

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 SUR-REPLY

TABLE OF CONTENTS

	Page
I. INPRIA’S ’867 APPLICATION PROVIDES WRITTEN DESCRIPTION SUPPORT FOR THE CLAIMED RANGES.....	2
A. The Specification.....	2
B. The Prosecution History	5
II. LAM’S ANTICIPATION AND OBVIOUSNESS ARGUMENTS BASED ON STOWERS 2008 ARE DEFICIENT	8
A. Stowers 2008 is Not Prior Art.....	8
B. Lam Has Not Proven Stowers 2008’s Films are Identical to the ’564 Patent’s Films.....	10
C. Lam’s Alternative Rationales to Inherency Also Fail.....	13
1. Claim 1 – Radiation Sensitive Ligands.....	13
2. Claim 7 – High Absorption of EUV Radiation Relative to Conventional Radiation Based Resists	14
3. Claim 12 – Effectively Patterned ... at a Dose of No More Than 100 mJ/cm ²	17
III. LAM’S ANTICIPATION AND OBVIOUSNESS ARGUMENTS BASED ON TRIKERIOTIS ARE DEFICIENT	18
A. Trikeriotis is not Prior Art.....	18
B. Lam’s Mapping of the Claim Limitations to Trikeriotis is Deficient	19
1. Claim 1 – Radiation Sensitive Ligands.....	19
2. Claim 7 – High Absorption of EUV Radiation Relative to Conventional Radiation Based Resists	22
3. Claim 12 – Effectively Patterned ... at a Dose of No More Than 100 mJ/cm ²	23
IV. CONCLUSION.....	25

TABLE OF AUTHORITIES

	Page(s)
Cases	
<i>Ariad Pharms., Inc. v. Eli Lilly & Co.</i> , 598 F.3d 1336 (Fed. Cir. 2010)	2, 3, 4
<i>Ariosa Diagnostics v. Verinata Health, Inc.</i> , 805 F.3d 1359 (Fed. Cir. 2015)	18
<i>In re Blaser</i> , 556 F.2d 534 (C.C.P.A. 1977)	7
<i>Bradford Co. v. Conteyor N. Am., Inc.</i> , 603 F.3d 1262 (Fed. Cir. 2010)	6
<i>Intelligent Bio-Sys., Inc. v. Illumina Cambridge Ltd.</i> , 821 F.3d 1359 (Fed. Cir. 2016)	20
<i>Kolmes v. World Fibers Corp.</i> , 107 F.3d 1534 (Fed. Cir. 1997)	8
<i>Nuvo Pharms. (Ir.) Designated Activity Co. v. Dr. Reddy's Lab 'ys</i> , <i>Inc.</i> , 923 F.3d 1368 (Fed. Cir. 2019)	3
<i>PAR Pharm., Inc. v. TWI Pharms., Inc.</i> , 773 F.3d 1186 (Fed. Cir. 2014)	15
<i>RAI Strategic Holdings, Inc. v. Philip Morris Prod. S.A.</i> , 92 F.4th 1085 (Fed. Cir. 2024)	2, 4, 7
<i>Storage Tech. Corp. v. Cisco Sys., Inc.</i> , 329 F.3d 823 (Fed. Cir. 2003)	6
<i>Teva Pharms. USA, Inc. v. Sandoz, Inc.</i> , 789 F.3d 1335 (Fed. Cir. 2015)	5
<i>Trintec Indus., Inc. v. Top-U.S.A. Corp.</i> , 295 F.3d 1292 (Fed. Cir. 2002)	16

<i>In re Wertheim</i> , 541 F.2d 257 (C.C.P.A. 1976)	2, 4, 7
---	---------

Lam’s first ground—anticipation by the publication of the priority application for Inpria’s U.S. Patent No. 9,823,564 (“the ’564 patent”)—fails because the priority specification provides sufficient written description support for the thickness limitations, and thus the publication is not prior art. The specification shows possession of the claimed thickness ranges by describing the variables that affect thickness and providing numerous ranges that encompass and overlap the claimed ranges. Lam argues that the specification does not expressly list both endpoints of the ranges, but express disclosure is not required. Lam also points to statements in the prosecution history but provides no proper basis for tying those statements to the written description inquiry guided by the “four corners of the specification,” or any equitable doctrine.

Lam’s anticipation and obviousness challenges fail at the outset because Lam fails to prove the prior art status of the references on which its Petition relies. Furthermore, Lam’s theories depend on deficient inherency rationales, conclusory obviousness analysis, and impermissibly new theories in its Reply. The Board should reject Lam’s arguments and confirm the patentability of all challenged claims.

I. Inpria’s ’867 Application Provides Written Description Support for the Claimed Ranges

A. The Specification

“[T]he level of detail required to satisfy the written description requirement varies depending on the nature and scope of the claims and on the complexity and predictability of the relevant technology.” *Ariad Pharms., Inc. v. Eli Lilly & Co.*, 598 F.3d 1336, 1351 (Fed. Cir. 2010) (en banc). Specifically, “the maturity of the science or technology, [and] the predictability of the aspect at issue” must be considered. *Id.* (quotation omitted); *see also In re Wertheim*, 541 F.2d 257, 264 (C.C.P.A. 1976) (“We see an important practical distinction between broad generic *chemical compound* inventions ... in which each compound within the genus is a separate embodiment of the invention, and inventions like that at bar, in which the range of solids content is but one of several process parameters.”). Here, a “lower level of detail” is required because the aspect at issue—the thickness limitation—can be predictably varied. *See RAI Strategic Holdings, Inc. v. Philip Morris Prod. S.A.*, 92 F.4th 1085, 1090 (Fed. Cir. 2024) (quotation omitted).

The specification describes numerous ranges, examples, coating techniques, and process variables for thickness that would allow a POSA to recognize the inventors possessed a wide range of thicknesses. EX1004, 11:18-20, 12:20-25, 21:3-7, 22:21-30, 23:1-26, 35:14-15, 36:29-30. The specification also describes how the thickness can be evaluated to confirm a desired thickness. *Id.*, 23:18-22. Lam

argues these teachings go to enablement, implying they are irrelevant for written description. Reply, 3 (citing *Nuvo Pharms. (Ir.) Designated Activity Co. v. Dr. Reddy's Lab'ys, Inc.*, 923 F.3d 1368, 1382 (Fed. Cir. 2019)). But these disclosures directly relate to “the complexity and predictability of the relevant technology.” *Ariad*, 598 F.3d at 1351. And Lam’s reliance on *Nuvo* is misplaced. There, the patentee was relying on disclosure of how to make and use a particular drug product as a surrogate (under inherency) for the claimed therapeutic effectiveness, which was never discussed or explained, and no test data was shown. *Nuvo*, 923 F.3d at 1380-1382. Here, by contrast, thickness is much more predictable than therapeutic efficacy, and it is thoroughly described with several exemplary ranges and actual examples. Indeed, Lam’s own petition asserted both that (1) the claimed range is not critical, Pet., 15 (arguing “[t]here is absolutely no indication in the ’867 application that the inventors gave any importance to these specific claimed thickness ranges when they filed the application”), 39, 49, 51; *see also* EX2017, 32:20-33:1, and (2) thickness is a “result-effective variable,” relying on the alleged “ease with which film thickness can be varied” in its prior art arguments, Pet., 49-51, 60; Reply, 21; EX1002, ¶131; EX1040, ¶132; EX2017, 24:16-26:19.

The specification nowhere indicates that each thickness range is a different invention or embodiment. To the contrary, the specification describes that “thickness of the coating generally can be a function of the precursor solution

concentration, viscosity and the spin speed” and that a “[POSA] will recognize that additional ranges of thicknesses within the explicit ranges above are contemplated and are within the present disclosure.” EX1004, 21:14-26; EX2011, 56:14-57:16. Because the thickness has a functional relationship to the variables described in the specification, the specification’s description of those variables and recitation of several varying ranges of thicknesses provides sufficient disclosure for the claimed ranges.

Lam’s only other rebuttal to the teachings of the specification is that the endpoints are not expressly recited. *See* Reply, 3-6; EX2017, 32:14-33:10 (Lam’s expert confirming her understanding that “the specification itself would need to mention those particular end points for a range to have written description support”). But that is not required. *RAI*, 92 F.4th at 1090 (“The specification need not expressly recite the claimed range to provide written description support.”); *see also Ariad*, 598 F.3d at 1352 (*in haec verba* disclosure not required); *Wertheim*, 541 F.2d at (“argu[ing] lack of literal support ... is not enough”). Neither is proving that ranges *other* than the claimed ranges would have also been supported. *Cf.*, Reply, 3 (faulting Dr. Banerjee for not testifying as to “other ranges”); EX1040, ¶37; EX2017, 33:11-35:9; EX1033, 42:15-43:5.

B. The Prosecution History

Lam fails to fit the prosecution statements on which it relies into the written description analysis rubric. Those statements are not “evidence” that a POSA would have had access to at the time of the filing of the ’867 application. Lam has also failed to present any cognizable legal theories for the “estoppel” it attempts to apply. Pet., 17. After Inpria and the Board explained their understanding of Lam’s legal theory as either prosecution history estoppel or collateral estoppel, Inst. Dec., 12; POR, 19-22, Lam disclaimed reliance on both of those doctrines, Reply, 6. It is clear that Lam wants to broadly invoke general notions of fairness but refuses to comply with the established guardrails for any equitable doctrines.

Lam now argues that its theory is based on “[t]he public notice function,” citing a case regarding indefiniteness. Reply, 6-7 (citing *Teva Pharms. USA, Inc. v. Sandoz, Inc.*, 789 F.3d 1335, 1344 (Fed. Cir. 2015)). But Lam is not asserting the claimed ranges are indefinite. And the particular use of prosecution history in *Teva* is well established—to establish the meaning of the claim terms. *Teva*, 789 F.3d at 1344. Here, Lam does not assert the prosecution history statements modify or shed light on the meaning of the claimed ranges or a POSA’s understanding of those terms.

Struggling to find a legal hook for its argument, Lam also cites a case regarding disclaimer, but provides no analysis or context. *See* Reply, 6 (citing

Bradford Co. v. Conteyor N. Am., Inc., 603 F.3d 1262, 1269-70 (Fed. Cir. 2010)).

And like with its other legal theories, Lam makes no attempt to comply with the requirements for disclaimer, which requires “clear and unambiguous disavowal.” *Storage Tech. Corp. v. Cisco Sys., Inc.*, 329 F.3d 823, 833 (Fed. Cir. 2003). In fact, the *Bradford* case on which Lam relies shows why disclaimer is inapplicable here.

In *Bradford*, the patentee expressly distinguished the purported priority document by arguing its teachings *did not disclose* the claimed feature, but then turned around and argued that the very same document *did disclose* the claimed feature for purposes of written description and priority. *Bradford*, 603 F.3d at 1268-70. The court rejected Bradford’s appellate argument, calling Bradford’s prosecution statements a “compelling disclaimer.” *Id.* at 1269. Here, by contrast, Lam argues that Inpria’s prosecution arguments distinguishing a *different* document (Stowers 2009, not the priority ’867 application) with a *different* range and disclosures than in the priority document should “estop” Inpria from claiming priority.

Lam asserts that “according to the patentees, a ‘30 nm’ thickness is **a different invention** than other thicknesses in the specification.” Reply, 2 (emphasis Lam’s). But Inpria said no such thing. The statement Inpria made was narrow, that the range of 5-30 nm in the claimed invention and the range of “35 nm or greater” in the asserted prior art “do not overlap and they are not close enough that one would

expect them to have the same properties.” EX1007, 508. In other words, the statement was explaining that the claimed invention and the asserted prior art would not have been understood to have the same properties.¹ It should not be construed as a statement that the claimed range “is a different invention than the other thicknesses in the specification,” as Lam asserts. Reply, 2.

The difference is even more stark for claim 6, which does not even extend to 30 nm but instead recites a range “from 5 nm to 25 nm.” EX1001, claim 6. For claim 6, the upper range finds express support in the specification, with only a 4 nm difference at the lower end. EX1001, 14:55 (reciting “about 1 nm to about 25 nm”). This is sufficient written description. *See RAI*, 92 F.4th at 1088-89 (discussing *Wertheim*, 541 F.2d at 263-65 (35%-60% range supported by 25%-60% disclosure); *In re Blaser*, 556 F.2d 534, 536-38 (C.C.P.A. 1977) (80°-200° C range supported by 60°-200° C disclosure); and *Kolmes v. World Fibers Corp.*, 107 F.3d 1534, 1537-39

¹ It also bears noting that Lam’s expert testifies that she “do[es] not believe that there is a meaningful difference between films that are 25 nm, 30 nm or 35 nm thick.” EX1002, ¶67 n.2; *see also* Pet., 39 (“Petitioner is not aware of any evidence in the specification or prosecution history that the claimed range of ‘from 5 nm to 30 nm’ is critical.”), 49, 51.

(Fed. Cir. 1997) (8-12 turns per inch range supported by 4-12 turns per inch disclosure)).

In short, nothing in the prosecution history overrides the strong written description support provided by the '867 application's specification. The '564 patent is entitled to claim priority to the '867 application's filing date.

II. Lam's Anticipation and Obviousness Arguments Based on Stowers 2008 Are Deficient

A. Stowers 2008 is Not Prior Art

Stowers 2008 was not available more than one year before the August 5, 2010 filing date of the priority '867 patent application. Lam's Petition relied on a theory that Stowers 2008 was prior art because, according to Lam, it "published on October 21, 2008." Pet., 19. Lam's basis for this argument was certain library catalog records and MARC records. EX1006, ¶¶44-50. The October 21, 2008 date was based on an "Entered" field in those records. *Id.*

Inpria explained that Stowers 2008 is not prior art because an embargo prevented Stowers 2008 from publishing until at least October 2009. POR, 25-28 (citing EX2008, ¶¶4-8). Inpria also explained that the "Entered" date that Lam relied on was insufficient to show the library made Stowers 2008 publicly accessible on that date, given the embargo. POR, 27-28; EX2012, 1 ("Date Available timestamp ... doesn't necessarily mean it was fully public" because "embargo functionality was handled separately from the approval workflow").

Lam's Reply fails to undermine these facts. Lam newly relies on a declaration from Heather Stewart of ProQuest and an email from an OSU librarian. Reply, 9-10 (citing EX1041; EX1042). For Ms. Stewart, her testimony is now that the full text of Stowers 2008 was loaded into ProQuest's system on December 8, 2009, EX2013, ¶8, which would make Stowers 2008 non-prior art. *See also* EX3007, 2. Although Ms. Stewart's declaration originally stated that the full text was loaded into their system in January 2009, that testimony did not consider the embargo. EX1041, ¶8. After Lam submitted Ms. Stewart's declaration with its Reply, Lam later provided its Reply to ProQuest for review. EX3007, 2. On further review by Ms. Stewart, she changed the public availability date from January 2009 to December 2009, now explicitly referencing the embargo. *Id.*; EX2013, ¶8. As such, Ms. Stewart's revised declaration corroborates Dr. Stowers's testimony that Stowers 2008 was available no earlier than October 2009. And Lam's only attempt to discredit Dr. Stowers's testimony was faulting him for having no receipt from a process he underwent as a student more than 16 years ago. Reply, 9. His sworn testimony is sufficient and is supported by contemporaneous evidence. EX2008, Attachment A.

Lam's OSU librarian statement, that the dissertation was "publicly available on 10-21-2008," is conclusory and fails on the merits. EX1042. It appears that the librarian was relying on a "Date Available" timestamp from the OSU library webpage:

Date Available	2008-10-21T19:29:37+00:00
----------------	---------------------------

EX2012, 2, 5 (listing https://ir.library.oregonstate.edu/concern/graduate_thesis_or_dissertations/rf55zb08z). But the OSU Digital Repository Librarian previously explained that the “Date Available timestamp ... doesn’t necessarily mean it was fully public, just that it had fully completed the approval process.” EX2012, 1. In other words, that date did not account for the embargo process, which “was handled separately.” *Id.*

B. Lam Has Not Proven Stowers 2008’s Films are Identical to the ’564 Patent’s Films

For Lam’s anticipation and obviousness arguments regarding Stowers 2008, Lam relies on inherency, repeatedly pointing to teachings in the ’564 patent itself as disclosing certain claim limitations. *See* POR, 33 (collecting citations). Lam does not contest that it is relying on inherency or dispute the high burden needed to meet inherency. *See* Reply, 17; *see also* Pet. 43-44, 52-54; POR, 32 (reciting legal standard). Lam fails to meet that burden.

First, Lam attempts to force fit an email from Dr. Stowers in 2010 into its faulty inherency theory, Reply, 8, 11, but the email, in fact, supports non-inherency. EX2008, 6. In the email, Dr. Stowers forwarded a link to his dissertation after the embargo had lifted. *Id.* He also stated, “[r]elevant magic sauce recipe is on page 68. Doug had me leave it vague.” *Id.* Andrew Grenville responded “thanks for the

heads up. At least that part is covered by the patent application.” *Id.* Even if one were to assume both that “magic sauce recipe” means a particular chemical formulation and that the “patent application” was a predecessor to the ’564 patent (two unsupported assumptions Lam makes), that magic sauce recipe would have been “covered by the patent application” but not Stowers 2008, whose disclosures “le[ft] it vague.” *Id.* In other words, the films of the ’564 patent would not have been inherent in the “vague” disclosures of the thesis.

Second, Lam fails to prove that the films in Stowers 2008 and in the ’564 patent specification are identical merely because the precursor ingredients are the same. *E.g.*, Pet., 36, Reply, 13. Inpria explained why it is a mistake to ignore the concentrations/proportions of the ingredients as well as their differing processing conditions. POR, 33-34. Lam’s Reply confusingly restructures its entire argument into supposedly “structural” versus “functional properties.” Reply, 10-13. Lam merely applies the label “functional properties” to certain differences between Stowers 2008’s film preparation processes and the ’564 patent specification’s processes, and then argues that those differences do not matter without providing sufficient evidence or rationale. Reply, 11-12. Lam’s belated explanation of the differences should be rejected out of hand as improperly new on Reply, but they also fail on the merits for the reasons below.

For instance, regarding metal concentration, Lam recognizes the difference between 0.5 M hafnium in Stowers 2008 and 0.15 M in the '564 patent yet claims it can disregard this difference because they “both form HafSOx materials.” Reply, 12. Although both solutions form “HafSOx materials,” the relevant question is whether Lam has met its burden to prove those two “HafSOx materials” are “necessarily and inherently” the same. And it is telling that both Lam and Dr. Holland avoid any discussion of the fact that the more dilute metal composition resulted in relatively thinner films (0.15 M led to 10-50 nm with an example at 20 nm), whereas the more concentrated metal composition resulted in relatively thicker films (0.5 M led to 30-35 nm thickness). Lam provides no basis to assume that a more concentrated metal composition would not also impact other properties (such as the film’s reaction to radiation exposure).

Lam then describes the impact of different rest and spinning procedures (“allow more ‘ligand exchange’” and “more time to ‘spread the resist across the wafer’”) but does not explain why those different effects would not impact the film’s properties, other than labelling them “inconsequential.” Reply, 12; *but see* EX2017, 73:8-24 (Lam’s expert opining that “we used to just do one spin” and then “learned later” that adding an initial spin “gives us a better coating”), 70:3-71:9 (regarding ligand exchange confirming it is “important for those ligands to be exchanged onto the hafnium ions”). Lam also accuses Inpria of “cherry-pick[ing]” regarding the

differences in the baking conditions, Reply, 12, but then cherry picks an embodiment of a prebake for a positive-tone pattern, and then a postbake for a different embodiment for a negative-tone pattern, both only for ZircSO_x and both discussed in the “Results and Discussion” section, rather than the “Experimental” section that describes the film creation processes for the entire chapter. EX1008, 69-70; *see* EX2017, 76:5-9, 77:7-78:4 (Lam’s expert opining that the differences in prebake between Stowers 2008 and the ’564 patent “could be” different at the top and bottom ends of the range and she “would have to do a test” but it “sounds like they were different”).

C. Lam’s Alternative Rationales to Inherency Also Fail

1. Claim 1 – Radiation Sensitive Ligands

In Ground 2 of the Petition, Lam presented two theories for why it believed the “radiation sensitive ligands” limitation was met by Stowers 2008. First, Lam argued the films are the same—*i.e.*, inherency based on the totality of the films being the same. Pet., 36-38. This rationale fails for the reasons above. Second, Lam argued an extinction coefficient theory. *Id.*, 35-36. But this alternative is likewise faulty.

In the Petition, Lam argued that Stowers 2008’s disclosure that the “extinction coefficients will be different with the presence of peroxide in the as-deposited material,” EX1008, 69, meant that a “POSA would ... understand that the peroxide

groups in Stowers 2008's precursor solution is a radiation sensitive ligand." Pet., 35. But as Dr. Banerjee explained, "it does not logically, or scientifically, follow that if a mixture (e.g., HafSO_x plus peroxide) is 'expected' to have a different extinction coefficient than the original material (e.g., HafSO_x), that the added material (peroxide) is a 'radiation sensitive ligand.'" EX2009, ¶45; POR, 37-38. Lam's reply to this is to merely repeat its faulty extinction coefficient argument and shift focus to a new argument that peroxide is inherently a radiation sensitive ligand. Reply, 13-14. The Board should reject Lam's new inherency argument, which Lam formulates from citations to new parts of the references that were never mentioned for this limitation in the Petition. *Compare* Reply, 13-14 (newly citing EX1008, 46, 143; EX1010, 21; EX1019, 2), *with* Pet., 34-38.

2. Claim 7 – High Absorption of EUV Radiation Relative to Conventional Radiation Based Resists

Lam nowhere contests that it relies on inherency for this limitation; in fact, Lam embraces inherency to justify its use of post-priority publications for this limitation. Reply, 16-17; *see also* Pet. 43-44, 52-54. Lam's concession means that Lam is stuck with a deficient inherency theory because Lam cannot establish inherency by pointing to a trend between material densities and EUV absorption. Reply, 16-17. A trend merely represents a probability of something, which cannot support a finding of inherency. *PAR Pharm., Inc. v. TWI Pharms., Inc.*, 773 F.3d 1186 (Fed. Cir. 2014). And Dr. Banerjee's testimony stands un rebutted that "it is

not necessarily the case that a higher mass density of a material equates to higher calculated linear absorption coefficient.” EX2009, ¶50.

Lam attempts to rescue its deficient inherency argument by relying on Dr. Banerjee’s assumption during deposition of where HafSO_x might have been on a particular graph if one were to assume a particular density for HafSO_x. EX1033, 179:5-181:6. Just as Lam did at the deposition, Lam’s Reply hastily moves on without explaining the context of Dr. Banerjee’s statements. Reply, 16-17. First and foremost, Dr. Banerjee confirmed he does not know “what the calculated linear absorption coefficient of HafSO_x and ZircSO_x are” or whether they are “higher or lower than the dots on [EX1025, Fig. 3].” EX1033, 187:21-188:11. In other words, he was assuming where they might be based on an assumed density and a trend. That is not a concession of inherency. Furthermore, when responding to Lam’s point-at-the-picture questions, Dr. Banerjee expressly cautioned that “one should not conflate the absorption properties of an inorganic material like HafSO_x with these materials which are all organic.” EX1033, 180:17-20.

Lam’s expert’s Reply declaration does nothing to repair Lam’s faulty theory. EX1040, ¶77. First, Dr. Holland attempted to rehabilitate her reliance on the EX1025 figure by characterizing the points Dr. Banerjee identified with higher density and lower EUV absorption as “outliers.” *Id.* Dr. Holland provided no basis for calling these points “outliers” and admitted at deposition that she had not done

any analysis or statistics to determine whether they were, in fact, outliers. EX2017, 96:8-24. And even if they had been outliers, their mere existence disproves inherency, which “does not embrace probabilities or possibilities.” *Trintec Indus., Inc. v. Top-U.S.A. Corp.*, 295 F.3d 1292, 1297 (Fed. Cir. 2002). Second, Dr. Holland relies on an extreme extrapolation of EX1025’s Figure 3 but provides no persuasive basis for assuming the trend holds at her extrapolated values. EX1040, ¶77. When asked at deposition “how do you know the trend is linear in the upward direction at those higher densities?” Dr. Holland responded, “We just drew it that way.” EX2017, 100:4-11. Then, when asked if she knew whether the trend line is linear at those much higher densities, she admitted she had not “calculated them” or “done experiments on these to get that answer” and she “would have to do experiments to understand them.” *Id.*, 100:12-16.

Finally, Lam’s reliance on post-priority publication data is faulty because, as Inpria explained, “Lam makes no attempt to link ‘the current generation of Inpria’s EUV resists,’ EX1022, 3—i.e., the subject of that 2011 article—to the films described in Stowers 2008.” POR, 44. It is telling that even though Inpria pointed out this deficiency, Lam’s Reply makes no attempt to fix it. Instead, Lam tries to obscure the differences by generalizing the article as being about “Inpria HafSOx resists.” Reply, 17. That cursory explanation is insufficient to apply a teaching from EX1022 as if it were an inherent property of Stowers 2008.

3. Claim 12 – Effectively Patterned ... at a Dose of No More Than 100 mJ/cm²

Apart from its deficient “same films” argument, Lam’s Petition argued obviousness based on a misapplied correlation between electron beam dose and EUV. Pet., 54-56. Lam took a correlation described for a particular HafSOx composition and attempted to apply it to the ZircSOx teachings in Stowers 2008. *Id.* But, as Inpria explained, Lam provided no rationale for why a HafSOx correlation would apply to ZircSOx. POR, 44-47.

Lam’s Reply relies on three new rationales, but each should be rejected. First, Lam argues EX1022 “relates to both HafSOx and ZircSOx,” attempting to blur the lines because the article also uses the term “MSOx.” Reply, 18. This ignores Dr. Holland’s concessions that “[t]his article is referring to hafnium as the photoresist metal.” EX2011, 199:25-203:12; *see also id.*, 190:11-15 (“Q: And to be clear, [EX1022] only recites hafnium; right? It doesn’t have zirconium? A. Correct.”). And it is inconsistent with Lam’s Reply argument on the immediately preceding page characterizing the article as being about “Inpria HafSOx resists.” Reply, 17.

Second, Lam attempts to newly rely on teachings of HafSOx patterning at 60 $\mu\text{C}/\text{cm}^2$ and 300 $\mu\text{C}/\text{cm}^2$. Reply, 18 (citing EX1008, 99-100). This is a new theory that appears nowhere in the Petition (*see* Pet., 47-48, 54-56) and thus should be rejected. *See Ariosa Diagnostics v. Verinata Health, Inc.*, 805 F.3d 1359, 1367 (Fed. Cir. 2015).

Finally, Lam relies on a new, one-sentence argument that the “dose **improves** with zirconium-based formulations.” Reply, 18. This theory should be rejected as both insufficiently explained and new on Reply. Lam’s Petition only relied on Exhibit 1014 for teachings regarding thickness, Pet., 50, not e-beam patterning. It is also telling that Lam’s expert, Dr. Holland, never signed on to this theory, *see* EX1040, ¶¶81-84, even though Lam cites paragraph 83, which does not support Lam’s argument that the dose would be “less” for ZircSOx, Reply, 19.

III. Lam’s Anticipation and Obviousness Arguments Based on Trikeriotis Are Deficient

A. Trikeriotis is not Prior Art

Lam fails to prove EX1024, which appears to be a scan of a physical copy allegedly obtained from the Library of Congress, is prior art, and Lam never once tries to bolster the testimony of its Petition declarant, Dr. Sylvia Hall-Ellis. EX1006, ¶59; *see generally* Reply (never citing EX1006). This is likely because, as Inpria explained, Dr. Hall-Ellis testified that EX1024 “was publicly available on or shortly after September 21, 2010,” when the “cataloging process was completed,” and the other dates she relied on were insufficient, making EX1024 non-prior art. POR, 28-30 (quoting EX1006, ¶¶62-63). Facing this deficiency, Lam’s Reply now relies on a new declarant from SPIE, Mr. Franzen. EX1043. Mr. Franzen’s declaration, however, only states a conclusion that the print version “published on 3 May 2010.” EX1043, ¶9. At deposition, however, Mr. Franzen clarified this “published” date

was merely when the “physical copies arrived at [the SPIE] warehouse” and that he did not know “how much time would have passed between when [SPIE] received these copies from the printer and then when [SPIE] distributed them.” EX2018, 30:11-31:15. To the extent that Lam is attempting to shift its reliance in its reply to a different, online publication of the same article, that shift is improper, and in any event Mr. Franzen’s declaration for that publication is conclusory, only stating it “published on the SPIE Digital Library ... on 25 March 2010,” without providing any records or supporting facts. EX1043, ¶9.

B. Lam’s Mapping of the Claim Limitations to Trikeriotis is Deficient

Realizing that Ground 5 in its Petition did not articulate with sufficient particularity either anticipation or obviousness, Lam’s Reply section discussing Trikeriotis, Reply, 20-27, is nearly double the length of the same section in its Petition, Pet., 58-62. This underscores that Lam is improperly attempting to plug holes in its deficient petition, which is not the proper role for an IPR Reply.

1. Claim 1 – Radiation Sensitive Ligands

Lam’s explanation of the limitation “coating material comprises metal ions with radiation sensitive ligands” is a good example of Lam completely remaking its arguments. It stretches its conclusory, one-paragraph reference to “organic ligands” and “absorption coefficient” in its Petition, Pet. 58-59, into almost four pages in Reply discussing, among other things, a “decarboxylation” theory based on a brand-

new reference, Reply, 22-25 (citing EX1036). Lam's failure to raise this new "decarboxylation" theory and EX1036 in its Petition is prejudicial to Inpria, who cannot respond with its own expert opinion. This theory should be disregarded by the Board. *See Intelligent Bio-Sys., Inc. v. Illumina Cambridge Ltd.*, 821 F.3d 1359, 1369-70 (Fed. Cir. 2016).

Lam's "absorption coefficient" theory fails for the reasons Inpria explained in its POR. POR, 37-38, 51. Lam's cursory rebuttal simply repeats the same argument, Reply, 22, and does nothing to bolster its logically and scientifically flawed theory. Lam also attempts to rely on a vague description of "unique properties" of unidentified "different ligands." *Id.* But Lam fails to explain which ligands it is attempting to map to the claim limitations and how "the *films* [acting] as positive or negative tone photoresists," EX1024, 15, necessarily means the *ligands* are radiation sensitive. The best example of why this is not necessarily the case is the mechanism described in Ober, EX1027, which shows a radiation sensitive "photoactive compound" but not a radiation sensitive *ligand*. POR, 52-55.

Ober shows a photoactive compound, such as DPAP, is the photosensitive part of Trikeriotis's films. As Dr. Banerjee described, those photoactive compounds are "interspersed in the films between the nanoparticles." EX2009, ¶59. In other words, the photoactive compounds are not ligands because they fail to meet even Dr. Holland's definition of "binds to a central atom—typically a metal—in a

coordination complex.” EX1040, ¶146; *see also* EX2011, 126:18-127:7 (describing a ligand as being “on the metal”); *but see id.*, 216:12-218:23 (pointing to DPAP as the “best [she] can do” for “radiation-sensitive ligands,” but admitting Trikeriotis “doesn’t say it’s a ligand”). Lam attempts to twist an admission out of Dr. Banerjee’s deposition testimony, but the transcript does not support their argument that he “admits that the ‘new ligands’ are ligands which are modified by radiation.” Reply, 24 (citing EX1033, 182:19-184:20); EX1033, 183:8-11 (testifying the “blue photoactive compound *byproducts* displace the pink ligand” (emphasis added)).

The photoinitiator (*e.g.*, DPAP) is broken apart, creating a sulfonic acid ligand. *See* EX2017, 86:12-17; *see also id.* 82:15-88:2. It is that ligand (shown in the right-hand side of the blue box in EX1027, 2 (Fig. 2)) that displaces the carboxylic acid ligand (methacrylate).

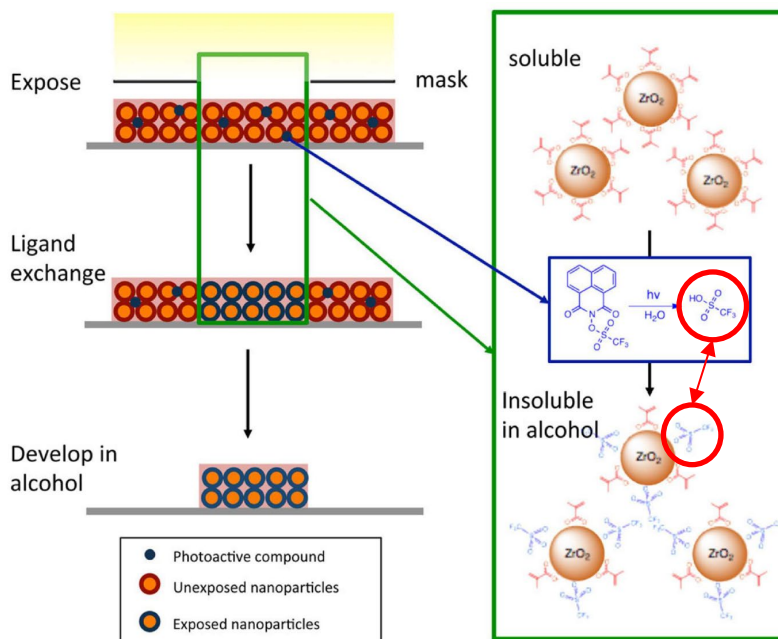


Figure 2. Schematic of the ligand-displacement patterning mechanism for negative-tone pattern formation. hν: Energy. H₂O: Water.

Lam has never attempted to prove that the sulfonic acid portion that breaks off of DPAP (*i.e.*, the “blue ‘new ligands,’” Reply, 24) itself is photosensitive. Instead, Trikeriotis’s mechanism requires a non-ligand (DPAP) that is photosensitive, and which breaks to form a sulfonic acid ligand that displaces the carboxylic acid ligand, methacrylate. EX1027, 2. Thus, Lam’s theory that the “blue ‘new ligands’” could also meet the claim limitation both is improperly new and fails on the merits.

2. Claim 7 – High Absorption of EUV Radiation Relative to Conventional Radiation Based Resists

Lam relies on the same faulty inherency theory that fails for the reasons described above for Stowers 2008. *Supra*, Section II.C.2. Lam also, in this section,

mischaracterizes Inpria's argument as "density does not correlate to EUV absorption." Reply, 25. Inpria's argument, however, is that Lam has failed to prove that higher density *necessarily* correlates to higher EUV absorption, which is what Lam failed to prove in its Petition by relying only on a trend line. POR, 57; *see also id.*, 41-44.

Lam also quotes a new reply exhibit, EX1044, that "[a]bsorption of EUV light in matter depends entirely on the atomic composition and the absorption cross section of elements." Reply, 25-26 (quoting EX1044, 2). This theory should be rejected as improperly new on reply, as well as for conflating EUV absorption for certain elements (the topic of EX1044) and EUV absorption of coating materials (the claimed subject matter). *See* EX2017, 106:17-22 (describing the two figures on EX1040, 40, "Q. ... So in paragraph 79, in those two figures, those are comparing elements, right? A. That's correct. Q. And it could have other things in the photoresists that affect the EUV absorption, right? A. It could be."); EX1044, 2 ("Recent improvements in the synthesis are addressing this [low absorption] issue by tuning the organic ligand, the exposure chemistry, and the optical absorptivity."). Thus, Lam's theory based on atomic composition should be rejected.

3. Claim 12 – Effectively Patterned ... at a Dose of No More Than 100 mJ/cm²

Lam's Reply attempts to rehabilitate its expert's deficient and confusing explanations, providing a new revision of what she meant by D_{0.8}. Reply, 26-27.

This explanation should be rejected as too late, being presented for the first time in Reply, and because Lam's explanation makes no sense. Lam asserts it is "unsurprising that Dr. Holland could not recall the specific meaning of $D_{0.8}$ during her deposition" because she supposedly "adopted" the term from the '564 patent inventors. Reply, 27 & n.4. However, Dr. Holland's second declaration does not say that she adopted the meaning from the inventors of the '564 Patent. *See* EX1040, ¶¶85-87. It is only Lam's attorney argument in the Reply that blames Inpria's inventors for this terminology.

In attempting to describe the meaning of $D_{0.8}$, Lam points to three non-Inpria articles, but fails to explain how those references support Lam's understanding of $D_{0.8}$. Reply, 27 (citing EX1037; EX1046; EX1047); EX1040, ¶86. This failure to explain is exacerbated by the fact that Lam's citations to these references make no sense. *See* EX1037, 43 (a page that does not exist in EX1037); EX1046, 1 (the cover page of the reference), EX1047, 186 (a section regarding "Photocuring").

Lastly, Lam's new explanation should be rejected on the merits because Lam fails to explain why $D_{0.8}$ in a contrast curve (radiation exposure with *no* patterning) signifies "effective patterning" as in claim 12. *See* EX1046, 5 ("The contrast curve describes the remaining resist fraction of a *uniformly illuminated resist* versus the

logarithm of the applied exposure dose.” (emphasis added)); POR, 59.² The cited portions of Dr. Holland’s testimony do not go so far, instead merely explaining her understanding of $D_{0.8}$ that was missing from the Petition and her original declaration. EX1041, ¶¶85-86. Dr. Holland also notes that her original declaration mentioned both “Figures 5 and 6 of Trikeriotis,” *Id.*, ¶85; *see* EX1002, ¶161, but Figure 5 is doses with no patterns, and Figure 6 is patterns with no doses.

IV. CONCLUSION

For the above reasons, Lam cannot meet its burden to prove that any challenged claim lacks written description to the priority application (and thus would be anticipated by the priority application’s publication) or would have been anticipated or obvious. The Board should confirm the patentability of the challenged claims.

Respectfully submitted,

Dated: December 4, 2024

By: /Daniel Zeilberger/
Daniel Zeilberger (Reg. No. 65,349)
Counsel for Patent Owner

² Inpria also explained why Lam’s reliance on Ober was misplaced, POR, 60 n.16, and Lam had no response, *see* Reply, 26-27.

CERTIFICATE OF COMPLIANCE

Pursuant to 37 C.F.R. § 42.24(d), the undersigned certifies that the foregoing Patent Owner's Sur-Reply contains, as measured by the word processing system used to prepare this paper, 5,536 words. This word count does not include the items excluded by 37 C.F.R. § 42.24 as not counting towards the word limit.

Respectfully submitted,

Dated: December 4, 2024

By: /Daniel Zeilberger/
Daniel Zeilberger (Reg. No. 65,349)
Counsel for Patent Owner

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 Sur-Reply by electronic means on December 4, 2024:

Dion M. Bregman (Reg. No. 45,645)
Michael J. Lyons (Reg. No. 37,386)
Ahren C. Hsu-Hoffman (Reg. No. 50,862)
Guylaine Haché (Reg. No. 76,083)
Alison P. Patitucci (Reg. No. 75,370)
Zachary D. Miller (*pro hac vice*)
E-mail: MLB-Lam-IPR-Team@morganlewis.com

Respectfully submitted,

Dated: December 4, 2024

By: /Daniel Zeilberger/
Daniel Zeilberger (Reg. No. 65,349)
Counsel for Patent Owner