

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

LAM RESEARCH CORP.,

Petitioner

v.

INPRIA CORP.,

Patent Owner.

Case No. IPR2024-00033

U.S. Patent No. 9,823,564

**PATENT OWNER'S REPLY TO
PETITIONER'S OPPOSITION TO THE MOTION TO AMEND**

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Lam's Opposition ("Opp.") takes a kitchen-sink approach, presenting arguments focused on Inpria's amendment but also numerous arguments directed to original claim limitations. Indeed, Lam even presents arguments that could have been, but were not, presented in its original petition. Lam's arguments are deficient and unpersuasive, failing to meet Lam's burden to prove the substitute claims are unpatentable. 37 C.F.R. § 42.121(d)(2).

I. Lam's Section 112 Arguments Are Deficient

A. Lam's Written Description Arguments Fail

Radiation Sensitive Ligands: Lam fails to prove each part of its argument that Inpria's claims are unpatentable because they are purportedly directed to a broad genus, whereas the specification only discloses a single species of the genus. Opp., 3-5. First, Lam fails to support its argument as to the breadth of the claimed genus, baldly arguing "[t]here are practically an infinite number of potential ligands," without Lam or its expert Dr. Holland providing any analysis or supporting evidence. *Id.*, 4 (citing EX1040, ¶146). And Lam's argument ignores the limitation of the potential candidates apparent in its expert's definition that a ligand requires a "functional group that binds to a central atom—typically a metal." EX1040, ¶146.

Second, "there is no categorical rule that a species cannot suffice to claim the genus." *Hynix Semiconductor Inc. v. Rambus Inc.*, 645 F.3d 1336, 1352 (Fed. Cir. 2011). And here, the specification discloses several groups and specific species of

peroxide ligands—not a single species. EX1001, 12:4-33 (describing “inorganic peroxide based ligands,” such as “peroxysulfate,” “peroxydisulfate,” “peroxychlorates,” “or the like or combinations thereof” as well as “organic compositions” or the “chemically simplest ligand...hydrogen peroxide”), 15:33-50.

Third, Lam ignores the specification’s description of the peroxide group’s structure and description of condensation reactions initiated by “break[ing] the oxygen-oxygen bond.” *Id.*, Fig. 1; 3:6-9; 7:57-8:5; 12:13-19 (describing “peroxide group, —O—O—.”). Lam has failed to provide the necessary analysis for a finding of lack of written description and the Board should reject their deficient argument.

Metal Ions and Radiation: Lam’s first argument on this issue hinges on its assertion that the combination of metal ions with certain ligands may affect their radiation sensitivity. Opp., 5-6. But Lam provides no evidence for this speculation, only pointing to its expert’s declaration that parrots the petition, again without citing any evidence. *Id.*, 5 (citing EX1040, ¶149). And Dr. Holland’s testimony in other portions relies on the opposite principle—that a peroxide ligand retains its radiation sensitivity whether attached to hafnium, zirconium, or polytungstate. EX1040, ¶54.

Lam’s second argument, that radiation alters the chemical properties in a coating material, is merely a derivative of its argument regarding radiation sensitive ligands. This argument fails for the same reasons—Lam only provides speculation as to the potential breadth or variability of the genus and gives no rationale (let alone

evidence) as to why the examples in the specification are insufficient to support the original or substitute claims. Opp., 6 (citing EX1040, ¶¶153-154).

B. Lam’s Non-Enablement Arguments Fail

Lam’s enablement arguments are deficient extensions of their written description arguments. Lam merely recites the enablement standard and refers to its analysis “above” regarding written description without any meaningful application of the enablement standard. Opp., 6-8. Lam merely characterizes potential testing as “lengthy” and “arduous” without explaining why such experimentation is *undue* in this particular technological field, let alone any consideration of the *Wands* factors. *Id.*, 8 (citing EX1040, ¶¶159-162).

C. Lam Fails to Prove Indefiniteness of “About 25 nm”

Lam’s argument fails at the outset because it applies the wrong indefiniteness standard and cites only pre-*Nautilus* law. Opp., 8-9. Lam fails to prove that, under the correct standard, the “claims, read in light of the specification delineating the patent, and the prosecution history, fail to inform, with reasonable certainty, those skilled in the art about the scope of the invention.” *Nautilus, Inc. v. Biosig Instruments, Inc.*, 572 U.S. 898, 901 (2014). Here there are significant guideposts in both the specification and the prosecution history that would have allowed a POSA to understand the meaning of “about 25 nm” as it is applied to a coating thickness in the relevant art.

The specification describes how to achieve desired thicknesses based on certain variables, such as “precursor solution concentration, viscosity and the spin speed,” listing many exemplary thicknesses and ranges of thicknesses—including specifically “about 25 nm.” EX1001, 14:43-61, 22:37-38, 23:35-37. The specification also describes those variables affecting thickness in further detail; teachings that Lam ignores. *E.g., id.*, 5:11-22 (discussing concentration of metal ions affecting viscosity), 6:50-54, 13:4-11 (discussing concentrations of species in the precursor solution), 14:24-42 (spin speeds/times); 14:62-15:4 (discussing concentration of solvent affecting viscosity). Additionally, the specification teaches exemplary methods for evaluating thickness using particular techniques such as “x-ray reflectivity and/or ellipsometry.” *Id.*, 14:58-61. This last teaching is significant in light of the prosecution history.

On the same page of the prosecution history that Lam cites to support its indefiniteness argument, Inpria explained a POSA “would interpret ‘about’ in the present context as corresponding to experimental error in the measurements of continuous variable of the present type” and that “the values would be interpreted in view of the accuracy of the measurements,” EX1007, 504. Additionally, Inpria explained that “the term ‘about’ is a well-settled term of approximation,” *id.*, 495, which Dr. Banerjee testified “comports with [his] understanding of ‘about’ also,” EX1033, 131:10-133:13. Lam overlooks all of this and demands a precise numerical

value or definition of “about,” even though (1) none of the prior art arguments turn on how close a disclosed thickness is to “about 25 nm,” and (2) such terms of degree are “ubiquitously used in patent claims” without being indefinite. *Ecolab, Inc. v. Envirochem, Inc.*, 264 F.3d 1358, 1367 (Fed. Cir. 2001); MPEP § 2173.05(b).

D. Lam Fails to Prove Indefiniteness of “Metal Ions”

The specification evidences the patentee’s intent to include elements that can be described as metals and metalloids within the term “metal ions,” consistent with its plain and ordinary meaning. EX1001, 10:65-11:42. And although Lam points to phosphorous and calls it a “non-metal,” Opp., 11; EX1001, 11:35-39, it ignores that phosphorous has been recognized as a metalloid for decades, a fact that Lam conceded at district court (albeit characterizing it as “rare instances”). *Inpria Corp. v. Lam Rsch. Corp.*, Case No. 22-cv-1359-CJB, D.I. 199, pp. 3, 7 (D. Del. Oct. 18, 2024) (joint claim construction brief). The Board should reject Lam’s underdeveloped and unpersuasive argument.

E. Lam’s Arguments That Terms of Degree Are Indefinite Fail

Lam’s argument that “high absorption,” “conventional radiation-based resists,” and “effectively patterned” are indefinite is critically undermined by the fact that its own expert understood each of those terms in attempting to apply the alleged prior art. Opp., 12; EX2011, 130:18-131:15 (effectively pattern); EX2017, 93:7-23 (high absorption), 93:24-94:21, 98:3-12, 101:1-3 (conventional radiation-based resists),

106:25-107:10 (effectively pattern). And Lam’s faulting of Dr. Banerjee for not providing them with a “hard number” at deposition is essentially demanding numerical precision, which is contrary to its own cited precedent. *See Biosig Instruments, Inc. v. Nautilus, Inc.*, 783 F.3d 1374, 1382-84 (Fed. Cir. 2015) (reversing indefiniteness holding of “spaced relationship,” in which district court faulted patent for not defining term “with actual parameters” such as “one inch”). Furthermore, Lam’s arguments should be rejected because they ignore the ample context provided for these terms in the ’564 patent specification. *E.g.*, EX1001, 1:38-2:13, 2:48-3:2, 4:23-26, 5:23-35, 6:36-47, 8:35-38, 8:67-9:4, 9:57-61, 11:21-42, 19:61-20:3, 20:49-53, Figs. 2-18.

F. Lam’s IPXL Mixed-Claim Type Argument Fails

Lam’s reliance on *IPXL Holdings, LLC v. Amazon.com, Inc.*, 430 F.3d 1377, 1384 (Fed. Cir. 2005) is misplaced because Inpria’s substitute claims recite “an apparatus with particular capabilities,” *UltimatePointer, LLC v. Nintendo Co.*, 816 F.3d 816, 828 (Fed. Cir. 2016), and do not “claim activities performed by the user,” *Mastermine Software, Inc. v. Microsoft Corp.*, 874 F.3d 1307, 1316 (Fed. Cir. 2017). Lam’s argument as to the “has been heated” limitation lacks any merit and is beyond the pale, as Lam relies on a self-created change of the actual claim language to “heat[ing]” and ignores that Lam itself called this a “structural feature.” *Compare* Opp., 13, *with* Reply, 10.

II. Lam’s Section 102 and 103 Arguments Are Deficient

A. Stowers 2008 and Trikeriotis Are Not Prior Art

Stowers 2008 was under embargo and was not publicly accessible until at least October of 2009. EX2008, ¶¶4-10; *see also* POR at 25-28; EX2012, 1. Indeed, while Lam tried to demonstrate otherwise, its own witness retracted her testimony and conceded an embargo applied to Stowers 2008. EX2013, ¶8; *see also* Sur-Reply, 8-10. Therefore, because Stowers 2008 is the work of named inventor Jason Stowers, it is not prior art.

As to Trikeriotis, Lam failed to prove EX1024, on which Lam relies, was publicly accessible before the ’867 priority application filing date—August 5, 2010. Lam’s Petition declarant testified EX1024 “was publicly available on or shortly after September 21, 2010,” EX1006, ¶¶62-63, and its Reply declarant testified only that the print version was received at SPIE from the printer on May 3, 2010, but they did not know how much time passed between SPIE receiving the prints and distributing them, EX2018, 30:11-31:15. *See also* POR, 28; Sur-Reply, 18-19.

B. Lam’s Arguments Based on Stowers 2008 Fail

For the thickness limitation, Lam mischaracterizes the 2 to 500 nm range in Stowers 2008 as “dispositive.” Opp., 15. This teaching is completely untethered to the photolithographic patterning and photoresist teachings in Stowers 2008. *Compare* EX1008, 18 (background disclosure that films range “in thickness from 2

to 500 nm”), *with* Pet., 38-39 (relying on EX1008, 68, which is Chapter 3 of Stowers 2008). Under anticipation, Lam’s argument is deficient for mixing and matching embodiments. *See Microsoft Corp. v. Biscotti, Inc.*, 878 F.3d 1052, 1069 (Fed. Cir. 2017). Under obviousness, Lam’s argument is deficient for failing to explain why a POSA would combine the generic background films with the films in other chapters. For example, HafSOx, as a generic term, was designed as a “high-k dielectric” and in that context it was shown it could be deposited in films “ranging in thickness from 2 to 500 nm.” *See* EX1008, 18. Stowers 2008 does not teach the composition of those dielectric films, their precursors, or the process to make them into films (*e.g.*, mixing steps, coating conditions, or baking temperatures or times). *See also* EX1019, Figure 3 (showing distinction between “HafSOx film with peroxide” and “HafSOx film without peroxide”). Lam’s other argument as to pattern collapse fails to provide any motivation for why a POSA would be able to reduce pattern collapse by reducing thickness to about 25 nm.

Lam’s peroxide ratio argument is both confusing and deficient. *Opp.*, 15-16. Lam argues Stowers 2008 “discloses” the claimed ratio (at least 2:1), but then points to a ratio falling below the claimed minimum (0.75:1). *Id.*, 15. Lam then presents a conclusory results-effective variable argument that fails to describe why a POSA would have understood peroxide *ratio* to be a results-effective variable from Stowers 2008’s conclusion that patterning was improved by “changing chemistries to a

peroxide based system.” EX1008, 143. And the only evidence Lam relies on for this obviousness argument is Dr. Holland’s declaration, which is conclusory and tainted by improper hindsight, citing a post-priority publication following “what Stowers [an inventor] later did.” EX1040, ¶137.

C. Lam’s Arguments Based on Trikeriotis Fail

Lam argues the proposed new limitations “Are Taught By Trikeriotis,” Opp., 16, but Lam never even attempts to point to an about 25 nm thickness teaching. For obviousness, Lam accuses Inpria of cherry picking statements out of context, Opp., 16, but then fails to provide any context for why a POSA would have been concerned with pattern collapse for the 30 nm thick films specifically disclosed in Trikeriotis, particularly when Trikeriotis himself suggested they wanted to use “thicker films,” not thinner. EX1024, 21. Instead, Lam cherry picks a generic statement from the introduction describing the general industry trend, Opp., 16, but ignores the expected “commonplace” 40-45 nm thick resists or 30 nm thick resists made to address this trend, *id.*, 15. Lam also ignores the sentence immediately after the one in Trikeriotis that it quotes, which explains why simply going thinner was not a one-size-fits-all solution—thin films affected the etch steps for processes like Trikeriotis’s, *id.*, which might also explain why Trikeriotis’s subsequent “optimization” was to pattern on “thicker films,” *id.*, 21.

D. Lam's Arguments Based on Keszler Fail

Lam argues that the proposed amended claims 13-18 and 20-23 are anticipated by Keszler and the peroxide ratio in dependent claim 19 is obvious over Keszler. Opp., 17-25. The Board should reject Lam's arguments in their entirety because Lam applies a mix-and-match analysis that is inappropriate for anticipation. "[A]nticipation is not proven by multiple, distinct teachings that the artisan might somehow combine to achieve the claimed invention." *Biscotti*, 878 F.3d at 1069.

Keszler is a lengthy disclosure describing several independent embodiments for "solution processed thin films and laminates." EX1038, 3. Where embodiments are related, Keszler includes an explicit reference. *E.g., id.*, 38 (Example 2 listing "solutions made according to Example 1"), 39 (same for Example 3), 42 (Example 5 referring to "the approach described above").

Lam's analysis attempts to cobble together Example 4, regarding "nanolaminate films" with no reference to radiation exposure or photolithography, with Example 7, a photolithography embodiment that uses thicknesses outside of the claimed "about 25 nm." Opp., 17-25. Anticipation does not allow combination of separate embodiments. *Biscotti*, 878 F.3d at 1069.

Lam's analysis also improperly injects out-of-context citations to Keszler's background without explanation how those would have been understood to apply to the Examples 4 and 7 that Lam is relying on for anticipation. For instance, Lam

cites a “new lithographic patterning method.” Opp., 18-19 (citing EX1038, 28:9-12; EX1040, ¶96). But Lam has not explained how this embodiment on page 28 relates to Example 4 on page 40; the page 28 embodiment is discussing “interdiffusion of stacked films” and a “bilayer diffusion.” EX1038, 28:3-9. Dr. Holland confirmed this at deposition. EX2017, 123:16-124:22. Lam does not rely on the “bilayer inorganic lithographic processing” Example 6, EX1038, 43, and does not explain how this embodiment on page 28 applies to the Examples 4 and 7 Lam relies on.

Lam’s arguments fail for additional reasons. For instance, Lam fails to prove Keszler’s Example 4 films are the same as the ’564 patent films, particularly given their facial differences. Opp., 19-20, 22, 24 (citing EX1040, ¶¶97-100). For high EUV absorption, Lam points to a post-dated reference without explaining why the properties of “the current generation of Inpria’s EUV resists” in 2011 would apply equally to Keszler’s films from 2008. Opp., 22 (citing EX1022, 3). Lam also relies on its faulty theory that increased density of a component of a film (*e.g.*, hafnium) necessarily equates to higher EUV absorption of the film. Opp., 22-23 (citing EX1040, ¶¶114-116); *but see* EX2017, 103:24-106:22. For peroxide ratio, Lam relies on the same unexplained results-effective variable and generic “optimize” rationales described above. Opp., 23. For “effectively patterned,” Lam points to a stray teaching that does not disclose the relevant properties of the film being tested (other than it is “HafSOx”), and relies on a teaching that “features have been written

via electron-beam exposure” without explaining why that should qualify as “effectively pattern[ed],” particularly in light of the fact that the teaching is describing Figure 16, which shows *no pattern at all* in the 2 $\mu\text{C}/\text{cm}^2$ portion. *Id.*, 24-25; EX1038, 33, 60 (Fig. 16).

III. The Motion to Amend Meets the Statutory and Regulatory Requirements

Lam argues that claim 19 improperly enlarges the scope of corresponding claim 8 by claiming a different ratio. Opp., 1. Lam’s analysis of the ratios is inapposite—claim 19 is proper because it depends on and thus incorporates all the limitations of claim 13, which is narrower than claim 1. *See* MPEP § 1412.03 (II) (explaining that a dependent claim is not a broadened reissue claim, even if it is broader than the original corresponding dependent claim, where it depends on an independent claim that has not been broadened); *see also Sisvel Int’l S.A. v. Sierra Wireless, Inc.*, 81 F.4th 1231, 1237 (Fed. Cir. 2023) (analogizing the restriction on broadening claims in IPRs with the same restriction in reissues).

IV. CONCLUSION

For the above reasons, Lam’s arguments should be rejected as deficient.

Respectfully submitted,

Dated: December 4, 2024

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CERTIFICATE OF SERVICE

I certify that I caused to be served on the counsel identified below a true and correct copy of the foregoing Patent Owner's Reply to Petitioner's Opposition to the Motion to Amend by electronic means on December 4, 2024:

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