

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ZHUHAI COSMX BATTERY CO., LTD.,
Petitioner

v.

NINGDE AMPEREX TECHNOLOGY LTD.,
Patent Owner

IPR2025-00432
Patent 11,575,148

PATENT OWNER'S SUR-REPLY

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2001	Second Amended Complaint, <i>Ningde Amperex Tech. Ltd. v. Zhuhai CosMX Battery Co.</i> , Case No. 2:24-cv-00728-JRG, ECF No. 23 (E.D. Tex. Jan. 28, 2025)
2002	Scheduling Order, <i>Ningde Amperex Tech. Ltd. v. Zhuhai CosMX Battery Co.</i> , Case No. 2:24-cv-00728-JRG, ECF No. 27 (E.D. Tex. Feb. 6, 2025)
2003	CosMX Invalidity Contentions Cover Pleading, <i>Ningde Amperex Tech. Ltd. v. Zhuhai CosMX Battery Co.</i> , Case No. 2:24-cv-00728-JRG (E.D. Tex. Jan. 7, 2025)
2004	Summons to attend oral proceedings in German Case No. 3 Ni 12/23 (EP) (“Germany Order 1”)
2005	Summons to attend oral proceedings in German Case No. 3 Ni 12/24 (EP) (“Germany Order 2”)
2006	Docket Navigator Statistics for Judge Rodney Gilstrap (accessed May 5, 2025)
2007	Docket, <i>Ningde Amperex Tech. Ltd. v. Zhuhai CosMX Battery Co.</i> , Case No. 2:22-cv-00232 (E.D. Tex.)
2008	Joint Motion for Entry of Protective Order, <i>Ningde Amperex Tech. Ltd. v. Zhuhai CosMX Battery Co.</i> , No. 2:24-cv-00728-JRG, ECF No. 30 (E.D. Tex. Feb. 11, 2025)
2009	Amended Final Judgment, <i>Ningde Amperex Tech. Ltd. v. Zhuhai CosMX Battery Co.</i> , Case No. 2:22-cv-00232, ECF No. 427 (E.D. Tex.)
2010	Article, <i>Lithium battery manufacturer ATL won injunction against its Chinese rival COSMX in German Court</i> , China IP Today (April 6, 2024)
2011	Reserved
2012	Reserved
2013	Reserved
2014	Reserved
2015	Declaration of Dean R. Wheeler, Ph.D.
2016	<i>Curriculum Vitae</i> of Dean R. Wheeler, Ph.D.
2017	Reserved
2018	Reserved

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2019	Reserved
2020	Reserved
2021	Reserved
2022	Reserved
2023	Reserved
2024	Reserved
2025	<i>2016 Batteries Conference GRC</i> , https://www.grc.org/batteries-conference/2016/ (accessed on May 12, 2025)
2026	<i>Hubs – Department of Energy</i> , https://www.energy.gov/hubs (accessed on May 12, 2025)
2027	<i>DOE Energy Innovation Hubs</i> , https://science.osti.gov/bes/Research/DOE-Energy-Innovation-Hubs (accessed on May 12, 2025)
2028	Salvatore Luiso & Peter Fedkiw, <i>Lithium-ion battery separators: Recent developments and state of art</i> , 20 <i>Current Opinion in Electrochemistry</i> 99–107 (2020).
2029	Sugino Machine Ltd., <i>StarBurst® P2218E 102501 AS</i> (Sugino Machine Ltd. 2025)
2030	<i>Declaration of Brady Cox in Support of Patent Owner’s Notice of Intent to Designate Provisionally Recognized PTAB Attorney Under 37 C.F.R. § 42.10(c)(2)</i>
2031	Declaration of Samuel P. Gido, Ph.D., dated February 22, 2023, IPR2023-00587
2032	CosMX Proposed Construction of Claim Terms, <i>Ningde Amperex Tech. Ltd. v. Zhuhai CosMX Battery Co.</i> , No. 2:24-cv-00728-JRG
2033	Deposition Transcript of Samuel P. Gido, Ph.D., dated November 13, 2025, IPR2025-00432
2034	Supplemental Declaration of Dean R. Wheeler, Ph.D.
2035	Valadoula Deimede and Costas Elmasides, <i>Separators for Lithium-Ion Batteries: A Review on the Production Processes and Recent Developments</i> , <i>Energy Technol.</i> 2015, 3, 453–468
2036	Hyun-Seok Jeong et al., <i>Effect of phase inversion on microporous structure development of Al₂O₃/poly(vinylidene fluoride-hexafluoropropylene)-based ceramic composite separators for lithium-ion batteries</i> , <i>Journal of Power Sources</i> 195 (2010) 6116–6121

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2037	Muhammad Rehman Asghar et al., <i>A Review on Inorganic Nanoparticles Modified Composite Membranes for Lithium-Ion Batteries: Recent Progress and Prospects</i> , Membranes 2019 , 9, 78; doi:10.3390/membranes9070078
2038	Marie-Francine Lagadec et al., <i>Characterization and performance evaluation of lithium-ion battery separators</i> , Nature Energy, 4 (2019); https://doi.org/10.1038/s41560-018-0295-9
2039	Kwang Man Kim et al., <i>Characterization of poly(vinylidenefluoride-co-hexafluoropropylene)-based polymer electrolyte filled with TiO₂ nanoparticles</i> , Polymer 43 (2002) 3951–3957
2040	Wenjing Lu et al., <i>Porous membranes in secondary battery technologies</i> , Chem. Soc. Rev., 2017, 46, 2199
2041	Shuhua Liu, et al., <i>Effect of grinding time on the particle characteristics of glass powder</i> , Powder Technology 295, 133-141 (2016)
2042	Laser diffraction for particle sizing – Anton Paar, available at: https://wiki.anton-paar.com/en/laser-diffraction-for-particle-sizing (last accessed on July 30, 2025)
2043	W. Pabst & E. Gregorova, <i>Characterization of particles and particle systems</i> , ICT Prague (2007).
2044	<i>Various types of chambers for “STAR BURST”</i> , https://www.sugino.com/en/column/sbs-technical-chamber/ (accessed on November 25, 2025)
2045	Declaration of Quinn Horn, Ph.D., dated October 21, 2025, <i>Ningde Amperex Tech. Ltd. v. Zhuhai CosMX Battery Co.</i> , No. 2:24-cv-00728-JRG
2046	KISUMA™ 5 Product Sheet
2047	U.S. Pat. No. 10,774,229 B2 to Maeda (“Maeda”)
2048	U.S. Pat. No. 10,793,748 to Yamamoto et al. (“Yamamoto”)
2049	Russel Paterson et al., <i>IUPAC-NIST Solubility Data Series 70. Solubility of Gases in Glassy Polymers</i> , Journal of Physical and Chemical Reference Data 28, 1255 (1999); https://doi.org/10.1063/1.556050
2050	Alpha Aluminum Oxide Data Sheet

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2051	<i>Pore Size Distribution</i> , https://micromeritics.com/pore-size-distribution/ (accessed on November 25, 2025)
2052	Kim Min et al., <i>Preparation of a Trilayer Separator and Its Application to Lithium-Ion Batteries</i> , J. Power Sources (2010) 8302-8305
2053	Ohji et al., <i>Advanced Processing and Manufacturing Technologies for Structural and Multifunctional Materials</i> , The American Ceramic Society (2008)
2054	Takemura et al., <i>A Powder Particle Size Effect on Ceramic Powder Based Separator for Lithium Rechargeable Battery</i> , J. Power Sources (2005) 779-783
2055	EPR No. 90/019,470, Notice of Intent to Issue a Reexamination Certificate (“NIRC”), 2-5 (Jan. 14, 2026).
2056	Claim Construction Order, <i>Ningde Amperex Tech. Ltd. v. Zhuhai CosMX Battery Co.</i> , Case No. 2:24-cv-00728-JRG, ECF No. 171 (E.D. Tex. Feb. 17, 2026)

I. INTRODUCTION

Petitioner's Reply fails to cure the deficiencies in its Petition, and Petitioner has not met its burden of proving unpatentability by a preponderance of evidence. Therefore, all claims of the '148 Patent should be determined as not unpatentable. *First*, under PO and the district court's correct plain and ordinary meaning, none of the prior art discloses or renders obvious both pore structure limitations. *Second*, Murakami fails to disclose or render obvious the claimed Dv10, Dv50, and Dv90 values even assuming, *arguendo*, Petitioner's reading of Murakami. *Third*, both experts agree that creating a porous layer for a battery separator is a complex process that requires balancing several variables, and that changing even a single variable can be unpredictable (let alone changing multiple at once). Petitioner failed to address this complexity in its Petition, and the handwaving it offers in its Reply—including relying on impermissible hindsight bias rooted in the inventors' success—cannot save its inadequate motivations to combine and reasonable expectations of success.

II. CLAIM CONSTRUCTION

The parties dispute the plain and ordinary meaning of “wherein the porous film comprises [A] pores formed by the binder, [B] the pores at least comprises a part of the inorganic particles.” The district court agreed with PO's plain and ordinary meaning.

At the district court, Petitioner and Dr. Guido argued that “the pores at least comprises a part of the inorganic particles” was indefinite despite arguing that the same term carries its plain and ordinary meaning in the proceeding. *Contrast* Ex. 2032, 8 *with* Paper 2, 14-15. Notwithstanding Petitioner’s inconsistencies, the court rejected Petitioner’s indefiniteness argument and agreed with PO that the term should be given its plain and ordinary meaning. Ex. 2056, 32-33; Paper 21, 11. In doing so, the court explained:

The claim states that “the porous film comprises [A] pores formed by the binder,” meaning the binder formed the boundaries or geometry of the pores. The claim separately states that [B] “the pores at least comprise[] a part of the inorganic particles,” meaning that inorganic particles are a part of the pores. ***These two requirements are not contradictory; they describe complementary structural features of the porous film. The binder forms the structure (the pore walls), and inorganic particles are located both within the binder structure and within the pore spaces themselves to lend structural support.*** The claim is not indefinite.”

Id. (emphasis added). The Board should adopt the same plain and ordinary meaning here. *See, e.g., H-E-B, LP v. Digital Retail Apps., Inc.*, IPR No. 2020-00348, Paper 16, 2020 Pat. App. LEXIS 12980 *10 (PTAB July 6, 2020); *Google LLC v. Virentem Ventures, LLC*, IPR No. 2019-01245, Paper 41, 2021 Pat. App. LEXIS 448 *20 (PTAB Jan. 26, 2021).

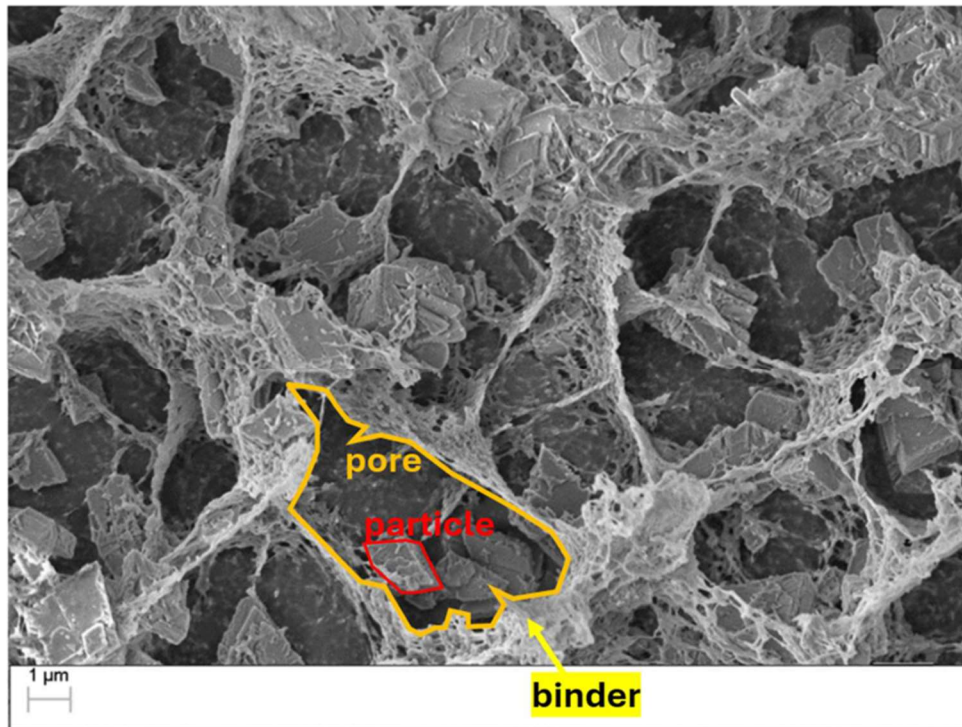
A. “Pores formed by the binder”

PO urged the adoption of the plain and ordinary meaning: “pores whose outer geometry is defined by binder.” Paper 21, 6; *see also, e.g., id.*, 11; Ex. 2034 ¶¶50, 54; Ex. 1037, 51:5-12. The district court adopted this same plain and ordinary meaning: “[t]he claim states that ‘the porous film comprises pores formed by the binder,’ *meaning the binder formed the boundaries or geometry of the pores.*” Ex. 2056, 32 (emphasis added); *see also, e.g., id.*, 32-33. The Board should adopt the same plain and ordinary meaning here, that “pores formed by the binder” means “the binder formed the boundaries or geometry of the pores” or, in other words, “the binder forms the structure (the pore walls).” Ex. 2056, 32; Paper 21, 6; *H-E-B*, 2020 Pat. App. LEXIS 12980 *10.

Petitioner and Dr. Guido falsely purport to agree with the district court’s plain and ordinary meaning, omitting key language from the court to preserve Petitioner’s invalidity theory. *Contrast* Ex. 1036 ¶21 *with* Ex. 2056, 32. Indeed, Petitioner tries to broaden construction beyond the stated plain meaning to encompass porous layers where the binder does *not* “form[] the boundaries or geometry of the pores” as the court stated (Ex. 2056, 32), but instead acts as discrete dots of glue to hold inorganic particles together and the pores are voids between inorganic particles. Paper 29, 5, 8. Dr. Guido argues those particle-formed pores are still “formed by the binder” because the binder holds the particles together: “[t]he configurations and pores

would not be permanent without the binder to glue the particles in place.” Ex. 1036 ¶29. But by this logic, **any** porous layer having a binder would satisfy this limitation, effectively reading the additional requirement that the pores be “formed by the binder” out of the claim. Paper 21, 6-7 (citing *Merck & Co. v. Teva Pharms. USA, Inc.*, 395 F.3d 1364, 1372 (Fed. Cir. 2005)). Petitioner’s Reply does not dispute this fact. Nor has Petitioner explained why the Board should disregard the fundamental principle of claim construction that avoids reading out claim language. *Merck & Co.*, 395 F.3d 1372 (Fed. Cir. 2005).

Petitioner argues that PO’s construction is wrong because it requires all the pores to be formed “entirely” or “exclusively” by binder, whereas the SEM images in the ’148 Patent show pores where the inorganic particles “partly” define the pore’s outer geometry. Paper No. 29, 6. This mischaracterizes PO’s arguments and the ’148 Patent. PO has never attached the words “exclusively” or “entirely” to the “formed by the binder” limitation. Rather, this idea was introduced by ***Petitioner’s counsel*** during Dr. Wheeler’s deposition, and Dr. Wheeler responded to that line of questioning. Ex. 1037, 11:15-17; *see* discussion *infra*, p. 6-7. Moreover, the SEM images in the ’148 Patent do not show particles “partly” defining the pore’s outer geometry—they show the particles protruding into the pore boundaries defined by the binder, as is required by the claim language “pores at least comprise[] a part of the inorganic particles.”



Paper 21, 14-15 (citing Ex. 2034 ¶¶68-70).

Petitioner also argues that PO's construction is wrong because it requires NIPs and/or a specific binder ratio. Paper 29, 6, 9. This again mischaracterizes PO's arguments. PO has never asserted that NIPs is **required** to meet the claimed pore structure limitations. The fact that the specification discloses using NIPs as a method to form the claimed porous structure is simply support for how a POSITA would understand the phrase "pores formed by the binder" in the context of the '148 Patent. *Trs. Of Columbia Univ. v. Symantec Corp.*, 811 F.3d 1359, 1365 (Fed. Cir. 2016). Similarly, PO has not and does not assert that the claims require a specific ratio of binder, but rather cites amounts of binder in the specification's disclosure as helpful context for the claim language. *Id.*

Petitioner further argues that PO's discussion of how the '148 Patent describes wall thicknesses between pores is meritless because the claims relate to an "average," not a "maximum," and thus some walls that are thicker than average could accommodate larger particles. Paper 29, 7. Petitioner misses the point. The '148 Patent's focus on wall thicknesses only makes sense in the context of a structure with binder walls, not walls made of inorganic particles glued together by dots of binder. If the wall between pores could simply be an inorganic particle, as Petitioner suggests, then "average wall thickness" would be the same measurement as "average particle diameter," or D50. But such an interpretation cannot be correct, especially in view of the dependent claims contemplating that "average wall thickness" is a measurement separate from D50.

Finally, Petitioner argues Dr. Wheeler "changed his opinion" regarding the plain and ordinary meaning of this limitation when deposed. Paper 29, 7-8. Not so. Ex. 1037, 12:12-14. In his Supplemental Declaration, Dr. Wheeler opined, "[a] POSITA would have understood the plain and ordinary meaning of this phrase, 'formed by the binder,' to require that the pore geometry is itself defined by the boundaries of the binder, rather than by some other component of the porous layer." Ex. 2034 ¶47. Dr. Wheeler repeatedly described the claims in the same way in his deposition. *See, e.g.*, Ex. 1037, 92:16-22; 150:3-14.

Petitioner’s counsel introduced the word “exclusively” and asked Dr. Wheeler to quantify a percentage of the pore boundary that is defined by binder, but Dr. Wheeler correctly pointed out that the claim language does not include percentages of binder and inorganic particles. Ex. 1037, 11:15-12:19. Dr. Wheeler explained that, instead, the claim language has the difficult task of describing a complex three-dimensional structure, and “so the idea is that the way that the binder is arranged is the primary factor in how the pores are shaped, *that what defines the limit of the pore and – rather than one of the other materials present in the porous layer.*” Ex. 1037, 13:15-14:8 (emphasis added). He explained, “*whatever shape that binder is doing, that’s determining the shape of the pore.*” *Id.*, 14:12-19 (emphasis added). This is entirely consistent with Dr. Wheeler’s Supplemental Declaration, PO’s Response, and the district court’s claim construction order that states “pores formed by the binder” plainly means “the binder formed the boundaries or geometry of the pores,” or “the binder forms the structure (pore walls).” Ex. 2056, 32-33.

B. “Pores at least comprises a part of the inorganic particles”

PO urged the adoption of the plain and ordinary meaning: “at least a part of the inorganic particles extend into the pore defined by binder walls.” Paper 21, 11; *see also, e.g.*, Ex. 2034 ¶67; Ex. 1037, 51:5-12. The district court adopted this same plain and ordinary meaning: “[t]he binder forms the structure (the pore walls), and *inorganic particles are located* both within the binder structure and *within the pore*

spaces themselves to lend structural support.” Ex. 2056, 32-33 (emphasis added); *see also, e.g., id.*, 32 (stating, in other words, “[t]he claim separately states that [B] ‘the pores at least comprise[] a part of the inorganic particles,’ meaning that inorganic particles are a part of the pores.”). The Board should adopt the same plain and ordinary meaning here. Paper 21, 11; Ex. 2056, 32-33; *H-E-B*, 2020 Pat. App. LEXIS 12980 *10.

While Petitioner and Dr. Guido first disagreed with the court, arguing this term was indefinite, they changed their minds for this proceeding, and now (falsely) purport to agree. Paper 29, 1; Ex. 1036 ¶11. Petitioner and Dr. Guido do not in fact agree with the court because their construction directly contradicts the court’s conclusion that at least some part of some inorganic particles must be located “within the pore spaces themselves,” and they omit this portion of the district court’s opinion. Paper 29, 1-3, 10-11. Petitioner’s inconsistent construction, which does not require any part of any inorganic particles to be “within the pore spaces themselves,” should be rejected. Ex. 2056, 32-33; *Virentem Ventures*, 2021 Pat. App. LEXIS 448 *20.

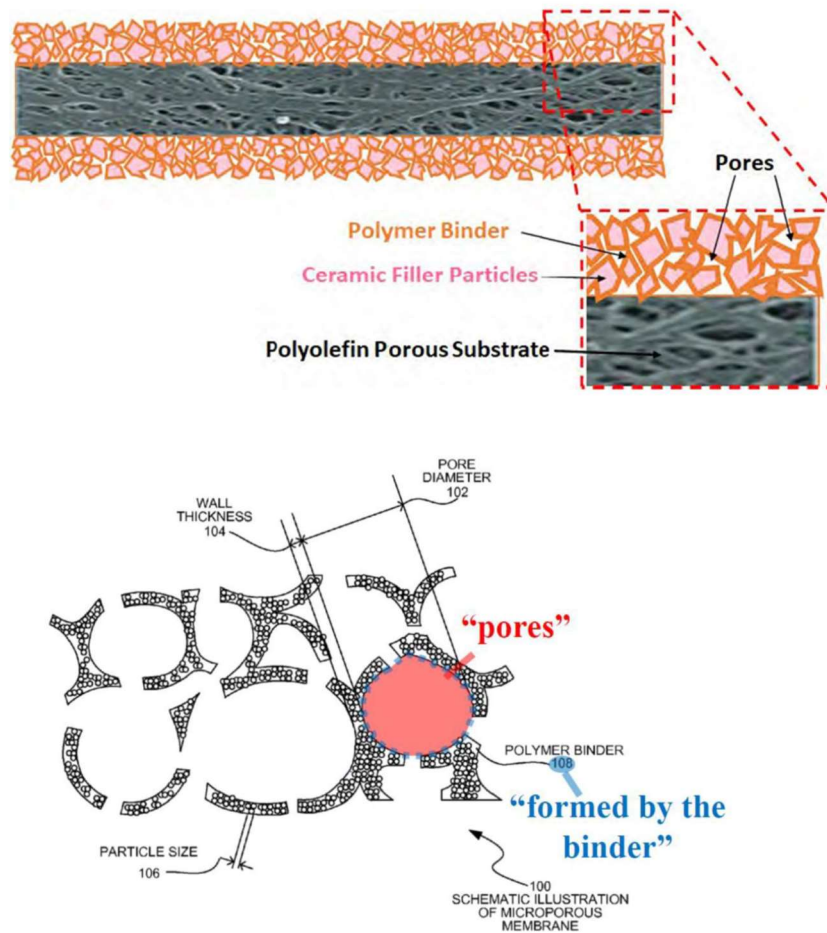
Petitioner’s arguments fail to consider the claim as a whole. For example, Petitioner argues “the pores” must include the walls between the pores because “[w]ithout pore walls, there is no pore.” Paper 29, 2. While the pore walls are what define the boundary of the pore, a POSITA would understand that the “pore” (that

is, the empty space between the walls) does not include the walls themselves. Any argument that the claim's requirements (that the pores be formed by the binder and that the pores also comprise a part of the inorganic particles) would contradict each other under PO's construction is wrong. The district court already explicitly rejected this argument:

These two requirements are not contradictory; they describe complementary structural features of the porous film. The binder forms the structure (the pore walls), and inorganic particles are located both within the binder structure and within the pore spaces themselves to lend structural support.

Ex. 2056, 32-33 (emphasis added).

Dr. Guido has repeatedly testified that “pores” means voids or spaces, thereby supporting the notion that a pore itself does not include the wall that forms the pore. While Petitioner argues that Dr. Guido's conflicting testimony was only in the context of a different proceeding involving different claim language, this is not true. Dr. Guido has equated “pores” to voids or spaces multiple times during the course of *this proceeding*.



Ex. 1003 ¶¶33, 165; Ex. 1038, 241:14-242:2. Moreover, Dr. Gido’s statements in that other proceeding, which involves similar claim language, are valid extrinsic evidence of how a POSITA would understand the plain meaning of the word “pore” in general when discussing porous layers, regardless of whether the exact same claim construction dispute was at issue. Ex. 2031 ¶¶41, 48, 52-53. Thus, Dr. Gido’s understanding of the word “pore” to mean the “pore space”—both in this proceeding and in a previous proceeding involving similar claim language—is another reason why the Board should adopt the same plain and ordinary meaning proposed by PO

and adopted by the district court, which confirms that at least a part of the inorganic particles must extend into the pore itself. Paper 21, 11; Ex. 2056, 32-33.

III. GROUNDS 1-3: OBVIOUSNESS GROUNDS BASED ON MURAKAMI¹

A. Murakami does not disclose and/or render obvious both pore structure requirements.

The claims of the '148 Patent have two structural requirements: [A] the pores must be formed by the binder, and [B] the pores must comprise at least a part of the inorganic particles. PO's Response explained why Murakami's general disclosure and preferred embodiments, Examples 1 and 2, teach neither. In Examples 1 and 2—which the Petition and Dr. Guido repeatedly argue a POSITA would have been motivated to choose over all other porous layers disclosed in Murakami (*see, e.g.*, Paper 2, 21; Ex. 1003 ¶¶80, 100)—the pores in Murakami's porous layers are formed by the large amount of inorganic particles (97% by weight or 93% by volume) rather than the minimal binder, and the inorganic particles are not a part of the pores because they themselves delineate the boundaries of the pores (and therefore do not extend into the pore spaces). Paper 21, 20-26; Ex. 1005 ¶[0141]. In other words,

¹ PO has addressed the additional failures of the grounds based on Murakami and Honda (Ground 2) and Murakami and Tanaka (Ground 3) in its POR. Paper 21, 34-41.

these high-particle loading porous layers are the exact type of porous layer the claims explicitly distinguish by requiring the pores to be “formed by the binder,” rather than simply being gaps between inorganic particles. *Id.*, 21-22 (citing Ex. 2034 ¶¶99-100).

In its Reply, Petitioner newly mentions other “examples” or “embodiments” in Murakami to argue that the pores are formed by the binder, even under PO’s construction. Paper 29, 9. But neither Murakami’s other examples, nor Murakami’s general disclosure, save Petitioner. First, Petitioner did not rely on any examples other than 1 and 2 in its Petition, and it is too late to do so now. Consolidated Trial Practice Guide (Nov. 2019); *Ariosa Diagnostics v. Verinata Health, Inc.*, 805 F.3d 1359, 1367-68 (Fed. Cir. 2015). Second, the examples in Murakami that use more polymer than Examples 1 and 2 do not and cannot satisfy the claims because they do not use inorganic particles *at all*. Ex. 1005 ¶¶[0172] (Example 3), ¶[0201] (Example 6), ¶[0206] (Comparative Example 1). Murakami’s remaining examples use the same low percentage of binder as set forth in Example 1, and thus fail to satisfy the claimed “pores formed by the binder” for the same reasons as Examples 1 and 2. Ex. 1005 ¶¶[0140]-[0141], [0161], [0185], [0196] (Examples 1-5). Worse still, Petitioner has not provided any motivation to combine the examples that don’t use inorganic particles (Examples 3, 6) with the examples that do use inorganic particles (Examples 1, 2, 4, 5). If anything, Petitioner’s expert has argued that a

POSITA would **not** have looked to Examples 3 and 6, including their amounts of polymer, because they would have chosen Examples 1 and/or 2 instead. Paper 2, 21; Ex. 1003 ¶¶80, 100.

Further, Petitioner’s **new** reliance on what it claims are “embodiments” in Murakami that allegedly use “up to 62%” binder is wrong. Paper 29, 9, 24 (citing Ex. 1036 ¶¶31-33, 103; Ex. 1005 ¶[0069]). There are no specific “embodiments” that teach a POSITA to use up to 62% binder in Murakami. This argument is based entirely on new expert testimony that cites generic statements in Murakami that are not tied to any specific embodiments, makes assumptions about densities and what is a “common binder material,” and extrapolates *ad nauseum* to arrive at manufactured “embodiments” of what Petitioner claims include up to 62% binder. *See, e.g.*, Ex. 1036 ¶¶31-36, 103.

This argument should be rejected as a new theory not raised in the Petition. *Ariosa Diagnostics*, 805 F.3d 1367. Petitioner cannot now offer new interpretations of Murakami’s general disclosure to support an argument that directly conflicts with what it argued in the Petition. *Contrast* Paper 2, 21 (arguing that the “superior performance” of Examples 1 and 2, which have 97% inorganic particles by weight (93% by volume), “would have enticed a POSITA to, with a reasonable expectation of success, implement these working Examples rather than attempt to prepare a laminated body having other features”) *with* Paper 29, 9 (suggesting instead that a

POSITA would have used other examples in Murakami that allegedly “include as high as 62% binder by volume”).

But even if the Board considers the 1-99% general disclosure in Murakami on its own, such general disclosure is insufficient to establish obviousness on the merits. The claims do not require a specific amount of binder, and so this is not a case of whether this broad range (1-99%) discloses a claimed value or range of binder. Rather, Petitioner argues that, because a POSITA *could* use any amount of binder (1-99%) it *would* use higher amounts that *could* lead to the claimed structural requirements. This fails on multiple counts.

First, providing such a broad range is not an “embodiment,” but rather an invitation for endless undue experimentation. A generic statement about a broad genus (porous layers containing 1-99% binder) is insufficient to meet Petitioner’s burden to establish obviousness of the claimed subset of species (porous layers having “pores formed by the binder” and “at least compris[ing] a part of the inorganic particles”). See, e.g., *Ariosa Diagnostics*, 805 F.3d 1367; *Eurand, Inc. v. Mylan Pharms., Inc.*, 676 F.3d 1063, 1072 (Fed. Cir. 2012). Second, Petitioner has not provided any motivation for a POSITA to choose experimenting with higher amounts of binder than in Murakami’s examples. Instead, Petitioner has identified two specific examples (Examples 1 and 2), arguing a POSITA would have looked to emulate *instead of* other potential adaptations of Murakami. Third, even if a

POSITA were to choose a higher percentage of binder in the 1-99% range, Petitioner has not established that a POSITA would have also chosen all the other variables necessary to result in the claimed pore structure, which its expert has conceded are unpredictable. Ex. 1038, 204:3-205:20, 96:3-97:3; Ex. 2034 ¶27.

Finally, Petitioner's arguments highlight that Murakami is devoid of any illustrations or images to explain the structure of its porous layers. POSITAs normally rely on SEM images or other illustrations to understand the pore structure of a porous layer. *See, e.g.*, Ex. 1038, 51:14-21; 98:11-99:10. Because Murakami has no SEM images or illustrations, the parties are left to speculate about what the porous layers in Murakami would look like and whether these pore structure requirements would be met. Petitioner's speculation that the pores in Murakami *could* be formed by the binder and *could* include at least a part of the inorganic particles is insufficient to meet its burden. *In re Giannelli*, 739 F.3d 1375, 1380 (Fed. Cir. 2014); *Eurand*, 676 F.3d 1072.

B. Murakami does not disclose the claimed Dv10, Dv50, and Dv90 values in its finished porous layer.

It is undisputed that the claims require the Dv10, Dv50, and Dv90 values to be met by the inorganic particles as they exist *in the finished porous layer*. Paper 29, 1 (not disputing this term); Paper 21, 18-20. Petitioner's expert, Dr. Guido, further agrees that Murakami provides the starting sizes for the inorganic particles it uses in

creating porous layers. *See, e.g.*, Ex. 1038, 172:15-173:18; 176:7-10. There is also no dispute that Murakami teaches using a “high-pressure dispersion method.” Ex. 1005 ¶¶[0073], [0141]. Dr. Gido agrees that Examples 1 and 2 of Murakami teach that a dispersion technique on its own is not enough, but instead requires the additional step of *high-pressure* dispersion after the “initial dispersion” step is finished. Ex. 1038, 166:10-18. The dispute is solely whether the starting sizes in Murakami accurately reflect the particle sizes in Murakami’s finished porous layer.

PO has presented ample evidence that this “high-pressure dispersion method,” using the Sugino Star Burst instrument at 100 MPa for 3 passes as explicitly referenced in Murakami, would necessarily alter the particle sizes and distribution of the inorganic particles in the finished porous layer. Paper 21, 26-34. Petitioner disagrees because “a POSITA would understand the single nozzle chamber—designed for dispersion only—would be used,” and “dispersion” allegedly never alters particle size. Paper 29, 14. Neither of Petitioner’s theories are true.

The record shows that using the single nozzle chamber would significantly impact particle sizes and distributions. First, the Sugino website—which Dr. Gido suggested the parties look at (Ex. 1038, 166:21-167:13)—states that “[r]aw materials are *pulverized and dispersed* with a cavitation effect” when using the single nozzle chamber. Ex. 2044, 2 (emphasis added).

Second, Petitioner focuses solely on the word “dispersion” and fails to address that “high-pressure” dispersion at 100 MPa—1,000 times atmospheric pressure—alters particle sizes. *See, e.g.*, Ex. 1038, 143:21-145:13; Ex. 2034 ¶128 (citing, e.g., Exs. 2047, 2048). Dr. Guido admitted that he has “no idea” what effect 100 MPa of pressure would have on particle sizes, even in the context of the single nozzle chamber. Ex. 1038, 155:14-56:20. And he opined that high-pressure dispersion in Murakami was required to break up agglomerated particles. Ex. 1038, 166:21-167:8. The idea that Murakami’s high-pressure process used *just* enough pressure to fully break up agglomerated particles, without *also* altering the particle sizes of any individual particles, is pure speculation and carries little to no weight here, where it runs counter to the Sugino materials (e.g., Exs. 2044, 2029) and a POSITA’s understanding of the term “high-pressure,” as evidenced by at least Exhibits 2047, 2048, Dr. Wheeler’s testimony (e.g., Ex. 2034 ¶128).

Finally, Petitioner’s arguments that the particle sizes must not be altered because Murakami discusses the importance of particle sizes depending “on the particle size distribution in the porous layer” are misplaced. The effects Petitioner cites relate to the interactions of the particles *during* the process of mixing particles in solution to make a porous layer, not the sizes in the finished porous layer. For example, Petitioner points to Murakami’s disclosure that “dispersibility tends to be decreased” if particle sizes are too small, and the “filler is more likely to precipitate”

if the particles are too large. Paper 29, 11-12 (quoting Ex. 1005, [0066]). Dispersibility and precipitation are descriptive of the process of making the porous layer, not the porous layer itself. *Contrast, e.g.,* Ex. 1005 ¶¶[0071]-[0073] *with id.*, ¶¶[0090]-[0099]. Moreover, a prior art reference is relevant for all that it teaches (*In re Fritch*, 972 F.2d 1260, 1264-65 (Fed. Cir. 1992)), and it is undisputed that Murakami teaches applying “high-pressure dispersion” at 100 MPa for 3 passes using the Sugino Star Burst. Ex. 1038, 150:16-19; Ex. 1005 ¶[0141]. A POSITA would have understood that applying this high pressure three times necessarily altered the starting particle sizes and distributions reported in Murakami (*see, e.g.,* Ex. 2034 ¶¶128-140).

IV. GROUNDS 4-6: OBVIOUSNESS GROUNDS BASED ON MURAKAMI IN FURTHER VIEW OF BEARD²

A. Beard does not disclose and/or render obvious “pores at least comprises a part of the inorganic particles” in the same porous layer as “pores formed by the binder.”

Petitioner’s Reply relies on the “unincorporated filler particles” in the Figure 2 embodiment of Beard to argue that its “pores at least comprises a part of the

² PO has addressed the additional failures of the grounds based on Murakami, Beard, and Honda (Ground 5) and Murakami, Beard, and Tanaka (Ground 6) in its POR. Paper 21, 56-57.

inorganic particles” (Paper 29, 20); but at the same time, Petitioner relies on the Figure 1 embodiment, which does **not** have unincorporated filler particles, to argue that Beard teaches “pores formed by the binder” (Paper 2, 49-52). This **new** theory that a POSITA would combine the Figure 1 embodiment with the Figure 2 embodiment is not what Beard teaches. The Board has already found that Beard presents Figure 1 and Figure 2 as **separate** embodiments and that Petitioner did not rely on the Figure 2 embodiment in its Petition. Paper 10, 33-34; *see also* Ex. 1010 ¶[0026]. What’s more, Beard teaches a POSITA to use the Figure 1 embodiment—where the inorganic particles are packed into walls encapsulated by binder and thus the pores do **not** at least comprise a part of the inorganic particles—because that embodiment has superior results. Ex. 2034 ¶¶192-194. Petitioner would have the Board ignore these teachings in Beard; use hindsight bias to blend the Figure 1 embodiment with the Figure 2 embodiment (but not the Figure 3 embodiment (Paper 29, 21)); and create a pore structure not disclosed in Beard without providing any motivation to combine these disparate teachings in Beard. Such an approach is insufficient to meet Petitioner’s burden.

B. A POSITA would not have been motivated to combine Murakami's alleged particle sizes and distributions with Beard's pore structure, nor would they have a reasonable expectation of success in doing so.

Even if Beard did teach a POSITA how to achieve both pore structure requirements, Petitioner has not shown that a POSITA would be motivated to use Murakami's bigger particle sizes and distribution range while still maintaining Beard's structure. Paper 21, 47-55. Petitioner concedes that many key variables must be adjusted to try to make Murakami's particle sizes and distributions work with Beard's pore structure. *See, e.g.*, Paper 29, 22, 23. Dr. Guido admitted that these variables have a complex interrelationship, such that changing any one of them—let alone many of them at once—can have an unpredictable effect on pore structure. Ex. 1038, 204:3-205:20, 96:3-97:3; *see also, e.g.*, Ex. 2034 ¶27. Neither the Petition nor the Reply address this complexity and the need for excessive experimentation to combine Beard with Murakami, and neither can explain why a POSITA would have had a motivation to combine and a reasonable expectation of success in the face of such uncertainty. *See, e.g., Cephalon, Inc. v. Watson Labs., Inc.*, 939 F. Supp. 2d 456, 501 (D. Del. 2013).

Petitioner argues that “Murakami discloses 1%-99% binder by volume, encompassing Beard's range” (Paper 29, 22), but insisted that a POSITA would have been motivated to choose the percentages of binder used in Examples 1 and 2 of

Murakami (3% by weight, 7% by volume) instead of the higher percentages used in other examples of Murakami. Paper 2, 21; Ex. 1003 ¶¶80, 100. The Petition never explained why a POSITA would have been motivated to use a higher percentage of binder in the broad 1-99% range or alter the amount of binder used Examples 1 and 2. Nor did Petitioner present any evidence that a POSITA would have had a reasonable expectation of success in using that higher percentage of binder with the particle sizes and distributions disclosed in Murakami, all while attaining the pore structure of Beard. Merely providing a broad range of practically every option in an unpredictable field is insufficient to support motivation to combine and/or reasonable expectation of success. *See, e.g., Eurand*, 676 F.3d 1072; *Ariosa Diagnostics*, 805 F.3d 1367; *Cephalon*, 939 F. Supp. 2d 501.

Petitioner tries to save its combination by arguing that “[i]ncreasing pore wall thickness accommodates larger particles while preserving Beard’s pore structure.” Paper 29, 22. Petitioner did not make this argument in the Petition and presents no supporting evidence in the Reply other than its expert’s conclusory say-so. *Id.* (citing Ex. 1036 ¶96). A POSITA would not have been motivated to “increase wall thickness” because Beard teaches a POSITA *not* to. Ex. 1010 ¶[0021]; Ex. 1038, 190:2-5; Ex. 2034 ¶¶205-206, 216, 220. And, even if a POSITA were to increase wall thickness enough to both accommodate Murakami’s particle sizes and retain Beard’s pore structure of encapsulating the inorganic particles in binder walls, doing

so would bring the wall thicknesses outside the thin wall measurements required by the dependent claims. *Contrast* Ex. 1001, Claim 3 *with, e.g.,* Ex. 1005 ¶[0140].

Finally, Petitioner speculates that a POSITA could reasonably expect to increase wall thicknesses enough to capture Murakami's larger particle sizes without affecting Beard's pore structure and/or extending beyond the claimed thicknesses. Paper 29, 24. This is unsupported conjecture, and it's telling that Petitioner's only support for this argument is that *the '148 Patent* claims that "pore walls no thicker than 0.5µm can capture 10µm particles." Paper 29, 24 (citing Claims 1, 3). Petitioner thus relies on "the challenged patent as a roadmap to reconstruct the claimed invention using disparate elements from the prior art—i.e., the impermissible *ex post* reasoning and hindsight bias that *KSR* warned against." *TQ Delta, LLC v. Cisco Sys.*, 942 F.3d 1352, 1361-63 (Fed. Cir. 2019).

V. GROUNDS 7-8: OBVIOUSNESS GROUNDS BASED ON BEARD IN FURTHER VIEW OF AKIIKE³

A. Akiike does not disclose or render obvious the claimed Dv10, Dv50, or Dv90 Values.

Petitioner relies on (1) Akiike's examples and/or (2) Akiike's general disclosure to meet this limitation. But as explained in the POR, the particle sizes in

³ PO has addressed the additional failures of the ground based on Akiike, Beard, and Tanaka (Ground 8) in its POR. Paper 21, 65-66.

Akiike's examples are the sizes of *all* the particles in the example slurries, not just inorganic particles; and the particle sizes in Akiike's general disclosure apply to "non-conductive particles," which includes organic particles and inorganic particles. Paper 21, 57-60. A POSITA would not have understood the reported particle sizes in Akiike's examples or its general disclosure to accurately reflect the particle sizes of just *inorganic particles*. The fact that Akiike does not disclose and/or render obvious the claimed Dv10, Dv50, and Dv90 values has already been confirmed by the Patent Office in an EPR of similar claims (claims 1, 17 of U.S. Pat. No. 10,964,987). Ex. 2055, 2-5.

Petitioner argues PO ignores the general disclosure in Akiike: "particle size distribution of the non-conductive particles . . . are as follows: D10 is 0.2μm to 0.4μm; D50 is 0.5μm to 0.9μm; and D90 is 1.0μm to 3.0μm." Paper 29, 25 (quoting Ex. 1011 ¶¶[0010]-[0013]). Not so. *Petitioner* ignores Akiike's plain disclosure by arguing that the phrase "non-conductive particles" is equivalent to "inorganic particles." To the contrary, when Akiike uses the phrase "non-conductive particles," it is referring to "any of inorganic particles *and organic particles*." Ex. 1011 ¶[0038] (emphasis added). Thus, the broad ranges for particle sizes in Akiike's general disclosure do not necessarily reflect the particle sizes of inorganic particles but rather include organic particle sizes, too.

A POSITA would have looked to the examples in Akiike to determine the particle sizes for the inorganic particles on their own. But, as explained in PO's Response and affirmed by the Patent Office in EPR No. 90/019,470, the reported particle sizes in Akiike's examples reflect the sizes of *all* the particles present in the example slurries, which includes at least particulate polymer particles as well. Paper 21, 57-60; Ex. 2055, 3-5. Thus, a POSITA could not rely on those reported values as the Dv10, Dv50, and Dv90 values of just the inorganic particles, either.

B. A POSITA would not have been motivated to combine Akiike's alleged particle sizes and distributions with Beard's pore structure, nor would they have a reasonable expectation of success in doing so.

Dr. Guido conceded that Murakami and Akiike have the same type of high-particle loading structure that the '148 Patent claims differentiate from. Ex. 1038, 241:14-242:2. Because of this, Akiike teaches using vastly different variables in creating a porous layer than Beard. Paper 21, 60-65. Even though Petitioner's expert agrees that these types of variables are unpredictable (Ex. 1038, 204:3-205:20, 96:3-97:3; Ex. 2034 ¶27), the Petition did not provide any reason why a POSITA would be motivated to undertake excessive experimentation by trying to fit Akiike's much larger particles and particle distribution into Beard's densely-packed, thin binder walls. Nor did it explain why a POSITA would have had a reasonable expectation of success in doing so.

In its Reply, Petitioner now argues it did not have to explain that a POSITA would have reasonably expected Akiike's particle sizes and distribution to work with Beard's pore structure because the inventors of the '148 Patent were able to achieve their claimed pore structure with their claimed particle sizes and distributions. The fact that Petitioner is forced to rely on what *the '148 Patent* teaches and claims is a textbook example of impermissible hindsight bias. *TQ Delta*, 942 F.3d 1361-63.

Worse still, Petitioner shifts the burden to PO to affirmatively prove that wall thicknesses would need to exceed 500 nm (which it pulled from the dependent claims) to support Akiike's particle sizes and distributions. Paper 29, 27. But it is *Petitioner's* burden to establish both motivation to combine and reasonable expectation of success. *FanDuel, Inc. v. Interactive Games LLC*, 966 F.3d 1334, 1341 (Fed. Cir. 2020). Here, Petitioner has not come close.

VI. CONCLUSION

PO respectfully submits that the Board should find all Challenged Claims to be patentable.

Dated: April 21, 2026

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 sur-reply complies with the type-volume limits of 37 C.F.R. §42.24(b)(1) because it contains 5,561 words, according to the word-processing system used to prepare this response, excluding the parts of this response that are exempted by 37 C.F.R. §42.24(b) (including a table of contents, a table of authorities, a listing of facts which are admitted, a certificate of service or this certificate word count, and appendix of exhibits).

Dated: April 21, 2026

By: /Christopher TL Douglas/
Christopher TL Douglas

CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. §42.6(e), the undersigned hereby certifies that a true and correct copy of the foregoing **PATENT OWNER'S SUR-REPLY** was served in its entirety on April 21, 2026 , via filing through the Patent Trial and Appeal Case Tracking System (P-TACTS), as well as by a delivering copy via electronic mail to the following:

James D. Stein
james.stein@leehayes.com

Kevin Yao
kevin.yao@leehayes.com

Jason D. Eisenberg
jasone-PTAB@sternekessler.com

Steven Philbin
steven.philbin@leehayes.com

Jason A. Fitzsimmons
jfitzsimmons-PTAB@sternekessler.com

Service email
COSMX-PTAB@leehayes.com

Service email
PTAB@sternekessler.com

Dated: April 21, 2026

By: /Christopher TL Douglas/
Christopher TL Douglas