zeng's electrolytes already contain PP, but Matsuoka's preferred weight percentage range of PP overlaps the amount of PP already contained in Zeng's electrolytes. Thus, the combination does not necessarily require substantial modification of Zeng's electrolytes.

65. I understand that, in deposition, Dr. Wheeler testified that PP is a "pure component" whose properties and effects are well known and predictable. EX1045, 134:21-135:20; *see also* EX1019, 27-30 (data sheet for pure PP showing its known properties). I agree—PP is a known electrolyte solvent component with well-established properties in its pure form, and the cited prior art confirms its use in lithium-ion battery electrolytes well before the claimed priority date of the '131 Patent. I understand Dr. Wheeler testified that his research focuses on computer simulation of electrolyte/battery systems, that simulation tools have been commercially available for decades, and that he could have simulated a system with an electrolyte including PP if he were interested. EX1045, 20:10-21:12, 29:2-36:19, 42:4-43:4. I agree with his characterization of the availability of simulation tools and their capabilities. Thus, even under Dr. Wheeler's framework, my proposed combination would have been predictable and reasonably expected to succeed—if modifies Zeng's compositions at all.

IV. GROUNDS 3, 4, AND 10: KIM

66. It remains my opinion that Kim shows that including both trinitrile (Y) and PP (Z)—and adjusting their relative amounts Y/Z—was known to improve electrolyte performance, and would have further motivated a POSITA to focus on and optimize Y/Z. As detailed in my original Declaration, Kim's Examples 1 and 2 have the same electrolyte composition except for trinitrile and PP in different proportions and showed better capacity retention and thickness stability than electrolytes lacking one or both of those components. Pet., 57-59; EX1003, ¶¶187-192, 194. This would have further motivated a POSITA to fine-tune Y/Z in Zeng's electrolytes, to adopt Matsuoka's preferred PP amounts (if needed) when implementing Zeng, and to substitute the ester EA for the ester PP in Zhou's Example 8. Pet., 57-60; EX1003, ¶¶187-196. I understand that the Board found I identified sufficient motivation for combining Kim with the other references. Decision, 56-57, 59-60, 75-76.

67. It appears that PO and Dr. Wheeler do not dispute Kim's core teachings of improved electrolyte performance when both trinitrile and PP are present, and their relative proportions are varied. Instead, PO and Dr. Wheeler nitpick Kim's experimental details and testing. In my opinion, those criticisms do not change the core disclosures of Kim or what a POSITA would understand from those disclosures,

and I have been informed that the law supports my view. Indeed, PO's criticism rings hollow because similar criticisms apply to the '131 Patent's own experimental details—for example, its methodology does not isolate the performance impact of Y/Z or D1/D2, as I explained above.

V. GROUNDS 5-8

68. I understand that PO and Dr. Wheeler do not dispute that Su teaches anode D2 values falling within the claimed range. Instead, they contend that Sunose's compaction density ratio N/M (corresponding to D2/D1) applies to cathodes, not anodes as required by claims 3 and 16. In my opinion, Sunose's compaction density ratio N/M applies to both cathodes and anodes.

69. I understand that Dr. Wheeler conceded in deposition that Sunose's disclosure of the N/M ratio—and the problem Sunose seeks to solve—applies to electrode plates generally, not just to cathodes. EX1045, 110:2-14, 113:18-114:21. I agree—Dr. Wheeler is correct on this point.

70. Although Sunose gives examples for cathodes, in my opinion, Sunose's invention is not electrode-specific. Sunose repeatedly describes and claims controlling the N/M compaction density ratio for electrode plates generally—positive or negative—before turning to examples. *See* EX1010, ¶¶[0021] (describing the N/M ratio for an “electrode plate” generally); *see also id.*, Abstract, ¶¶[0001],

[0004], [0011]-[0018] (discussing the problem addressed and N/M ratio solution for electrode plates generally), claims 1–2 (reciting a method of manufacturing and controlling the N/M ratio for an electrode plate generally), claim 3 (applying the method of claim 1 or 2 to a battery having both a positive electrode and a negative electrode).

71. Indeed, the problem Sunose addresses—achieving appropriate compaction across single- and double-sided coated regions—is a geometric/structural issue, not a chemical one. In my opinion, any electrode plate having both single-sided and double-sided coated portions presents the same challenge: different coating thicknesses in these two regions can lead to non-uniform compaction unless the process is controlled via Sunose’s N/M ratio.

72. My proposed combinations incorporate Sunose’s entire electrode structure, not just a cathode. *See* Pet., 36-38; EX1003, ¶¶122-126. Indeed, Zeng and Zhou describe electrolytes, not electrode structures, and a battery of course needs an electrode structure with both positive (cathode) and negative (anode) electrodes to function. This structure comes from Sunose. Accordingly, it remains my opinion that the combination of Zeng and Sunose renders obvious claims 3 and 16.

VI. GROUND 9: ZHOU AND SUNOSE

73. I understand that PO and Dr. Wheeler do not dispute Zhou's disclosure. In my opinion, PO and Dr. Wheeler instead present meritless arguments regarding the selection and implementation of Zhou.

A. A POSITA Would Have Selected Zhou

74. PO and Dr. Wheeler argue that Zhou is "fundamentally different" and not analogous art to the '131 Patent because Zhou pertains to 4.35V batteries while the '131 Patent relates to 4.45V batteries. POR, 48-49; EX2015, ¶¶241-247, 249-253, 261. But they cite no support for this statement, and, in my opinion, they are wrong that a 0.10V between batteries renders them "fundamentally different."

75. Regardless, even if Dr. Wheeler were correct that a 0.10 V difference is "substantial," it is irrelevant because the '131 Patent's claims impose no voltage limitations. *See* EX1001, claims 1–17.

76. Further, in my opinion, Zhou *does* address at least some problems identified by the '131 Patent, including preventing battery capacity decreases over cycles. *Compare* EX1014, ¶[0006] *with* EX1001, 1:32-39. That is precisely what Zeng's Figures 1-2 tests evaluate. EX1014, ¶¶[0061]-[0062]. And like the '131 Patent, Zeng also addresses internal resistance of the battery by disclosing electrolytes with high ionic conductivity and testing AC impedance of batteries

using different electrolyte formulations. *See id.*, ¶¶[0020], [0024], [0057], [0054], FIG. (showing results of AC Impedance test).

B. A POSITA Would Have Selected Zhou's Example 8

77. Essentially, PO and Dr. Wheeler argue that Example 8 is not the best example from Zhou, and therefore a POSITA would not have chosen it. I disagree. Example 8 is one of the better examples from Zhou. While I initially misinterpreted the AC impedance results shown in Zhou Figure 4, Example 8 outperformed at least the Comparative Examples and Examples 4 and 6 in that test. Dr. Wheeler agrees. EX1045, 125:22-126:10. I understand Dr. Wheeler agreed that Example 8 outperformed at least the Comparative Example and Examples 3-6 in Zhou's Figure 1 discharge capacity test. EX1045, 123:1-124:6; EX1003, ¶208.

78. PO and Dr. Wheeler observe that Zhou's solvent mass ratio for Example 8 sums to 90 (not 100) and argue that this purported error would dissuade a POSITA from relying on it. POR, 53; EX2015, ¶260. But there is no error because a mass ratio does not need to sum to 100. A mass ratio specifies the relative number of parts by mass of each component. For example, a 3:1 mass ratio of A:B is perfectly valid even though it sums to 4—and can be equivalently stated as 75% A and 25% B by mass. I understand that Dr. Wheeler now agrees with me that the Zhou Example 8 mass ratio need not sum to 100. EX1045, 127:2-9. Although I

inadvertently used percentage symbols when listing the mass-ratio components in my original Declaration, this was merely a typo. I treated Zhou's disclosed mass ratio correctly in my calculations. *See* EX2050, 179:10–19; EX1003, ¶¶206–207. The math is the same, except that a mass percentage uses a fixed denominator of 100 while a mass ratio can have any denominator.

**C. A POSITA Would Have Substituted PP for Ethyl Acetate
Because Zhou Teaches Doing So**

79. As I explained in my original Declaration, Example 8 of Zhou includes the ester EA as a solvent component, and Zhou expressly identifies eight optional esters—one being EA and another being PP—that may be substituted for one another Pet., 60-61; EX1003, ¶197; EX1014, ¶[0011]. PO and Dr. Wheeler contend that a POSITA would not have made that substitution for various reasons, but this contradicts the express teachings of Zhou, which teaches substituting any of the eight esters for one another—including substituting EA with PP in Example 8. Pet., 62 (citing EX1014, ¶[0011]); EX1003, ¶201. I understand that Dr. Wheeler agrees, admitting in deposition that Zhou teaches that any of the eight esters may optionally be used in Zhou's electrolytes. EX1045, 129:14-130:2.

80. In my opinion, it is irrelevant that Zhou does not use PP in any example because Zhou expressly teaches substituting EA (used in Example 8) for PP. It is likewise irrelevant that PP may increase the boiling and melting points of the

Example 8 electrolyte. As the Petition and my Original declaration explain, PP still has sufficiently low melting and boiling points to serve Zhou's purpose of providing high ion conductivity, and increasing an electrolyte's melting and boiling points would also desirably improve battery safety at elevated temperatures. Pet., 69 (citing EX1003, ¶225).

81. Finally, PO and Dr. Wheeler contend that lithium-ion batteries are too unpredictable to allow any changes or substitutions. POR, 55-57; EX2015, ¶¶274; EX2047, ¶¶127-130. But Zhou explicitly teaches to substitute EA for PP, which in my opinion gives a POSITA a reasonable expectation of success regardless of PO's conclusory and general assertion. Pet., 68-70; EX1003, ¶¶224-230. Second, I understand that Dr. Wheeler admitted in deposition that he predicted the substitution of EA for PP would raise the boiling/melting points of Zhou's Example 8 electrolyte. EX1045, 136:2-137:20. He explained could make that prediction because EA and PP are "pure components" with well understood properties. *Id.*, 135:3-16. I agree with Dr. Wheeler that the proposed modification of Zhou is predictable—it would slightly raise the melting/boiling points of the electrolyte.⁴

⁴ Indeed, it is my opinion that all Petitioner's proposed electrolyte modifications would have been predictable because the solvent components in Zeng

82. Again, PO and Dr. Wheeler effectively argue that any change to an electrolyte is unpredictable. I disagree. Chemistry is science, not magic. In my opinion, a POSITA would have had an advanced degree and years of experience in the field. POR, 5 (citing Pet., 16); EX2015, ¶¶54-56; EX2047, ¶¶20-22. This highly educated and experienced POSITA would expect substituting one ester for another—especially because Zhou expressly teaches doing so—to provide a suitable channel for ion conductivity as Zhou teaches. Pet., 68-70; EX1003, ¶¶224-230; EX1014, ¶[0011].⁵ Even if the substitution caused small changes (like slightly raising the melting/boiling points of the electrolyte), it is my opinion that this would not have dissuaded a POSITA from trying a combination that Zeng teaches.

and Zhou are “pure” components with well-understood properties. *See* EX1018-1020 (data sheets specifying the properties for pure, battery-grade versions of the solvent components at issue in this proceeding).

⁵ PO and Dr. Wheeler cite Kim for the proposition that substituting EP with PP would decrease recovery capacity. POR, 58; EX2047, ¶¶132-135. But the cited Kim examples differ in other ways than just swapping EP with PP. Thus, according to PO’s own view on the unpredictability of battery chemistry, it is impossible to predict that the substitution would have the same effect as PO claims it has in Kim.

D. Ground 9: Zhou and Sunose

83. I understand that PO and Dr. Wheeler repeat the same arguments for Sunose for the Zhou-Sunose combination. POR, 58-60; EX2015, ¶¶230-231, 233-234, 276-281; EX2047, ¶¶45-61, 138-141. I incorporate by reference my arguments above in Section II.

VII. GROUND 10: ZHOU, SUNOSE, AND KIM

84. I understand PO and Dr. Wheeler repeat the arguments made for Grounds 3 and 4. POR, 60-61; EX2015, ¶¶267, 282-287; EX2047, ¶¶95-99, 142-143, 145-146. I incorporate by reference my responses from Section IV.

VIII. GROUNDS 11-12

85. I understand PO and Dr. Wheeler repeat the arguments made for Grounds 9 and 10. POR, 61-62; EX2015, ¶¶288-289; EX2047, ¶¶147-155. I incorporate by reference my responses from Sections V, VI, and VII.

IX. CONCLUSION

For these reasons, and the reasons stated in my first declaration, it remains my opinion that the Challenged Claims of the '131 Patent are unpatentable.

I hereby declare that all statements made of my own knowledge are true and that all statements made on information and belief are believed to be true. I could testify to the matters in this declaration competently if called upon to do so. I further declare that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of the Title 18 of the United States Code.

Date: February 18, 2025

Respectfully Submitted,

A handwritten signature in black ink, appearing to read 'Brett Lucht', is written over a horizontal line.

Brett Lucht, Ph.D.