

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG DISPLAY CO., LTD.
Petitioner,

v.

PICTIVA DISPLAYS INTERNATIONAL LTD.,
Patent Owner.

Case No. IPR2024-01094
Patent No. 8,558,223

PATENT OWNER SUR-REPLY

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EXHIBIT LIST

Exhibit No.	Document Description
EX2001	Declaration of Professor Kirk Schanze
EX2002	K. Walzer et al., <i>Highly Efficient Organic Devices Based on Electrically Doped Transport Layers</i> , 107 Chem. Rev. 1233-71 (2007)
EX2003	Böjn Lüssem et al. <i>Doped Organic Transistors</i> , 116 Chem. Rev. 13714-51 (2016)
EX2004	F. Albert Cotton et al., <i>Multiple Bonds between Metal Atoms</i> , 3d ed., Spring Science and Business Media, Inc. (2005)
EX2005	Dan Wang et al., <i>Highly efficient green organic light-emitting diodes from single exciplex emission</i> , 92 App. Phys. Lett. 053304 (2008), downloaded from https://www.researchgate.net/publication/257949210_Highly_efficient_green_organic_light-emitting_diodes_from_single_exciplex_emission/download?tp=eyJjb250ZXh0Ijp7ImZpcnN0UGFnZSI6Ii9kaXJlY3QiLCJwYWdlIjoieX2RpcmVjdCJ9fQ
EX2006	Q. Xin et al., <i>Emission mechanism in organic light-emitting devices comprising a europium complex as emitter and an electron transporting material as host</i> , 101 J. App. Phys 044512 (2007)
EX2007	Hsian-Fan Chen et al., <i>1,3,5-Triazine derivatives as new electron transport-type host materials for highly efficient green phosphorescent OLEDs</i> , 19 J. Mater. Chem. 8112-8118 (2009), downloaded from https://www.researchgate.net/publication/228923869_1_3_5-Triazine_derivatives_as_new_electron_transport-type_host_materials_for_highly_efficient_green_phosphorescent_OLEDs
EX2008	F. Albert Cotton et al., <i>Synthesis and reactivity of a very strong reducing agent containing a quadruple bond: structures of $W_2(hpp)_4$ and $W_2(hpp)_4Cl_2 \cdot 4CH_2Cl_2$</i> , 6 Inorganic Chemistry Communications 121-126 (2003)

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EX2009	F. Albert Cotton et al., <i>Closed Shell Molecules That Ionize More Readily Than Cesium</i> , 298 Science 1971-1974 (2002)
EX2010	Sebastian Scholz et al., <i>Self-doping and partial oxidation of metal-on-organic interfaces for organic semiconductor devices studied by chemical analysis techniques</i> , 104 J. App. Phys. 104502 (2008), downloaded from https://www.researchgate.net/publication/52002446_Self-doping_and_partial_oxidation_of_metal-on-organic_interfaces_for_organic_semiconductor_devices_studied_by_chemical_analysis_techniques
EX2011	Huan Wang et al., <i>Photophysical and Electronic Properties of Five PCBM-like C₆₀ Derivatives: Spectral and Quantum Chemical View</i> , 116 J. Phys. Chem. 255-62 (2012), downloaded from https://www.researchgate.net/publication/51842031_Photophysical_and_Electronic_Properties_of_Five_PCBM-like_C-60_Derivatives_Spectral_and_Quantum_Chemical_View
EX2012	Koopman's Theorem, downloaded from https://chem.libretexts.org/@go/page/64945
EX2013	M. Amati et al., <i>The Electron Affinity as the Highest Occupied Anion Orbital Energy with a Sufficiently Accurate Approximation of the Exact Kohn-Sham Potential</i> , 16 J. Chem. Theory Comput. 443-52 (2020), available from https://pubs.acs.org/doi/10.1021/acs.jctc.9b00981 .
EX2014	Shigeki Naka et al., <i>High electron mobility in bahophenanthroline</i> , 76 Appl. Phys. Lett. 197-199 (2000)
EX2015	Torben Menke, <i>Molecular Doping of Organic Semiconductors: A Conductivity and Seebeck Study</i> , Dissertation, Technische Universität Dresden (2013)
EX2016	Max L. Tietze et al., <i>Self-passivation of molecular n-type doping during air exposure using a highly efficient air-instable dopant</i> , 210 Physica Status Solidi 2188-2198 (2013), abstract only, available from https://onlinelibrary.wiley.com/doi/10.1002/pssa.201330049

Exhibit No.	Document Description
EX2017	Charles A. Crawford et al., <i>Reaction of 2,2'-Bipyridine (bpy) with Dirhodium Carboxylates: Mono-bpy Products with Variable Chelate Binding Modes and Insights into the Reaction Mechanism</i> , 32 Inorg. Chem. 3125-3133 (1993)
EX2018	Charles A. Crawford et al., <i>Reaction of Nitrogen Chelates with the $[Rh_2]^{4+}$ Core: Bis-Chelate Products and Demonstration of Reversible, Chelate-Based Reduction Process</i> , 36 Inorg. Chem., 2361-2371 (1997)
EX2019	C. W. Law et al., <i>Effective organic-based connection unit for stacked organic light-emitting devices</i> , 89 Appl. Phys. Lett. 133511 (2006), abstract only
EX2020	Dong-Seok Leem et al., <i>Rubidium-Carbonate-Doped 4,7-Diphenyl-1,10-phenanthroline Electron Transporting Layer for High-Efficiency p-i-n Organic Light Emitting Diodes</i> , 12(1) Electrochem. & Solid-State Lett. J8-J10 (2009), available from https://www.semanticscholar.org/paper/Rubidium-Carbonate-Doped-Electron-Transporting-for-Leem-Kim/5f64df92acfbbaa00c68c05bdd74f6ebbecb78fa
EX2021	Yongzhen Chen et al., <i>n-Doping-induced efficient electron-injection for high efficiency inverted organic light-emitting diodes based on thermally activated delayed fluorescence emitter</i> , 5 J. Mater. Chem. C. 8400-8407 (2017), abstract only, available from https://pubs.rsc.org/en/content/articlelanding/2017/tc/c7tc02406a
EX2022	printout of https://www.sciencedirect.com/science/article/abs/pii/S0379677908001653 (Ma reference)
EX2023	Scopus Preview for references citing the Ma reference, available from https://www.scopus.com/results/citedbyresults.uri?sort=plf-f&cite=2-s2.0-57649228487&src=s&imp=t&sid=d32d5ac36b34f63475a939d79b8ad832&sot=cite&sdt=a&sl=0&origin=inward&editS aveSearch=&txGid=504fad81394a3927a1e740526430fa60

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EX2024	screen shot of Web of Science Record of Ma
EX2025	Printout of https://web.archive.org/web/20250000000000*/www.elsevier.com/locate/synmet (last visited May 3, 2025)
EX2026	Certified Translation of DE 10 2008 049 286.8
EX2027	Certified Translation of DE 10 2008 056 391.9
EX2028	Shinji Toyota et al., <i>Synthesis, Spectroscopic Properties, and Cu(I) Complexes of All Possible Symmetric Bi-1,10-Phenanthroline</i> , 65(3) <i>Heterocycles</i> 551-562 (2005), available from http://triggered.edina.clockss.org/ServeContent?url=http%3A%2F%2Fwww.heterocycles.jp%2Fclockss%2Fdownloads%2FPDF%2F01540%2F65%2F3]
EX2029	Tracy J. Terry & T. Daniel P. Stack, <i>Covalent Heterogenization of a Discrete Mn(II) Bis-Phen Complex by a Metal-Template/Metal-Exchange Method: An Epoxidation Catalyst with Enhanced Reactivity</i> , 130(14) <i>J. Am. Chem. Soc.</i> (2008), abstract only, downloaded from https://pubs.acs.org/doi/10.1021/ja0742030
EX2030	Mudasir et al., <i>DNA Binding of Iron(II)-Phenanthroline Complexes: Effect of Methyl Substitution on Thermodynamic Parameters</i> , 77(3-4) 63b <i>Z. Naturforsch.</i> 37-46 (2008), downloaded from http://www.znaturforsch.com/ab/v63b/63b0037.pdf
EX2031	Mudasir et al., <i>Iron(II) and nickel(II) mixed-ligand complexes containing 1,10-phenanthroline and 4,7-diphenyl-1,10-phenanthroline</i> , 24 <i>Transition Met. Chem.</i> 210-217 (1999)
EX2032	Johannes Karges et al., <i>Rationally Designed Long-Wavelength Absorbing Ru(II) Polypyridyl Complexes as Photosensitizers for Photodynamic Therapy</i> , 142(14) <i>J. Am. Chem. Soc.</i> 6578-6587 (2020), downloaded from https://insu.hal.science/insu-02892038v1
EX2033	Federal Court Management Statistics for U.S. District Courts,

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	available from https://www.uscourts.gov/statistics/table/na/federal-courtmanagement-statistics/2024/06/30-1
EX2034	Samsung Invalidity Contentions in <i>Pictiva Displays Int'l Ltd. v. Samsung Electronics Co. Ltd., et al.</i> , Case No. 2:23-cv-000495 (E.D. Tex. Jun. 11, 2024)
EX2035	Amira K. Hajri et al., <i>Synthesis and photophysical properties of new reactive fluorophenanthrenes</i> , 23(4-5) Comptes Rendus Chimie 315-327 (2020), downloaded from https://comptes-rendus.academie-sciences.fr/chimie/articles/10.5802/crchim.29/
EX2036	R. J. Holmes et al., <i>Efficient, deep-blue organic electrophosphorescence by guest charge trapping</i> , 83 Appl. Phys. Lett. 3818-3820 (2003)
EX2037	Yu-Xiao Lin et al., <i>Connecting the irreversible capacity loss in Li-ion batteries with the electronic insulating properties of solid electrolyte interphase (SEI) components</i> , 309 J. Power Source 221-230 (2016)
EX2038	Paul A. Anderson, <i>the Work Function of Lithium</i> , 75 Phys. Rev. 1205 (1949), abstract only
EX2039	2024-12-09 Email from Samsung to Pictiva re “IPR2024-01095 –Stipulation”
EX2040	Deposition Transcript of Dr. Schubert with Ex. 1 of the deposition (Schubert Declaration)
EX2041	Declaration of Professor Kirk Schanze
EX2042	Deposition Transcript of Dr. Barry Rand
EX2043	U.S. Patent No. 7,911,129 assigned to Novaled AG
EX2044	U.S. Patent No. 7,972,541 assigned to Novaled AG
EX2045	U.S. Patent No. 7,704,554
EX2046	M. T. Rodgers et al., <i>Cationic Noncovalent Interactions: Energetics and Periodic Trends</i> , 116 Chem. Review 5642-5687 (2016)
EX2047	T. Sasaki et al., <i>Effects of Energy-Level Alignment on Operating Voltages of Blue Organic Light-Emitting Diodes</i> , Adv. Mater. Interfaces 2023, 10, 2201925

Exhibit No.	Document Description
EX2048	T. Sasaki et al., <i>Effects of Energy-Level Alignment on Operating Voltages of Blue Organic Light-Emitting Diodes</i> , Supporting Information for Adv. Mater. Interfaces 2023, 10, 2201925, available at DOI: 10.1002/admi.202201925
EX2049	Felipe A. Angel et al., <i>Silver-induced activation of 8-hydroxyquinolinato lithium as electron injection material in single-stack and tandem OLED devices</i> , Organic Electronics 59, 220-223 (2018)
EX2050	Min Seok Ki et al., <i>Improved Thermal Stability and Operational Lifetime of Blue Fluorescent Organic Light-Emitting Diodes by Using a Mixed-Electron Transporting Layer</i> , ACS Materials Lett. 4, 1676–1683 (2022)
EX2051	Kymissis Opening Report (Excerpt)
EX2052	Kymissis Rebuttal Report (Excerpt)
EX2053	Redacted Responsive Claim Construction Brief by Samsung
EX2054	Declaration of Dr. E. Fred Schubert in <i>Pictiva Displays International Ltd. v. Samsung Electronics Co., Ltd.</i> , 2:23-cv-495-JRG (E.D. Tex., Nov. 12, 2024)
EX2055	District Court Claim Construction Order
EX2056	2025-08-26 Rand Deposition Transcript with attached exhibits
EX2057	2025-09-03 Holmes Deposition Transcript
EX2058	Resubmitted EX1021 with missing exhibits
EX2059	2025-09-03 Munford Deposition Transcript
EX2100	Jun Yeob Lee, <i>Efficient electron injection in organic light-emitting diodes using lithium quinolate/Mg:Ag/Al cathodes</i> , Journal of Industrial and Engineering Chemistry 14, 676–678 (2008)
EX2101	C. Schmitz et al., <i>Lithium-Quinolate Complexes as Emitter and Interface Materials in Organic Light-Emitting Diodes</i> , Chem. Mater., 12, 3012-3019 (2000)
EX2102	Exhibit 2102 of Rand deposition

Exhibit No.	Document Description
EX2103	Markman Hearing Transcript in <i>Pictiva Displays International Ltd. v. Samsung Electronics Co., Ltd.</i> , 2:23-cv-495-JRG (E.D. Tex. Feb. 4, 2025)
EX2104	Abderrahim Moumen et al., <i>P-Type Metal Oxide Semiconductor Thin Films: Synthesis and Chemical Sensor Applications</i> , Sensors 2022, 22, 1359
EX2105	Fu, Y. et al., <i>Quantum-Chemical Predictions of Absolute Standard Redox Potentials of Diverse Organic Molecules and Free Radicals in Acetonitrile</i> , J. Am. Chem. Society, 127, 7227-7234 (2005) (referenced as Ex. 11 to EX1021)
EX2106	(under seal) Kymissis Deposition Transcript (referenced as Ex. 13 to EX1021)

I. Improper New Theories, New Evidence and Incorporation by Reference

For the Werner Ground, the Petition relied only on the combination of W₂(hpp)₄ and BPhen or TAZ for independent claims, and on W₂(hpp)₄ and BPhen for dependent claims. *See* Pet. 26-27, 28-29, 30-31, 35-37, 46-48; EX2056_2025-08-26_Rand, 11:10-13:25. The Reply attempts to inject combinations from EX2044. Reply, 10. The Board should not consider these improper new grounds that appeared for the first time in Reply. *See* 35 U.S.C. § 312(a)(3); *Intelligent Bio-Sys., Inc. v. Illumina Cambridge Ltd.*, 821 F.3d 1359, 1369 (Fed. Cir. 2016); Consolidated Trial Practice Guide at 73 (prohibiting “new evidence or argument in reply that ... could have presented earlier, e.g. to make out a *prima facie* case of unpatentability”). Likewise, Petitioner may not pivot away from its original theory of “joint vaporization” and “coordination” (*see* Pet. 26, 36-37, 62-63, POR 4-5, 20-23) to now rely on papers from the German proceeding on different claims or the Ki article by Samsung (EX2050) to “make a meaningfully distinct contention” regarding inherency (*see* Reply, 23-24). *Ariosa Diagnostics v. Verinata Health, Inc.*, 805 F.3d 1359, 1367 (Fed. Cir. 2015).

Additionally, because the Munford Declaration (EX1037) could have been submitted nine months earlier before institution, the Board should also disregard it to deter inappropriate gamesmanship and sandbagging. Specifically, in November 2024, after seeking permission from the Board (EX3002), Petitioner submitted an

alleged “form declaration” (EX1018) by Ms. Garland, a declarant whom Petitioner failed to make available for the required deposition. *See* EX3102. When Patent Owner brought this issue to the Board’s attention in March 2025, Petitioner sought to submit an additional declaration, which the Board indicated would require authorization. *Id.* Instead, Petitioner waited until August 2025 to submit the Munford Declaration with its Reply. Ms. Munford revealed at her deposition that she actually began working on her declaration in November 2024, the same month Petitioner submitted the Garland “form declaration.” EX2059-Munford, 6:17-25. She spent only 6-7 hours preparing the declaration, recalled no “issues that would have delayed [its] creation,” and testified that she simply “was following the schedule preferred by [Petitioner].” *Id.*, 8:13-21. Petitioner offers no reason for withholding Ms. Munford’s declaration until the Reply. Nor does it explain what materials she requested from libraries but excluded from her declaration. *Id.*, 9:15-10:4. The Board should not countenance these tactics by considering the Munford declaration.

The Reply further improperly incorporates pages of Reply Declaration without specifically discussing the contents. *E.g.*, Reply 4 (¶¶5-8), 9 (¶¶20-28), 20 (EX1020, ¶¶38-41, EX1037, ¶¶9-10, 13-26), 21(¶¶46-51), 27 (¶¶55-58). The Board should disregard the incorporated declaration under 37 CFR §42.6(a)(3) and Consolidated Trial Practice Guide.

II. The Werner Ground

A. A POSITA Would Not Have Used $W_2(hpp)_4$ -Doped Bphen Or TAZ to Form a Claimed Electron-Conducting Layer for OLEDs

1. Numerous Unspecified Combinations

Petitioner does not dispute that Werner discloses millions, if not billions, of combinations with no specific reference to a combination of $W_2(hpp)_4$ and BPhen or TAZ. POR 2-3. Petitioner argues instead that BPhen/TAZ and $W_2(hpp)_4$ were expressly disclosed in Werner's respective lists for matrix materials and metal complexes. Reply at 3-4. But Werner never suggested the particular combinations and numerous species were disclosed. For metal complexes, Werner discloses nine preferred metals for the ligands. EX1005, 60:16-61:3. For corresponding ligands, in addition to at least guanidine, cyclopentadienyl, terpyridine, the six examples (EX1005, 13:25, 60:19, 60:27, 39-45), the unsubstituted versions of the 64 classes of ligands that would be known to a POSITA (EX2056_2025-08-26_Rand, 217:18-218:20, -219:24-220:6, 224:21-226:11), Werner also cited dozens of journal articles on the "Synthesis of ligands and their precursors" (see EX1005, 45-52; EX2056_2025-08-26_Rand, 220:7-22, 222:3-12). Dr. Rand acknowledges that in his experience, journal articles disclose species. EX2056_2025-08-26_Rand, 221:11-222:1. Dr. Rand reconfirmed that Werner disclosed at least 1,000 matrix materials. EX2056_2025-08-26_Rand, 148:3-149:5; EX2042, 137:3-18. That gives at least 657,000 $((3+6+64) \times 9 \times 1000)$ combinations. In contrast, *Kennametal* or

Syngenta involved only a few combinations. Nor is this a case where the proposed combinations were expressly disclosed or suggested by EX1005.

Dr. Rand also conceded that without conducting experiments, he could not predict conductivity for doping BPhen with even expressly disclosed species of metal complexes. EX2056_2025-08-26_Rand, 223:3-224:6. Nor could he predict which combinations would have a reasonable expectation of success. EX2042, 147:10-148:4; POR 2. Testing 657,000 combinations would take 65,700 working days (180 years) even if all the metal complexes and organic compounds were available and ten combinations could be tested a day, an unrealistically optimistic assumption. That evidences non-obviousness.

2. No Demonstration That the Combinations Were “Electron-Conducting”

For the $W_2(hpp)_4$ -BPhen combination, the focus of Petitioner’s analysis for the Werner Ground (*see e.g.*, Pet. 23-23, 26-31, 35-37), Werner’s later work (EX2056_2025-08-26_Rand, 14:19-15:7) establishes that it is not electron conducting or suitable for OLEDs,¹ the type of organic electronic device analyzed by Petitioner (*see* Pet. 19, 49):

¹ There is also no evidence that the resulting films would be suitable for other organic electronic devices.

W₂(hpp)₄ Doping Level	Conductivity (S/cm)	Citation
5 mol%	4×10^{-9}	EX2044, 4:1-10, 4:20-26
4 mol%	4×10^{-7}	EX2044, 10:9-17

Dr. Rand could not explain why the two reported values differed by two orders of magnitude, while those for the 1e were the same,² speculating the experiment “was not very reproducible” or “it’s a typo.” EX2056_2025-08-26_Rand, 51:24-53:10. Dr. Rand does not explain which number was more reliable. Nor does he explain why a POSITA would have pursued a combination that even Werner could not reproduce over numerous other possibilities. Nor has he established that even a conductivity of 4×10^{-7} S/cm makes the film “electron conducting.” In fact, instead of examining the value of conductivity, Dr. Rand argues that, because doping increased BPhen film’s conductivity by 40–4000 fold, the resulting film is electron conducting. Reply 7-8; EX1020, ¶11; EX1020 n.4.

That argument directly contradicts EX2044’s characterization of the reported conductivity as “very low” or “too low for use in organic light-emitting diodes” (the subject of the Petition). EX2044, 4:44-46, 10:9-17; Pet. 19, 49. This is consistent with Werner, which describes C60’s conductivity of 10^{-7} S/cm as “a low conductivity.” EX1005, 62 (Example 3). Dr. Schanze confirmed that a POSITA

² EX2044, Table 2, Example 2; EX2056_2025-08-26_Rand, 53:11-54:5.

would not consider the film as electron conducting or be motivated to use the film as an electron-conducting layer in OLED. EX1021, 152:2-154:14.

Petitioner argues that Ma's Liq-doped BPhen allegedly only increased BPhen's conductivity by 2–3 fold; and consequently, W₂(hpp)₄-doped BPhen, with a 40–4000 fold improvement, must be electron conducting and suitable. Reply 9. Petitioner is mistaken. As Dr. Rand acknowledged, EX2044 was measuring a film's bulk conductivity using a lateral structure. EX2056_2025-08-26_Rand, 19:24-21:23. Ma involved a vertical structure that included resistivity through not just doped-BPhen layer, but also other layers and interfaces. *Id.*, 24:20-28:19. Dr. Rand confirmed that, due to the existence of resistivity in non-BPhen parts, the conductivity of the vertical structure might increase by only 2-fold despite orders of magnitude increase in BPhen layer's conductivity. *Id.*, 29:23-34:11. Dr. Holmes, another expert of Petitioner who examined Ma, testified that he could not estimate the conductivity of Ma's Liq-doped BPhen film. EX2057-2025-09-03_Holmes, 226:14-232:9; *contra* EX1020, ¶12 & n.3. Simply put, there is no competent evidence that the conductivity of Ma's doped BPhen film increased by only 2–3 fold.

Notably, Werner himself regarded the conductivity for W₂(hpp)₄-doped BPhen as too low to be suitable for OLEDs. EX2044, 4:20-46, 10:9-17. Even though Dr. Rand (an expert) disagrees with Werner's assessment (EX1020, 9 n.4), a POSITA at the time of the invention would not have ignored express statements by

Werner himself. As such, a POSITA would not have combined $W_2(hpp)_4$ and BPhen for the OLED application as Petitioner proposes. Pet. 19, 49.

3. No Motivation or Reasonable Expectation of Success

The Reply repeatedly cites EX2044 (Reply 7-10), which, as a whole, shows why the proposed combinations are not obvious. Specifically, Werner regarded the doping results with compounds 1a-1e as “surprising[.]” EX2044, 8:44-46. “Surprising” and thus unexpected results indicate not even Werner had expected them to work; and the Petition did not suggest any of these combinations. *Compare* EX2022, Table 2 *with* Pet. 26-27.

EX2044 observes the need to make “the LUMO of the phenanthroline derivate fall[] within a range” so it can be doped by $W_2(hpp)_4$. EX2044, 8:46-52; *see also* 8:19-23 (LUMO of organic compound and HOMO of metal complex should be within 0.5eV of each other); POR 10-13. Yet, EX2044 reported similar LUMO levels for compounds 1a-1e and BPhen, yet orders of magnitude differences in conductivity, ranging from “very low” to “considerably improved” conductivity. EX2044 Tables 1-2, 4:44-46, 9:50-53; EX2056_2025-08-26_Rand, 42:12-44:3 (Dr. Rand could not explain the observed differences in conductivity, arguing that the different molecular weights and thermal properties could all contribute in some unspecified way to the observed differences), 46:25-51:23 (listing factors that could affect electron conductivity without showing those factors were known at the time

of the invention). This supports a conclusion that the field was too unpredictable to have a reasonable expectation of success. *In re Stepan*, 868 F.3d 1342, 1347 (Fed. Cir. 2017) (“to have a reasonable expectation of success, one must be motivated to do more than merely to vary all parameters or try each of numerous possible choices until one possibly arrived at a successful result”).

The Reply argues that Petitioner’s proposed combinations would have a reasonable expectation of success because $W_2(hpp)_4$ had a “solid phase ionization potential” of 2.5 eV, similar to BPhen’s LUMO level obtained by cyclic voltammetry (“CV”).³ EX1020, ¶27; Reply 8-9. The 2.5eV is not the proper ionization potential to use. First, in Werner, the ionization potential of interest is that of “gas phase,” not that of the “solid phase.” See EX1005, 36:20-37:3. Second, Dr. Rand does not rebut Dr. Schanze’s testimony that the 2.5eV value—which allegedly is derived from a Fu paper⁴—is “not reliable” because Fu concerns only “a variety

³ A compound’s LUMO level measured by CV at the time might have large error margins. EX2044, 2:56-58 (LUMO difficult to measure using CV); EX2056_2025-08-26_Rand, 44:12-46:9 (considerable errors if the CV measurements were not completely reversible).

⁴ Petitioner withheld this paper even though it was marked as EX2105/Ex. 11 during Dr. Schanze’s deposition.

of different organic compounds, and organic ions, and free radicals,” and nothing about $W_2(hpp)_4$. EX1021, 149:20-152:1; EX2056_2025-08-26_Rand, 65:8-13 (Dr. Rand did not review the Fu paper). In contrast, experimental data supports the gas phase ionization potential that Dr. Schanze used. EX1021, 149:1-19; EX2004, 770; EX009, 1972, Fig. 2, Table 1.

At any rate, the wide range of conductivity for materials with similar reported LUMO levels underscores the unpredictability of the art: the 0.5eV energy gap may be at most a necessary but insufficient condition. Furthermore, regardless of the actual value for $W_2(hpp)_4$'s ionization potential, (*see* EX1020, ¶¶ 21-23), Werner's own experiments showed that BPhen films doped with $W_2(hpp)_4$ had unsuitably low conductivity. EX2044, 4:20-46, 10:9-17.

And given this unpredictability, TAZ's LUMO level, and the fact that TAZ does not purportedly have “suitable electron-attracting substituents” (EX2044, 8:46-52) as in 1a-1e, a PSOITA also would not have expected $W_2(hpp)_4$ -doped TAZ to yield a suitable electron-conducting layer to try the combination. EX2044, 8:44-53.

4. Improper Reliance on the '223 Patent's Teachings

Petitioner argues that the inventors' work on $W_2(hpp)_4$ -doped BCP (with an allegedly similar structure to BPhen) shows a reasonable expectation of success. Reply, 7-8, 10, 13-14. It is improper for Petitioner to be relying on the '223 patent itself for key limitations since the '223 patent is neither a patent nor a printed

publication that forms the basis of an IPR. *Cf., Qualcomm Inc. v. Apple Inc.*, 2025 WL 1174161, at 7* (Fed. Cir. Apr. 23, 2025) (the basis of an IPR can “only” include “prior art consisting of patents or printed publications”); 7/31/2025 Memorandum (general knowledge may not be used to supply a missing claim limitation). Nor does the '223 patent's description of its invention, unknown to a POSITA, reflect state of the art or general knowledge.

The '223 patent's experimental results on BCP also do not show that $W_2(hpp)_4$ -doped BPhen is inherently or even obviously electron conducting, especially in light of EX2044's express description that $W_2(hpp)_4$ -doped BPhen had “insufficient” and “very low” conductivity. EX2044, 4:20-46; *see also* EX1034, 094506-3 (allegedly 100-fold difference in electron mobility between BPhen and BCP). If, instead, Petitioner's argument is that a POSITA could optimize deposition conditions to make the resulting doped film suitably electron conducting, there is no evidence that a POSITA could do so: Werner certainly could not. The inventors' success with BCP despite Werner's failure with BPhen provides objective evidence of non-obviousness.

5. Doped BPhen's Short Lifetime Is Consistent with $W_2(hpp)_4$'s Destructures of Organic Compounds

Petitioner asserts that $W_2(hpp)_4$ would not destroy organic compounds such as phenanthrolines. Reply 8. But admittedly, the lifetime of devices made with

W₂(hpp)₄-doped Bphen was as little as 5 minutes. EX2056_2025-08-26_Rand, 57:5-59:23; EX1001, 18:18-22 (lifetime defined as 50% of the value of the original brightness); EX2044, 10:48-57 (comparison made regarding “the stability” of the structures). The instability of the resulting devices would not motivate a POSITA to use the combination for OLEDs as Petitioner argues. EX1021, 156:12-157:11; *compare* EX1001, Fig. 8, 18:17-45 *with* EX2044, Fig. 3, (curve 53 of '223 shows a T50 of over 2500 hours, 3–4 orders of magnitude longer than W₂(hpp)₄-BPhen's).

Post-invention studies also showed that W₂(hpp)₄ may be more prone to morphological changes and/or reactions with residual oxygen in vacuum chamber, making it less effective in charge transfer. *See* EX1022, 093304-2. This further supports a finding of no reasonable expectation of success with W₂(hpp)₄-doped BPhen or TAZ at the time of the invention.

6. No Disclosure of Joint Evaporation

Contrary to Petitioner's assertion, Werner did not disclose that “joint vaporization” “can be used for combining any of the disclosed metal complexes and organic compounds” Reply 11. Werner's Example 3 admittedly used sequential deposition and not co-evaporation (which is a broader term than joint vaporization). EX2042, 203:13-19; EX1005, 62:26-34; EX2056_2025-08-26_Rand, 153:24-155:16 (discussing EX2106, 103:12-16). Additionally, Werner discloses polymers as candidate organic materials (EX1005, 53:5-19), but does not suggest evaporating

polymers.

Tellingly, although EX2044 discloses doping phenanthrolines with $W_2(hpp)_4$, Petitioner does not assert that it teaches or suggests joint vaporization. *See also* EX2044, 8:39-40, 8:62-67, 9:18-10:5 (vaporization temperature of organic compounds used as a proxy for thermal stability and not for processing conditions); EX2056_2025-08-26_Rand, 201:13-202:6, 203:19-204:10 (the terms “evaporation” and “sublimation” often used interchangeably). Dr. Rand argued that EX2009, Ref. 16 showed a “gas-phase reaction ... with $W_2(hpp)_4$,” (EX1020, ¶35), but admitted that reference relates to only the metal complexes and “doesn’t specifically describe any charge transfer reaction between a metal complex and an organic compound.” EX2056_2025-08-26_Rand, 115:19-118:25, 121:10-122:2; *see also* discussions for Claim 8. Petitioner has not pointed to any such pre-invention disclosures.

B. Werner Does Not Disclose or Suggest Claim 2

Petitioner does not dispute Dr. Schanze’s explanation for why BPhen would not coordinate to $W_2(hpp)_4$, especially not in the manner suggested in the Petition. POR 18-24; Reply 13-15. Instead, Petitioner again argues that the ’223 patent teaches the limitation. Reply, 13-14. But the ’223 patent is “not a patent or a printed publication” that Petitioner may rely on for supplying missing elements. Indeed, the portion relied on by Petitioner is not even APA, but the description of the inventions unknown to POSITAs.

Moreover, the part relied on by Petitioner states only that certain compounds are “well suited as an organic compound for the electron-conducting layer,” not that they form a coordinated compound with any and all metal complexes. *Id.*, 7:43-45. That coordination “can” provide certain benefits does not mean coordination necessarily happens. *Id.* Indeed, the ’223 patent notes that “electrons of the organic compounds I to XIII *can* also be transferred effectively amongst the organic compounds themselves,” (*id.*, at 7:63-65), which would not involve a coordinated metal complex. *See also* EX2042, 199:14-200:6 (degree and type of interactions depend on processing conditions). At any rate, the inventors’ success with BCP does not mean a POSITA would have been able to do the same, given the failure by Werner himself to obtain suitable doped BPhen films with $W_2(hpp)_4$ (EX2044, 4:19-46, 10:9-17).

Petitioner’s reliance on the German proceeding is misplaced. Reply 13-14. First, Petitioner presents no evidence on the procedural postures and evidentiary burden in the German proceeding. Second, unlike Petitioner, Dr. Schanze knew the process conditions used to make the Liq-doped films and used XPS to verify coordination.

Moreover, Samsung successfully advocated in the district court that the term “coordinate[s]” in claim 2 should be construed as “form[s] a dative bond,” which in turn means “form[s] a chemical bond between two atoms in which a shared pair has

been supplied by one of the two atoms.” EX2055 at 29-30; EX2103, 84:25-88:13. Pictiva believes that “coordinate” “refers to bonding interactions between the organic compound and the central metal atom.” POR, 5. Dr. Rand has not provided analysis under either construction; and Petitioner fails to inform the Board of this inconsistency. POR, 5, 18-24, 62-63; Reply 13-15.

C. Werner Does Not Disclose or Suggest Claim 8

Petitioner does not deny that interactions between BPhen and $W_2(hpp)_4$ differ greatly from those between C_6Me_6 and $Rh_2(O_2CCF_3)_4$ such that the structure illustrated in the Petition would not occur. POR 24-26. Lacking competent evidence, Petitioner again resorts to the '223 patent itself (Reply 15-16), which is both procedurally improper and substantively insufficient as explained above.

D. $W_2(hpp)_4$ -doped Bphen or TAZ Not Suitable for OLEDs (Claim 9)

EX2044 makes clear that $W_2(hpp)_4$ -doped BPhen (or TAZ) is not a suitable electron-conducting layer for OLEDs. *See* EX2044, 10:9-17 (conductivity “too low for use in organic light-emitting diodes”); 4:20-46 (conductivity “insufficient” and “very low”). A POSITA would have no motivation to use the combination in OLEDs given the express disclosure.

Nor is there any competent evidence that TAZ has the matching LUMO to $W_2(hpp)_4$'s HOMO or that the resulting film would be reasonably expected to be suitably electron conducting. *See* Petition, Reply *generally*.

E. Other Claims

For reasons stated in the POR and above, Petitioner has also not demonstrated obviousness for other challenged claims.

III. Ma Does Not Render Claims Obvious.

A. Ma Is Not Prior Art

Petitioner does not dispute that if Ma was not publicly available in August 2008, then it would not qualify as prior art. It also does not dispute that it gained institution with a declaration from a declarant that it knew would unlikely sit for deposition. Now with its Reply, it belatedly submits two additional declarations addressing Ma's prior art status, but ultimately, the totality of the evidence does not establish that Ma was publicly accessible in August 2008.

1. The Unsupported Rand Reply Declaration Is Irrelevant

Dr. Rand bases his declaration primarily on an article published *after 2008* in a *different* journal. He never published in *Synthetic Metals* before the priority date, and there is no indication he served on *Synthetic Metals*' editorial board or acted as a reviewer in the relevant time period. EX1004 (Rand CV); EX2056_2025-08-26_Rand, 184:23-185:6. He also concedes that "Elsevier is a large publishing house with many journals, so [he] can't assert that [he] understand[s] the publishing process in all Elsevier journals either now or then." *Id.*, 185:7-13. Thus, his testimony based on his experience publishing in a different Elsevier journal is

irrelevant. EX1020, ¶¶38-41. Moreover, his Reply Declaration provides no information on how or whether a POSITA interested in the field could locate Ma in the relevant time period. *Id.*

2. The Form Declaration Should Be Disregarded

The Reply does not meaningfully respond to Pictiva’s explanation for why the Garland Declaration fails to establish Ma is prior art. It asserts instead that the Board “agreed” that EX1018 establishes that Ma was published online on August 28, 2008. Reply 18-19. To the contrary, the Board only found the Elsevier form declaration sufficient for purposes of institution, and acknowledge that the issue “may be best suited for resolution on a full and robust trial record, including cross-examination.” Paper 11, at 19.

3. The Munford Declaration Fails to Establish Ma as Prior Art

Ms. Munford’s declaration fails to remedy the deficiencies of Petitioner’s belated attempts to establish Ma (EX1007) as publicly accessible prior to December 2008. Indeed, she has no personal knowledge and offers no direct evidence that Ma was available online in any manner prior to December 2, 2008. For that opinion, she relied on a combination of the unsubstantiated date on the face of the Ma article, the deficient Elsevier “form declaration,” and an archived version of an Elsevier “Articles in Press” webpage from December 2, 2008 (EX1037, Appendix 2). *See* EX2059-Munford, 18:24-19:4, 23:13-22, 28:5-31:17. That December 2, 2008

archived webpage has no bearing on whether Ma was available before the priority date. Ms. Munford nonetheless relies on a “Purchase PDF” link in that archived December 2008 “Articles in Press” webpage to conclude that Ma “was available to the public as of August 29, 2008.” EX1037, ¶ 19. But she admits that she has no personal knowledge of whether that link was available prior to December 2008, or even whether the “Purchase PDF” function was operational at that time. *Id.*, 27:6-28:3, 30:3-19, 32:24-33:19. Indeed, she admits that she has no evidence that Ma was even listed on the “Articles in Press” webpage prior to December 2008. *Id.*, 36:17-24. Nor does she provide any evidence of any individual accessing any version of Ma in August 2008. *Id.*, 61:23-62:1.

Ms. Munford also fails to establish that any version of Ma purportedly available online was substantively the same as EX1007. She relies on a comparison of notations on EX1007 to two articles published *after* August 2008 that note revision dates (*see* EX1037, ¶¶ 15-16), but concedes that she offers no evidence that these types of notations were used prior to November 2008. EX2059-Munford, 20:11-22:24, 23:9-14. She also relies on an “In Press, Corrected Proof” notation on the December 2, 2008 archived “Articles in Press” webpage, but again has no evidence that this notation was provided in connection with Ma before the critical date. *Id.*, 35:1-21. And the majority of the appendices she provided are not specific to Ma. *See* EX1037, Appendices 1, 3-15.

Ms. Munford likewise fails to establish that a POSITA could locate Ma through online searches before the '223 priority date. She provides an archived version of an “Advanced Product Search” webpage from August 2008 (EX1037, Appendix 9), but no specific examples of search results from that time. She includes one example of search results by title from 2025 (EX1037, Appendix 11), but provides no examples of keyword searching from any year. EX2059-Munford, 51:3-5. More importantly, she concedes that she has no direct evidence regarding when Ma was indexed by Elsevier for Internet searching, nor any evidence that Ma or the Synthetic Metals journal was indexed by keyword, *Id.*, 47:19-48:2, 49:6-22. Further, she provides no evidence that Articles in Press (including any version of Ma prior to December 2008) were searchable. *Id.*, 49:24-50:10. Ms. Munford suggested—for the first time at her deposition—that Ma may have been searchable through a different “All Elsevier Sites Search,” which purportedly provided searching “through all online available full texts from Elsevier products.” *Id.*, 51:23-52:18, 58:11-59:5. But she conceded that even her (flawed) interpretation of the evidence only suggested that a PDF version of Ma could be purchased, and that the availability of a PDF document does not imply that the text of that document was searchable on the website. *Id.*, 57:3-19, 59:14-24.

Finally, Ms. Munford provided an archived copy of a Penn State University library webpage from March 2008 indicating that “[t]he system provides access to

the electronic versions of the Elsevier journals that we subscribe to.” (EX1037, Appendix 14). But she admitted that there is no evidence that Penn State subscribed to the Synthetics Metal journal, nor any evidence that Articles in Press would be included in any such subscription. *Id.*, 60:14-61:22.

In sum, Ms. Munford’s declaration does not establish public accessibility of any version of Ma prior to December 2008. Petitioner has not carried its burden to establish that Ma qualifies as prior art.

B. Ma Does Not Render the Challenged Claims Obvious

1. Ma Does Not Disclose Joint Vaporization (All Claims)

Petitioner does not deny that Samsung’s expert in the district court stated unequivocally that he “do[es] not agree that [Ma’s] process constitutes ‘joint vaporization.’” EX2051, ¶¶452-453. At his deposition, the expert confirmed that co-deposition would not necessarily qualify as joint vaporization, testifying “So I have done co-deposition of materials but I’m not certain that that would necessarily qualify as joint vaporization because of the types of systems that I was using.” EX1021, 169:18-170:13 (discussing EX2106, 78:20-25). When asked “If you evaporate something at the same time, is that -- will that result in joint evaporation,” he answered “Not necessarily” with a follow-up that “[i]t really depends on the details of the deposition, the pressure, the reactivity of the two materials, the degree of intermixing.” EX1021, 171:14-172:11 (discussing EX2106, 81:22-82:3); *see also*

173:1-174:2 (Samsung’s expert stated that in the context of the ’223 patent, whether joint vaporization occurs “depends on the pressure, because that determines how much interaction the two materials will have in the vapor phase,” which may “depend[] on the structure of the evaporation sources and whether the plumes are allowed to interact in a way that permits the reaction to occur in the vapor phase”) (EX2106, 82:20-83:17); EX2056_2025-08-26_Rand, 153:24-155:16 (discussing EX2106, 103:12-16) (simultaneous vaporization is a broader term than joint vaporization and is not necessarily joint vaporization); *see also* EX2106, 153:22-154:20 (not enough information to determine whether Ma involved joint vaporization).⁵

Dr. Schanze agreed that whether Ma disclosed joint vaporization depended on the specific configuration of Ma’s evaporator, including the degree that the plumes overlapped. POR, 54-56; EX1021, 174:8-17 (“Ma does not provide sufficient information to define joint vaporization, as it’s been described by Kymissis in his deposition”). Given agreement between Samsung and Pictiva experts, under even a preponderance of evidence standard, Petitioner has not shown that Ma disclosed joint evaporation.

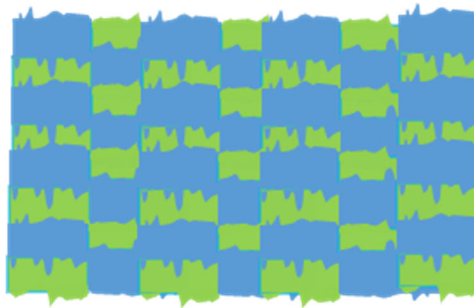
⁵ Petitioner improperly withheld EX2106 even though it was introduced at Dr. Schanze’s deposition, in violation of the duty of candor.

This is different from Dr. Schanze's German declaration where the claims at issue recited "co-evaporation," and not "joint vaporization." EX1032, ¶21. The claims at issue there also exclude BPhen. *Id.*, ¶26 ("unclaimed compound BPhen"). Moreover, Dr. Schanze could conclude joint vaporization had occurred because he knew the processing conditions, evaporator configurations and degrees of intermixing. EX2056_2025-08-26_Rand, 171:22-175:7. Ma did not disclose all that information.

Ki does not suggest otherwise because Ki's processing conditions differed from Ma's and nothing indicates that Ki's evaporators were structured similarly to Ma's. *Compare* EX1007 with EX1031 (10^{-7} torr v. 10^{-5} torr, different deposition rates, no disclosure of the evaporator or evaporation source configuration, or the degree if any of the overlap of the plumes). Thus, Ki—published nearly fifteen years after Ma and used different processing conditions—does not teach or suggest that joint vaporization took place in Ma, especially in light of unequivocal denial by Samsung expert's expert in the district court that Ma disclosed joint evaporation. *See* EX2051, ¶¶452-453.

That Ma maintained a non-zero deposition rate for organic materials is also not determinative, because the reported deposition rate is the total rate for all organic materials, and not the deposition rate for each individual material. EX2056_2025-08-26_Rand, 181:4-10. Thus, that rate does not indicate what the deposition rate is

for each individual material at a given time; indeed, the deposition of Liq and BPhen could occur simultaneously, but just at different portions of the substrate. POR, 54-56. In that regard, Petitioner's evidence regarding the differences in properties for layered structures versus mixed structures is irrelevant because in the specific deposition, each "sub-layer" still has a mixture of Liq and BPhen:



2. Samsung Continues To Argue in The District Court that Liq Has No Central Atom (All Claims)

Petitioner does not deny that in the district court, Samsung argued and continues to argue that Liq has no central metal atom allegedly because (1) "[t]he lithium atom in Liq is not located at the center of the molecule, but rather on an arm on the side," (2) "Lithium does not Enable Liq to Coordinate with Additional Ligands," and (3) "Lithium Does Not Enable Liq to Have a High Disposition and Ability to Provide 'Free' Electrons." EX2052 at 49-57; POR 56-58; Reply 23.

The Acting Director has recently repeatedly exercised her discretion to deny institution when she determined that institution would risk inconsistent outcomes. Here, Samsung is clearly taking inconsistent positions in two different proceedings

that risk inconsistent outcomes. As noted in the POR, “Petitioner should have explained why ... the inconsistent positions are warranted,” *Cambridge Mobile Telematics, Inc. v. Sfara, Inc.* IPR2024-00952, Paper 12 at 8 (P.T.A.B., Dec. 13, 2024). Contrary to Petitioner’s characterization, *Cambridge*’s holding is not limited to 112(6) terms, but reflects the requirement under 37 C.F.R. §42.104(3)-(4).

3. Petitioner Has Not Shown Dependent Claims Are Unpatentable

(a) Claim 2

The Reply continues its mischaracterization of Pictiva’s infringement theory. POR 58-60. It cites, for example, Dr. Schanze’s statement in EX1032, ¶10. Reply, 25. That paragraph and the surrounding text describes “the technical background of electron conduction,” and not about coordination. *Id.*, ¶¶7-10. In the paragraphs that follow, Dr. Schanze focused on specific properties under the main request. *Id.*, ¶¶11-13; p.14 (“On the Teaching of the Patent-in-Suit and the Subject Matter of the Invention *in Accordance with the Main Request and its Interpretation*”). The main request in the German proceeding has additional structural requirements of the organic compounds that excludes BPhen. *See* EX1032, ¶21 (claim elements for main request), ¶26 (“unclaimed compound BPhen”). As such, Petitioner’s reliance on statements in the German proceeding is misplaced and those statements do not support Petitioner’s argument that in Ma, BPhen coordinates to Liq. EX1032, ¶¶26-

29 (contrasting rigid BPhen with claimed relatively flexible compounds).

Moreover, the Reply does not dispute that the Petition provided no evidence that coordination occurred in Ma under either Samsung's district court claim construction or Pictiva's claim interpretation. Reply 23-25; POR 60-63. Nor does it explain why Ma's theory for improved conductivity demonstrated coordination under the proper construction. Reply 23-25.

The Reply argues instead that "Ma and Ki used the same materials and same processing conditions" such that what happened in Ki happened in Ma. Reply 24. This is a new theory that the Board should not consider. Moreover, no matter what "coordination" means in Ki, Ki mentions "coordination complexes when Liq exists alone," not coordination between Liq and BPhen. EX2050, 1678. Petitioner then makes an attorney argument that "some chemical interaction between N atoms (BPhen) and the Li atom (LiQ)" meets the district court's claim construction, but attorney argument is not evidence. Reply 24 n.8. Dr. Rand also does not assert that the term "coordination" is satisfied under Pictiva's interpretation. EX2042, 93:2-6, 94:10-12, 211:22-212:14 (cited on POR 62, which Reply does not dispute).

Furthermore, as explained above, Ma and Ki did not use the same processing conditions and one therefore cannot conclude that what happened in Ki necessarily or even obviously occurred in Ma. *Par Pharm., Inc. v. TWI Pharms., Inc.*, 773 F.3d 1186, 1195 (Fed. Cir. 2014) (the concept of inherency when applied to obviousness

“is present only when the limitation at issue is the ‘natural result’ of the combination of prior art elements”). And unlike Dr. Schanze or Ki, Petitioner did not submit test results from Ma to verify that coordination occurred. Thus, there is a complete failure of proof that Ma produced coordination under either party’s construction.

(b) Claims 8 or 12

The Reply largely fails to address the arguments in the POR. POR 64-67; Reply 25-26. It argues instead “Liq coordinates to BPhen under Pictiva’s infringement theory.” As explained above, Dr. Schanze’s German declaration relates to compounds of distinct structures and has no bearing on complexation between BPhen and Liq. EX1032, ¶¶26-29. In that regard, Petitioner’s footnote 9 is incorrect, as EX1032, ¶11(e) concerns features of the main request that excludes BPhen. EX1032, ¶11 (“According to the main request, the organic compound exhibits six properties,” one of which is discussed in 11(e)), ¶26 (“unclaimed compound BPhen”).

Petitioner also cannot rely on the inventors’ disclosures on its inventions to show obviousness or missing elements. That would be hindsight.

Petitioner also argues that claim 8 does not require “the presence of more than one central atom” Reply 26. But the district court construed “chain-like structure” as “a structure in which at least parts of organic compounds bridge exactly two metal complexes together” in light of the specification. EX2055, 30-31.

Petitioner does not disagree with the district court's construction; nor does it explain how this limitation could be satisfied without two central metal atoms under the construction. There is thus a complete failure of proof.

(c) Claims 10-13

Petitioner's arguments for claims 10-13 largely track those for claims 1, 2, and 8. Thus, these claims are also not unpatenable. Additionally, concerning claim 11 which further requires coordination in the gas phase, there is no evidence that in Ma's co-deposition, Liq and BPhen molecules are "next to each other in the gas phase" as taught in the '223 patent. *Contra* Reply 26; *see* POR 68-69; EX2041, ¶142 (OVP would not promote productive collisions between Liq and BPhen. Thus, *Kubin* is inapplicable.

As to claim 13, Ma and prior art references at most show electron conductivity changes with changing dopant concentrations, but nothing about cross-linking density. Hence, there is no evidence that a POSITA would know the relationship between cross-linking density and electron conductivity at the time of the invention. POR 70; Reply 27.

IV. Conclusion

The challenged claims are not unpatentable.

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Respectfully submitted,

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CERTIFICATE OF WORD COUNT

I hereby certify, pursuant to 37 C.F.R. section 42.24, that the foregoing Patent Owner Sur-Reply contains 5,589 words, excluding the words in the table of contents, table of authorities, exhibit list, this certificate of word count, signature block and certificate of service. The word count is based on the word count of the Microsoft Word program used to prepare the Patent Owner Sur-Reply.

/Hong Zhong/
H. Annita Zhong

CERTIFICATE OF SERVICE

I hereby certify, pursuant to 37 C.F.R. section 42.6, that on September 17, 2025, a complete copy of the foregoing document **PATENT OWNER SUR-REPLY AND EXHIBITS 2056-2059 and 2105-2106** were served by electronic mail, as agreed to by the parties, upon the following:

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