

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

IPR2023-00586
Patent 10,833,363

PATENT OWNER'S PRELIMINARY RESPONSE

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Exhibit Number	Description
2001	Declaration of Victor R. Koch, Ph.D.
2002	Curriculum Vitae of Victor R. Koch, Ph.D.
2003	Statutory Disclaimer Under 37 CFR 1.321(a) and Electronic Acknowledgment Receipt dated May 25, 2023.
2004	Dixon Valve List of Dielectric Constants available at https://dixonvalve.com/sites/default/files/documents/dielectric-constant-values_0.pdf (last accessed on May 29, 2023).
2005	“Propylene Carbonate Solvent Properties,” available at https://macro.lsu.edu/howto/solvents/Propylene%20Carbonate.htm (last accessed on May 29, 2023).
2006	Chugh <i>et al.</i> , A Combinatorial Study of Electrochemical Anion Intercalation into Graphite, <i>Mater. Res. Express</i> , 8, 085502 (2021).
2007	Akkoyun <i>et al.</i> , On the Use of an Internal Mixer to Study the Impregnation of Carbon Fillers by Organic Liquids, <i>Appl. Rheol.</i> 24, 13487 (2014).

I. INTRODUCTION

Ningde Amperex Technology Ltd. (“ATL” or “Patent Owner”) respectfully submits this Preliminary Response to the Petition for *inter partes* review filed by Petitioner Zhuhai CosMX Battery Co., Ltd. (“Petitioner” or “CosMX”). Paper 1 (“Pet.”). The Petition seeks *inter partes* review (“IPR”) of claims 1-16 (the “Challenged Claims”) of U.S. Patent No. 10,833,363 (the “’363 Patent,” Ex. 1001). The Petition should be rejected and institution should be denied for numerous reasons.

First, Petitioner makes numerous unjustified, incorrect, and/or inconsistent assumptions and calculations to obtain a propyl propionate wt % value that allegedly meets the claimed Formula (3) range, in an attempt to remedy the fact that Hong does not expressly disclose a wt % value. Pet. at 14-21. As explained below, these unsupported assumptions render the methodology used by Petitioner unreliable, demonstrate that lack of sufficient disclosure in Hong, and altogether undercut Petitioner’s ability to meet its burden. For example, the unsupported assumptions cannot be applied in the electrolyte solutions of Hong, which contain up to 14 components, including components for which the states of matter at room temperature are unknown, and components for which no physical or chemical properties whatsoever are known or disclosed. Ex. 1005 ¶¶32-35 (Table 3); Ex. 2001 (“Koch Decl.”) ¶¶55, 61-63, 67, 72, 83, 86. Worse still, when these multiple

electrolyte solution components are mixed, it is extremely difficult, if not impossible, to predict how the components will react with each other, and affect the final mass and volume of the solution, which are critical figures to Petitioner's assumptions and calculations. Ex. 2001 ¶¶65, 75, 86. Petitioner cannot fix its unsupported assumptions and, thus, will not be able to prove, by a preponderance of the evidence, that Hong anticipates claim 1.

Second, even if Petitioner's assumptions were permissible and the Board deemed the methodology reliable, Petitioner's calculations are themselves flawed. Dr. Anderman first calculates the wrong states of matter and the wrong densities at different temperatures in his calculations, resulting in a mix-and-match calculations of weights, volumes, and densities of components in a total solution that could not possibly exist at any single temperature. Next, Dr. Anderman's calculations regarding Hong's specified lithium salt electrolyte substance molarity concentrations are incorrectly performed and therefore unreliable. For example, Dr. Anderman's calculations of Hong's electrolyte substance molarity concentrations incorrectly use a total volume of 100 mL for a combined solution that includes 100 mL of solvent *plus* the added electrolytes, which would result in a volume greater than 100 mL, making his calculated molarities wrong. Finally, Dr. Anderman relies on unstated numerical values for his "initial estimate" of Hong's electrolyte masses but never shares those values with Patent Owner or the Board. Taken together or

individually, these errors further undercut the methodology used and are fatal to Petitioner's case.

Third, the Petition should be denied under § 314(a) based on the *Fintiv* factors because, in the remaining¹ district court case where the '363 Patent is at issue, the parties are the same as in this IPR, a stay is unlikely to be granted, trial is scheduled to happen almost seven months *before* the statutory final written decision deadline in this IPR, and the same prior art that is asserted in the Petition is asserted by Petitioner at the district court.

Finally, Patent Owner has disclaimed claims 13–16 by way of a Statutory Disclaimer filed on May 25, 2023. Ex. 2003 (Statutory Disclaimer Under 37 CFR 1.321(a) and Electronic Acknowledgment Receipt).² Thus, only claims 1-12 remain

¹ The district court case previously pending in N.D. Cal. has now been voluntarily dismissed.

² Patent Owner's decision to disclaim claims 13–16 is not a concession of any kind with respect to the grounds presented in the Petition. *See, e.g., Raytheon Techs. Corp. v. Gen. Elec. Co.*, 993 F.3d 1374, 1379 n.4 (Fed. Cir. 2021) (noting that disclaimer “does not legally constitute ‘an admission that the subject of the disclaimer appears in the prior art.’”).

at issue in this proceeding. *See* 37 C.F.R. § 42.107(e) (“No *inter partes* review will be instituted based on disclaimed claims.”). Because this Preliminary Response demonstrates that Petitioner has failed to demonstrate that Hong anticipates the sole remaining independent claim, claim 1, remaining Grounds 2-4 (for which other art is added to Hong only for dependent claim elements) also fail.

As such, the Board should deny institution because Petitioner has not met its burden of demonstrating that it is more likely than not that any claim of the ’363 Patent is unpatentable and because denial is warranted in the interests of efficiency and fairness.

II. BACKGROUND

A. Technology Overview³

In lithium-ion batteries, lithium ions shuttle back and forth between the negative and positive electrodes during cycling. Ex. 2001, ¶40. During the first charge of the lithium-ion battery the electrolyte undergoes reduction at the negative electrode (or anode), and oxidation at the positive electrode (or cathode). *Id.* This forms a passive protective layer on the anode and cathode called the solid electrolyte interphase (SEI), comprising a mixture of inorganic and organic electrolyte

³ Dr. Koch provided a technology overview and summary of the ’363 Patent, which are largely reproduced below for convenience. Ex. 2001, Section IV.A.

decomposition products. *Id.* Battery performance, irreversible charge loss, rate capability, cyclability, and safety are highly dependent on the quality of the SEIs. *Id.*

Many vital, interdependent factors contribute to properties of the SEI and there is no absolute parameter circumscribing the SEI. *Id.* ¶41. It is the combined effect of all these factors which affects the properties, quality, and efficiency of SEI. *Id.* In particular, the specific type of solvent, organic additives, and lithium salt(s) added to the electrolyte solution, and the specific concentration each such component, can play a crucial role in determining the performance of the SEI. *Id.*

While anode SEIs have been studied for over two decades, cathode SEIs have not been studied as much, and constitute a relatively new and “hot” area of research today. *Id.* ¶42. In particular, cathode SEIs that do not decompose and perform well at voltages above 4.4V are an area of high interest in industry and academia. *Id.*

As Patent Owner Dr. Koch explains, “designing and creating an ideal protective SEI is akin to playing a game of electrochemical Tetris. One needs to reduce on the anode material or oxidize on the cathode material those electrolyte solvent molecules and/or additive molecules in the “right” sequence and at the “right” potential in order to confer high cycle life at high voltages for a lithium-ion battery.” *Id.* ¶43.

B. The '363 Patent Claims an Innovative Electrolyte Solution Composition

The '363 Patent describes a novel lithium-ion battery electrolyte solution that can provide a firm protective SEI film on the surface of the cathode of an electrochemical device such as a lithium-ion battery that is not easily decomposed, effectively inhibits the increase in DC internal resistance of the lithium ion battery, and achieves high capacity density, and excellent cycle and storage performances. Ex. 1001, 1:49-56, 3:1-13. The '363 Patent achieves this by providing an electrolyte solution comprising a compound comprising a dinitrile compound, a trinitrile compound, and propyl propionate in specific wt % concentrations. *Id.* 1:49-56, 27:55-61.

The '363 Patent explains that a dinitrile compound can form a protective film (or SEI)⁴ on the cathode of the electrochemical device, so as to inhibit the decomposition of the electrolyte solvent in the electrochemical device. *Id.* 1:43-46. However, since the protective film itself is decomposed on the surface of the cathode at a high potential, the protective film's role of inhibiting decomposition of the solvent cannot be sustained for a long time. *Id.* 1:46-49.

⁴ The "protective film" described in the '363 Patent is akin to the "SEI" described in Section IV.A.

The '363 Patent discusses the challenges with electrochemical devices working at voltages above 4.4V, noting that “[a]t a high voltage, the oxidizability of the cathode material is increased, and the stability is lowered, which makes the electrolyte easily decompose on the surface of the positive electrode or results in deterioration of the materials of the electrochemical device, so that the capacity of the electrochemical device is decreased.” *Id.* 21:52-57, 1:24-34; *see also* 1:26-31 (“at high voltages, the oxidation activity of the positive electrode material increases, and the stability decreases, which makes the electrolyte decompose on the surface of the positive electrode easily or cause deterioration of the battery material, resulting in a decrease in battery capacity.”). The '363 Patent further explains that “[p]rior to the present application, the primary solution [was] to add a film-forming additive to the electrolyte [but] doing so will cause an increase in the DC internal resistance of the battery, thereby resulting in a decrease in the cycle performance and a decrease in the capacity retention rate.” *Id.* 21:57-62.

The '363 Patent explains that its specific dinitrile, trinitrile, and propionate wt % ratio ranges, including Formula (3), were unexpectedly found to provide a firm, protective SEI film on the surface of the cathode that was not easily decomposed, and which could provide performance improvements by allowing a battery to operate at a high potential of 4.45 V and effectively reduce DC internal resistance of the battery. *Id.* 1:49-56 (“The present inventors unexpectedly found that by using a

mixture of a dinitrile compound, a trinitrile compound and propyl propionate, a firm protective film which is not easily decomposed on the surface of the cathode at a high potential can be formed. The electrolyte according to the embodiment of the present application can effectively inhibit the increase in DC internal resistance of the electrochemical device”); *Id.* 27:55-61 (“The ratio of the content of the trinitrile compound to the content of propyl propionate has great effect on the change in DC internal resistance of the battery. When Y/Z is within the range of 0.01-0.3, a better inhibition effect on the increase in DC internal resistance is achieved.”) *see also Id.* 2:8-16. Indeed, during prosecution, Applicant was able to obtain allowance by arguing that “[i]n the structure and operation of the present invention as claimed, it was found that when Y/Z is within the range of 0.01-0.3, the electrolyte has a better inhibit effect on the increase in the DC internal resistance.”⁵ Ex. 1002 at 861.

While the '363 Patent contemplates that the addition of film-forming additives such as VC, VEC, FEC, PS and DTD can further improve the stability of the solid

⁵ Petitioner does not dispute that the claims were deemed allowable because “the claimed formulaic ranges and that ‘the results yielded by the claimed invention are unexpected in view of the cited prior art.’” Petitioner confirms that “[t]he Examiner’s Notice of Allowance indicates acceptance of both arguments.” Pet. at 11-12 (citing Ex. 1002, 869-870).

electrolytic interface, it only tests between one and three such additives in isolation for examining the voltage drop in storage. *Id.* 30:47-31:7.

As such, protective films produced with electrolyte solutions according to the '363 Patent can inhibit side reactions, reduce a voltage drop during storage, effectively inhibit the increase in DC internal resistance of the electrochemical device, resulting in excellent cycle and storage performance even at high temperatures and high voltages. *Id.* 1:49-56, 2:8-16, 2:31-44, 3:1-13, 27:41-61.

C. Hong Does Not Disclose Any Propyl Propionate wt % Values, Nor the Claimed Formula (3) Range

Hong discloses using rare tricyanophosphite and tricyanophosphate “functional compounds” in electrolyte solutions to provide certain performance advantages for lithium batteries. Ex. 1005, 1 (Abstract), ¶¶5-9, 17-18, 20-24, 39-43; Ex. 2001 ¶55. Hong discloses fourteen tricyanophosphite and tricyanophosphate functional compounds included in twenty-five electrolyte solution embodiments mixed with numerous other components. Ex. 1005 ¶¶20-24, 33-35; Ex. 2001 ¶55. Hong performs performance testing on lithium batteries made with these electrolyte solutions to test the effect that the tricyanophosphite and tricyanophosphate functional compounds have on performance of the batteries. Ex. 1005 ¶¶39-43; Ex. 2001 ¶55.

Because Hong never appreciated the importance and unexpected benefits of the ratio of the content of the trinitrile compound to the content of propyl propionate, Hong never disclosed a wt % value for propyl propionate based on the total weight of the electrolyte solution as claimed, but instead disclosed a relative *mass ratio* of propyl propionate in a mixture of four organic solvents, based on the *total mass of these four organic solvents*, without providing that total mass. Ex. 1005 ¶¶13, 26, 33-35; Ex. 2001 ¶¶58, 60-61. Not only does Hong not disclose wt % value for propyl propionate but it also does not disclose the information needed to calculate such a value. Hong does not disclose “wherein, based on the total weight of the electrolyte, a weight percentage of the propyl propionate is Z, where Y and Z meet a condition represented by Formula (3): $\text{about } 0.01 \leq (Y/Z) \leq \text{about } 0.3$ (3),” and never discloses any particular ratios of its electrolyte solution components, such as the “Y/Z” ratio in Formula (3). Ex. 1001 Claim 1; Ex. 2001 ¶¶58, 60-61.

III. LEGAL STANDARDS

The Petition must establish, with particularity, the grounds and evidence that support invalidating the patented claims. 35 U.S.C. §312(a)(3). Petitioner “must ‘specify where each element of the claim is found in the [relied upon] prior art patents.’” *In-Depth Geophysical, Inc. v. ConocoPhillips Co.*, IPR2019-00850, Paper 56, *27 (Sept. 3, 2020) (quoting 37 C.F.R. § 42.104(b)(4)). And, as is the case here, Petitioner must demonstrate that Hong “discloses[] within the four corners of the

document . . . all of the limitations claimed,” and that disclosure must be “arranged or combined in the same way as recited in the claim.” *Net MoneyIN, Inc. v. VeriSign, Inc.*, 545 F.3d 1359, 1371 (Fed. Cir. 2008). Petitioner cannot satisfy this burden by reliance on unsupported and unscientific assumptions, an unreliable method, and incorrect calculations that attempt to cover the glaring shortcoming of Hong—it does not disclose Formula (3) as claimed.

In addition, the Board makes its determination regarding institution based on what the Petition *actually presents* and not what it could have reasonably contained had it been drafted differently. *In re Magnum Oil Tools Int’l, Ltd.*, 829 F.3d 1364, 1381 (Fed. Cir. 2016) (holding that the Board is *not* “free to adopt arguments on behalf of petitioners that could have been, but were not, raised by the petitioner during [a post-grant proceeding]”). The Board cannot “deviate from the grounds in the petition and raise its own” theories of invalidity. *Sirona Dental Sys. GmbH v. Institut Straumann AG*, 892 F.3d 1349, 1356 (Fed. Cir. 2018).

It is Petitioner’s burden to demonstrate unpatentability by a preponderance of the evidence. However, for the sole independent claim remaining in this patent, Petitioner relies on a reference that fails to appreciate the important and unexpected result derived from the claimed ratio of the content of the trinitrile compound to the content of propyl propionate or disclose such a ratio, and, thus, must rely on unsupported and unscientific assumptions, an unreliable method, and incorrect

calculations to attempt to demonstrate the presence of a ratio that is just not disclosed. Petitioner fails to satisfy its burden. *Dynamic Drinkware, LLC v. National Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015) (quoting 35 U.S.C. § 316(e)) (stating that “the burden of persuasion is on the petitioner to prove ‘unpatentability by a preponderance of the evidence’ . . . and that burden never shifts to the patentee”).

IV. CLAIM CONSTRUCTION

Petitioner puts forth claim construction positions in the Petition. Pet. at 12-14. While Patent Owner reserves all rights to dispute the constructions advanced in Petition, no claim construction is necessary to deny institution because Patent Owner’s arguments for denial do not rely on the outcome of an actual controversy about claim interpretation and fail even under Patent Owner’s constructions. *See Wellman, Inc. v. Eastman Chem. Co.*, 642 F.3d 1355, 1361 (Fed. Cir. 2011) (“[C]laim terms need only be construed to the extent necessary to resolve the controversy”). The failure to anticipate the claims is clear in view of the arguments below without construing any specific claim term or phrase.

V. LEVEL OF ORDINARY SKILL IN THE ART

Each of the arguments below should be considered from the standpoint of a person of ordinary skill in the art (“POSA”) in the field of the ’363 Patent.

Petitioner provides the following definition of a POSA:

Petitioner submits that a person of ordinary skill in the art for the field of the '363 patent would have a Ph.D. or a similar advanced degree in chemistry, chemical engineering, materials science, or a related field, and two or more years of experience related to the design, research, evaluation, preparation, and/or manufacture of electrochemical energy storage devices. This level of skill is approximate, and more experience would compensate for less formal education, and vice versa. It is consistent with the field provided by the '363 patent: "The present disclosure relates to the technical field of energy storage technologies, in particular to an electrolyte and an electrochemical device containing the electrolyte." Ex. 1001, 1:13-15. Ex. 1003, ¶¶24-25.

Pet. at 12.

For purposes of this Patent Owner's Preliminary Response, Patent Owner adopts the definition proposed by Petitioner. Patent Owner reserves the right to further address the level of ordinary skill in the art if this proceeding is instituted.

VI. THE BOARD SHOULD NOT INSTITUTE INTER PARTES REVIEW ON THE MERITS

D. Ground 1: Hong Does Not Anticipate Claims 1-6 and 11⁶

Petitioner fails to establish that there is a reasonable likelihood that at least one challenged claim of Ground 1 is unpatentable, for the reasons below.

1. Petitioner Fails to Show that Hong Anticipates the Claimed Formula (3) Range of Claim 1

Among other arguments, Petitioner points to the electrolyte compositions of Hong's Embodiments 2, 18, and 25, and Comparison Case 6 (the Hong "Examples") and alleges that these electrolyte compositions anticipate the claimed Formula (3) range. *See* Pet. at 14-21. These embodiments, however, do not disclose, expressly or inherently, a propyl propionate wt % value, nor the claimed Formula (3) range, and therefore cannot anticipate claim 1.

Independent claim 1 recites:

1. An electrolyte, comprising a dinitrile compound, a trinitrile compound, and propyl propionate, wherein, based on a total weight of the electrolyte, a weight percentage of the dinitrile compound is X and a weight percentage of the trinitrile compound is Y, where X and Y meet conditions represented by Formula (1) and Formula (2):

⁶ Without conceding patentability, Patent Owner has disclaimed claims 13 and 16.

Thus, claims 13 and 16 are no longer at issue in Ground 1 and are not subject to institution.

about 2 wt % $\leq (X+Y) \leq$ about 11 wt % (1); and

about 0.1 $\leq (X/Y) \leq$ about 8 (2),

wherein, based on the total weight of the electrolyte, a weight percentage of the propyl propionate is Z, where Y and Z meet a condition represented by Formula (3):

about 0.01 $\leq (Y/Z) \leq$ about 0.3 (3).

Hong is directed to a completely different invention than what is recited in claim 1 of the '363 Patent. In particular, Hong discloses the use of rare tricyanophosphite and tricyanophosphate “functional compounds” in electrolyte solutions to provide certain performance advantages for lithium-ion batteries. Ex. 1005, 1 (Abstract), ¶¶5-9, 17-18, 20-24, 39-43; Ex. 2001 ¶55. Hong’s electrolyte solutions also contain numerous other components in addition to the functional compounds. Ex. 1005 ¶¶10-15, 33-35; Ex. 2001 ¶¶55, 58. Hong’s Embodiments 2, 18, 25, and Comparison Case 6, for example, contain between 12 and 14 components. Ex. 1005 ¶¶10-15, 33-35; Ex. 2001 ¶¶55, 58.

Unlike Hong, Claim 1 of the '363 Patent is directed to three components⁷—a dinitrile compound, a trinitrile compound, and propyl propionate—mixed in specific

⁷ As discussed in Section II.B, while the '363 Patent contemplates that the addition of film-forming additives such as VC, VEC, FEC, PS and DTD can further

wt % ratio ranges (as claimed in Formulas (1)-(3)) that were unexpectedly found to provide a firm, protective SEI film on the surface of the cathode that was not easily decomposed, and which could provide performance improvements by allowing a battery to operate at a high potential of 4.45 V and effectively reduce DC internal resistance of the battery. Ex. 2001 ¶56; Ex. 1001 1:49-56 (“The present inventors unexpectedly found that by using a mixture of a dinitrile compound, a trinitrile compound and propyl propionate, a firm protective film which is not easily decomposed on the surface of the cathode at a high potential can be formed. The electrolyte according to the embodiment of the present application can effectively inhibit the increase in DC internal resistance of the electrochemical device”), 27:55-61 (“The ratio of the content of the trinitrile compound to the content of propyl propionate has great effect on the change in DC internal resistance of the battery. When Y/Z is within the range of 0.01-0.3, a better inhibition effect on the increase in DC internal resistance is achieved.”). Hong, on the other hand, says nothing about this critical ratio and/or reducing DC internal resistance of the battery, let alone a propyl propionate wt % value.

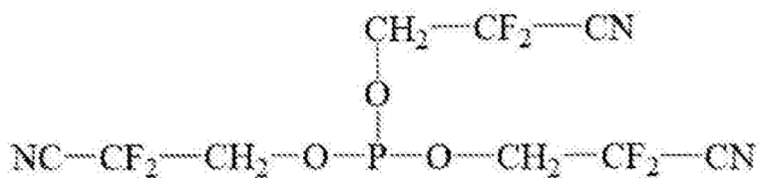
improve the stability of the solid electrolytic interface, it only tests between one and three such additives in isolation for examining the voltage drop in storage.

Instead of identifying the claimed Formula (3) or a disclosure related to the critical nature of the ratio of the content of the trinitrile compound to the content of propyl propionate, Petitioner relies on Hong's Embodiments 2, 18, and 25, and Comparison Case 6. Pet. at 14-21; Ex. 2001 ¶¶58. Hong's Examples, however, are very different from those claimed in the '363 Patent, and each comprise numerous additional components, including organic solvents, "additives," "functional compounds," and electrolyte substances. Ex. 1005 ¶¶10-15, 33-35; Ex. 2001 ¶¶58. Specifically, Hong discloses that each of these electrolyte solutions includes:

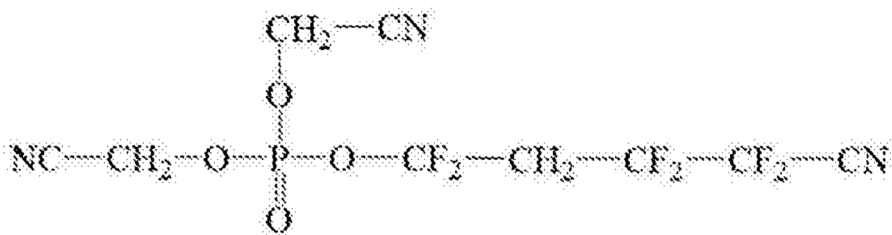
- A mixture of four organic solvents comprising ethylene carbonate (EC), propyl propionate (PP), diethyl carbonate (DEC), and propylene carbonate (PC). Ex. 1005, ¶¶12-13, 26, 33-35. For these organic solvents, Hong provides a relative mass ratio of each organic solvent based on the total mass of the organic solvents. *Id.*
- Between six and seven "[a]dditives," including 1,3-propane sultone (PS), fluoroethylene carbonate (FEC), vinyl ethylene carbonate (VEC), and ethylene sulfate (DTD), as well as the dinitriles adiponitrile (ADN), succinonitrile (SN), and ethylene glycol bis(propionitrile) ether (DENE). For Embodiment 25 and Comparison Case 6, Hong also includes the trinitrile 1,3,6-hexanetricarbonitrile (HTCN) as an "additive." *Id.* ¶¶15, 33-35, 38. For each of these additives, Hong

provides a mass percentage (“mass %”) concentration based on a total mass of the electrolyte solution. *Id.*

- A “[f]unctional compound” (for Embodiments 2, 18, and 25), constituting the trinitrile Compound I₁ for Embodiments 2 and 28, or the trinitrile Compound II₆ for Embodiment 25. *Id.* ¶¶20-24, 33-35, 38. For each of these functional compounds, Hong provides a mass % concentration based on a total mass of the electrolyte solution. *Id.* Below are the chemical structures of Hong’s trinitrile compounds I₁ and II₆.



Compound I₁



Compound II₆

Ex. 1005 ¶¶20-24.

- An “[e]lectrolyte substance” comprising either LiPF_6 (for Embodiments 2 and 18) or $\text{LiPF}_6 + \text{LiTFSI}$ (for Embodiment 25 and Comparison Case 6). *Id.* ¶¶11-12, 33-35, 38. For each of these electrolyte substances, Hong provides a molarity (M) concentration, which is equivalent to the number of moles of the electrolyte substance divided by the total volume of the as-mixed electrolyte solution. *Id.*

Below is an excerpted Table 1 presenting the components and concentrations of the various electrolyte components that Hong discloses for Embodiments 2, 18, and 25, and Comparison Case 6, where the various dinitrile compounds are highlighted in blue, the various trinitrile compounds are highlighted in green, and the propyl propionate component is highlighted in red. Dr. Koch also annotated this table to provide concentration units for each component highlighted in purple. Ex. 2001, ¶59.

	<u>Organic solvent (mass ratio)</u>	<u>Additive (mass % in final electrolyte)</u>	<u>Functional compound (mass % in final electrolyte)</u>	<u>Electrolyte substance (molarity concentration in final electrolyte)</u>
Embodiment 2	EC:PP:DEC:PC = 25:25:40:10	3% PS, 5% FEC, 2% ADN, 1% SN, 0.3% VEC, 1% DENE	0.8% Compound I ₁	1.1 M LiPF ₆
Embodiment 18	EC:PP:DEC:PC = 25:25:40:10	3% PS, 5% FEC, 2% ADN, 1% SN, 0.3% VEC, 1% DENE	5% Compound I ₁	1.1 M LiPF ₆
Embodiment 25	EC:PP:DEC:PC = 25:25:40:10	3% PS, 5% FEC, 2% ADN, 1% SN, 0.5% DTD, 1% DENE, 0.5% HTCN	1.5% Compound II ₆	1.0 M LiPF ₆ +0.5 M LiTFSI
Comparison Case 6	EC:PP:DEC:PC = 25:25:40:10	3% PS, 5% FEC, 2% ADN, 1% SN, 0.5% DTD, 1% DENE, 0.5% HTCN	--	1.0 M LiPF ₆ +0.5 M LiTFSI

Table 1. Hong's Embodiments 2, 18, and 25, and Comparison Case 6.

Hong does not disclose, either in the information excerpted in Table 1 above, or anywhere else, a *weight percentage* (“wt %”) of propyl propionate *based on a total weight of the electrolyte solution* as claimed, but rather, discloses a *relative mass ratio* of each organic solvent based on the total mass of the organic solvents. Ex. 2001, ¶60. Petitioner’s expert Dr. Anderman acknowledges that Hong discloses “organic solvents [that are] mixed according to a *mass ratio*,” and that “[f]or Embodiments 2, 18, 25, and Comparison Case 6, *the base organic solvent [(i.e., not the total electrolyte solution)]* is 25 wt % propyl propionate (PP), 25 wt % ethylene

carbonate (EC), 40 wt % diethyl carbonate (DEC), and 10 wt % propylene carbonate (PC).” Ex. 1003, ¶108 (emphasis added); Ex. 2001, ¶60. In fact, as shown in Table 3 of Hong, every single embodiment of Hong that includes propyl propionate provides PP at an unvarying mass ratio of 25 %, indicating that Hong never appreciates or tests the impact of varying the amount of PP. Ex. 1005, ¶¶33-35; Ex. 2001, ¶60.

Despite Hong’s Examples comprising between 12-14 components having three different types of concentration units—mass ratio of the organic solvents, mass % based on the final electrolyte mass, and molarity (M)—which are respectively based on different measurements (total mass of the organic solvents, total mass of the electrolyte solution, and total volume of the electrolyte solution), Hong does not provide such measurements (*i.e.*, the total mass, total weight, or total volume of each final electrolyte solution), which would be necessary to even attempt to calculate the theoretical wt % of the propyl propionate component based on the total weight of the electrolyte solution. Ex. 2001, ¶61.

Without any disclosure related to the critical ratio of the content of the trinitrile compound to the content of propyl propionate, and without any mention of a propyl propionate wt %, the total mass, total weight, or total volume of each final electrolyte solution, it is improper for Petitioner to conclude that it can determine

that Hong discloses the claimed propyl propionate wt % value and Formula (3) range. *Id.* ¶62. There is simply not sufficient disclosure in Hong.

Worse still, Hong does not disclose *any* chemical or physical properties of its functional compounds I₁ and II₆. *Id.* ¶63. For example, Hong does not disclose the density of these compounds at room temperature, which would also be necessary to try to even attempt to calculate the mass, weight, and volume contributions of these compounds for each final electrolyte solution, which in turn would be necessary to even attempt to accurately calculate a theoretical propyl propionate wt % value. *Id.* All that Hong provides for these compounds is their chemical structures. Ex. 1005, ¶¶20-24; Ex. 2001, ¶63.

This lack of disclosure undercuts Petitioner's case and demonstrates the need for Petitioner and its expert to rely on disclosures outside the four corners of Hong. As is evidenced below by the numerous errors and unsupported assumptions, Hong does not anticipate the claims.

**a. Dr. Anderman's Assumptions Are Unjustified and
Render His Methodology Unreliable**

Because Hong does not disclose or appreciate the importance of the actual wt % of propyl propionate, and discloses three different concentration units for its various components that are based on three different measurements—total mass of the organic solvents, total mass of the electrolyte solution, and total volume of

electrolyte solution—without actually providing those measurements, Petitioner does not and cannot directly and accurately calculate the actual wt % of propyl propionate. Ex. 2001, ¶64. Instead, Petitioner must rely on Dr. Anderman, who makes a parade of unjustified and scientifically unsound assumptions regarding the total volume of the final electrolyte solution, including how the various liquid and solid components of Hong's electrolyte solutions would interact with each other at room temperature⁸ to affect such volume despite the unpredictability of combining those liquid and solid components, and regarding certain physical properties of Hong's functional compounds I₁ and II₆, in an attempt to calculate theoretical propyl propionate wt % values that allegedly would have met the claimed Formula (3) range. *Id.* Specifically, the Petition states:

Petitioner's Expert, Dr. Anderman, used Hong's description of the electrolyte preparation method and proportions of each component to determine the propyl propionate weight percentage (Z) in Embodiments 2, 18, 25, and CC6. Dr. Anderman's calculations incorporate three assumptions: (1) the total volume of the liquid

⁸ Dr. Anderman indicates that his calculations assume that Hong's electrolyte solutions are prepared at room temperature. See Ex. 1003, ¶¶109, 111, 112-114, 132, 149.

components does not meaningfully change after mixing, (2) the solid components do not meaningfully contribute to the total volume of the electrolyte, and (3) Hong's tricyanophosphate and tricyanophosphite compounds are liquids at room temperature with a density of 0.60 g/cm. These assumptions are justified by Dr. Anderman's experience, the similarity of the solvent components, the common effect of solutes on solvent organization, and the known densities of common organic compounds.

Pet. at 19-20.

As an initial matter, there is no dispute that Petitioner's case relies on a series of assumptions made by its expert from outside of the four corners of Hong and without any disclosure from Hong to support such assumptions. But "a claim is anticipated if each and every limitation is found either expressly or inherently in a single prior art reference." *Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 851 F.3d 1270, 1273 (Fed. Cir. 2017). Instead of relying on Hong (either expressly or inherently), Petitioner is forced to improperly use expert testimony to reach beyond the boundaries of Hong and fill in gaps for the missing disclosure of the claimed invention in Hong. *Scripps Clinic & Research Foundation v. Genentech, Inc.*, 927 F.2d 1565, 1576 (Fed. Cir. 1991), clarified on denial of reconsideration, 1991 WL 523489 (Fed. Cir. 1991) ("The role of extrinsic evidence is to educate the decision-maker to what the reference meant to persons of ordinary skill in the field

of the invention, not to fill gaps in the reference. If it is necessary to reach beyond the boundaries of a single reference to provide missing disclosure of the claimed invention, the proper ground is not § 102 anticipation, but § 103 obviousness.”)

Petitioner provides no caselaw to support reliance on its multi-layered assumptions to support an anticipation case, especially when Petitioner and its expert must rely on quantities, states of matter, physical properties, and chemical behaviors that are not disclosed by Hong. The lack of caselaw is not surprising given the requirement that each and every limitation be found either expressly or inherently in a single prior art reference for a claim to be anticipated.⁹ Indeed, without express

⁹ In the context of obviousness, the Federal Circuit has not allowed assumptions similar to what is presented in the Petition. Indeed, the Federal Circuit “ha[s] never before applied the presumption of obviousness for overlapping ranges in a case in which the prior art does not contain an express disclosure of a range.” *ModernaTx, Inc. v. Arbutus Biopharma Corp.*, 18 F.4th 1364, 1373 (Fed. Cir. 2021). That is, even in the context of obviousness, the Board has rejected the notion that values can be generated based on assumptions made by an expert. *Moderna Therapeutics, Inc. v. Arbutus Biopharma Corp.*, IPR2019-00554, Paper 40 at 24-25 (PTAB July 23, 2020) (“while Petitioner derives an overlapping phospholipid range by making certain

disclosure, there is no way that Petitioner can show, with sufficient specificity, that Hong actually disclosed Formula 3. The lack of express disclosure of Formula 3 in Hong is fatal for Petitioner's case, which does **not** rely on obviousness for claim 1.

Even if Petitioner were able to rely on assumptions outside of the four corners of Hong, Dr. Anderman's assumptions are unjustified and unscientific and render his methodology unreliable in view of the complexity of Hong's electrolyte formulations and the lack of disclosure and details in Hong regarding the preparation of such formulations. For example, when a large number of electrolyte components such as those of Hong, including Hong's various additives, organic solvents, rare functional compounds, and electrolyte substances, are mixed, the behavior and interactions of such components, and the effect that mixing these components have on the final volume of the final electrolyte solution, are extremely difficult, if not

assumptions about the other lipid components of the particle, nothing in [the case law] suggests that a presumption of obviousness applies... when one of the claimed ranges for one of the expressly claimed sub-components of the claimed composition is not necessarily disclosed based on broader ranges for other components disclosed in the prior art... [t]o the contrary, the Federal Circuit has only applied the presumption where the overlapping range is expressly disclosed, not where an overlap might be assumed based on other motivating factors.”).

impossible to accurately predict, let alone calculate.¹⁰ Ex. 2001, ¶65. As such, there is insufficient detail to render the claims anticipated. *See Tf3 Ltd. v. Tre Milano, LLC*, 894 F.3d 1366, 1374 (Fed. Cir. 2018) (“Invalidity for anticipation requires that the identical invention must be shown in as complete detail as contained in the patent claim.” (quotes omitted)).

As explained *supra* Section II.C, Hong is directed to the use of rare tricyanophosphate and tricyanophosphite functional compounds, along with numerous other additives, solvents, and electrolyte substances, for improved battery performance, whereas the '363 Patent is directed to the use of a dinitrile, a trinitrile, and propyl propionate in specific wt % ratio ranges that allow a battery to perform well at high potentials. Ex. 1005, 1 (Abstract), ¶¶5-9, 17-18, 20-24, 39-43; Ex. 2001, ¶66. But Hong does not expressly disclose any wt % ratios between dinitrile and

¹⁰ While Petitioner did not put forth an obviousness position based on Hong with respect to Claim 1, such a position would have also failed given the necessary assumptions at issue in this proceeding. *ModernaTx, Inc. v. Arbutus Biopharma Corp.*, 18 F.4th 1364, 1375 (Fed. Cir. 2021) (holding that “the assumption necessary to derive the implicit overlapping range is itself undermined by the unpredictable interactivity between the components”); *see also In re Applied Materials, Inc.*, 692 F.3d 1289, 1298 (Fed. Cir. 2012).

trinitrile compounds as claimed, or between any trinitrile compounds and propyl propionate as claimed, and does not expressly disclose any ranges of any such wt % ratios as claimed. Ex. 2001 ¶67. Rather, Hong discloses, with respect to the four examples, electrolyte solutions having from 12 to 14 components, each including a functional compound whose physical properties and chemical properties are unknown, with different concentration units for the various components based on different measurements (total mass of the organic solvents, total mass of the electrolyte solution, and total volume of the electrolyte solution), none of which are specified by Hong. Ex. 1005 ¶¶33-35; Ex. 2001 ¶67. Without additional information, a POSA reading Hong would not have been able to accurately derive propyl propionate wt % values that meet the claimed Formula (3) range. Ex. 2001 ¶67.

Yet Petitioner seeks to remedy such deficiencies in Hong by making various unjustified, inconsistent, or scientifically unsound assumptions, in an attempt to “calculate” a theoretical propyl propionate wt % that allegedly meets the claimed Formula (3) range. Pet. at 14-21. These calculations suffer from their own shortcomings. Altogether, the number of unjustified, inconsistent, or outright incorrect assumptions and incorrect calculations render Dr. Anderman’s methodology and conclusions unreliable. For at least the reasons below, the Petition fails.

(i) **Dr. Anderman's First Assumption is
Unjustified and Unscientific**

Dr. Anderman's first assumption that is that: "(1) the total volume of the liquid components does not meaningfully change after mixing." Ex. 1003, ¶110. While not in the Petition, Dr. Anderman notes that "this assumption is justified based on the similarity of the liquid components in Embodiments 2, 18, 25, and Comparison Case 6" and that "[f]or example, since the polarity of the liquid components is similar, it is unlikely that there will be a meaningful change in volume in comparison to adding the individual volumes." *Id.* Dr. Anderman then identifies PP, DEC, PC, ADN, VEC, DENE, FEC, and HTCEN as liquid components in Hong's examples, and notes that "[e]thylene carbonate (EC) has long been known to function as a solvent when mixed with liquids," suggesting that he is also considering EC to be a liquid component for purposes of making his first assumption. *Id.* ¶111.

Dr. Anderman's first assumption is flawed for numerous reasons.¹¹

¹¹ Petitioner incorporates ¶¶107-129 from Ex. 1003 to support less than a full page of conclusory text in the Petition. Pet. at 19 -20. On this basis alone the Board should not consider ¶¶107-129 from Ex. 1003. 37 C.F.R. § 42.6(a)(3) ("Arguments must not be incorporated by reference from one document into another document."). Regardless, Patent Owner addresses each of Dr. Anderman's assumptions to

(A) Dr. Anderman Does Not Define Room Temperature

Dr. Anderman assumes that Hong's electrolyte solutions are prepared at room temperature, but a POSA would have understood "room temperature" to not have one universally agreed and defined temperature, but to possibly constitute any temperature between 18 °C and 25 °C depending on the source defining such "room temperature." Ex. 2001 ¶73. But which temperature Petitioner and Dr. Anderman relied on is unknown because the Petition and declaration are both silent on this topic. *Id.* This is important because at least one material relied on in Dr. Anderman's calculations has a melting point between 18–23 °C and so its physical and chemical properties would vary considerably depending on which temperature he was relying upon. *See* Table 2, *infra*.

(B) Dr. Anderman Does Not and Cannot Define Whether Hong's Components Are Liquids or Solids

It is not discussed in the Petition and it is not clear from the declaration how many of Hong's components must be considered liquids *before mixing* as contemplated by Dr. Anderman's first assumption. Ex. 2001 ¶72. For example, Dr.

demonstrate his flawed analysis if indeed the Board were to look beyond the text in the Petition.

Anderman appears to erroneously include EC in his list of components that he considers liquid components for his first assumption, but the Material Safety Data Sheet (“MSDS”) for ethylene carbonate (EC) that Dr. Anderman cites (Ex. 1014) indicates that EC is in a solid crystalline form at room temperature. Ex. 1003, ¶111; Ex. 2001, ¶72. Dr. Anderman appears to consider EC to be a liquid component but Dr. Anderman’s first assumption is that “the total volume of the *liquid components [before mixing]* does not meaningfully change *after they are mixed,*” not that the volume of a *solid* component before mixing does not meaningfully change after mixing. Ex. 1003, ¶110-111; Ex. 2001, ¶72. In fact, it is known that the volumes of solid components may materially change when dissolved in a solvent. Ex. 2001 ¶72. Thus, whether EC functions as a solvent or liquid *after* mixing with liquids would be irrelevant to Dr. Anderman’s first assumption, and EC cannot be considered a liquid component in Dr. Anderman’s first assumption because it is a solid at room temperature. *Id.*

Dr. Anderman also assumes that FEC is also a liquid at room temperature, whereas the MSDS for FEC that Dr. Anderman cites indicates that FEC’s state of matter is “[w]ax like” at room temperature. Ex. 1003, ¶111; Ex. 1015 at 5; Ex. 2001 ¶73. Because Dr. Anderman has put the states of matter of Hong’s components at issue for his first assumption, the states of matter of each of Hong’s components are critical. Ex. 2001 ¶73. But a POSA would not have been known the state of matter

of FEC at “room temperature” (*i.e.*, liquid or solid), and Hong is silent on the state of matter of FEC at room temperature. *Id.*

Next, Hong’s Examples also include functional compounds I₁ and II₆—whose physical and chemical properties, including their states of matter at room temperature, are not provided by Hong, and are not described in any published literature, including any literature cited by Dr. Anderman. *Id.* ¶74. Therefore, it is not possible to know if these compounds are to be treated as liquid components. *Id.* Notably, Dr. Anderman takes conflicting positions as to whether functional compounds I₁ and II₆ are liquids or not. *Id.* For example, in his third assumption Dr. Anderman assumes that Compounds I₁ and II₆ are liquids at room temperature, yet in his first assumption he does not include these compounds in his list of liquid components. Ex. 1003 ¶¶111, 114; Ex. 2001 ¶74. Again, Hong’s components are critical to Dr. Anderman’s first assumption. The lack of understanding of the states of matter of Compounds I₁ and II₆ undercuts the entire calculation performed and underscores why a POSA could not and would not perform the calculations performed by Dr. Anderman.

**(C) The Result of Mixing Hong’s Components
Is Unpredictable**

Hong’s Examples contain between 6-8 different liquid components (assuming EC is a solid component before mixing, which Dr. Anderman has not done, and also

depending on whether FEC and Compounds I₁ and II₆ are considered liquid components or not) that each have widely varying physical and chemical properties as shown in Table 2 below, which presents data for select components from the MSDS references that Dr. Anderman cites. Ex. 2001 ¶75. The POSA would have understood that the widely varying physical and chemical properties make it impossible to conclusively reach the calculations presented in the Petition. *Id.*

	Component	Molecular Weight	State of Matter at RT	Density	MP	BP	Flash Point	Vapor Pressure	Water Solubility
Organic Solvent	ethylene carbonate (EC)	88.06 g/mol	solid (crystalline)	1.321 g/cm ³ at 25 °C	35-38 °C	243-244 °C	143 °C	1 hpA at 20 °C	778 g/l at 20 °C
	propyl propionate (PP)	116.16 g/mol	liquid	0.881 g/cm ³ at 25 °C	- 76 °C	122-124 °C	19 °C	1.7 hpA at 20 °C	0.2 g/l at 20 °C
	diethyl carbonate (DEC)	118.13 g/mol	liquid	0.975 g/cm ³ at 25 °C	- 43 °C	126-128 °C	25 °C	13 hpA at 23.8 °C	18.8 g/l at 20 °C
	propylene carbonate (PC)	102.09 g/mol	liquid	1.2047 g/cm ³ at 20 °C	- 55 °C	240 °C	132 °C	0.17 hpA at 20 °C	175 g/l at 25 °C
Additive	1,3-propane sultone (PS)	122.14 g/mol	solid	1.39 g/mL (g/cm ³) at 25 °C	30 - 33 °C	180 °C at 40 hPa	171.5 °C	0.003 hpA at 20 °C	100 g/l
	fluoroethylene carbonate (FEC)	106.05 g/mol	"Wax like"	"1,485 g/cm ³ "	18-23 °C	212 °C	> 102.2 °C	N/A	N/A
	adiponitrile (ADN)	108.14 g/mol	liquid	"0.961 g/cm ³ "	0-1 °C	161-162 °C at 15 hPa; 295 °C at 1013 hPa	> 110 °C	N/A	N/A
	vinyl ethylene carbonate (VEC)	114.10 g/mol	liquid	1.188 g/cm ³ at 25 °C	< -30 °C	237 °C	96.9 °C	0.0458 hpA at 25 °C	66.44 g/l at 20 °C
	ethylene glycol bis(propionitrile) ether (DENE)	168.2	liquid	"1.07"	N/A	165 °C	N/A	N/A	N/A
	1,3,6-hexanetricarbonitrile (HTCN)	161.2 g/mol	liquid	1.04 g/cm ³ at 25 °C	N/A	255-260 °C	85 C	N/A	N/A
Functional Compound	I1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	II6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table 2. Physical and Chemical Properties of Select Hong Components According to Dr. Anderman's MSDS References.¹²

¹² See Exs. 1014, 1020, 1011, 1019, 115, 1010, 1024, 1012 and 1016.

**(D) Dr. Anderman Does Not Define
“Meaningfully” or “Similarity”**

The methodology relied on by Dr. Anderman is further undercut by his reliance on terms of degree like “meaningfully” or “similarity” without any explanation. For example, neither Petitioner nor Dr. Anderman explains what is meant by “meaningfully” when Dr. Anderman states that “the total volume of the liquid components does not *meaningfully* change after mixing,” implicitly conceding that he considers some level volume change to be acceptable to his analysis. Ex. 1003 ¶110; Ex. 2001 ¶71. For example, Dr. Anderman does not provide any volume change percentage threshold (e.g., 1%, 5%, 10%) that he considers to be “meaningful.” Ex. 2001 ¶71. Without any concrete indication of what Dr. Anderman meant by “meaningful[],” it is impossible to understand the metes and bounds of Dr. Anderman’s first assumption and to assess how the “un-meaningful” changes in the total volume would impact his calculations for Formula (3). Ex. 2001 ¶71.

In addition, Dr. Anderman also does not explain what he means by “similarity” when he states that his “[first] assumption is justified based on the *similarity of the liquid components.*” Ex. 1003, ¶110; Ex. 2001 ¶76. Dr. Anderman notes that, “[f]or example... the polarity of the liquid components is similar,” but does not explain if polarity is the only factor by which to determine similarity, or if other properties, such as density, solubility, melting point, and boiling point, must

also be considered. Ex. 1003 ¶110; Ex. 2001 ¶76. Further, Dr. Anderman does not provide any objective standard by which he purports to determine *when* any particular properties of two liquids might be similar enough to support his first assumption. Ex. 2001, ¶76.

Worse still, Hong's examples *do not* have similar polarities by any definition. Ex. 2001, ¶77. A POSA would understand that Hong's organic solvents have *widely varying* dielectric constants as shown in Table 3 below. *Id.*

Organic Solvent	Temperature (°C)	Dielectric Constant ϵ
EC	25	95.3 ¹³
DEC	20	2.82 ¹⁴
PC	20	64.9 ¹⁵
PP	20	4.7 ¹⁶

Table 3. Dielectric Constants of Hong's Organic Solvents.

A POSA would not consider a 34-fold difference in polarity between EC and DEC, and a 20-fold difference in polarity between EC and PP to be “similar.”¹⁷ Ex.

¹³ See Ex. 1025. Table 2.

¹⁴ See Ex. 2004, 13.

¹⁵ See Ex. 2005, 1.

¹⁶ See Ex. 2004, 34.

¹⁷ Patent Owner believes that EC should be considered a solid for purposes of Petitioner's first assumption, but assumes that it is a liquid here.

2001, ¶78. Nor would a POSA consider a 23-fold difference in polarity between PC and DEC, and a 14-fold difference in polarity between PC and PP to be “similar.” *Id.* Therefore, Dr. Anderman’s assumption that all of Hong’s liquid components have similar polarities, which is the **only** stated basis for his opinion that the liquid components are “similar,” which in turn is the **only** stated basis for his first assumption, is incorrect. *Id.*

Contrary to Dr. Anderman’s conclusions, Table 2 above indicates that Hong’s liquid components actually have widely varying physical properties, and Table 3 shows that Hong’s organic solvents have widely varying dielectric constant (i.e., polarity) values, undermining Dr. Anderman’s statement that his “[first] assumption is justified based on the *similarity of the liquid components*.” *Id.* ¶¶78-79.

(E) Dr. Anderman’s First Assumption Is Irreconcilably Flawed

For the above reasons, Dr. Anderman’s first assumption is unjustified and flawed, and Dr. Anderman’s calculations based on his first assumption are also unjustified and flawed. These issues when taken together and in context of the other errors identified herein render Dr. Anderman’s method unreliable.

(ii) Dr. Anderman’s Second Assumption is Unjustified and Unscientific

Dr. Anderman’s second assumption is that “the solid components (“solutes”) do not meaningfully contribute to the total volume of the electrolyte.” Ex. 1003,

¶112. Dr. Anderman attempts to justify his second assumption by explaining that “[w]hen solutes are dissolved in a solvent (here, the liquid component mixture), the molecules in the solvent rearrange to form solvation shells that surround the solute... these solvation shells rearrange the solvent molecules in the electrolyte such that the solutes do not meaningfully contribute to the total volume of the electrolyte.” *Id.*

**(A) Dr. Anderman Does Not and Cannot
Define Whether Hong’s Components Are
Liquids or Solids**

It is unclear which of Hong’s components Dr. Anderman considers liquid components and solid components, and in some instances he offers internally inconsistent opinions. Ex. 2001 ¶83. For example, as discussed above, EC is in a solid crystalline form at room temperature, yet Dr. Anderman considers EC a liquid for his first and second assumptions. Ex. 1003 ¶¶111, 116, 121, 123, 125, 127; Ex. 2001 ¶83. Yet Dr. Anderman’s second assumption that “the solid components (“solutes”) do not meaningfully contribute to the total volume of the electrolyte” contemplates that it is the components that are solid *before mixing* that do not meaningfully contribute to the total volume of the electrolyte *after mixing*. Ex. 1003 ¶112; Ex. 2001 ¶83. As such, EC should be considered a solid component for Dr. Anderman’s second assumption, yet Dr. Anderman treats it as a liquid component for both his first and second assumptions, undermining both assumptions. Ex 1003 ¶¶111-112, 116, 121, 123, 125, 127; Ex. 2001 ¶83.

As explained above, FEC has a melting point of 18–23 °C, which creates ambiguity as to whether FEC is a solid or liquid at "room temperature," which neither Dr. Anderman nor Hong defines. Ex. 2001 ¶84; Ex. 1015 at 5. Because Dr. Anderman has put the states of matter of each one of Hong's components at issue for his second assumption, the states of matter of those components are critical. Ex. 2001 ¶84. Here a POSA would not have been able to know if FEC is a solid or liquid at room temperature for Dr. Anderman's second assumption. *Id.*

In addition, as described above, the physical and chemical properties for Hong's functional compounds I₁ and II₆, including their states of matter at room temperature, are not provided by Hong, and are not described in any published literature, including any literature cited by Dr. Anderman. *Id.* ¶85. Therefore, it is not possible for Petitioner or the Board to know if these compounds are to be treated as liquid or solid components with respect to Dr. Anderman's second assumption. *Id.* Without this information, Dr. Anderman's assumptions lack supporting evidence and therefore fail.

At bottom, Dr. Anderman takes conflicting and irreconcilable positions as to whether these individual compounds are liquids or not. Indeed, in his third assumption, Dr. Anderman ***assumes that compounds I₁ and II₆ are liquids*** at room temperature, yet in his first assumption, ***he does not include these compounds in his list of liquid components***, further rendering both his first and second assumptions

unreliable. Ex. 1003 ¶¶110-114; Ex. 2001 ¶85. Again, because Dr. Anderman has put the states of matter of Hong's components at issue for his second assumption, the states of matter of each of Hong's components are critical, but a POSA would not have been able to know if Compounds I₁ and II₆ are solids or liquids at room temperature for Dr. Anderman's second assumption. Ex. 2001 ¶85.

(B) Dr. Anderman's Assumption That a Solid Dissolved in a Liquid Does Not Contribute to the Solution's Volume Is Fatally Flawed

Contrary to Dr. Anderman's second assumption, a solid dissolved in a liquid does in fact take up solution volume, and thus does contribute to the total volume of the solution.¹⁸ Ex. 2001 ¶86. While Dr. Anderman's second assumption may possibly be a reasonable one to make when dealing with very dilute solutions (e.g., less than 0.1 M) comprising a small number of solutes and solvents with well-known properties and reactivities, that is not the case with Hong's Examples. *Id.* Hong's

¹⁸ Unsure of his position, Dr. Anderman seems to contemplate that solid dissolved in a liquid does in fact take up solution volume in paragraph 112 of his declaration. Even if the Board overlooks the fact that Dr. Anderman himself does not resolve whether or not a liquid takes up solution volume, paragraph 112 is replete with errors, as explained in this section.

electrolyte solutions contain 12-14 different components, including 4-8 different solid components mixed with 6-8 different liquid components (assuming that EC is a solid component before mixing, which Dr. Anderman has not done, and also depending on whether FEC and Compounds I₁ and II₆ are considered to be solid components or liquid components, which is uncertain), including the rare functional compounds I₁ and II₆ whose chemical and physical properties are unknown, as well as electrolyte substances in concentrations of 1.1 M LiPF₆ or 1.0 M LiPF₆ + 0.5 M LiTFSI. *Id.* When there are so many different solid and liquid components in an electrolyte solution with unknown reactivities to each other, it is impossible to accurately predict, using generalized assumptions and calculations, how these different components will actually interact with each other, and the degree to which the total volume of the electrolyte solution, will be affected by the solid components. *Id.*

In addition, Hong's electrolyte solutions are too complex and not dilute enough for Dr. Anderman's second assumption to apply. *Id.* ¶87. In Hong's electrolyte solutions, the added concentration of the solid additives alone, without accounting for the EC organic solvent, the functional compounds I₁ and II₆, the FEC additive, and the electrolyte substances LiPF₆ and LiTFSI, is 4.5 mass % or wt %. *Id.* If the concentrations of EC, FEC, I₁, II₆, LiPF₆ and LiTFSI were to be accounted for, the total concentration of all solid components in Hong's Examples would be

significantly higher, resulting in an even less dilute electrolyte solution rendering Dr. Anderman's second assumption even more inaccurate and scientifically unsound. *Id.*

Thus, to suggest, as Dr. Anderman does, that when Hong's 4-8 solid solutes are dissolved in Hong's 6-8 liquid solvents, the solvent molecules would move closer together around the solutes, yet that the solutes would not "meaningfully" contribute to the total volume of the electrolyte solution, is both incorrect and contradictory. *Id.* ¶88. For example, when a solid solute (such as the LiPF₆ electrolyte substance in Hong) is added to a solvent or mixture of solvents, it must necessarily take up space when dissolved (solvated) because the Li cation and PF₆ anion that LiPF₆ dissociates into are not point charges that lack any intrinsic volume, but rather, take up actual space in the solution, and thus will be expected to increase the overall volume of the electrolyte solution. *Id.* For example, the PF₆ anion possesses a volume of 94 Å³ and thus each PF₆ anion will be expected to contribute at least 94 Å³ in additional volume to the total electrolyte solution, before accounting for any solute-solvent interactions. Ex. 2006, 15 (Table 6); Ex. 2001, ¶88. Further, the larger TFSI anion that is dissociated when LiTFSI is dissolved in a solution possesses a volume of 179 Å³ thus contributing additional volume to the electrolyte solution in Hong's Embodiment 25 and Comparison Case 6. Ex. 2006 at 15 (Table 6); Ex. 2001 ¶88. In comparison, the liquid solvent PC possesses a molecular volume

of $141 \text{ \AA}^3$ which places it between that of the PF_6 anion and that of the TFSI anion. Ex. 2007 at 4; Ex. 2001 ¶88. Dr. Anderman acknowledges that the total volume of the electrolyte will be affected but makes no attempt to quantify or measure the degree of that effect. Ex. 1003 ¶¶110-112; Ex. 2001 ¶88. Because he relies on the total solution volume for his molarity calculations, and the total volume he arrives at is wrong, Dr. Anderman's calculated molarities and ratios must be rejected.

**(C) Dr. Anderman Does Not Define
“Meaningfully”**

As with his first assumption, Dr. Anderman does not explain what he means by “meaningfully” when he states that “the solid components (“solutes”) do not *meaningfully* contribute to the total volume of the electrolyte.” Ex. 1003 ¶112; Ex. 2001 ¶82. For example, Dr. Anderman does not provide any volume contribution by the solid components that could be considered meaningful. Ex. 2001 ¶82. Without any concrete indication of what is meant by “meaningful[],” it is not possible to understand the metes and bounds of Dr. Anderman's second assumption and to assess how the solutes' contribution to the total volume would impact the calculations in Formula (3). *Id.*

**(D) Either Alone or in Combination With the
First Assumption, Dr. Anderman's**

**Second Assumption Is Irreconcilably
Flawed**

For the above reasons, Dr. Anderman's second assumption is unjustified and improper, and Dr. Anderman's calculations based on his second assumption are unjustified and improper. Indeed, in combination with the errors and improper first assumption, the improper second assumption further undercuts the reliability of Dr. Anderman's opinions.

**(iii) Dr. Anderman's Third Assumption is
Unjustified and Unscientific**

Dr. Anderman's third assumption is that "the tricyanophosphite and tricyanophosph[a]te compounds disclosed in Hong are liquid at room temperature and have a density of 0.60 g/cm³." Ex. 1003 ¶114. Dr. Anderman's purported justification for this assumption is that:

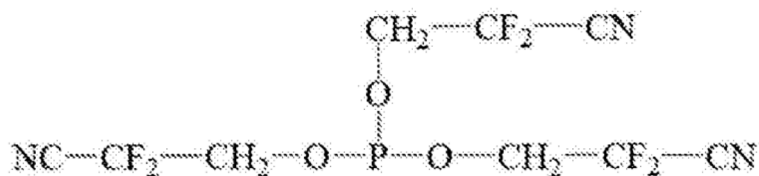
This assumption captures the maximum reasonable effect that the tricyanophosphite and tricyanophosphite compounds could have in reducing the proportion of propyl propionate in Hong's electrolytes. The lower the density of liquid tricyanophosphite and tricyanophosphite compounds, the lower the proportion of propyl propionate in the total electrolyte. For these calculations, I have assumed a density for the tricyanophosphite and tricyanophosphite compounds that is lower than the

density of the least dense common organic compound. *See*
Ex. 1027.

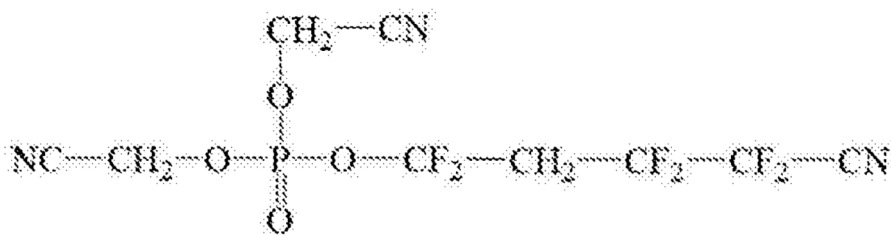
Id.

Because Hong's tricyanophosphate and tricyanophosphite compounds include Compound I₁ and Compound II₆ present in the Examples at issue, Dr. Anderman's third assumption necessarily further assumes that Compound I₁ and Compound II₆ are liquids at room temperature, and have a density of 0.60 g/cm³. Ex. 1005 ¶¶20-24; Ex. 2001 ¶91.

There is ***no basis*** for such an assumption. Neither Hong nor Dr. Anderman provide any physical, chemical, or other properties of Compound I₁ and Compound II₆, apart from the following chemical structures provided in Hong:



Compound I₁



Compound II₆

Ex. 1005 ¶¶20-24; Ex. 2001 ¶92.

Compounds I₁ and II₆ are not common or well-known organic compounds in the field of lithium-ion battery electrolytes, let alone in the general field of organic chemistry. Ex. 2001, ¶93. In fact, Patent Owner is not aware that there is now, or that there was when the '363 Patent was filed, any information on any chemical or physical properties of these compounds available in any published scientific literature. *Id.* Because neither Petitioner nor Dr. Anderman cite to any scientific literature indicating or suggesting that these compounds are liquids at room temperature, there is no rational support for such an assumption or any assumptions with regard to Compounds I₁ and II₆. *Id.*

Instead, Dr. Anderman merely relies on the densities of the compounds in the table of arbitrary “common organic compounds” (Ex. 1027) to support his justification for his assumption that Compounds I₁ and II₆ have a density of 0.60 g/cm³. Ex. 1003, ¶114; Ex. 1027; Ex. 2001 ¶94. Not only do the compounds in Exhibit 1027 list only “common” organic compounds without accounting for the essentially infinite number of organic compounds that exist, but the compounds in Exhibit 1027 do not include Compounds I₁ and II₆. Ex. 2001 ¶94. Dr. Anderman does not provide any convincing reason why the densities of Compounds I₁ and II₆ should be determined based on the lowest density listed in his short list of common organic compounds. *Id.* The densities of Compounds I₁ and II₆ cannot be determined from Exhibit 1027.

For the above reasons, Dr. Anderman's third assumption is unjustified and improper, and Dr. Anderman's calculations based on his third assumption are unjustified and improper. Indeed, in combination with the errors and improper first and second assumptions, the improper third assumption further undercuts the reliability of Dr. Anderman's opinion.

b. Dr. Anderman's Calculations Are Also Flawed

In addition to Dr. Anderman's assumptions being unjustified and improper, Dr. Anderman's calculations, which are based on his three assumptions, are themselves rife with inconsistencies, and incomprehensible calculations. Ex. 2001 ¶96.

(A) Dr. Anderman Mixes and Matches States of Matter and Density Values

Table 5 from Dr. Anderman's declaration (reproduced below), shows the room temperature states of matter, densities, and volume and weight contributions of the various components of Hong's Embodiment 2, as determined by Dr. Anderman based on the MSDSs that he cites. Ex. 2001 ¶97.

	Compound	Density	Volume	Contribution	Wt%
Base Solvent		g/ml	Vol, ml	Weight, g	Total Electrolyte
	EC	1.321	18.93	25.00	
	PP	0.881	28.38	25.00	
	DEC	0.975	41.03	40.00	
	PC	1.204	8.31	10.00	
	Sum Base Solvent	N/A	96.65	100.00	
Liquid Additives	ADN	0.961	2.83	2.72	2.00
	VEC	1.188	0.35	0.41	0.30
	DENE	1.07	1.27	1.36	1.00
	FEC	1.485	4.57	6.79	5.00
	Compound I ₁	0.60	1.82	1.09	0.80
	Sum Liquid Additives	N/A	10.84	12.37	
	Sum Liquid Components	N/A	107.49	112.37	
Solid Additives	SN	0.985	0.00	1.36	1.00
	PS	1.392	0.00	4.07	3.00
Lithium Salt	LiPF ₆ (1.1 M; MW = 151.91 g/mol)	2.83	0.00	17.96	
	Sum Solid Components	N/A	0.00	23.39	
	Sum All Components	N/A	107.49	135.76	
	PP weight %			18.4%	

Table 5: Weight Percentage of Components in Embodiment 2 of Hong

Ex. 1003 ¶45 (Table 5); Ex. 2001 ¶97.

Dr. Anderman’s calculations, however, assume incorrect states of matter, and use inconsistent, incorrect, and/or unreliable density values, for certain components of Hong’s electrolyte solutions. Ex. 2001 ¶98. For example, according to Dr. Anderman’s Table 5, EC is a liquid at room temperature. Ex. 1003, ¶45 (Table 5); Ex. 2001 ¶99. But as Dr. Anderman’s reference indicates, EC is actually a solid, or in “crystalline” state, at room temperature. Ex. 1014 at 5; Ex. 2001 ¶99.

In addition, the density values for the various electrolyte components of Hong that Dr. Anderman uses for his calculations are inconsistent or unreliable, as they are based on density values at different temperatures, density values without any

given corresponding temperatures, or density values with missing units. For example, the densities that Dr. Anderman uses for PC, DTD and LiTFSI are based on a temperature of 20 °C (Exs. 1019, 1013, 1018), whereas those for EC, PP, DEC, PS, SN, VEC, and LiPF₆ are based on a temperature of 25 °C (Exs. 1020, 1011, 1021, 1022, 124, 1017). Ex. 2001, ¶99. In addition, the density used for DENE, is taken from the MSDS for DENE that Dr. Anderman cites, which does not include any units at all for the density (Ex. 1012), and the densities used for FEC and ADN are based on densities from the FEC and ADN MSDSs that do not include any temperatures on which those densities are based (Exs. 1015, 1010). *Id.* In addition, as discussed above, it is not clear what the state of matters of FEC and Compounds I₁ and II₆ are at room temperature. *Id.*

These issues are further complicated by the fact that Dr. Anderman assumes that Hong's electrolyte solutions are prepared at room temperature without specifying a numerical temperature, and a POSA would understand room temperature to be anywhere from 18 °C to 25 °C depending on the source defining "room temperature." *Id.*

Tables 6-8 from Dr. Anderman's declaration, and the corresponding calculations performed by Dr. Anderman, suffer from the same or similar deficiencies described above regarding Dr. Anderman's calculations in Table 5. *Id.*

**(B) Dr. Anderman's Calculations Do Not
Result in the Lithium Salt Molarity
Concentration Specified by Hong**

Dr. Anderman's calculations for Embodiments 2, 18, and 25, and Comparison Case 6, cannot result in the 1.1 M LiPF_6 or 1.0 M $\text{LiPF}_6 + 0.5 \text{ M LiTFSI}$ electrolyte substance concentrations disclosed by Hong for its Examples because in calculating wt % values for Hong's components, *Dr. Anderman assumes that the lithium salt(s) and all of the additives are included in 100 mL of the solvent mixture.* Ex. 1003 ¶¶ 115-130; Ex. 2001 ¶100. This erroneous assumption in turn increases the final electrolyte solution volume to greater than 100 mL, which in turn lowers the molarity concentration of the lithium salt components, resulting in electrolyte substance molarity concentrations that are less than the 1.1 M LiPF_6 or 1.0 M $\text{LiPF}_6 + 0.5 \text{ M LiTFSI}$ concentrations disclosed by Hong. Ex. 2001 ¶100. This error in turn renders Dr. Anderman's wt % calculations for each Hong component incorrect and inaccurate. *Id.*

There is simply not enough information in Hong to reliably perform the calculations needed to reach the conclusions in the Petition. As such, the results disclosed in the Petition cannot be used to anticipate Formula 3 of claim 1.

(C) Dr. Anderman Requires an “Initial Estimate” but Never Discloses It

In conducting the calculations and derivations for his wt % values based on his three assumptions, Dr. Anderman uses an incomprehensible methodology involving an unstated “initial estimate” and repeated calculations based on such estimate. Ex. 1003 ¶117-119; Ex. 2001 ¶101.

Dr. Anderman states that he used an “initial estimate of the final electrolyte mass [to] calculate the mass of each additive using the mass percentages provided by Hong,” but does not state what that initial estimate was, nor does he explain the reasoning behind using such an initial estimate. Ex. 1003 ¶117. The lack of context carries through the entire experiment as Dr. Anderman notes that:

I then added the masses of the base solvent, the additives, and the lithium salt(s) to determine the total electrolyte mass. If there was a difference between this calculation of the total electrolyte mass and my *initial estimate* of the total electrolyte mass, I *repeated this process* until the calculated total electrolyte mass matched the *initial estimate* of total electrolyte mass. The calculated mass matching the *estimated mass* meant that the calculations correctly accounted for the mass ratio, mass percentage, or concentration of each component described in Hong.

Id. ¶119 (emphasis added); Ex. 2001 ¶101.

In the cited excerpt above, Dr. Anderman essentially states that he took some unstated, unexplained, and thus unknown to the reader “initial estimate,” added the masses of the various components that were obtained based on various unjustified assumptions, and compared this added mass to the initial estimate. Ex. 2001 ¶102. If the added mass did not match such “initial estimate,” the process was repeated, until it eventually did. *Id.* Dr. Anderman’s methodology and explanation for performing such calculations are both incomprehensible and impossible to follow because it is not known what his “initial estimate” is and what it represents. *Id.* In fact, it appears that Dr. Anderman seeks to adjust his series of calculations to “fit” a predetermined propyl propionate wt % value that he wants to show. *Id.* Essentially, Dr. Anderman has attempted to describe, using more scientific language than his actual process, that he “guessed” at the sum of the masses and then did not explain what the numerical value of the guess was. *Id.* A POSA reading Hong would have no reason to perform the serial calculations based on guesswork that Dr. Anderman performed here, to meet his initial “estimate” (or guess). *Id.*

c. Even Putting Aside His Three Unjustified Assumptions, Dr. Anderman’s Calculations Fail

The Petition also includes what appears to be a fallback position as it states: “[i]f the assumptions were set aside, propyl propionate could account for no more than 25 wt % and no less than 15.3-18.1 wt % of the total electrolyte in Embodiments

2, 18, 25, and CC6. And Y/Z could equal no less than 0.020-0.200 and no more than 0.032-0.294.” Pet. at 21 (footnote omitted). Then the Petition incorporates by reference a variety of different unsupported theories from Dr. Anderman at ¶¶130-151 not detailed in the Petition that seem to hedge against, and at times undercut, prior assumptions made by Dr. Anderman. *See* 37 C.F.R. § 42.6(a)(3) (“Arguments must not be incorporated by reference from one document into another document.”). Regardless, these additional fallback positions fail, and also reincorporate the same errors and assumptions.

If the Board accepts Petitioner’s invitation to look beyond the four corners of the Petition to additional arguments and assumptions incorporated by reference, the Board will find that, first, Dr. Anderman repeats the same unfounded, unexplained, and inconsistent calculations identified *supra* Section VI.A.1.b. Ex. 2001 ¶104. For example, Dr. Anderman again assumes incorrect states of matter, and uses inconsistent, incorrect, and/or unreliable density values for his calculations based on his three flawed assumptions. Ex. 1003 ¶¶130-151; Ex. 2001 ¶105. Dr. Anderman also repeats his erroneous calculations that result in electrolyte substance concentrations that are more dilute, and lower, than the 1.1 M LiPF₆ or 1.0 M LiPF₆ + 0.5 M LiTFSI concentrations that Hong requires into his calculations, which taint Dr. Anderman’s calculations for every other component. Ex. 2001 ¶105. Lastly, Dr. Anderman again uses an incomprehensible methodology involving an “initial

estimate” that is not known nor explained, “calculated values” and “estimated values” that are not stated, and serial calculations “[i]f there was a difference between the estimated values and the calculated values.” Ex. 1003 ¶¶135-137; Ex. 2001 ¶105

In addition, Dr. Anderman makes additional assumptions that are scientifically unsound and incomprehensible. Ex. 2001 ¶106. For example, Dr. Anderman states that “[i]f my first assumption is set aside, the total volume of the solvents would reduce upon mixing as the smaller molecules in the solvent occupied the space between the larger molecules.” Ex. 1003 ¶131; Ex. 2001 ¶106. Dr. Anderman does not explain here if he is referring to just the four organic solvents, or all of the liquid components of the solution. Ex. 2001 ¶106. In addition, Dr. Anderman does not explain what is meant by “smaller molecules” and “larger molecules” in the solvent. *Id.* Dr. Anderman also does not identify where such molecules come from (*e.g.*, whether they come from Hong’s organic solvents, solid additives, liquid additives, functional compounds, or electrolyte substances). *Id.* Notably, Dr. Anderman does not provide any explanation to support his opinion as to why such smaller molecules would “occup[y] the space between such larger molecules” to reduce the total volume of the solvents. Ex. 1003. ¶131; Ex. 2001 ¶106.

Furthermore, Dr. Anderman notes that “my third assumption represents the lowest reasonable density for the tricyanophosphite and tricyanophosphate compounds. In fact, the weight percentages of propyl propionate in Embodiments 2, 18, 25, and Comparison Case 6 would likely be higher than the values I have calculated here given the similarity of propyl propionate to compounds having a higher density.” Ex. 1003, ¶146; Ex. 2001 ¶107. Here, Dr. Anderman not only repeats his unfounded and unsupported assumption regarding the densities of Hong’s tricyanophosphite and tricyanophosphate compounds discussed above, but doesn’t explain what he means by “similarity to compounds having a higher density,” nor explains how such a comparison supports his assumption. Ex. 2001 ¶107.

In addition, Dr. Anderman assumes that there would be an upper limit for the weight percentage of propyl propionate of 25 wt % because the mass ratio of propyl propionate among the four organic solvents is 25%. Ex. 1003, ¶148; Ex. 2001 ¶108. However, there is no reason why the 25% mass ratio of propyl propionate prior to mixing with the 11-13 other components in Hong’s electrolyte solutions, including other liquid and solvent components, should place an upper limit on the resulting wt % of propyl propionate. Ex. 2001 ¶108. As explained above, Hong’s examples are complex electrolyte solution mixtures comprising between 12 and 14 organic solvents, additives, functional compounds, and electrolyte substances, including components with unknown physical and chemical properties. *See supra* Section

VI.A.1; Ex. 2001 ¶108. Even if the physical and chemical properties of each of Hong's 12-14 components were known, it would be extremely difficult if not impossible to predict how so many components would interact with each other when mixed, including whether they will chemically or physically react with each other, and affect the final total volume of the electrolyte solution, as well as the final wt % of each component. Ex. 2001 ¶108.

Finally, these assumptions do not take into account the complex and unpredictable nature of the interactions between the various components of Hong's electrolyte solutions. For example, these assumptions assume that EC is a liquid at room temperature when it is actually a solid, and assume that the I₁ and II₆ compounds are liquid at room temperature, when these compounds are actually rare organic compounds whose chemical and physical properties, including their states of matter at room temperature, and their densities, are unknown. Ex. 2001 ¶110.

Accordingly, even putting aside Dr. Anderman's incorrect assumptions (1)-(3), Hong does not anticipate the claimed Formula (3) range.

2. Patent Owner Establishes Criticality of the Claimed Formula (3) Range

Even if one were to assume that Dr. Anderman's flawed assumptions and calculations are reasonable and justified, and that Hong discloses a range of Y/Z values that fall within or overlap the claimed range of Formula (3), Hong still fails

to anticipate claim 1 because the claimed range is **critical** and is not disclosed by Hong's overly broad range. *E.I. DuPont de Nemours & Co. v. Synvina C.V.*, 904 F.3d 996, 1006 (Fed. Cir. 2018) (a “claimed range that demonstrates [] unexpected results is referred to as a ‘critical’ range, and the patentee has the burden of proving criticality”) (citation omitted).

Hong, as a whole, discloses, at best, electrolyte solutions with trinitrile and propyl propionate concentration ranges that are broader than the claimed Formula (3) range. For example, Hong's claim 2 recites mass percentages of the functional compound (i.e., a trinitrile) in the electrolyte being in the range of 0.05% – 10%, which, assuming Dr. Anderman's assumptions and calculations are proper, and applying such range to some of the disclosed embodiments, results in a Y/Z range that is broader than the claimed Formula (3) range. Ex. 2001 ¶113.

For example, applying the trinitrile range of Hong's claim 2 to Hong's Embodiment 2, for example, using Hong's smallest disclosed trinitrile and Hong's largest disclosed trinitrile, would respectively result in Y/Z values of 0.494 and 0.0099, both of which are outside of the claimed Formula (3) range for Hong's Embodiment 2, indicating Y/Z point values outside of the claimed Formula (3) range, and/or a broader Formula (3) range than the claimed Formula (3) range, the former precluding anticipation by itself, and the latter precluding anticipation because the narrower claimed range is critical to the invention. *Id.* ¶114.

The '363 Patent explains that its *specific wt % ratio ranges*, including Formula (3), were *unexpectedly* found to provide a firm, protective SEI film on the surface of the cathode that was not easily decomposed, and which could provide performance improvements by allowing a battery to operate at a high potential of 4.45 V and effectively reduce DC internal resistance of the battery. Ex. 2001 ¶115; Ex. 1001 1:49-56 (“The present inventors *unexpectedly found* that by using a mixture of a dinitrile compound, a trinitrile compound and propyl propionate, a firm protective film which is not easily decomposed on the surface of the cathode at a high potential can be formed. The electrolyte according to the embodiment of the present application can effectively inhibit the increase in DC internal resistance of the electrochemical device”), 27:55-61 (“The *ratio* of the content of the trinitrile compound to the content of propyl propionate *has great effect* on the change in DC internal resistance of the battery. When Y/Z is within the range of 0.01-0.3, a better inhibition effect on the increase in DC internal resistance is achieved.”). Because Hong does not disclose the specific critical values of the invention within its overly broad claimed range, it does not anticipate. *Atofina v. Great Lakes Chem. Corp.*, 441 F.3d 991, 999-1000 (Fed. Cir. 2006) (reversing a finding of anticipation because prior art’s broad disclosure of temperature ranges of 100 to 500 °C and 150 to 350 °C did not anticipate the “critical” claimed narrower temperature range of 330 to 450 °C and finding that “no reasonable fact finder could conclude that the prior art

describes the claimed range with sufficient specificity to anticipate this limitation of the claim”).

3. Claims 2-12 are not unpatentable

Claims 2-12 are not unpatentable for the same reasons as discussed above with respect to claim 1. Petitioner does not rely on any reference other than Hong to meet the limitations of claim 1. As such, Grounds 2-6 fail. Patent Owner reserves the right to address claims 2-12 individually if this proceeding is instituted.

VII. THE BOARD SHOULD NOT INSTITUTE INTER PARTES REVIEW UNDER § 314(A) BASED ON THE *FINTIV* FACTORS

In addition to the underlying failures of the Petition, the Board should deny institution under *Apple v. Fintiv, Inc.*, No. IPR2020-00019, Paper 11 (PTAB Mar. 20, 2020) (precedential).

Factor 1 is neutral. In the Eastern District of Texas where Patent Owner is asserting the ’363 Patent against Petitioner, a stay pending institution of this IPR has not been requested, and even if requested is unlikely to be granted. The Board should not infer the outcome of such a motion. *Sand Revolution II LLC v. Continental Intermodal Group – Trucking LLC*, IPR2019-01393, Paper No. 24 at 7 (PTAB June 16, 2020) (informative).

Factor 2 weighs against institution because a trial date is already scheduled to occur in the district court on February 5, 2024, almost seven months before the

August 28, 2024 statutory deadline for the Board to issue a final written decision in this IPR (assuming that the Board issues an institution decision on August 28, 2023, a full three months after Patent Owner’s Preliminary Response). Ex. 1029. Even Petitioner agrees that trial will occur prior to final written decision when considering median time-to-trial. Pet. at 72. The Board has denied institution in view of smaller gaps between the final written decision and trial. *See, e.g., EClinicalWorks, LLC v. Decapolis LLC*, IPR2022-00229, Paper No. 10 at 9 (PTAB Apr. 13, 2022) (finding this factor weighed in favor of discretionary denial and denying institution where “the beginning of the jury trial in the WDTX Cases is roughly one or two months before any final decision would have been due had *inter partes* review been instituted” (emphasis added)).

Factor 4 also weighs against institution because Hong, Zhuang, and Kim ’934, three of the asserted prior art references in this IPR, are all also being asserted by Petitioner in its Invalidity Contentions at the Eastern District of Texas. In addition, there is substantial overlap in how these references are being asserted at the district court, and in this IPR—for example, Petitioner points largely to the same disclosures in each prior art reference, in both the district court, and in this IPR. Petitioner did not file any stipulation let alone a *Sotera* stipulation with respect to the overlapping claims and references.

Factor 5 also weighs against institution because the Petitioner is the accused infringer and defendant, while Patent Owner is the plaintiff, in the district court litigations. Ex. 1031, 1 (case caption); Ex. 1032 (case caption).

Factor 6 weighs against institution because the Petition has a fatal flaw with respect to the required, but unsupported, assumptions made by its expert to reach an anticipation position. Given that these unsupported assumptions fail to meet the *likelihood of success* standard, they certainly fail to meet the higher compelling standard, which requires challenges “in which the evidence, if unrebutted in trial, would plainly lead to a conclusion that one or more claims are unpatentable by a preponderance of the evidence.” *Commscope Techs. LLC v. Dali Wireless, Inc.*, IPR 2022-01242, Paper No. 23 at 3 (PTAB Feb. 27, 2023) (citing Interim Procedure for Discretionary Denials in AIA Post-Grant Proceedings with Parallel District Court Litigation at 4. (June 21, 2022) (“Guidance Memo”).)

VIII. CONCLUSION

For the reasons noted above, Patent Owner respectfully submits that the Board should deny institution of all Grounds of the Petition.

Dated: May 30, 2023

Respectfully submitted,

By: / Christopher TL Douglas /
Christopher TL Douglas, Reg. No. 56,950

CERTIFICATION UNDER 37 C.F.R. §42.24

Pursuant to 37 C.F.R. §42.24(d), I certify that this reply complies with the type-volume limits of 37 C.F.R. §42.24(c)(1) because it contains 12,688 words, according to the word-processing system used to prepare this reply, excluding the parts of this reply that are exempted by 37 C.F.R. §42.24(c) (including the 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: May 30, 2023

By: / Christopher TL Douglas /
Christopher TL Douglas

CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. §42.6(e), the undersigned hereby certifies that a copy of the foregoing **PATENT OWNER'S PRELIMINARY RESPONSE** was served by filing this document through the PTAB's E2E Filing System as well as delivering a true and correct copy by electronic mail on Patent Owner's lead and backup counsel at the following email addresses (as agreed by counsel for Patent Owner):

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Dated: May 30, 2023

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