

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

LAM RESEARCH CORP.,
Petitioner,

v.

INPRIA CORP.,
Patent Owner.

IPR2024-00033
Patent 9,823,564 B2

PETITIONER'S NOTICE OF APPEAL

In accordance with 35 U.S.C. §§ 141(c), 142 and 37 C.F.R. §§ 90.2 and 90.3(a), Lam Research Corp. (“Petitioner”) hereby appeals to the United States Court of Appeals for the Federal Circuit for review of the Judgment/Final Written Decision of the Patent Trial and Appeal Board (the “Board”), entered on April 18, 2025, (the “Final Decision,” Paper 65, attached hereto as Exhibit A), and from all underlying orders, decisions, rulings, and opinions related to the Final Decision.

For the limited purpose of providing the Director of the United States Patent and Trademark Office with the information required under 37 C.F.R. § 90.2(a)(3)(ii), Petitioner anticipates that the issues on appeal will include, but are not limited to, whether the Board erred in granting Patent Owner’s Motion to Amend to add substitute claims 13-23 to U.S. Patent No. 9,823,564, including by:

1. Finding Patent Owner met the statutory and/or regulatory requirements to amend;
2. Finding the priority date for the substitute claims to be August 5, 2010;
3. Finding the substitute claims have written description support;
4. Finding the substitute claims are enabled;
5. Finding the substitute claims are definite;
6. Finding Stowers 2008 does not qualify as prior art to the substitute claims;

7. Finding the substitute claims are not anticipated, including but not limited to by Stowers 2008, Trikeriotis, and/or Keszler; and
8. Finding the substitute claims are not rendered obvious, including but not limited to by any individual or combination of Stowers 2008, Trikeriotis, Ober, Krysak, and/or Keszler.

In addition, Petitioner also appeals all other issues decided adverse to Petitioner in any orders, decisions, rulings, or opinions.

This Notice of Appeal is timely pursuant to 37 C.F.R. § 90.3, having been duly filed within 63 days after the Final Written Decision.

Contemporaneously with this submission, a copy of the Notice of Appeal is being filed electronically with the Patent Trial and Appeal Board. In addition, a copy of this Notice of Appeal, along with the required docketing fees, is being electronically filed with the Clerk's Office for the United States Court of Appeals for the Federal Circuit.

Dated: June 16, 2025

Respectfully submitted,

/Dion M. Bregman/
Dion M. Bregman (Reg. No. 45,645)
Morgan, Lewis & Bockius LLP
1400 Page Mill Road
Palo Alto, CA 94304
T: +1.650.843.7519
F: +1.650.843.4001
dion.bregman@morganlewis.com

Petitioner's Notice of Appeal
Case IPR2024-00033
U.S. Patent No. 9,823,564 B2

Attorney for Petitioner
Lam Research Corp.

CERTIFICATE OF SERVICE

In accordance with 37 C.F.R. § 90.2(a)(1) and § 104.2, I hereby certify that on June 16, 2025, in addition to being filed electronically through the Board's P-TACTS System, the original version of the foregoing, Petitioner's Notice of Appeal was filed by USPS Priority Mail Express on the Director of the United States Patent and Trademark Office, at the following address:

Office of the Solicitor
United States Patent and Trademark Office
Mail Stop 8,
P.O. Box 1450
Alexandria, Virginia 22313-1450

I hereby certify that on June 16, 2025, a true and correct copy of the foregoing, Petitioner's Notice of Appeal, along with a copy of the Final Written Decision, was filed electronically with the Clerk's Office of the United States Court of Appeals for the Federal Circuit, at the following address:

Clerk of Court
United States Court of Appeals for the Federal Circuit
717 Madison Place, N.W., Room 401
Washington, DC 20439

Pursuant to 37 C.F.R. § 42.6(e), the undersigned certifies that on June 16, 2025, a complete and entire copy of this Petitioner's Notice of Appeal was served by FedEx Priority Overnight Delivery and via email, to the Patent Owner at the following addresses:

Naveen Modi (naveenmodi@paulhastings.com)
Phillip W. Citroën (phillipcitroen@paulhastings.com)
Daniel Zeilberger (danielzeilberger@paulhastings.com)
Michael Wolfe (michaelwolfe@paulhastings.com)
PAUL HASTINGS LLP
2050 M Street NW
Washington, DC 20036

Eric W. Dittmann (ericdittmann@paulhastings.com)
Isaac S. Ashkenazi (isaacashkenazi@paulhastings.com)
PAUL HASTINGS LLP
200 Park Avenue
New York, NY 10166

Paul M. Anderson (paulanderson@paulhastings.com)
PAUL HASTINGS LLP
600 Travis Street, 58th Floor
Houston, TX 77002

Dated: June 16, 2025

/Dion M. Bregman/
Dion M. Bregman (Reg. No. 45,645)

EXHIBIT A

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

LAM RESEARCH CORP.,
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Patent Owner.

IPR2024-00033
Patent 9,823,564 B2

Before GRACE KARAFFA OBERMANN, CHRISTOPHER M. KAISER,
and DEBRA L. DENNETT, *Administrative Patent Judges*.

OBERMANN, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining All Challenged Claims Unpatentable
Granting Patent Owner's Motion to Amend
35 U.S.C. § 318(a)

I. INTRODUCTION

A. *Background and Summary*

Lam Research Corp. (“Petitioner”) filed a Petition (Paper 1, “Pet.”) seeking an *inter partes* review of claims 1–12 of U.S. Patent No. 9,657,564 B2 (Ex. 1001, “the ’564 patent”). Inpria Corp. (“Patent Owner”) filed a Preliminary Response. Paper 11.

We instituted review of all claims based on the grounds of unpatentability asserted in the Petition. Paper 13 (“Institution Decision” or “Inst. Dec.”); *see* Pet. 3 (Petitioner’s identification of grounds). After institution, Patent Owner filed a Response (Paper 19, “Resp.”), Petitioner filed a Reply (Paper 27, “Reply”), and Patent Owner filed a Sur-reply (Paper 43, “Sur-reply”).

In addition, Patent Owner filed a Contingent Motion to Amend (Paper 20, “MTA”) proposing cancellation of original claim 6 and amending claims 1–5 and 7–12 via proposed substitute claims 13–23. Petitioner filed an Opposition to that Motion (Paper 28, “Opp.”). We provided Preliminary Guidance in response to Patent Owner’s Motion to Amend and Petitioner’s Opposition thereto. Paper 35 (“Prelim. Guid.”). Thereafter, Patent Owner filed a Reply to the Opposition (Paper 44, “PO Reply MTA”) and Petitioner filed a Sur-reply to the Motion to Amend (Paper 54, “Pet. Sur-reply MTA”).

We held a final hearing on January 30, 2025, and a transcript is in the record. Paper 64 (“Tr.”). With our authorization, after the final hearing, the parties filed additional briefing regarding the prior art status of the Stowers 2008 reference. Paper 58 (“Pet. Supp. Br.”); Paper 59 (“PO Supp. Br.”); Paper 61 (“Pet. Supp. Resp. Br.”); Paper 62 (“PO Supp. Resp. Br.”); *see infra* n.3 (identifying the Stowers 2008 reference).

We have jurisdiction under 35 U.S.C. § 6. We issue this Final Written Decision pursuant to 35 U.S.C. § 318(a). For the reasons that follow, we determine that Petitioner demonstrates by a preponderance of the evidence that original claims 1–12 are unpatentable and, further, we grant Patent Owner’s Motion to Amend for proposed substitute claims 13–23.

B. Real Parties in Interest

Petitioner, as well as Patent Owner, identifies itself as the sole real party-in-interest. Pet. 4; Paper 4, 2.

C. Related Matters

The parties identify *Inpria Corp. v. Lam Research Corp.*, Case No. 1:22-cv-01359 (D. Del.) as a related matter. Pet. 4; Paper 4, 2.

D. The ’564 Patent (Ex. 1001)

The ’564 patent is titled “Patterned Inorganic Layers, Radiation Based Patterning Compositions and Corresponding Methods.” Ex. 1001, code (54). The claimed invention relates to stabilized precursor solutions useful for forming inorganic coating materials designed for patterning with radiation. *Id.* at code (57).

Semiconductor-based devices may be based on structures formed through an iterative process that includes deposition or removal of patterned materials. *Id.* at 1:38–46, 4:52–60. The ’564 patent describes “silicon wafers” in which a precursor solution is “coated on a standard lithography spin coating track.” *Id.* at 22:8–13. The amount of precursor solution dispensed is “selected based on the desired coating thickness and the size of the wafer.” *Id.* at 22:15–18. “The thickness of the coating generally can be a function of the precursor solution concentration, viscosity and the spin speed.” *Id.* at 14:43–45. Critical to this Decision, the claimed invention

includes a “coating material” that “has an average thickness from 5 nm to 30 nm.” *Id.* at 24:11–12.

The Specification indicates that “inorganic precursor solutions” may “provide for superior direct patterning results.” *Id.* at 3:66–67. An example describes “a ZrO^{+2} -based coating” irradiated with patterned ultraviolet light to produce a patterned coating material, which results in “highly resolved patterns” in the “Zr-based coating material.” *Id.* at 22:38–54.

The Specification further indicates that “radiation sensitive inorganic compositions” purportedly improve “the structure of the patterned material.” *Id.* at 5:2–8. According to the Specification, “[i]n some embodiments, it can be desirable to use a thin coating to facilitate formation of small and highly resolved features.” *Id.* at 14:48–49.

E. Illustrative Claim

Petitioner challenges claims 1–12 of the ’564 patent. Pet. 1. Claim 1, reproduced below, is the only independent challenged claim.

1. A structure comprising a substrate and a coating material on a surface of the substrate, wherein the coating material comprises metal ions with radiation sensitive ligands and wherein ***the coating material has an average thickness from 5 nm to 30 nm***, wherein exposure of the coating material to UV, EUV and/or electron-beam radiation alters the chemical properties of the coating material creating an exposed coating material with differential dissolution rates between exposed and un-exposed regions of the coating material.

Ex. 1001, 24:8–17 (Board’s emphasis).

Claims 2–5 and 7–12 depend directly from claim 1 and inherit the emphasized limitation, which we refer to in our analysis as “the coating limitation” of claim 1. *Id.* at 24:18–28, 24:31–44. Claim 6 also depends from

claim 1, but specifies a coating material that has an “average thickness” that “is from 5 nm to 25 nm.” *Id.* at 24:29–30.

F. Asserted Grounds of Unpatentability

The Petition advances grounds of unpatentability based on 35 U.S.C. § 102 and 35 U.S.C. § 103.¹ We identify the grounds in the following chart.

Ground	35 U.S.C. §	Claims Challenged	Reference(s)/Basis
1	102	1–12	’888 Publication ²
2	102	1–5, 7–10, 12	Stowers 2008 ³
3	103	1–10, 12	Stowers 2008
4	103	8	Stowers 2008, Stowers 2009 ⁴
5	102 or 103	1, 3, 6, 7, 9, 11, 12	Trikeriotis ⁵

Pet. 3.

G. Testimonial Evidence

The Petition is supported by a declaration of Declaration of Dr. Karey Holland. Ex. 1002. Patent Owner’s Response is supported by the

¹ The Leahy-Smith America Invents Act (“AIA”), Pub. L. No. 112–29, 125 Stat. 284 (Sept. 16, 2011), includes revisions to Sections 102 and 103 that became effective on March 16, 2013. We apply AIA law to the challenges because, as discussed below with regard to Petitioner’s challenge over the ’888 Publication, the earliest filing date for the challenged claims is September 18, 2015, which is after AIA’s effective date. Ex. 1001, code (22). Neither party indicates that this decision would change by applying the AIA law.

² U.S. Patent Pub. No. 2011/0293888, published Dec. 1, 2011 (Ex. 1003).

³ Stowers, Jason K., *Direct patterning of solution deposited metal oxides*. Oregon State University, 2008 (Ex. 1008).

⁴ Stowers, Jason K. et al., *High resolution, high sensitivity inorganic resists*. Microelectronic Engineering 86:4–6 (2009), 730–733 (Ex. 1010).

⁵ Trikeriotis et al., *Development of an inorganic photoresist for DUV, EUV, and electron beam imaging*. Advances in Resist Materials and Processing Technology XXVII Vol. 7639, SPIE, 2010 (Library Version) (Ex. 1024).

Declarations of Dr. Jason K. Stowers (Ex. 2008) and Dr. Sanjay Banerjee (Ex. 2009). Petitioner's Reply and Opposition to the Motion to Amend are supported by an additional Declaration of Dr. Karey Holland (Ex. 1040).

II. ANALYSIS OF PETITION'S CHALLENGES

A. *Legal Standards*

Petitioner bears “the burden from the onset to show with particularity why the patent it challenges is unpatentable.” *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016) (citing 35 U.S.C. § 312(a)(3) (requiring petitions to identify “with particularity . . . the evidence that supports the grounds for the challenge to each claim”)); *see* 37 C.F.R. § 42.104(b) (requiring petitions to identify how the challenged claim is to be construed and where each element of the claim is found in the prior art patents or printed publications relied upon).

A prior art reference can only anticipate a claim if it discloses all the claimed limitations “arranged or combined in the same way as in the claim.” *Wm. Wrigley Jr. Co. v. Cadbury Adams USA LLC*, 683 F.3d 1356, 1361 (Fed. Cir. 2012) (quoting *Net MoneyIN, Inc. v. VeriSign, Inc.*, 545 F.3d 1359, 1370 (Fed. Cir. 2008)). “However, a reference can anticipate a claim even if it ‘d[oes] not expressly spell out’ all the limitations arranged or combined as in the claim, if a person of skill in the art, reading the reference, would ‘at once envisage’ the claimed arrangement or combination.” *Kennametal, Inc. v. Ingersoll Cutting Tool Co.*, 780 F.3d 1376, 1381 (Fed. Cir. 2015) (alteration in original) (quoting *In re Petering*, 301 F.2d 676, 681 (CCPA 1962)); *see also Blue Calypso, LLC v. Groupon, Inc.*, 815 F.3d 1331, 1343 (Fed. Cir. 2016) (distinguishing *Net MoneyIN* when the

reference in question explicitly contemplated the combination of the disclosed functionalities).

A patent claim is unpatentable as obvious if the differences between the claimed subject matter and the prior art are such that the subject matter, as a whole, would have been obvious at the time the invention to a person of ordinary skill in the art. *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). We resolve obviousness based on underlying factual determinations including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of ordinary skill in the art; and (4) when presented, objective evidence of nonobviousness.⁶ *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

The obviousness analysis typically concerns “whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue.” *KSR*, 550 U.S. at 418 (citing *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006) (requiring “articulated reasoning with some rational underpinning to support the legal conclusion of obviousness”)). Petitioner cannot satisfy its burden of proving obviousness by “mere conclusory statements,” but “must instead articulate specific reasoning, based on evidence of record, to support the legal conclusion of obviousness.” *In re Magnum Oil Tools Int’l, Ltd.*, 829 F.3d 1364, 1380 (Fed. Cir. 2016).

B. Level of Ordinary Skill in the Art

The level of ordinary skill in the art at the time of the invention is a factual determination that provides a primary guarantee of objectivity in an obviousness analysis. *Al-Site Corp. v. VSI Int’l Inc.*, 174 F.3d 1308, 1324

⁶ Neither party presents objective evidence of nonobviousness, therefore, we do not address that issue in this Decision.

(Fed. Cir. 1999) (citing *Graham*, 383 U.S. at 17–18; *Ryko Mfg. Co. v. Nu-Star, Inc.*, 950 F.2d 714, 718 (Fed. Cir. 1991)).

Petitioner, in the Petition, proposes that an ordinarily skilled artisan would have had “at least a graduate degree, such as a [M]asters or Ph.D., in a relevant discipline such as in chemistry, materials science, chemical engineering, physics, or an equivalent field,” as well as between one and three “years of experience in the research, design, development and/or testing of resist materials.” Pet. 5. Patent Owner does not dispute Petitioner’s definition. Resp. 5.

In the Institution Decision, we adopted Petitioner’s definition. Dec. 6. Neither party timely opposes the definition adopted in the Institution Decision. *See generally* Resp.; *see generally* Reply.

We apply in this Decision the same definition that we applied in the Institution Decision. It is not opposed by either party and is consistent with disclosures of the asserted prior art and the declaration testimony of Dr. Holland. Ex. 1003 ¶¶ 3–6 (description of field and background of ’888 Publication); Ex. 1024, 15–16 (abstract of asserted prior art reference Trikeriotis, describing the relevant field); Ex. 1002 ¶¶ 18–20.

C. Claim Construction

Claim terms are given their ordinary and customary meaning, as understood by one of ordinary skill in the art in the context of the entire disclosure. *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007). We construe only terms in controversy, and then only to the extent necessary to resolve the controversy. *Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017).

With regard to the original challenged claims, Petitioner argues that no express construction is necessary, with one exception relating to claim 8. Pet. 6. Patent Owner counters that no express claim construction is necessary. Resp. 5.

Except for claim 8, we agree with the parties that no claim term requires express construction for purposes of this Decision.

Claim 8 depends from claim 1 and recites “a metal ion to radiosensitive ligand ratio of at least 2.” Ex. 1001, 24:34–35. According to Petitioner, the ’564 patent does not provide support for this limitation because its “specification states that ‘the composition has a molar concentration ratio of ligands to metal suboxide cations of at least about 2.” Pet. 6 (citing Ex. 1001, 2:31–33, 10:2-4) (emphasis omitted). Petitioner contends that the ’564 patent discloses a “ligand to metal” ratio, not a “metal to ligand” ratio, as claim 8 recites. *Id.*

Petitioner argues:

Courts (and the Board) may correct “obvious minor typographical and clerical errors in patents” through claim construction. *Novo Indus., L.P. v. Micro Molds Corp.*, 350 F.3d 1348, 1357 (Fed. Cir. 2003); *Samsung Elecs. Co. v. M&K Holdings Inc.*, IPR2018-00696, Paper 55, 13-14 (Aug. 23, 2021). “Major errors are subject only to correction by the PTO.” *Novo*, 350 F.3d at 1357; *id.* at 1356 (“[W]e do not think that Congress intended that the district courts have the authority to correct any and all errors that the PTO would be authorized to correct . . .”).

Id. at 7.

On one hand, Petitioner asserts that claim 8 does not include an obvious error. *Id.* at 7–8. Petitioner contends that “the claim language is linguistically correct as written—there are no grammatical errors, missing words, misspellings, or similar problems that would make the phrase

unreadable or suggest there was an obvious error in the claim language” and “it is unclear if any error is in the specification or in the claim.” *Id.* at 7 (citing Ex. 1002 ¶ 56). Petitioner further argues that one of ordinary skill in the art could reasonably conclude claim 8 does not have an error because subsequent publications by the named inventor Douglas Keszler demonstrate that a ratio including peroxide and HfO_2^{2-} saturates at about 2:1 and, therefore, “the ligand to metal ion ratio could never reach at least 2.” *Id.* at 8 (citing Ex. 1002 ¶¶ 56–58) (emphasis omitted).

On the other hand, when addressing the unpatentability of claim 8 in view of the ’888 Publication, Petitioner asserts that the ’564 patent does not disclose claim 8’s ratio but instead discloses “a molar concentration ratio of ligands to metal suboxide cations of at least about 2” and, thus, “the specification describes a ‘ligand to metal’ ratio of at least 2, not a ‘metal to ligand’ ratio.” *Id.* at 30–31 (citing Ex. 1001, 2:31–33). In other words, Petitioner here acknowledges that an ordinarily skilled artisan, reading this disclosure set forth in the specification, would have realized, notwithstanding that claim 8 refers to a metal-to-ligand ratio, that the inventors actually meant a ligand-to-metal ratio. *Id.* A simple, clerical error.

Patent Owner does not propose a construction for original claim 8. But when addressing a proposed substitute claim for claim 8 in the MTA, Patent Owner submits, “[f]or original claim 8, without conceding the correctness of” Petitioner’s positions, Patent Owner “reverses the claimed ratio in a way that [Petitioner] seems to concede would be supported by the original application’s written description.” MTA 8 (citing Pet. 6–7, 30–31).

We are cognizant that a district court may “correct an error in a patent by interpretation of the patent where no certificate of correction has been issued . . . only if (1) the correction is not subject to reasonable debate based

on consideration of the claim language and the specification and (2) the prosecution history does not suggest a different interpretation of the claims.” *Novo*, 350 F.3d at 1354; *see Fitbit, Inc. v. Valencell, Inc.*, 964 F.3d 1112, 1119–20 (Fed. Cir. 2020) (suggesting the standard from *Novo* extends to corrections the Board may make in post-grant proceedings, and holding it was error to not correct a “conspicuous” and undisputed error related to antecedent basis).

To reiterate, Petitioner on one hand contends that the ’564 patent does not support claim 8, but on the other hand denies that claim 8 contains an obvious error because one of ordinary skill in the art would reasonably conclude that the ligand to metal ion ratio could never reach the claimed range of “at least 2.” Pet. 6–8 (citing Ex. 1002 ¶¶ 56–58).

Petitioner, in that regard, approaches claim 8 from the context of whether its terms comply with the requirements of § 112 — not whether there is a reasonable debate about an error when considering claim 8’s language and the ’564 patent’s specification. The language of claim 8 itself does not indicate an error. However, consultation of the specification reveals that the only ratios described are for ratios of *ligands* to *metal cations*. Ex. 1001, 2:20–22, 2:31–33, 5:61–65, 10:2–4.

The lack of disclosure of a numerical ratio of metal ions to ligands suggests that error was committed when claim 8 was drafted. To the extent Petitioner is correct that claim 8’s ratio cannot be achieved, we view this as supporting that claim 8 contains an error and not, as Dr. Holland opines, that claim 8 was intended to recite a ratio that is unsupported by the specification. Ex. 1002 ¶ 58 (concluding sentence).

The prosecution history for the ’564 patent, moreover, does not suggest a different interpretation of claim 8. Several claims were added via

amendment during prosecution. Ex. 1007, 141–8, 404–406. One of the claims added via amendment, claim 21, recited “a metal ion to radiosensitive ligand ratio of at least about 2.” *Id.* at 405. After the Examiner allowed the claims, claim 21 was renumbered as claim 8. *Id.* at 592. Page 2, line 30, was cited to support new claim 21 when it was added via amendment. *Id.* at 141. However, this portion of the specification disclosed “a molar concentration ratio of *ligands to metal suboxide cations* of at least about 2.” *Id.* at 8 (emphasis added). This ratio is the reverse of claim 8’s ratio, which recites a ratio of metal ion to radiosensitive ligand. Ex. 1001, 24:34–35. This comports with the ’564 patent’s remaining disclosures for such a ratio, which all describe a ratio of ligands to metal cations. Ex. 1007, 9 (3:7–8), 14 (8:15–16), 20 (14:20).

In view of these considerations, we construe claim 8 as containing an error and that claim 8 should instead read “having a *radiosensitive ligand to metal ion ratio* of at least 2.” (emphasis to show changes relative to claim 8).

D. Ground Based on Anticipation by the ’888 Publication

Petitioner argues that claims 1–12 are anticipated by the ’888 Publication. Pet. 3. Before addressing that challenge, we first address the parties’ arguments regarding the priority date of the challenged claims and whether the ’888 Publication is prior art with respect to those claims.

1. Whether the ’888 Publication is Prior Art

The ’564 patent issued on November 21, 2017 from nonprovisional application 14/858,612 (“the ’612 application”), filed September 18, 2015. Ex. 1001 codes (21), (22), (45). The ’564 patent also claims priority to nonprovisional patent application 12/850,867 (“the ’867 application”), filed

August 5, 2010, and to provisional patent application 61/350,103, filed June 1, 2010. Ex. 1010 codes (60), (63).

The '888 Publication was published December 1, 2011, is a publication of the '867 application, and claims priority to the same provisional application as the '564 patent. Ex. 1003 codes (21), (43), (60). To the extent the '564 patent does not have priority to the '867 application (and therefore would have an earliest effective filing date of nonprovisional application 14/858,612, filed September 18, 2015), the '888 Publication would be prior art due to its effective filing date of August 5, 2010 (the filing date of the '867 application).

Petitioner contends that claims 1 and 6 of the '564 patent lack written description support in the '867 application and the '888 Publication is therefore prior art. Pet. 10–18; Reply 1–7.

Patent Owner disputes that contention and asserts a priority date as of the '867 application's filing date, which means the '888 Publication is not prior art. Resp. 7–24, 31; Sur-reply 2–8.

a) Legal Framework for Priority

“It is elementary patent law that a patent application is entitled to the benefit of the filing date of an earlier filed application only if the disclosure of the earlier application provides support for the claims of the later application, as required by 35 U.S.C. § 112.” *In re Chu*, 66 F.3d 292, 297 (Fed. Cir. 1995). One may show support for the claims of a later application by showing that a single, earlier application provides written description support for the claims. *PowerOasis, Inc. v. T-Mobile USA, Inc.*, 522 F.3d 1299, 1306 (Fed. Cir. 2008); *Studiengesellschaft Kohle, MBH v. Shell Oil Co.*, 112 F.3d 1561, 1564 (Fed. Cir. 1997) (patentee “cannot show

possession of an invention based upon a combination of several distinct previous applications”).

Once Petitioner identifies a prior art reference with an effective filing date prior to that of the challenged patent, the burden of production to show entitlement to the benefit of the filing date of an earlier filed application shifts to Patent Owner. *See In re NTP*, 654 F.3d 1268, 1276 (Fed. Cir. 2011) (“a patent’s claims are not entitled to an earlier priority date merely because the patentee claims priority . . . Rather, for a patent’s claims to be entitled to an earlier priority date, the patentee must demonstrate that the claims meet the requirements of 35 U.S.C. § 120”). Therefore, although Petitioner bears the ultimate burden of persuasion to prove unpatentability of the challenged claims, Patent Owner bears the burden of production on the question of whether claims 1–12 are entitled to the filing date of the ’867 application, when relying on that date to overcome the patentability challenges. *See Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1379–80 (Fed. Cir. 2015) (discussing burdens applicable to priority date disputes).

b) Petitioner’s Arguments

Petitioner asserts that “the ’888 publication qualifies as prior art because claims 1-12 are not entitled to an effective filing date earlier than September 18, 2015, when the ’612 application was filed.” Pet. 11. Specifically, Petitioner argues that the ’867 application does not provide written description support for the average thickness ranges of claims 1 and 6 because the ’867 application does not demonstrate “that the inventors believed that a coating with ‘an average thickness from 5 nm to 30 nm’ or ‘from 5 nm to 25 nm’ were part of their invention.” *Id.* at 13. According to

Petitioner, the '867 application's only discussion of coating thickness are the following passages:

In some embodiments, it can be desirable to use a thin coating to facilitate formation of small and highly resolved features. In some embodiments, the coating materials can have an average thickness of no more than about 1 micron, in further embodiments no more than about 250 nanometers (nm), in additional embodiments from about 1 nanometers (nm) to about 50 nm, in other embodiments from about 1 nm to about 40 nm and in some embodiments from about 1 nm to about 25 nm. A person of ordinary skill in the art will recognize that additional ranges of thicknesses within the explicit ranges above are contemplated and are within the present disclosure.

Id. at 13–14 (quoting Ex. 1004, 23:16–26) (emphases omitted). “The coating material was produced according to the method of Example 2 with a ZrO^{+2} -based coating composition. The coating material was deposited at a thickness form (sic) 10-50 nm.” *Id.* at 14 (quoting Ex. 1004, 35:14–15) (emphasis omitted). “The resist was applied with a thickness of 20 nm by spin coating on a silicon wafer, followed by a post-apply bake of 50° C.” *Id.* (quoting Ex. 1004, 36:29–30) (emphasis omitted). “22. The method of claim 14 wherein the layer of coating material has an average thickness from about 1 nm to about 40 nm.” *Id.* (quoting Ex. 1004, 40, claim 22) (emphasis omitted).

Petitioner contends that these passages show that “the '867 application does not describe a coating material with a particular thickness of either 5 nm or 30 nm, let alone a thickness **range** of 5 nm to 30 nm (claim 1)” and the '867 application “never recites a thickness of 5 nm, let alone a thickness **range** of 5 nm to 25 nm (claim 6).” *Id.* at 15 (Petitioner's emphases); *see* Reply 2 (for similar arguments). According to Petitioner, the '867 application “does not disclose either of the two end values (5 nm

and 30 nm) or the range (5 nm to 30 nm)” recited by claim 1. Pet. 16; Reply 4–5 (for similar arguments).

Petitioner contends that, in contrast, the endpoints of a claimed range were disclosed in *RAI Strategic Holdings, Inc. v. Philip Morris Products S.A.* and there was no indication that changing the parameter would change a characteristic of the invention. Reply 5–6 (citing 92 F.4th 1085 (Fed. Cir. 2024)). In response to Patent Owner’s citation to *BioDelivery Science International v. Alvogen PB Research & Development LLC*, Petitioner argues that the specification in that case “disclosed the claimed range’s endpoints.” Reply 3 (citing 576 F. Supp. 3d 184, 211 (D. Del. 2021)).

Petitioner also argues that the general statement, set forth in the ’564 patent, that “[a] person of ordinary skill in the art will recognize that additional ranges of thicknesses within the explicit ranges above are contemplated and are within the present disclosure” lacks the specificity required to support the claimed ranges, even if one viewed that general statement as sufficient to render those ranges obvious. Pet. 17–18 (citing Federal Circuit authority that entitlement to a priority date does not extend to subject matter merely obvious over what is disclosed).

In addition, Petitioner argues that Patent Owner should be estopped from arguing that 5 nm is “close enough” to other thickness values or similarly argue that 30 nm is “close enough” to other thickness values in light of a statement made during prosecution of the ’612 application. *Id.* at 17 (citing Ex. 1007, 508; Ex. 1009, 264; Ex. 1002 ¶ 67); *see* Reply 1–2, 4, 6–7 (for similar arguments).

c) Patent Owner's Arguments

Patent Owner counterargues that the '867 application's disclosures, regarding average thickness for a coating material, are identical to those of the '564 patent because the latter's application was a continuation of the former. Resp. 7. Patent Owner asserts that the shared specification for those applications discloses the following ranges for a coating thickness: no more than about 1000 nm, no more than about 250 nm, from about 1 nm to about 50 nm, from about 1 nm to about 40 nm, and from about 1 nm to about 25 nm. Resp. 8; Ex. 1004, 23:14–26. Patent Owner contends these ranges either fully encompass or overlaps the ranges of claims 1 and 6. Resp. 8.

Patent Owner also cites the specification's statement that “person of ordinary skill in the art will recognize that additional ranges of thicknesses within the explicit ranges above are contemplated and are within the present disclosure.” Resp. 8–9 (Patent Owner's emphasis omitted); Ex. 1004, 23:22–24; Ex. 2009 ¶¶ 27–28; Ex. 2011, 56:14–57:16, 175:7–177:25. According to Patent Owner, “the specification also describes how the thickness can be varied, explains variables that affect the thickness, and provides specific examples within or overlapping with the claimed ranges,” specifically a thickness of 10–50 nm and a thickness of 20 nm. Resp. 9–11; Ex. 2009 ¶¶ 23–26; Ex. 1004, 11:18–20, 12:20–25, 21:3–7, 22:21–30, 23:1–15, 35:14–15. Patent Owner further asserts that “a ‘lower level of detail’ is required because the aspect at issue—the thickness limitation—can be predictably varied. Sur-reply 2 (citing *RAI Strategic Holdings, Inc. v. Philip Morris Prod. S.A.*, 92 F.4th 1085, 1090 (Fed. Cir. 2024)).

Patent Owner argues that “[t]he 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,” “[t]he specification also describes how the thickness can be evaluated to confirm a desired thickness,” “thickness is much more predictable than therapeutic efficacy, and it is thoroughly described with several exemplary ranges and actual examples,” and “[t]he specification nowhere indicates that each thickness range is a different invention or embodiment” because the specification instead indicates thickness has a functional relationship to variables it describes. *Id.* at 2–4 (citing Ex. 1004, 11:18–20, 12:20–25, 21:3–7, 22:21–30, 23:1–26, 35:14–15, 36:29–30).

According to Patent Owner, the present facts are analogous to those in *BioDelivery*, 576 F. Supp. 3d at 210–211, because the specification discloses thickness ranges that include the claimed ranges and discloses that additional ranges would be recognized by one of ordinary skill in the art. Resp. 12.

In addition, Patent Owner contends that Petitioner argues that some endpoints of the claimed ranges are not expressly disclosed, which is a legal error. Resp. 13; Sur-reply 4. Patent Owner asserts that this “overlooks the express teaching that ‘thicknesses within the explicit ranges above are contemplated and are within the present disclosure.’” Resp. 13–14; Ex. 1004, 23:22–24. According to Patent Owner:

The mere fact that the endpoints of the claimed ranges are not explicitly recited in the specification, on its own, is insufficient to undermine written description support here, when weighed against the numerous teachings regarding how to accomplish different thicknesses, several overlapping and encompassing ranges, and the express statement that “thicknesses within the explicit ranges” are included.

Resp. 14. Patent Owner further argues that caselaw is distinguishable on the facts and does not support Petitioner’s assertions. Resp. 14–18.

Patent Owner also asserts that Petitioner’s estoppel arguments exceed the narrow scope of the prosecution statement upon which the arguments

depend, are unpersuasive in view of the doctrine that prevents a patent owner from arguing infringement by the doctrine of equivalents of subject matter that falls within the scope of a claim surrendered to allowance, and are unsupported by the Federal Circuit's decision in *RAI*. Resp. 18–24; Sur-reply 5–8.

In view of these arguments, Patent Owner argues that the challenged claims are supported by the '867 application and therefore the '888 Publication is not prior art. Resp. 24.

d) Analysis

A review of the cases regarding written description support, particularly those that involve numerical ranges, is instructive here.

The test for sufficiency of a written description is whether the disclosure “clearly allow[s] persons of ordinary skill in the art to recognize that [the inventor] invented what is claimed.” *Ariad Pharms., Inc. v. Eli Lilly & Co.*, 598 F.3d 1336, 1351 (Fed. Cir. 2010) (en banc) (quoting *Vas-Cath Inc. v. Mahurkar*, 935 F.2d 1555, 1562–63 (Fed. Cir. 1991)). The disclosure must “reasonably convey[] to those skilled in the art that the inventor had possession of the claimed subject matter as of the filing date.” *Id.* at 1351. Possession means “possession as shown in the disclosure” and “requires an objective inquiry into the four corners of the specification from the perspective of a person of ordinary skill in the art.” *Id.*

In *RAI*,⁷ the Board determined that claims reciting a heating member having “a length of about 75% to about 85% of a length of the disposable aerosol forming substance” lacked written description support in a post-grant

⁷ During the hearing, Patent Owner expressed their view that *RAI* was the closest case in their favor for this issue. Tr. 56:19–57:1.

review. 92 F.4th at 1087. On appeal, the Federal Circuit noted that although the challenged patent's specification "does not disclose the claimed range itself, it does expressly disclose both endpoints" because the specification disclosed ranges of "about 75% to about 125%" and "about 85% to about 115%." *Id.* at 1090.

The Federal Circuit further noted other considerations, including "the context of the technology at issue and the knowledge gained by a person of ordinary skill in the art reading the specification," the predictability of the art, the "complexity of the particular claim limitation at issue," and whether the specification indicated "that changing the length of the heating member changes the invention." *Id.* The court viewed the art as predictable, the claim limitation as not complex, and discerned nothing in the specification as indicating a different invention was claimed. *Id.* at 1090–1091. The court in *RAI* further contrasted the facts there with those in *Indivior UK Limited v. Dr. Reddy's Laboratories S.A.*, 18 F.4th 1323, 1329 (Fed. Cir. 2021) because the specification in *RAI* disclosed "the end points of the claimed range and there are no inconsistent statements regarding the range." *Id.* at 1091.

With this guidance in mind, we evaluate the disclosures of the '867 application cited by Patent Owner. As noted above, Patent Owner asserts that the '867 application discloses ranges of no more than about 1000 nm, no more than about 250 nm, from about 1 nm to about 50 nm, from about 1 nm to about 40 nm, and from about 1 nm to about 25 nm. Resp. 8–9; Ex. 1004, 23:14–26; Ex. 2009 ¶¶ 27–28. Patent Owner also cites a disclosed thickness range of 10–50 nm and an exemplary thickness of 20 nm. Resp. 10–11; Ex. 1004, 35:14–15, 36:29–30; Ex. 2009 ¶¶ 23–29.

Although these cited ranges encompass or overlap with the claimed ranges of "5 nm to 30 nm" (claim 1) and "5 nm to 25 nm" (claim 6), none of

these disclosures describe the lower endpoint of 5 nm that is shared by the two claimed ranges at hand. The value closest to the claimed lower endpoint of 5 nm in these relied-upon disclosures is “about 1 nm.” Further, Patent Owner’s witness, Dr. Banerjee, relies upon the ranges and examples Patent Owner cites in the ’867 application (Ex. 2009 ¶ 27) and opines on how those ranges include or overlap the claimed ranges (*id.* ¶ 28).

This situation stands in contrast with that of *RAI*, in which the disclosure of the priority document set forth the claimed endpoints. 92 F.4th at 1090–1091. Here, quite dissimilarly, Patent Owner directs us to disclosures of broad ranges in an asserted priority document that discloses just one of four endpoints at issue, namely, the upper endpoint of 25 nm set forth in claim 6. Resp. 8; Ex. 1004, 23:14–16.

“The disclosure of a broad range of values does not by itself provide a written description support for a particular value within that range.” *Gen. Hosp. Corp. v. Sienna Biopharm., Inc.*, 888 F.3d 1368, 1372 (Fed. Cir. 2018). Given the differences between the cited ranges and exemplary thickness, such disclosures are insufficient to “convey[] to those skilled in the art the information that the applicant invented the subject matter of the claims.” *In re Wertheim*, 541 F.2d 257, 263 (CCPA 1976).

Patent Owner also relies on *BioDelivery*, but that decision, in fact, supports Petitioner’s position. As explained by Patent Owner, *BioDelivery* involved specified pH ranges of “about 4-6, about 4.5-5.5, and about 4.5-5.” Resp. 11. Patent Owner acknowledges that the court in *BioDelivery* found sufficient support in the following paragraph:

In one embodiment, e.g., when the medicament is buprenorphine, the pH of the mucoadhesive polymeric diffusion environment in the devices of the present invention is between *about 4.0* and about 7.5. In another embodiment, the pH of the

mucoadhesive polymeric diffusion environment is *about 6.0*. In one embodiment, the pH of the mucoadhesive polymeric diffusion environment is *about 5.5* to about 6.5, or between about 6.0 and 6.5. In yet another embodiment, the pH of the mucoadhesive polymeric diffusion environment is about 7.25. In another embodiment, the pH is between about 7.0 and 7.5, or between about 7.25 and 7.5. In other embodiments, the pH of the device may be *about 4.0, 4.5, 5.0, 5.5, 6.0, 6.5, 7.0, or 7.5*, or any incremental value thereof. It is to be understood that all values and ranges between these values and ranges are meant to be encompassed by the present invention.

Resp. 11–12 (quoting 576 F. Supp. 3d at 210-11) (emphases added).

Importantly, as shown by the emphasized language in the above paragraph, not only did the asserted priority document in *BioDelivery* disclose a pH range of “between about 4.0 and about 7.5,” which encompassed or overlapped all of the claimed ranges, that document also disclosed *every* endpoint of the claimed ranges (i.e., about “4.0,” “6.0,” “4.5,” “5.5,” and “5.0”). We view *BioDelivery* as similar to *RAI* in that there was evidence in the cited disclosure reasonably conveying that the inventor possessed the claimed ranges, including the relevant endpoints.

During the hearing, the Board asked Patent Owner if it had “cited a single case where the endpoints are not disclosed” in the asserted priority document “and yet the Board or a court has found written description support” for the claimed range. Tr. 47:13–15. Patent Owner initially argued that *In re Blaser*, 556 F.2d 534 (CCPA 1977), involved a situation in which an endpoint was not disclosed but there was a finding of written description support for a claimed range. Tr. 47:25–26. However, Patent Owner then acknowledged that the claimed range in that case “was 80 to 200” and, although the asserted priority document disclosed a range of “60 to 200,” that document further “disclosed a preferred embodiment of 80.” In other

words, “it did disclose the endpoint,” although not as “part of the range.” *Id.* at 48:1–7.

We are not persuaded that *In re Blaser* supports Patent Owner’s view that the ’867 application supports the ranges specified in claim 1 or claim 6. As Patent Owner ultimately acknowledged at the hearing, the court there considered a claimed temperature range of 80°C to 200°C. Tr. 48:1–4; *see* 556 F.2d at 536. A priority application described a temperature range of between 60°C and 200°C and a specific embodiment using a temperature of 80°C. *Id.* at 538. Citing *In re Wertheim*, the court agreed there was written description support for the claimed range of 80°C to 200°C. *Id.* Thus, both endpoints of 80°C and 200°C were disclosed in the priority application at issue in *In re Blaser*.

Patent Owner cites *In re Blaser* to support its arguments regarding priority to the ’867 application. Sur-reply 7. For the reasons discussed above, we do not view it this way, at least because Patent Owner has not directed us to any disclosure in that asserted priority document of 5 nm, the lower endpoint for the claimed coating thickness ranges set forth in claims 1 and 6, or any other disclosure reasonably conveying that the inventors possessed a coating material having an average thickness with 5 nm as a lower endpoint. We instead view *In re Blaser* as indicating the probative value of disclosing endpoints when determining whether possession of a numerical range has been demonstrated, consistent with other binding decisions of our reviewing court, including *RAI* and *BioDelivery*.

Patent Owner also cites *Kolmes v. World Fibers Corp.*, 107 F.3d 1534, 1537–1539 (Fed. Cir. 1997) to support its view that, notwithstanding that the specified lower endpoint of the invention is not disclosed in the ’867 application, that document nonetheless supports the endpoint limitations of

claims 1 and 6. Sur-reply 7–8. However, *Kolmes* involved yet another situation in which both endpoints of a numerical range were disclosed in an asserted priority document. 107 F.3d at 1538–1539 (a claimed wrapping rate of 8–12 turns per inch was supported by a disclosure of “at the rate of 4–12 turns per inch, with 8 turns per inch being preferred.”).

Although the ’867 application does not expressly disclose the claimed endpoint of 5 nm, we do not end our analysis there. We also evaluate whether any other disclosures of the ’867 application reasonably convey that the inventors possessed the invention of claims 1 and 6, specifically the claimed average thickness ranges.

Patent Owner, on that point, also directs us to disclosure in the ’867 application indicating that a “person of ordinary skill in the art will recognize that additional ranges of thicknesses within the explicit ranges above are contemplated and are within the present disclosure.” Resp. 8–9 (citing Ex. 1004, 23:22–24; Ex. 2009 ¶¶ 27–28; Ex. 2011, 56:14–57:16, 175:7–177:25) (emphasis omitted). That disclosure, however, is broad in nature and does not guide or direct one of ordinary skill in the art in any particular direction with regard to an average thickness value. Ex. 1004, 23:22–24.

Dr. Banerjee’s cited testimony merely refer to this general disclosure. Ex. 2009 ¶ 27; Ex. 1004, 23:22–24. Further, Dr. Holland stated during deposition that one of ordinary skill in the art “might choose any range to fit the thickness they want,” could deposit a desired thickness by changing a spin coating speed, and could vary film thickness, but Dr. Holland did not sufficiently explain how the cited disclosure reasonably conveys possession of the claimed average thickness ranges. Ex. 2011, 56:19–20, 57:5–8, 175:13–24, 176:1–4, 176:15–18, 177:5–11.

In addition, Patent Owner argues that “the specification also describes how the thickness can be varied, explains variables that affect the thickness;” “the specification describes various ‘coating approaches,’ including ‘spin coating,’ ‘spray coating,’ ‘knife edge coating,’ and ‘printing techniques;” “the specification teaches that ‘multiple coating steps’ can be used to ‘provide greater control over the coating process,’ for instance with multiple layers used ‘to yield an ultimate coating thickness desired;” and “[t]he specification also explains that the ‘concentrations of the species in the precursor solution’ can affect the thickness of the coating material and that ‘lower concentrations overall . . . can achieve thinner coatings using reasonable coating parameters.” Resp. 9–10 (citing Ex. 2009 ¶¶ 23–26; Ex. 1004, 11:18–20, 12:20–25, 21:3–7, 22:21–30, 23:1–15).

Dr. Banerjee’s cited testimony and the cited passages of the ’867 application merely refer to deposition techniques for a coating material, such as spin coating; how coating thickness can be a function of precursor solution concentration, viscosity, and spin speed; using coating parameters to adjust the thickness of a coating; and methods that can be used to evaluate a coating’s thickness. Ex. 2009 ¶¶ 23–26; Ex. 1004, 11:18–20, 12:20–25, 21:3–7, 22:21–30, 23:1–15. None of this cited evidence, which is also general in nature, guides one of ordinary skill in the art toward using any particular coating thickness.

To the extent Patent Owner’s position is that merely by indicating that various coating thicknesses were achievable, the ’867 application provides written description support for the challenged claims, that position has no merit. That is not the test for written description support and such general disclosures do not reasonably convey to one of ordinary skill in the art that

the inventors possessed the claimed structure in which a coating material had an average thickness from 5 nm to 30 nm, as recited in claims 1 and 6.

Given the lack of support for the claimed average thickness ranges, we do not view the cited disclosures in the '867 application as “a statement of the invention” that includes those ranges; instead, we view Patent Owner’s arguments as “an invitation to go on a hunting expedition to patch together after the fact” a disclosure of them. *Indivior*, 18 F.4th at 1329 (“A written description sufficient to satisfy the requirement of the law requires a statement of an invention, not an invitation to go on a hunting expedition to patch together after the fact a synthetic definition of an invention.”).

We find significant that Dr. Banerjee’s conclusions and opinion on the priority issue are based on the cited disclosures of the '867 application discussed above. Ex. 2009 ¶ 29. For the reasons discussed above, we do not view the cited disclosures as sufficiently supporting Dr. Banerjee’s conclusion that the '867 application provides support for claim 1’s average thickness range (*id.*) and, therefore, give this testimony little weight. Stated somewhat differently, Dr. Banerjee’s advances an opinion (really a legal one) that is not supported by the facts and not in line with the caselaw discussed in this section (such as *RAI*).

The Federal Circuit noted in *RAI* that an art’s predictability is a consideration for written description support of a range. 92 F.4th at 1090. Patent Owner contends that “a ‘lower level of detail’ is required because the aspect at issue—the thickness limitation—can be predictably varied” and that coating thickness is relatively predictable. Sur-reply 2–3. We do not share this view, which is advanced as mere attorney argument. Instead, as explained in our Institution Decision, the claimed invention is within the unpredictable chemical arts. Inst. Dec. 15 (citing Ex. 1001, codes (54), (57),

Fig. 1, 1:28–35, 24:8–17; *In re Fisher*, 427 F.2d 833, 839 (CCPA 1970) (observing, in context of enablement, that “most chemical reactions” involve “unpredictable factors”)).

e) Conclusion

For the reasons set forth above, we determine that Patent Owner has not carried its burden of production to show that the ’867 application provides written description support for the challenged claims. As a result, the earliest filing date for the ’564 patent is the filing date of the ’612 application, which is September 18, 2015. Ex. 1001, code (21), (22). The ’888 Publication published December 1, 2011, which is more than one year before this filing date. Ex. 1003, code (43). Accordingly, the ’888 Publication qualifies as prior art under 35 U.S.C. § 102(a)(1).

2. Assessment of Patentability Challenge over ’888 Publication

Having determined that the ’888 Publication is prior art as of the earliest filing date of the ’564 patent, we therefore evaluate whether Petitioner has demonstrated that the ’888 Publication anticipates claims 1–12 by a preponderance of the evidence.

The ’888 Publication is the work of the same individuals named as the inventors on the face of the ’564 patent. *Compare* Ex. 1001, code (72), *with* Ex. 1003, code (76). Petitioner explains, and Patent Owner does not dispute, that the ’888 Publication “contains the same disclosure as the ’564 patent specification.” Pet. 26.

a) Claims 1–7 and 12

Petitioner advances arguments, supported by detailed claim charts, that map with particularity every limitation of the challenged claims to disclosures in the ’888 Publication. Pet. 24–33.

For example, with regard to independent claim 1, Petitioner identifies disclosures by the '888 Publication relating to a patterned inorganic material on the surface of a substrate; the inorganic material including metal suboxide cations, ligands having a peroxide group (i.e., radiation sensitive ligands), and inorganic polyatomic anions; Example 4, which discloses a coating thickness of 20 nm; irradiating the coating material with extreme ultraviolet light, which causes un-irradiated material to be more easily dissolved by a developer composition, or irradiating via electron beam lithography. Pet. 26–28 (citing Ex. 1003 ¶¶ 9–10, 32, 39, 43, 46, 75, 102–107). Petitioner also cites to disclosures by the '888 Publication that teach the limitations of claims 2–7 and 12. *Id.* at 29–30, 32–33.

As discussed above, Patent Owner sets forth arguments regarding the earliest filing date of the '564 patent and the '888 Publication's prior art status but identifies no deficiency in Petitioner's anticipation arguments and declines to address Petitioner's mapping of claim limitations. Resp. 7–24; Sur-reply 2–8.

Based on our review of Petitioner's uncontested arguments for claims 1–7 and 12, including the table in the Petition identifying where each limitation of claims 1–7 and 12 allegedly is disclosed in the '888 Publication, and in view of no contrary argument or evidence presented by Patent Owner regarding the unpatentability of these claims with regard to the '888 Publication, we determine Petitioner has shown by a preponderance of the evidence in the record that claims 1–7 and 12 are anticipated by the '888 Publication.

b) Claim 8

As discussed above with regard to claim construction, we construe claim 8 as reading “having a radiosensitive ligand to metal ion ratio of at least 2” due to the error it contains.

Petitioner argues that, to the extent claim 8 contains an error, the ’888 publication discloses a ligand to metal ion ratio.⁸ Pet. 31 (citing Ex. 1003 ¶ 7). The ’888 Publication’s disclosure supports this assertion. Ex. 1003 ¶ 7.

As discussed above with regard to claims 1–7 and 12, Patent Owner does not dispute Petitioner’s anticipation positions with regard to the ’888 Publication.

Based on our review of Petitioner’s uncontested arguments for claim 8, we determine Petitioner has shown by a preponderance of the evidence in the record that claim 8 is anticipated by the ’888 Publication.

c) Claim 11

Dependent claim 11 recites “wherein following exposure an exposed coating region is soluble in an organic solvent.” Ex. 1001, 24:40–41.

Petitioner acknowledges that “[t]he ’888 publication does not disclose this limitation.” Pet. 32. However, Petitioner asserts that when claim 11 was added during prosecution,⁹ a passage describing that “[t]raditional organic resists are soluble in nonpolar solvents and are deposited onto hydrophobic surfaces” was cited to support that claim. *Id.* (citing Ex. 1007, 26, 141, 405). Petitioner also directs us to prior decisions in which the Board previously

⁸ As discussed previously, Petitioner advances this anticipation ground by construing claim 8 to include an error.

⁹ Petitioner appears to be referring to claim 24, which was added via amendment and later renumbered as claim 11 upon allowance. Ex. 1007, 405, 592.

applied the logic that the publication of a prior document that contains the same disclosure as the challenged patent (such as the '888 Pub) necessarily must anticipate a challenged claim). *Id.* at 26. On that basis, Petitioner argues that the '888 Publication anticipates claim 11 because it contains the same passage. *Id.* (citing Ex. 1003 ¶ 65). The record supports Petitioner's assertions. Ex. 1007, 26, 141, 405; Ex. 1003 ¶ 65.

As discussed above with regard to claims 1–7 and 12, Patent Owner does not dispute Petitioner's anticipation positions with regard to the '888 Publication. Based on our review of Petitioner's uncontested arguments as to claim 11, we determine Petitioner has shown by a preponderance of the evidence in the record that claim 11 is anticipated by the '888 Publication.

d) Conclusion

For the reasons discussed above, Petitioner has demonstrated by a preponderance of the evidence in the record that claims 1–12 are anticipated by the '888 Publication.

3. Remaining Challenges in the Petition

Because Petitioner has met its burden of demonstrating that all of the challenged claims are unpatentable over the '888 Publication, we do not reach the remaining grounds set forth in the Petition.

III. MOTION TO AMEND ANALYSIS

In an *inter partes* review, amended claims are not added to a patent as of right, but rather must be proposed as a part of a motion to amend.

35 U.S.C. § 316(d). In its Contingent Motion to Amend, Patent Owner moves to cancel claim 6 of the '564 patent and proposes to substitute claims 13–23. MTA 1–3. Petitioner opposes the addition of the substitute claims, asserting, among other reasons, that the proposed claims are unpatentable for

lack of written description support, lack of enablement, for indefiniteness, and as anticipated or obvious. Opp. 2–25.

The Board must assess the patentability of proposed substitute claims “without placing the burden of persuasion on the patent owner.” *Aqua Prods., Inc. v. Matal*, 872 F.3d 1290, 1328 (Fed. Cir. 2017) (en banc); see also *Lectrosonics, Inc. v. Zaxcom, Inc.*, IPR2018-01129, Paper 15 at 3–4 (PTAB Feb. 25, 2019) (precedential).

Petitioner must prove that the proposed substitute claims are unpatentable by a preponderance of the evidence. *Bosch Auto. Serv. Sols., LLC v. Matal*, 878 F.3d 1027, 1040 (Fed. Cir. 2017); *Lectrosonics*, Paper 15 at 3–4.

As explained further below, having considered the arguments and evidence presented by the parties at trial, we determine Patent Owner has met its statutory and regulatory burden for proposed substitute claims 13–23 by a preponderance of the evidence, whereas Petitioner has not met its burden of showing, by a preponderance of the evidence, that the proposed substitute claims are unpatentable.

A. Whether Patent Owner Has Met Statutory and Regulatory Requirements

Patent Owner bears the burden to show, by a preponderance of the evidence, that its motion to amend complies with the requirements of 35 U.S.C. § 316(d)(1), (3) and 37 C.F.R. § 42.121(a)(2), (a)(3), (b)(1), and (b)(2). 37 C.F.R. § 42.121(d)(1).

For the reasons discussed below, Patent Owner has shown by a preponderance of the record that it has satisfied the statutory and regulatory requirements associated with filing a motion to amend. See 37 C.F.R. § 42.121(e)(1).

1. Reasonable Number of Substitute Claims

A motion to amend must propose a reasonable number of substitute claims. 35 U.S.C. § 316(d)(1)(B); 37 C.F.R. § 42.121(a)(3). Patent Owner has shown it proposes a reasonable number of substitute claims because it proposes one substitute claim for each of claims 1–5 and 7–12. Mot. 1–3. Petitioner does not argue otherwise. *See generally* Opp.; Pet. Sur-reply MTA.

2. Responsive to Ground of Unpatentability

A motion to amend must respond to a ground of unpatentability involved in the proceeding. 37 C.F.R. § 42.121(a)(2)(i). Patent Owner has responded to a ground of unpatentability involved in this proceeding by contending that the proposed substitute claims are patentable over three of the references asserted in the Petition’s challenges. Mot. 4; Paper 1 (“Pet.”), 3. Petitioner does not argue that the Motion is nonresponsive. *See generally* Opp.; Pet. Sur-reply MTA.

3. Scope of Amended Claims

A motion to amend may not enlarge the scope of the claims of the patent. 35 U.S.C. § 316(d)(3); 37 C.F.R. § 42.121(a)(2)(ii). Patent Owner proposes to use the language “at least about 2” instead of “at least 2” in proposed substitute claim 19, which, at first blush, may appear enlarging. Mot. 14. Indeed, Petitioner argues that the proposed amendment for substitute claim 19 enlarges the scope of the claims because “new claim 19 covers ratios outside the scope of the original claim—therefore, enlarging the scope of claim 8.” Opp. 1.

Proposed substitute claim 19, however, depends from a claim that has a narrowing amendment (claim 13). Therefore, we do not view proposed

substitute claim 19 as impermissibly enlarging the scope of the claims. *See Hisense USA Corp. v. Brightplus Ventures LLC*, IPR2023-01410, Paper 19 at 5 (PTAB Oct. 23, 2024) (non-precedential).

4. *New Matter*

A motion to amend may not introduce new subject matter. 35 U.S.C. § 316(d)(3); 37 C.F.R. § 42.121(a)(2)(ii). Patent Owner cites passages in support of proposed amendments for substitute claims 13 and 19 in the '867 application. Mot. 4–8 (citing Ex. 1004).

The test for sufficiency of a written description is whether the disclosure “‘clearly allow[s] persons of ordinary skill in the art to recognize that [the inventor] invented what is claimed.’” *Ariad*, 598 F.3d at 1351. The disclosure must “reasonably convey[] to those skilled in the art that the inventor had possession of the claimed subject matter as of the filing date.” *Id.* Possession means “possession as shown in the disclosure” and “requires an objective inquiry into the four corners of the specification from the perspective of a person of ordinary skill in the art.” *Id.*

Patent Owner’s citations to the '867 application sufficiently support the proposed substitute claims. For instance, the '867 application indicates possession of substitute claim 13’s average thickness of “about 25 nm” by describing an average thickness range of “about 1 nm to about 25 nm.” Ex. 1004, 23:18–22; *see* Mot. 4.¹⁰ In particular, the disclosed endpoint of “about 25 nm” provides support for reciting “about 25 nm” in proposed substitute claim 13.

¹⁰ Following Patent Owner’s convention, we refer to pagination added to Exhibit 1004 by Petitioner.

In addition, the '867 application indicates possession of substitute claim 19's "molar concentration ratio of radiation sensitive ligands to metal ion of at least about 2." Ex. 1004, 4:26–27, 10:10–11, 16:17–19, 20:8–10, 38 (claim 1).

Petitioner raises challenges regarding the written description requirement for the proposed substitute claims, which we address in the next section. Opp. 2–6. Otherwise, Petitioner does not argue that the proposed amendments introduce new matter. *See generally* Opp.; Pet. Sur-reply MTA.

For these reasons, Patent Owner has met its burden to show by a preponderance of the evidence that the proposed substitute claims contain no new matter.

B. Priority for Proposed Substitute Claims 13–23

Before analyzing Petitioner's challenges for proposed substitute claims 13–23, we first evaluate the priority date to which those claims are entitled to determine which of Petitioner's asserted references are prior art and, in particular, whether unlike the original claims, these proposed substitute claims are entitled to claim priority through the '867 application.

The '867 application, in fact, indicates that the inventors were in possession of substitute claim 13's average thickness of "about 25 nm," by virtue of its description of an average thickness range of "about 1 nm to about 25 nm." Ex. 1004, 23:18–22. To be clear, the '867 application expressly discloses the specified average thickness of "about 25 nm" (*id.*), which in our view represents "a statement of" that thickness range, not "an invitation to go on a hunting expedition to patch together after the fact" a disclosure of that thickness range. *Indivior*, 18 F.4th at 1329

The '867 application also indicates possession of substitute claim 19's "molar concentration ratio of radiation sensitive ligands to metal ion of at least about 2." Ex. 1004, 4:26–27, 10:10–11, 16:17–19, 20:8–10, 38 (claim 1). The parties do not dispute whether the remaining limitations, which are from the original claims, have written description support in the '867 application. Pet. 10–18; Resp. 7–24; Reply 1–7; Sur-reply 2–8.

As a result, we determine that proposed substitute claims 13–23 have written description support in the '867 application and are entitled to the filing date of the '867 application, namely, August 5, 2010. Ex. 1001, code (63).¹¹

C. Petitioner's Challenges for Proposed Substitute Claims 13–23

Petitioner opposes the addition of the substitute claims by asserting that the proposed claims are unpatentable for lack of written description support, lack of enablement, for indefiniteness, and as anticipated or obvious, which we analyze below. Opp. 2–25.

1. Written Description

Petitioner argues that proposed substitute claims 13–23 fail to comply with the written description requirement for several reasons. Opp. 3–6. We analyze these challenges below.

a) "radiation sensitive ligands" (claims 13–15 and 17–23)

Petitioner contends that "[c]laim 13 uses functional language to claim a broad genus of compounds based on the desired result—*i.e.*, 'ligands' that

¹¹ Because proposed substitute claims 13–23 have a filing date prior to AIA's effective date, we apply pre-AIA law to Petitioner's challenges against proposed substitute claims 13–23. Neither party indicates that this decision would change by applying the AIA law.

have the function of being ‘radiation sensitive.’” Opp. 3. According to Petitioner, “[t]he specification neither describes a representative number of species nor common structural features to provide adequate written description” for such a genus. *Id.* Petitioner argues that the claims are directed to an unpredictable art and “[c]hemical properties can be highly variable and difficult to predict—including whether any given ligand would be ‘radiation sensitive.’” *Id.* (citing Ex. 1040 ¶ 145).

Petitioner asserts “[t]here are practically an infinite number of potential ligands that could be ‘radiation sensitive,’” “[y]et the specification discloses only one species of a ‘radiation sensitive ligand’: ligands with peroxide groups.” *Id.* at 4 (citing Ex. 1040 ¶ 146; Ex. 1001, 5:45–47, 6:9–14). Petitioner argues “disclosing a single species is insufficient to support generic claims.” *Id.* Petitioner further contends that claims 13–15 and 17–23 also lack written description support “because they do not disclose ‘common structural features of the claimed [] genus’ that ‘identify which [candidates] would function as claimed.’” *Id.* According to Petitioner, “the specification simply identifies peroxide ligands as being ‘radiation sensitive ligands’ and provides a few examples of suitable inorganic peroxide ligands” and “[n]owhere does the specification disclose any structure-function correlation between a ligand’s structure and its functionality as ‘radiation sensitive.’” *Id.* (citing Ex. 1001, 12:22-33; Ex. 1040 ¶ 148).

Patent Owner asserts that Petitioner fails to support its argument because Petitioner “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.” PO Reply MTA 1. Patent Owner argues that the ’564 patent “discloses several groups and specific species of

peroxide ligands—not a single species.” *Id.* at 1–2 (citing Ex. 1001, 12:4–33, 15:33–50). Patent Owner further contends that Petitioner “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.* at 2 (citing Ex. 1001, 3:6–9, 7:57–8:5, 12:13–19, Fig. 1).

Petitioner contends that Patent owner’s arguments relies upon attorney argument and inapplicable law but “Petitioner’s expert Dr. Holland testified to the meaning of ligand and the breadth of the genus of ligands” and the “testimony that the field is ‘unpredictable’ and that ‘[t]here are practically an infinite number of potential ligands’ in the genus stands unrebutted and is a basic fact that any POSA would know.” Pet. Sur-reply MTA 1–2 (citing Ex. 1040 ¶¶ 144–146).

Petitioner further argues that Patent Owner misrepresents the legal requirements by “suggesting that the specification discloses multiple variations (and the chemical structure) of *peroxide* ligands” because proposed substitute claims 13–15 and 17–23 “are directed to the broad genus of ‘ligands’ generally,” not peroxide ligands” and the ’564 patent’s “disclosure of examples of peroxide ligands or the chemical structure of that species, is simply not enough to sufficiently describe the entire genus of ‘ligands.’” *Id.* at 2–3 (citing *AbbVie Deutschland GmbH & Co., KG v. Janseen Biotech, Inc.*, 759 F.3d 1285, 1300 (Fed. Cir. 2014); *Idenix Pharms. LLC v. Gilead Scis. Inc.*, 941 F.3d 1149, 1164 (Fed. Cir. 2019)).

In our Preliminary Guidance, we noted that this challenge regards a limitation of the original claims¹² and we did not address the challenge

¹² Petitioner asserts that the Federal Circuit has confirmed the Board may review amended claims for compliance with statutory requirements. Pet. Sur-reply MTA 1 (citing *Samsung Electronics America, Inc. v. Prisua*

further. Prelim. Guid. 7. Having considered the parties' arguments since that guidance,¹³ we determine that Petitioner has not met its burden for this challenge.

To claim a genus, a patentee must disclose "a representative number of species falling within the scope of the genus or structural features common to the members of the genus so that one of skill in the art can 'visualize or recognize' the members of the genus." *Ariad*, 598 F.3d at 1350. When considering whether representative species have been disclosed:

One factor in considering the question is how large a genus is involved and what species of the genus are described in the patent. If the genus is not large or, even if it is, the specification discloses species representing the genus throughout its scope, the requirement may be met. On the other hand, analogizing the genus to a plot of land, if the disclosed species only abide in a corner of the genus, one has not described the genus sufficiently to show that the inventor invented, or had possession of, the genus. He only described a portion of it."

AbbVie, 759 F.3d at 1299–1300.

The '564 patent explains that "[r]adiation sensitive ligands of particular interest have a peroxide group, —O—O—," that radiation breaks the oxygen to oxygen bond in a peroxide group —O—O—, and this leads to the formation of M-O-M bonds with metals. Ex. 1001, 12:13-19. The '564

Engineering Corp., 948 F.3d 1342 (Fed. Cir. 2020); *Uniloc 2017 LLC v. Hulu, LLC*, 966 F.3d 1295 (Fed. Cir. 2020)).

¹³ The Federal Circuit has determined that the Board may revise its position for an issue between Preliminary Guidance and a Final Written Decision, given the Office's notice of the non-binding nature of Preliminary Guidance and as long as the APA is followed and there is an opportunity for the parties to be heard on the issue. *Medytox, Inc. v. Galderma S.A.*, 71, F.4th 990, 999–1002 (Fed. Cir. 2023).

patent further describes the use of hydrogen peroxide and three inorganic peroxides. *Id.* at 12:22–33.

As noted above, Petitioner asserts that the genus for “radiation sensitive ligands” is practically infinite. Opp. 4; Pet. Sur-reply MTA 1–2 (citing Ex. 1040 ¶¶ 144–146). However, Petitioner does not adequately support this argument by explaining what other ligands can function as a radiation sensitive ligand besides peroxides. During oral argument, Petitioner acknowledged there was no evidence of a single radiation sensitive ligand that was not disclosed by the ’564 patent. Tr. 39:18–21. Petitioner asserted during oral argument that Trikeriotis discloses radiation sensitive ligands that are not peroxide, although it was unclear what ligand Petitioner was referencing. *Id.* at 41:2–7, 42:16–43:1. For the reasons discussed below with regard to Petitioner’s unpatentability challenge of the proposed substitute claims in view of Trikeriotis, we determine Petitioner has not shown by a preponderance of the evidence that Trikeriotis teaches or suggests radiation sensitive ligands.

Dr. Holland opines that the genus for “radiation sensitive ligands” would be nearly infinite but, here again, does not describe a single ligand that would fall within such a genus. Ex. 1040 ¶ 146. We further note that this testimony relies on a definition of a ligand binding to a central atom but overlooks the role of radiation and a ligand’s sensitivity to radiation. *Id.*¹⁴ As

¹⁴ Dr. Holland provides a definition for ligand (Ex. 1040 ¶ 146) that relates somewhat to how the ’564 patent describes a radiation sensitive ligand (breaking the peroxide group O—O bond leads to forming bonds with a metal (Ex. 1001, 12:12–18)), but Dr. Holland’s definition doesn’t mention radiation leading to a bond with a central atom, which casts some doubt on the sufficiency of her definition.

a result, Dr. Holland’s testimony on the size of the genus is conclusory and we accord it little weight.

Petitioner and Dr. Holland cite the unpredictability of the art as well. Opp. 3; Ex. 1040 ¶ 145; Pet. Sur-reply MTA 2. Unpredictability of the art is certainly a consideration for this issue. However, given the totality of the evidence here, including the ’564 patent’s description of peroxide species and how peroxide species function as radiation sensitive ligands due to their oxygen to oxygen bond, the unpredictability of the art, and Petitioner’s lack of sufficient explanation or persuasive evidence that the genus for “radiation sensitive ligands” is as large as Petitioner asserts, the preponderance of the evidence does not support Petitioner’s arguments that proposed substitute claims 13–23 lack written description support.

b) *“metal ions with radiation sensitive ligands” and “coating material . . . radiation alters the chemical properties” (claims 13–23)*

Petitioner argues that the term “metal ions with radiation sensitive ligands” lacks written description support because “combining metal ions with various ligands may affect whether those ions are ‘radiation sensitive.’” Opp. 5 (citing Ex. 1040 ¶ 149). According to Petitioner, “while a ligand may be radiation sensitive on its own or in combination with certain metal ions, it may lack radiation sensitivity when combined with other metal ions.” *Id.* (citing Ex. 1040 ¶ 149).

Petitioner also argues that the term “coating material . . . radiation alters the chemical properties” lacks written description support because “[t]he only examples of ‘metal ions with radiation sensitive ligands’ in the specification are hafnium or zirconium ions with hydrogen peroxide ligands.” *Id.* (citing Ex. 1001, 21:12–23:41; Ex. 1040 ¶ 150). Petitioner

contends that “[m]aterial coatings made from these two combinations are also the only examples of ‘coating materials’ with chemical properties altered by radiation.” *Id.* at 5–6 (citing Ex. 1001, 21:12–23:41). According to Petitioner, “[t]he specification fails to disclose any structure-function correlation between a metal ion/ligand combination’s structure and the functionality of the ligand as ‘radiation sensitive.’” *Id.* at 6 (citing Ex. 1040 ¶ 150). Petitioner further asserts that “while the ’564 patent teaches some methods for increasing radiation absorption . . . , it does not teach any structure correlating to whether a specific coating material will be altered by radiation.” *Id.* (citing Ex. 1001, 11:21–42, Ex. 1040 ¶¶ 153–154).

Patent Owner argues that Patent Owner’s “first argument on this issue hinges on its assertion that the combination of metal ions with certain ligands may affect their radiation sensitivity.” PO Reply MTA 2. Patent Owner asserts that Petitioner “provides no evidence for this speculation, only pointing to its expert’s declaration that parrots the petition, again without citing any evidence.” *Id.* (citing Opp. 5; Ex. 1040 ¶ 149). Patent Owner further argues that “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.” *Id.* (citing Ex. 1040 ¶ 54).

Patent Owner also contends that Petitioner’s argument regarding radiation altering the chemical properties in a coating material “is merely a derivative of its argument regarding radiation sensitive ligands” and “fails for the same reasons” because Petitioner merely speculates “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.” *Id.* at 2–3.

Petitioner responds by arguing that “Dr. Holland opined that ‘a ligand that has radiation sensitivity as an independent molecule, or when used with one type of metal ion, may not have the same radiation sensitivity when used with a different metal ion.’” Pet. Sur-reply MTA 3–4 (citing Ex. 1040 ¶ 149). According to Petitioner, Patent Owner “attempts to confuse the issue by pointing to Dr. Holland’s testimony that a specific ligand—peroxide—is radiation sensitive when combined with three different metals (hafnium, zirconium, or polytungstate).” *Id.* (citing Ex. 1040 ¶ 54).

Petitioner argues that this does not inform someone “about whether peroxide is radiation sensitive when combined with other metals or whether other ligands when combined with the hafnium, zirconium, or polytungstate will be radiation sensitive, and cannot resolve the unpredictability of practicing the full scope of claims that require metal ions with radiation sensitive ligands.” *Id.* at 4. Petitioner summarizes by asserting “the facts and law are clear: (1) the only examples of ‘metal ions with radiation sensitive ligands’ in the specification are hafnium or zirconium ions with hydrogen peroxide ligands,” “(2) material coatings made from these two combinations are also the only examples of ‘coating materials’ with chemical properties altered by radiation,” and “(3) disclosing limited species is insufficient to support broad genus claims, where the art is unpredictable, like here.” *Id.* (citing Ex. 1001, 21:12–23:41; Ex. 1040 ¶ 150).

In our Preliminary Guidance, we noted that this challenge regards a limitation of the originally challenged claims and we did not address the challenge further. Prelim. Guid. 7. Having considered the parties’ arguments since that guidance, for the following reasons, we determine that Petitioner has not met its burden of proof for this challenge.

First, Petitioner contends that “combining metal ions with various ligands *may* affect whether those ions are ‘radiation sensitive.’” Opp. 5 (emphasis added). In other words, Petitioner merely speculates that combining metal ions with a ligand *may* affect radiation sensitivity. Dr. Holland’s testimony similarly is based on speculation that, “combining different metal ions with different ligands could affect the radiation sensitivity of the ligands” and that, although “a ligand that has radiation sensitivity as an independent molecule, or when used with one type of metal ion, [the ligand] may not have the same radiation sensitivity when used with a different metal ion.” Ex. 1040 ¶ 149. Although Dr. Holland notes the unpredictability of the art, this does not adequately explain why the premise of Petitioner’s argument and Dr. Holland’s testimony would be true; that combining a metal ion with a ligand would affect radiation sensitivity.

Petitioner’s second argument regarding the term “coating material . . . radiation alters the chemical properties” similarly is unsupported. Petitioner argues that the ’564 patent only discloses the use of hafnium and zirconium ions with ligands but, in fact, the ’564 discloses the use of other ions. Ex. 1001, 10:62–63, 11:7, 11:35–39 (describing the use of various ions). As discussed above with regard to the term ‘radiation sensitive ligands,’ it is plain that the ’564 patent also describes several types of peroxide ligands. *Id.* at 12:22–33. Therefore, the disclosure of the ’564 patent is not as limited as Petitioner alleges. Dr. Holland’s testimony similarly limits itself to alleging a disclosure of only two metal ions and hydrogen peroxide and, therefore, is insufficiently supported and entitled to little weight. Ex. 1040 ¶¶ 150, 153.

As noted above, Petitioner asserts that, “while the ’564 patent teaches some methods for increasing radiation absorption . . . , it does not teach any structure correlating to whether a specific coating material will be altered by

radiation.” Opp. 6 (citing Ex. 1001, 11:21–42). This argument is not persuasive because the cited passage of the ’564 patent describes various ions, other than hafnium and zirconium ions, useful to adjust radiation absorption and, further, discloses that “[t]he energy absorbed is transferred to the peroxide ligand which can result in the rupturing of the peroxide bond, which provides desired control over the material properties.” Ex. 1001, 11:21–42. For these reasons, Dr. Holland’s testimony regarding the lack of structure of coating material related to the term “coating material . . . radiation alters the chemical properties” is unsupported by adequate objective proof, runs counter to relevant intrinsic disclosure, and is entitled to little weight. Ex. 1040 ¶ 154.

To the extent Petitioner argues that the full scope of these terms lacks written description support due to “radiation sensitive ligands” being a large genus, this argument is unpersuasive for the reasons discussed above with regard to Petitioner’s written description challenge for that term.

For these reasons, Petitioner does not demonstrate by a preponderance of the evidence that proposed substitute claims 13–23 fail to comply with the written description requirement due to the terms “metal ions with radiation sensitive ligands” and “coating material . . . radiation alters the chemical properties.”

2. *Enablement*

Petitioner argues that proposed substitute claims 13–23 fail to comply with the enablement requirement. Opp. 6–8. Specifically, Petitioner contends that “the ’564 patent’s specification does not enable the full scope of the claims, due to the limitation requiring ‘metal ions with radiation sensitive ligands.’” *Id.* at 7.

Petitioner argues, in that regard, that “the claims cover a combination of ‘metal ions with radiation sensitive ligands,’ but the ’564 patent provides examples of only two working combinations—hafnium or zirconium ions with hydrogen peroxide ligands.” *Id.* (citing Ex. 1001, 21:12–23:41). Petitioner asserts that the limitation claims “all ‘metal ions with radiation sensitive ligands’” but “the ’564 patent does nothing more than provide a POSA with a research assignment to test all combinations of metal ions and ligands in hopes of determining if the combination results in a material comprising ‘metal ions with radiation sensitive ligands.’” *Id.* at 7–8 (citing Ex. 1033, 156:9–160:12). According to Petitioner, “[t]his testing is a lengthy and arduous process and amounts to undue experimentation.” *Id.* at 8 (citing Ex. 1040 ¶¶ 159–162).

Petitioner also contends that the ’564 patent’s specification “does not enable the full scope of ‘coating materials’ where ‘radiation alters the chemical properties.’” *Id.* Citing arguments pertaining to an alleged failure of written description support, Petitioner submits that “the specification only discloses two coating materials with the claimed functional requirement (i.e., ‘radiation alters the chemical properties’—namely, coating materials made of hafnium or zirconium with hydrogen peroxide ligands” and therefore only provides one of ordinary skill in the art “with a research challenge of making all potential material coatings and testing them to determine whether radiation alters the coating’s chemical properties.” *Id.* (citing Ex. 1001, 21:12–23:41; Ex. 1040 ¶ 162; Ex. 1033, 159:13–160:12).

Patent Owner counterargues that Petitioner’s “enablement arguments are deficient extensions of their written description arguments.” PO Reply MTA 3. According to Patent Owner, Petitioner “merely recites the enablement standard and refers to its analysis ‘above’ regarding written

description without any meaningful application of the enablement standard.” *Id.* In Patent Owner’s further view, Petitioner “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.* (citing Ex. 1040 ¶¶ 159–162).

Petitioner responds to this by submitting that Patent Owner’s arguments lack “evidentiary and expert support, rendering it conclusory.” Pet. Sur-reply MTA 4. According to Petitioner, “both parties’ experts agree that determining radiation sensitivity would require extensive and iterative testing.” *Id.* at 4–5 (citing Ex. 1040 ¶¶ 159–160).¹⁵ Petitioner also contends that “Dr. Holland’s testimony that such testing ‘would be a lengthy and arduous process, and would qualify as undue experimentation’ is unrebutted.” *Id.* (citing Ex. 1040 ¶ 162).

In our Preliminary Guidance, we noted that this challenge regards a limitation of the originally challenged claims and we did not address the challenge further. Prelim. Guid. 7. Having considered the parties’ arguments since that guidance, we determine that Petitioner has not met its burden for this challenge.

Petitioner’s arguments are based on the same premises discussed above with regard to Petitioner’s written description challenges. Specifically, Petitioner contends that “the ’564 patent’s specification does not enable the full scope of the claims, due to the limitation requiring ‘metal ions with radiation sensitive ligands’” because “the claims cover a combination of ‘metal ions with radiation sensitive ligands,’ but the ’564

¹⁵ Petitioner’s citation is to “Ex. 1040 ¶¶ 195–160),” which we construe as including a harmless, typographical error. Pet. Sur-reply MTA 5.

patent provides examples of only two working combinations—hafnium or zirconium ions with hydrogen peroxide ligands.” Opp. 7. Our reasoning above, presented in the context of Petitioner’s written description challenge for this claim term, applies with equal force here and leads us to conclude Petitioner’s enablement argument similarly is not adequately supported.

Nor does Petitioner adequately support the enablement argument regarding the term “coating materials” where “radiation alters the chemical properties” because, here again, that enablement argument has the same deficiencies discussed above with regard to the written description challenge for this term. *Id.* at 8. This enablement argument, moreover, relies on Dr. Holland’s testimony, which rests on the same faulty premises regarding the number of coating materials encompassed, the number of examples disclosed, and the amount of testing required. Ex. 1040 ¶¶ 159–162.

For these reasons, Petitioner has not demonstrated by a preponderance of the evidence that proposed substitute claims 13–23 fail to comply with the enablement requirement.

3. *Indefiniteness*

Petitioner argues that proposed substitute claims 13–23 are indefinite for several reasons. Opp. 8–14. We analyze these challenges below.

a) “*about 25 nm*” (*claims 13–23*)

Petitioner argues that proposed substitute claims 13–23 are indefinite because proposed substitute claim 13 recites an average thickness of “about 25 nm.” Opp. 8–10. Specifically, Petitioner contends that the ’564 patent “fails to give sufficient guidance to construe the magnitude of variation permitted” and “fails to provide any guidance to a POSA in determining the range of thicknesses would fall within ‘about 25 nm.’” *Id.* at 8–9 (citing

Amgen, Inc. v. Chugai Pharm. Co., Ltd., 927 F.2d 1200, 1217–18 (Fed. Cir. 1991); *Synthes (USA) v. Smith & Nephew, Inc.*, 547 F. Supp. 2d 436 (E.D. Pa. 2008)); Ex. 1040 ¶¶ 163–168.

Petitioner contends that the claim phrase “about 30 nm” was rejected during examination as indefinite and, although disagreeing with the rejection, Patent Owner ultimately removed “about” from the claim. *Id.* at 9 (citing Ex. 1007, 404, 489, 495–497, 504). Petitioner also observes that Patent Owner’s witness, Dr. Banerjee, when posed questions regarding the breadth of the term “about 25 nm,” repeatedly insisted that one of ordinary skill in the art would understand its scope but “was unable to answer whether any particular value would fall inside or outside that scope.” *Id.* at 9–10 (citing Ex. 1033, 85:16–135:14).

Patent Owner counters that Petitioner applies an incorrect indefiniteness standard under pre-*Nautilus* law and that Petitioner “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.’” PO Reply MTA 3 (citing *Nautilus, Inc. v. Biosig Instruments, Inc.*, 572 U.S. 898, 901 (2014)).

According to Patent Owner, “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.” *Id.* Specifically, Patent Owner asserts that “[t]he 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’” and “also describes

those variables affecting thickness in further detail.” *Id.* at 4 (citing Ex. 1001, 5:11–22, 6:50–54, 13:4–11, 14:24–14:43, 14:58–15:4, 22:37–38, 23:35–37).

In addition, Patent Owner argues that, in response to the rejection Petition recites, Patent Owner “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.’” *Id.* (citing Ex. 1007, 504). Patent Owner also states “that ‘the term ‘about’ is a well-settled term of approximation,” which Dr. Banerjee testifies to. *Id.* (citing Ex. 1033, 131:10–133:13). According to Patent Owner, Petitioner overlooks these points “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.” *Id.* at 4–5 (citing *Ecolab, Inc. v. Envirochem, Inc.*, 264 F.3d 1358, 1367 (Fed. Cir. 2001)).

Petitioner responds by contending that Dr. Holland explains “why a POSA would be unable to determine the permitted variation that would fall within ‘about 25 nm.’” Pet. Sur-reply MTA 5 (citing Ex. 1040 ¶¶ 163–168). Petitioner further asserts that, although “the prosecution may provide some minimal guidance on the issue of thickness (*e.g.*, 5 nm is not ‘about’ . . . , it does not provide sufficient guidance to determine what thicknesses *do* fall within the claim scope.” *Id.* (citing Prelim. Guid. 8; Ex. 1040 ¶¶ 163–168). According to Petitioner, “even though ‘about’ can be definite in other patents, it is indefinite here because the intrinsic evidence fails to provide sufficient guidance to construe the allowed variation.” *Id.*

On this record, Petitioner does not demonstrate that proposed substitute claims 13–23 are indefinite due to the term “about 25 nm.” Petitioner’s arguments and Dr. Holland’s testimony allege that the ’564 patent lacks guidance regarding the scope of this term and cite the indefiniteness rejection made during examination. Opp. 8–10; Ex. 1040 ¶¶ 163–168; Pet. Sur-reply MTA 5.

Petitioner and Dr. Holland, however, do not sufficiently explain why the term “about 25 nm” are indefinite, on these particular facts, notwithstanding that such words of approximation are used ubiquitously in patent claims without being indefinite. Opp. 8–9; Pet. Sur-reply MTA 5; Ex. 1040 ¶ 164. Instead, Petitioner merely cites the indefiniteness rejection that was made during prosecution and the subsequent amendment to remove “about.” Opp. 9–10. Dr. Holland does the same to support her conclusion that “about 25 nm” is indefinite. Ex. 1040 ¶¶ 165–168.

Words of approximation, such as “substantially” or “about,” are ubiquitous in patent claiming and do not necessarily render a claim indefinite. MPEP § 2173.05(b) (words of approximation are acceptable if one of ordinary skill in the art would understand what is claimed). As noted in our Decision on Institution and in our Preliminary Guidance, the public record of prosecution provides some guidance on the issue because it reveals that one of ordinary skill in the art would have expected small changes to coating thickness (for example, a change of 5 nm, when going from 30 nm to 35 nm) to change the properties of the invention. Dec. 11 (citing Ex. 1007, 508); Prelim. Guid. 8.

Furthermore, Patent Owner disagreed with the Examiner’s rejection, asserting that one of ordinary skill in the art “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.” Ex. 1007, 504. The ’564 patent discloses exemplary methods for evaluating thickness using specific techniques such as “xray reflectivity and/or ellipsometry.” Ex. 1001, 14:58-61. In other words, one of ordinary skill in the art would view “about” in terms of the scope of error in such measurement techniques.

In addition, the ’564 patent also describes how to achieve a desired thickness, based on “precursor solution concentration, viscosity, and . . . spin speed,” and why “it can be desirable to use a thin coating” for applications in which one aims to “facilitate formation of small and highly resolved features.” *Id.* at 14:43–61. These disclosures further cut against Petitioner’s view that the qualifier “about” results in an indefinite claim under the particular and unique circumstances at hand.

As noted above, Petitioner cites Dr. Banerjee’s extensive testimony during deposition. Opp. 9–10 (citing Ex. 1033, 85:16–135:14). We do not view this evidence as persuasive. Dr. Banerjee’s refusal or inability to answer questions during cross-examination about whether particular values fall within or outside the scope of “about 25 nm” is not determinative on the question of indefiniteness. Ex. 1033, 91:8–13, 115:2–116:3, 121:7–11, 123:19–126:16. Petitioner does not show that this line of questioning falls within the scope of his direct examination, as presented in his supporting declaration (Ex. 2009), and, as a result, it is unsurprising that Dr. Banerjee was unprepared or unwilling to answer Petitioner’s questions regarding the meaning or scope of “about 25 nm.” *See* Ex. 1033, 131:10–19 (Dr. Banerjee noting he was not asked to analyze the meaning of “about” prior to deposition).

For these reasons, Petitioner has not demonstrated by a preponderance of the evidence in the record that claims 13–23 are indefinite due to the term “about 25 nm.”

b) “metal ions” (claims 13–14 and 16–23)

Petitioner contends that proposed substitute claims 13 and 14 are indefinite due to the limitation “metal ions.” Opp. 10–11. Specifically, Petitioner argues that “[t]he term ‘metal ions’ as used in claim 13, simply refers to ions of a ‘metal’ element.” *Id.* at 10 (citing Ex. 1040 ¶ 169). According to Petitioner, one of ordinary skill “would understand the meaning of ‘metal’ to be those elements identified as such on the periodic table” but “the specification and claims obfuscate the meaning of ‘metal’ by using it to reference elements that a POSA would understand to be nonmetals and metalloids.” *Id.* at 10–11 (citing Ex. 1040 ¶¶ 170–175).

For instance, Petitioner argues that “the ’564 patent refers to elements such as boron, silicon, and antimony as metals, even though a POSA would know that those elements are metalloids” and “[s]imilarly, the specification refers to phosphorous as a metal, even though a POSA would know phosphorous as a non-metal.” *Id.* at 11 (citing Ex. 1001, 10:65–11:42; Ex. 1040 ¶ 173).

Patent Owner counters that “[t]he 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.” PO Reply MTA 5 (citing Ex. 1001, 10:65–11:42).

Petitioner responds that Patent Owner asserts “a claim construction of ‘metal ions’ where ‘metal’ means both a metal and a metalloid . . . [b]ut this ignores that the only evidence of the plain and ordinary meaning of ‘metal’

to a POSA.” Pet. Sur-reply MTA 6 (citing Ex. 1040 ¶¶ 170–172). According to Petitioner, Patent Owner’s definition of “metal” lacks support in the specification and in the expert testimony. *Id.* Petitioner asserts that, “because the patent clearly includes other non-metals or metalloids without identifying the scope of which further non-metals or metalloids are included, the term ‘metal ions’ is indefinite.” *Id.*

In our Preliminary Guidance, we noted that this challenge regards a limitation of the originally challenged claims and we did not address the challenge further. Prelim. Guid. 9. Having considered the parties’ arguments since that guidance, we determine that Petitioner has not met its burden for this challenge.

In particular, Petitioner’s arguments are based on limiting “metal” to a definition that would exclude elements considered to be nonmetals and metalloids. Opp. 10–11. Dr. Holland’s testimony takes the same tack by citing extrinsic evidence in the form of a textbook, which defines metals, nonmetals, and metalloids, as well as a periodic table that color codes elements by these types. Ex. 1040 ¶¶ 170–172.

“In determining the meaning of the disputed claim limitation, we look principally to the intrinsic evidence of record, examining the claim language itself, the written description, and the prosecution history, if in evidence.” *DePuy Spine, Inc. v. Medtronic Sofamor Danek, Inc.*, 469 F.3d 1005, 1014 (Fed. Cir. 2006) (citing *Phillips v. ASW Corp.*, 415 F.3d 1303, 1312–17 (Fed. Cir. 2005)). Extrinsic evidence is “less significant than the intrinsic record in determining ‘the legally operative meaning of claim language.’” *Phillips*, 415 F.3d at 1317 (quoting *C.R. Bard, Inc. v. U.S. Surgical Corp.*, 388 F.3d 858, 862 (Fed. Cir. 2004)).

Here, the '564 patent's specification expressly describes the use of antimony, silicon, and boron (which would each be considered a metalloid under Petitioner's definitions) and phosphorous (which would be considered a nonmetal under Petitioner's definitions) as metal ions. Ex. 1001, 10:62–63, 11:7, 11:35–39; Ex. 1040 ¶ 171. This intrinsic evidence indicates that the ordinary meaning for “metal ions,” when considered in the context of the '564 patent's disclosure, should not be restricted in the way Petitioner argues but instead should encompass metalloids and nonmetals. *Phillips*, 415 F.3d at 1312–13. Because Petitioner's arguments and Dr. Holland's cited testimony are premised upon a definition of “metal ions” that excludes metalloids and nonmetals, a construction we decline because it relies upon extrinsic evidence that we find less probative than the intrinsic evidence noted here, regarding the scope of “metal ions.” Petitioner's arguments are unpersuasive and Dr. Holland's testimony is accorded little weight.

For these reasons, Petitioner has not demonstrated by a preponderance of the evidence that proposed substitute claims 13–14 and 16–23 are indefinite due to the term “metal ions.”

c) *“high absorption . . . relative to conventional radiation-based resists” and “effectively patterned” (claims 18 and 23)*

Petitioner asserts that proposed substitute claims 18 and 23 are indefinite due to the limitations “high absorption . . . relative to conventional radiation-based resists” and “effectively patterned.” Opp. 12. According to Petitioner, “[t]he '564 patent provides no guidance on how to determine if a material coating has ‘high absorption’ when compared to conventional resists.” *Id.* (citing Ex. 1040 ¶¶ 178–180). Petitioner argues there is no “disclosure of what ‘conventional resists’ to use for such a comparison, how many ‘conventional resists’ must be used for a comparison, or what

constitutes ‘high absorption’ compared to such resists.” *Id.* (citing Ex. 1040 ¶¶ 178–180; Ex. 1033, 168:1–169:10, 175:17–176:3, 169:15–170:6, 171:3–173:11). Petitioner also contends that “the ’564 patent provides no guidance on how to determine whether a coating material can be ‘effectively patterned’” and “[i]nstead, such a determination is necessarily subjective, leading to uncertain claim scope.” *Id.* (citing Ex. 1040 ¶ 183).

Patent Owner counterargues that Petitioner’s expert appeared to understand each term when attempting to apply alleged prior art. PO Reply MTA 5–6 (citing Ex. 2011, 130:18–131:15; Ex. 2017, 93:7–24:21, 98:3–12, 101:1–3, 106:25–107:10). Patent Owner asserts that the ’564 patent also provides context for these terms. *Id.* at 6 (citing Ex. 1001, 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).

Petitioner, in turn, contends that “even if a claim is indefinite, a POSA may still be able to opine on whether the prior art invalidates the claim.” Pet. Sur-reply MTA 6 (citing *IPXL Holdings, LLC v. Amazon.com, Inc.*, 430 F.3d 1377 (Fed. Cir. 2005)). In Petitioner’s view, “‘high absorption’ and ‘effectively patterned’ are indefinite terms of degree that rely on subjective standards and provide no objective guidance for a POSA to evaluate the scope of the claim.” *Id.* at 6–7.

In our Preliminary Guidance, we noted that this challenge regards a limitation of the originally challenged claims and we did not address the challenge further. Prelim. Guid. 9. Having considered the parties’ arguments since that guidance, we determine that Petitioner has not met its burden for this challenge.

Petitioner supports its argument by citing testimony from Dr. Holland, which indicates that the limitation “high absorption...relative to

conventional radiation-based resists” “requires a comparison between the absorption of the claimed resist as compared to “conventional radiation-based resists.” Ex. 1040 ¶¶ 178–179. The testimony further indicates that “[n]umerous conventional resists are known in the art, and such resists have different absorption characteristics” but Dr. Holland does not identify a single conventional resist that is known in the art or explain how such conventional resists have different absorption characteristics. *Id.* ¶¶ 179–180. On this record, the testimony is unsupported and conclusory. Similarly, Dr. Holland’s testimony about a lack of guidance in the ’564 patent contains insufficient explanation and is conclusory.

Proposed substitute claim 18’s language “wherein the coating material has high absorption of EUV radiation relative to conventional radiation-based resists” is comparative in nature. In other words, the coating material is required to have higher absorption of EUV radiation in comparison to a conventional radiation-based resist, which provides some benchmark for assessing the limitation, in contrast to, for example, a coating material more vaguely assigned some “high” EUV absorption value untethered to a benchmark. As a result, we view the facts in this case as different from other cases in which claim language was deemed indefinite for specifying a numerical amount absent any disclosure of a scope-defining benchmark.

We agree with Patent Owner, moreover, that the ’564 patent provides sufficient context for conventional resists and the absorption of radiation to one of ordinary skill in the art. Ex. 1001, 1:38–2:13, 5:23–35, 6:36–47, 8:35–38, 8:67–9:4, 9:57–61, 11:21–42. Dr. Banerjee’s deposition testimony also indicates that one of ordinary skill in the art would appreciate the meaning and scope of conventional resists and the absorption of radiation. Ex. 1033, 168:1–169:10, 170:7–18. In addition, the cited deposition

testimony indicates that Dr. Holland was able to understand what high absorption would be (Ex. 2017, 93:7-23), what a conventional resist would be (Ex. 2017, 94:14-20, 101:1-3), and what effectively patterned would mean (Ex. 2017, 106:25-107:10).

For these reasons, Petitioner has not demonstrated by a preponderance of the evidence that proposed substitute claims 18 and 23 are indefinite.

d) Mixed Claim Type (claims 13–23)

Petitioner asserts that “[w]hen a single claim is directed to an apparatus or article, but requires a method step, the claim is indefinite. Opp. 13 (citing *IPXL Holdings, LLC v. Amazon.com, Inc.*, 430 F.3d 1377 (Fed. Cir. 2005)). According to Petitioner, proposed substitute claims 13–23 are indefinite because proposed substitute claim 13 is directed to an apparatus but requires a method step in the limitation “exposure of the coating material to . . . radiation” and proposed substitute claim 20 recites “the coating material has been heated to temperatures from 45° C. to 150° C.” *Id.* (citing Ex. 1040 ¶¶ 184–187). Petitioner further contends there is a “lack of any claimed structure that performs the claimed method steps,” asserting that “an apparatus claim that recites a functional or method step that is not performed by any claimed structure is necessarily indefinite.” *Id.*

Patent Owner responds that Petitioner’s “reliance on *IPXL Holdings, LLC v. Amazon.com, Inc.*, 430 F.3d 1377, 1384 (Fed. Cir. 2005) is misplaced because [Patent Owner’s] substitute claims recite ‘an apparatus with particular capabilities . . . and do not ‘claim activities performed by the user.’” PO Reply MTA 6 (citing *UltimatePointer, LLC v. Nintendo Co.*, 816 F.3d 816, 828 (Fed. Cir. 2016)).

Petitioner disputes as nonsensical Patent Owner's position that the phrase "has been heated" does not claim an activity performed by a user. Pet. Sur-reply MTA 7. According to Petitioner, the problem with the proposed substitute claims is that they are apparatus claims including steps that require "exposure of the coating material to . . . radiation" or the apparatus "has been heated to temperatures from 45° C. to 150° C." *Id.* Petitioner argues "[t]hese steps indicate a mixed-claim type and render the claims indefinite." *Id.*

As stated in the Preliminary Guidance, we find the *IPXL Holdings* case inapposite, because unlike any proposed substitute claim at issue here, the *IPXL Holdings* case involved a claim that attempted to cover "both a system and a method for using that system." *IPXL Holdings, LLC*, 430 F.3d at 1384; Prelim. Guid. 9–10. Petitioner relies on additional authority that involved a means-plus-function claiming, and whether the specification disclosed sufficient structure for the claimed means, which also is inapposite to the facts at hand. Opp. 13 (citing *In re Katz Interactive Call Processing Pat. Litig.*, 639 F.3d 1303 (Fed. Cir. 2011)).

For these reasons, Petitioner has not demonstrated by a preponderance of the evidence that proposed substitute claims 13–23 are indefinite because they are mixed-claim types, as Petitioner argues.

4. *Anticipation and Obviousness*

Petitioner presents several challenges for the proposed substitute claims based on anticipation or obviousness over Stowers 2008, Trikeriotis, and Keszler. Opp. 14–25. We first provide overviews of these references before evaluating these challenges.

a) Overview of Asserted References

(1) Stowers 2008 (Ex. 1008)

Stowers 2008 is a doctoral dissertation titled “Direct Patterning of Solution Deposited Metal Oxides” by Jason K. Stowers, who is a named inventor on the ’564 patent. Ex. 1008, 2; Ex. 1001, code (72).

Stowers 2008 describes using HafSO_x and ZircSO_x in depositing films having a “thickness from 2 to 500 nm.” *Id.* at 18. Stowers 2008 further describes using zirconium oxide and hafnium oxide compounds in a solution with hydrogen peroxide. *Id.* at 68. Stowers 2008 explains that ZircSO_x materials “could be patterned by UV light in either positive or negative tone” and indicates a sensitivity to UV and EUV light. *Id.* at 70, 143.

(2) Stowers 2009 (Ex. 1010)

Stowers 2009 is an article titled “High resolution, high sensitivity inorganic resists.” Ex. 1010, 19. Stowers 2009 describes resists made using aqueous solutions of Zr and Hf and having “metal-to-peroxide ratios of 1:0.5.” *Id.*

(3) Trikeriotis (Ex. 1024)

Trikeriotis is an article titled “Development of an inorganic photoresist for DUV, EUV, and electron beam imaging” as part of a conference proceeding. Ex. 1024, 1, 15. Trikeriotis describes “the need to reduce resist thickness to prevent pattern collapse” as feature sizes decrease. *Id.* at 15.

Trikeriotis teaches the use of hafnium oxide nanoparticles with an organic ligand in an inorganic nanocomposite for a photoresist. *Id.* Trikeriotis states that this material made be used “for optical (DUV or EUV)

and electron beam lithography.” *Id.* at 16. According to Trikeriotis, “film thicknesses ranging from 30 nm to 200 nm can be easily achieved.” *Id.* at 18.

(4) *Keszler (Ex. 1038)*

Keszler is titled “Solution Processed Thin Films and Laminates, Devices Comprising Such Thin Films and Laminates, and Method for Their Use and Manufacture” and published July 10, 2003. Ex. 1038, codes (43), (54). Keszler is directed to “[a] method for patterning a device using a positive or negative resist.” *Id.* at code (57).

Keszler’s describes “a thin film or laminate structure comprising at least one hafnium and/or zirconium” compound. *Id.* at 4:23–31.¹⁶ Keszler teaches forming a solution of inorganic materials, such as a metal oxide with a polyatomic anion, such as sulfate (SO_4^{2-}). *Id.* at 12:21–13:2. Keszler further teaches that “small coordinating species such as peroxide (O_2^{2-}) can be incorporated into aqueous-based inorganic liquid suspensions and films to provide an additional, new lithographic patterning method.” *Id.* at 28:9–12. Keszler describes exposing the material “to an energy source, such as UV light” and using “an electron beam at dose levels ranging from greater than $0 \mu\text{C}/\text{cm}^2$ to at least $400 \mu\text{C}/\text{cm}^2$ ” and “at dose levels as low as $2 \mu\text{C}/\text{cm}^2$.” *Id.* at 28:17–19, 33:13–18. Keszler further describes “depositing a thin film (from about 1 nm to about 100 nm) of an inorganic precursor” “onto a substrate.” *Id.* at 32:4–6.

b) *Anticipation and Obviousness Based Upon Stowers 2008*

Citing the Petition and the arguments in its Opposition to the Contingent Motion to Amend, Petitioner argues that proposed substitute

¹⁶ Our citations are to pages of the exhibit, not to pages of the original document.

claims 13–21 and 23 are anticipated by Stowers 2008, proposed substitute claims 13–21 and 23 would have been obvious in view of Stowers 2008, and proposed substitute claim 19 would have been obvious in view of Stowers 2008 and Stowers 2009. Opp. 14–16. Before addressing Petitioner’s patentability arguments based upon Stowers 2008, we first address whether Stowers 2008 is prior art for the proposed substitute claims.

(a) The Parties’ Arguments Regarding Prior Art Status of Stowers 2008

Petitioner initially argued that “Stowers 2008 published on October 21, 2008.” Pet. 19 (citing Ex. 1006 ¶¶ 44–50, 67). The cited evidence is Dr. Hall-Ellis’ declaration testimony that a record was created for Stowers 2008 in The Valley Library at Oregon State University (“OSU”) on October 21, 2008, this was accessible via any library with access, and, therefore, Exhibit 1008 (the copy of Stowers 2008 filed with the Petition) was publicly available on October 21, 2008.¹⁷ Ex. 1006 ¶¶ 47–49.

Patent Owner disputes this position in its Response, contending that “the document on which [Petitioner] relies was not completed and submitted to the Oregon State University Library until a few months later in October 2008,” which “is consistent with the Oregon State University Library record that [Petitioner]’s declarant (Dr. Sylvia Hall-Ellis) retrieved.” Resp. 25 (citing Ex. 2008 ¶ 4; Ex. 1006 ¶ 47). According to Patent Owner, “[t]he Oregon State University Library, however, allows for submissions to be placed under ‘Embargo’ for a period of time before it is released to the

¹⁷ Dr. Hall-Ellis testifies that Exhibit 1008, the copy of Dr. Stowers’ dissertation upon which Petitioner’s challenge is based, is a true and correct copy that she downloaded from ProQuest’s database — thus, this copy was *not* obtained from OSU. Ex. 1006 ¶ 44; *see* Opp. 15 (relying on Ex. 1008).

public.” *Id.* Patent Owner also directed us to evidence that the lab where Dr. Stowers conducted his research “had a policy requiring dissertations to be submitted under embargo for a one year period.” *Id.* at 26 (citing Ex. 2008 ¶ 6).

In addition, in the Response, Patent Owner asserted that “Dr. Stowers complied with this requirement and submitted his dissertation subject to one-year embargo, meaning EX1008 would have been available to the public, at the earliest, in October 2009” and “contemporaneous evidence from shortly after October 2009 confirms that Dr. Stowers placed his thesis under a one-year embargo.” *Id.* (citing Ex. 2008 ¶¶ 7–8). Dr. Stowers testifies that he requested a one-year embargo for his thesis (Stowers 2008) and, for corroborating support, cites an email dated February 2010 in which he states to a colleague that “[m]y Dissertation is now past its 1 year publication embargo.” Ex. 2008 ¶¶ 7–8.

Petitioner counterargues that Dr. Stowers was incorrect in his belief that an embargo was placed on his dissertation because “a third-party publisher published it on January 15, 2009.” Reply 9 (citing Ex. 1041 ¶ 8). Petitioner relies, however, on an original declaration by Ms. Heather Stewart, a Manager at ProQuest LLC (Ex. 1041), subsequently discredited by Ms. Stewart’s second declaration (Ex. 2013) and deposition testimony (Ex.1050).

Originally, Ms. Stewart testified that ProQuest’s records show that Stowers 2009 was first made available for sale (via print or electronically) in January 2009. Ex. 1041 ¶ 8. Specifically, Ms. Stewart stated that the dissertation was loaded into ProQuest’s database and made available as of this date. *Id.* Petitioner argues that Patent Owner relies on Dr. Stowers’ email, stating his embargo had been lifted after one year, and a screenshot of

a current embargo process at OSU, but falls short of producing any evidence showing that an embargo, even if requested by Dr. Stowers, actually was placed on the dissertation. Reply 9.

Petitioner further contends the Oregon State University library “does not have any information regarding embargos for dissertations submitted before 2017.” *Id.* To support this argument, Petitioner cites an email exchange between Alan Telecky at Inpria and Cara Key at Oregon State University. *Id.*; Ex. 2012. Mr. Telecky asks Ms. Key whether certain dissertations were under embargo. Ex. 2012, 2–3. Ms. Key responds that the dissertations in question were submitted via a previous software platform and records for embargo dates were not retained during migration to the current software platform. *Id.* at 1.

Patent Owner, in counterargument, reiterates that Stowers 2008 was unavailable more than one year prior to the ’564 patent’s filing date of August 5, 2010, due to the embargo placed on this dissertation. Sur-reply 8. According to Patent Owner, Ms. Stewart in her original declaration was not aware of the embargo and, thus, did not consider it. *Id.* at 9 (citing 1041 ¶ 8). Patent Owner supports that view by citing a second, subsequent declaration by Ms. Stewart in which she acknowledges an embargo end date of December 7, 2009, and states that the dissertation (Stowers 2008), in fact, was made publicly available only as of December 8, 2009. *Id.*; Ex. 2013 ¶ 8.

Given the legal importance and factual complexity of this dispute, we authorized additional briefing regarding the prior art status of Stowers 2008. In that briefing, Petitioner shifts gears, abandoning its reliance on the publication date of the copy of Stowers 2008 that was filed with the Petition and supports the challenges (namely, a copy published by ProQuest, Ms. Stewart’s employer).

Petitioner newly relies exclusively on a different (but supposedly identical) version of Dr. Stowers’ dissertation allegedly published by OSU without any embargo. Ex. 1051 (*see infra* n.18). Specifically, Petitioner submits that “Stowers 2008 was available from two independent sources—OSU and ProQuest—and was publicly available from OSU by October 2008” and that Exhibit 1008, although published by ProQuest subject to the one-year embargo, “is a copy of Stowers 2008, merely reflecting the subject matter of the same document from one of its public sources” available prior to the embargo. Pet. Supp. Br. 1 (citing Ex. 1006 ¶¶ 44, 46).

The Board remarked during the final hearing that Petitioner’s view that OSU and ProQuest published identical versions of Dr. Stowers’ dissertation is conclusory because what, if anything, was in fact published independently by OSU, on a date that establishes the prior art status of the content, is not of record.¹⁸ Tr. 85:8–87:26. And Patent Owner, in its supplemental briefing, correctly observes that “during the regular briefing period,” which concluded prior to the final hearing, Petitioner “never

¹⁸ After the final hearing in this proceeding, Petitioner’s counsel downloaded and filed Exhibit 1051, asserting that this is a copy of Stowers 2008 published by OSU prior to the critical date. Ex. 2021, 35:8–39:17. We agree with Patent Owner that Exhibit 1051, at best, “is only relevant to the *current* availability of” Stowers 2008 from some unidentified OSU website, which “says nothing about the availability of” that dissertation “from OSU *at the relevant time* (early 2009).” PO Supp. Resp. Br. 3–4 & n.1 (citing 1032, 60:7–60:21; Ex. 2008, 6; Ex. 2021, 35:8–39:17). Notably, Petitioner stops short of submitting the type of evidence typically proffered in our forum to establish the prior art status of a web publication, namely, testimony from a competent custodian about information captured from “the internet archive service known as the Wayback Machine (<https://web.archive.org/>).” *Murray & Poole Enterprises Ltd. v. Institut de Cardiologie De Montreal*, IPR2023-01064, Paper 49 at 29 (PTAB Jan. 14, 2025).

emphasized any ‘separate publications’ distinction, and instead intertwined ProQuest and OSU.” PO Supp. Resp. Br. 1 (and citations therein).

To be clear, after the final hearing, Petitioner for the first time argues clearly that there are two publications of Stowers 2008, one published by OSU under no embargo and another published by ProQuest only after the embargo was lifted, that these two publications are “materially identical,” and that Petitioner relies “on the public accessibility of Stowers 2008 from the OSU library,” even though the version of Stowers 2008 (Exhibit 1008) filed in support of the patentability challenges was published by ProQuest. Pet. Supp. Br. 2–3 (citing Pet. 19; Ex. 1006 ¶¶ 44–50; Exs. 1052, 1053). Based on this, Petitioner argues that “EX1008 can be relied upon by the Board, regardless when or from where EX1008 was obtained, consistent with precedent.” *Id.* at 3–4 (citing *VidStream LLC v. Twitter, Inc.*, 981 F.3d 1060 (Fed. Cir. 2020); *Hulu, LLC v. Sound View Innovations, LLC*, IPR2018-01039, Paper 29, 10–11 (PTAB Dec. 20, 2019) (precedential)).

Petitioner further asserts in its post-hearing briefing that “Stowers 2008 was publicly available from OSU by October 21, 2008,” citing Dr. Hall-Ellis’ declaration (Ex. 1006 ¶¶ 44–50), a page showing a date available from OSU (Ex. 2012, 5), and an email from OSU’s Cataloging Manager (Ex. 1042). With regard to the embargo advanced by Patent Owner, Petitioner contends such an embargo would apply only to ProQuest, and not to OSU. *Id.* To support this, Petitioner cites Exhibit 2020, which the parties refer to as “the OSU packet.”

According to Petitioner, “[t]he OSU packet shows that the one-year embargo was requested solely for ProQuest on a ProQuest publishing agreement form.” Pet. Supp. Br. 4–5 (citing Ex. 2020, 2–3) (statement that “[e]mbargoes start from the date we receive your manuscript at

ProQuest/UMI”)). Petitioner further cites Ms. Stewart’s deposition testimony, in which she states that the OSU packet includes “a ProQuest publishing agreement form” and agrees that the embargo applied only to ProQuest’s publication of Stowers 2008, not to OSU’s publication of Stowers 2008. *Id.* at 5 (citing Ex. 1050, 23:17–25:1, 43:4–15, 44:20–45:16).

Petitioner contends that the email from Ms. Key “should be given no weight because she admitted that ‘the record of prior embargo dates wasn’t retained . . . so I don’t have that information for anything earlier than 2017 and I can’t confirm either way’ and further added, ‘[s]orry it isn’t the answer you’re looking for.’” *Id.* (citing Ex. 2012, 1).¹⁹

Patent Owner disputes Petitioner’s position that Stowers 2008 was publicly accessible as of the date Dr. Hall-Ellis testified to, citing Dr. Stowers’ testimony regarding the embargo. PO Supp. Br. 1 (citing Ex. 1006 ¶ 47; Ex. 2008 ¶¶ 5–7; Ex. 2012, 1, 5). Patent Owner further argues that, “[i]n preparing her original declaration (EX1041), Ms. Stewart had mistakenly accessed records for a different dissertation and provided incorrect publication information.” *Id.* at 2 (citing Ex. 2021, 15:9–16:7, 47:16–49:18, 55:10–56:4). Realizing her mistake, Ms. Stewart revised the

¹⁹ At the final hearing, upon questioning, Petitioner’s counsel was not able to direct the Board to any evidence that Ms. Stewart (testifying as an employee of ProQuest) is competent to testify, or in fact testified, that an early version of Dr. Stowers’ dissertation, allegedly published by a different entity (OSU), was, in fact, identical in all material respects to the copy kept under embargo by ProQuest (that is, the copy upon which Petitioner’s challenge is based). Tr. 85:8–87:26. As Patent Owner correctly points out, in the Petition, Petitioner’s “evidence of public availability was tied (by its own expert) to ‘Exhibit 1008 . . . that I downloaded from . . . *ProQuest*.’” PO Supp. Resp. Br. 1.

public accessibility date of Stowers 2008 to December 2009 in her second declaration. *Id.* at 2–3 (citing Ex. 2013 ¶¶ 8–9; Ex. 2021, 16:8–22:22).

Patent Owner asserts that the OSU packet “shows that Dr. Stowers requested a ‘1 year embargo’ when he submitted his dissertation to OSU in October 2008.” *Id.* at 3 (citing Ex. 2020, 3; Ex. 2021, 23:22–25:21). According to Patent Owner, the OSU packet shows that “OSU instructed Dr. Stowers to complete ProQuest’s publishing agreement for his dissertation, thus tying OSU’s purported publication together with ProQuest’s” and, further, that Dr. Stowers placed a “1 year embargo” on the dissertation. *Id.* at 4 (citing Ex. 2020, 1, 3). In Patent Owner’s further view, Petitioner attempts to shift its position by arguing that the ProQuest version of Stowers 2008 was available from OSU before the critical date and, in any event, “[t]he OSU packet shows that the embargo request was made and is tied to both OSU and ProQuest.” *Id.* at 4–5 (citing Ex. 2020, 1, 3).

Petitioner responds by arguing that it has consistently argued and proven that Stowers 2008 was publicly accessible from OSU in October 2008. Pet. Supp. Resp. Br. 1–3. Petitioner reiterates its position that the embargo did not apply to OSU and, further, that the OSU and ProQuest publications of Stowers 2008 “are substantively and materially identical.” *Id.* at 2–3. Petitioner further contends that the cited evidence fails to demonstrate that the OSU version of Dr. Stowers’ dissertation was embargoed, citing the email from Ms. Key; argues that the OSU packet was directed at ProQuest, not OSU; and directs us to Ms. Stewart’s deposition testimony that the embargo did not apply to OSU. *Id.* at 3–4 (citing Ex. 2012, 1; Ex. 2020, 2–3; Ex. 1050, 23:17–25:1, 43:4–15, 44:20–45:16). According to Petitioner, Patent Owner is left with only attorney argument, which is insufficient. *Id.* at 4.

Patent Owner responds to those arguments by reiterating its position that Dr. Stowers' testimony about the one-year embargo and Ms. Stewart's second declaration acknowledging an embargo show sufficiently that Stowers 2008 was subject to an embargo. PO Supp. Resp. Br. 1 (citing Ex. 2008 ¶ 7; Ex. 2013 ¶ 8 ; Ex. 2021, 20:4–21:22, 23:22–25:21, 47:16–49:18). Patent Owner also contends that Petitioner makes an untimely argument regarding publication of Stowers 2008 by ProQuest and OSU as separate entities. *Id.* at 1–2.

In addition, according to Patent Owner, “[a]ll of the evidence shows an embargo” because “[n]othing in the OSU packet indicates the embargo did not apply to OSU itself, and an embargo at ProQuest and not at OSU would make no sense” and “it was OSU that produced the document showing that Dr. Stowers checked the one-year embargo box on the form that was provided to him *by OSU* and retained *by OSU* in its files.” *Id.* at 2. Patent Owner argues that Petitioner “misplaces reliance on Ms. Stewart’s testimony about OSU processes . . . because she is not an OSU employee” and “ProQuest is not connected to the OSU repository.” *Id.* at 2 (citing Pet. Supp. Br. 5; Ex. 2021, 43:4–7, 42:13–18).

Patent Owner further asserts Dr. Hall-Ellis testified that she downloaded Exhibit 1008 from ProQuest and therefore her testimony does not regard “whether a separate copy was available from OSU at the relevant time.” *Id.* at 2–3 (citing Ex. 1006 ¶¶ 44, 46, 49) (emphasis omitted). Patent Owner contends that Petitioner’s Exhibit 1051 is relevant to the current availability of Stowers 2008 because Petitioner’s counsel downloaded it from an OSU website to prepare Petitioner’s comparison copies of Stowers 2008. *Id.* at 3–4. Patent Owner also asserts that Dr. Hall-Ellis relied upon a date for when Stowers 2008 “was ‘Entered’ into the library system,” which

does not explain how Stowers 2008 was publicly accessible. *Id.* at 4 (citing Ex. 1006 ¶¶ 44–50).

(b) *Analysis*

“To prevail in a final written decision in an *inter partes* review, the petitioner bears the burden of establishing by a preponderance of the evidence that a particular document is a printed publication.” *Hulu*, IPR2018-01039, Paper 29, 11 (citing *Nobel Biocare Servs. AG v. Instradent USA, Inc.*, 903 F.3d 1365, 1375 (Fed. Cir. 2018)).

Whether a reference qualifies as a “printed publication” involves an inquiry into the facts and circumstances surrounding the reference’s disclosure to members of the public. *In re Klopfenstein*, 380 F.3d 1345, 1350 (Fed. Cir. 2004). A reference is considered “publicly accessible” upon a satisfactory showing that the document has been “disseminated or otherwise made available to the extent that persons interested and ordinarily skilled in the subject matter or art exercising reasonable diligence[] can locate it.” *Kyocera Wireless Corp. v. ITC*, 545 F.3d 1340, 1350 (Fed. Cir. 2008) (citation and internal quotation marks omitted).

We consider a totality of the evidence when determining whether a Petitioner has established that a reference was publicly accessible. *Hulu*, IPR2018-01039, Paper 29, 3, 17–19, 21. We therefore consider the cited evidence in the record and whether Petitioner has established by a preponderance of the evidence that Stowers 2008 was publicly accessible by the effective filing date of the proposed substitute claims.

Patent Owner cites Dr. Stowers’ testimony that he requested an embargo but the only corroborating evidence Dr. Stowers provides is an email from Dr. Stowers to a colleague stating the embargo has ended, as

well as a screen shot showing how an embargo could be requested. Ex. 2008 ¶¶ 7–9. This does not adequately corroborate Dr. Stowers testimony by demonstrating that an embargo, even if requested, actually was put in place. We do not find conclusive, therefore, Dr. Stowers’ testimony on the ultimate existence or length of the embargo.²⁰

Ms. Stewart provided two declarations on this subject. In her first declaration, Ms. Stewart testified that ProQuest’s records showed that Stowers 2009 was first made available for sale (via print or electronically) in January 2009. Ex. 1041 ¶ 8. However, Patent Owner provided a second declaration in which Ms. Stewart acknowledges an embargo end date of December 7, 2009 and states that the dissertation (Stowers 2008) was made available on December 8, 2009. Ex. 2013 ¶ 8.

During a deposition conducted after the final hearing, Ms. Stewart acknowledged that she was not made aware of the embargo when preparing her first declaration, that she mistakenly accessed the wrong dissertation when searching for Stowers 2008, and when reviewing her prior work, Ms. Stewart discovered that error and found the correct information date for Stowers 2008, (December 8, 2009). Ex. 2021, 15:4–16:7, 47:16–49:18,

²⁰ The Board is permitted to weigh expert testimony and other record evidence and, in so doing, rely on certain portions of an expert’s declaration while disregarding others. *See Velandier v. Garner*, 348 F.3d 1359, 1371 (Fed. Cir. 2003) (“[W]hat the [PTAB] consistently did was accord little weight to broad conclusory statements that it determined were unsupported by corroborating references. It is within the discretion of the trier of fact to give each item of evidence such weight as it feels appropriate.” (citation omitted)); *see also In re Am. Acad. of Sci. Tech Ctr.*, 367 F.3d 1359, 1368 (Fed. Cir. 2004) (“[T]he [PTAB] is entitled to weigh the declarations and conclude that the lack of factual corroboration warrants discounting the opinions expressed in the declarations” (citations omitted)).

55:10–56:4. Given Ms. Stewart’s second declaration and explanation for her testimony in the first declaration, we accord greater weight to Ms. Stewart’s second declaration.

We also consider the OSU packet. Ex. 2020. The OSU packet demonstrates that Dr. Stowers requested selected option “TR-2” on a ProQuest form. *Id.* at 3. The TR-2 options states that “[i]f no boxes are checked below, your work will be released immediately with no restrictions.” Dr. Stowers selected a “1 year embargo” within the TR-2 option and signed the form in October 2008. *Id.* The form further states that “[e]mbargoes start from the date we receive your manuscript at ProQuest/UMI.” *Id.*

We view this as strong evidence that an embargo was placed upon at least ProQuest. We note that the Petitioner’s grounds over Stowers 2008 (Exhibit 1008) were based on a copy of Stowers 2008 that was obtained from ProQuest. Pet. 19 (citing Ex. 1006 ¶¶ 44–50, 67); Ex. 1006 ¶ 44 (Dr. Hall-Ellis explaining that she downloaded Exhibit 1008 from ProQuest); Tr. 100:14–101:6 (Petitioner’s counsel confirming during oral arguments that Stowers Exhibit 1008 was downloaded from ProQuest).

We also consider whether the embargo would apply to OSU. We appreciate Petitioner’s position that the OSU packet includes both a letter from OSU and ProQuest forms and that any embargo would only to apply to ProQuest, not OSU. Pet. Supp. Br. 4–5; Pet. Resp. Supp. Br. 3–4.

Importantly, however, the OSU letter appears to refer to the ProQuest form by stating “[y]ou must complete the **UMI/ProQuest Publishing Agreement form** available on the web” and directing Dr. Stowers to “[c]omplete the forms on pages 3 & 4 (page 5 is optional), print it and submit with your dissertation to the Graduate School.” Ex. 2020, 1. The

ProQuest forms are numbered 4 and 3 and, therefore, appear on this record to be the pages the OSU letter refers to. *Id.* at 2–3. Based on this evidence, we agree with Patent Owner that the OSU packet shows that Dr. Stowers requested a one-year embargo for his dissertation and that this embargo would apply to *both* OSU and ProQuest.

We also consider Ms. Stewart’s deposition testimony that the embargo would not apply to OSU. Ex. 1050, 23:17–25:1, 43:4–15, 44:20–45:16). As stated in her second declaration, Ms. Stewart is an employee of ProQuest, not OSU. Ex. 2013 ¶ 2. Further, Ms. Stewart acknowledges that she had no idea whether OSU published the dissertation and “ProQuest is not connected to the OSU repository.” Ex. 2021, 42:13–18, 43:4–7. Therefore, the cited testimony does not sufficiently explain how Ms. Stewart would be knowledgeable about the practices of OSU’s libraries, particularly regarding any procedure OSU libraries would have had for a dissertation having an embargo in 2008. As a result, Ms. Stewart’s deposition testimony regarding the applicability of the embargo to OSU is unsupported and conclusory. We accord this testimony little weight on that basis.

The exhibit, which includes Ms. Key’s email, has a page stating a date available of October 21, 2008. Ex. 2012, 5. This page contains little other information, such as what publication it may be referring to and its source. Ms. Key’s email acknowledges that the information regarding an embargo was unavailable at the time Dr. Stowers submitted his dissertation and, therefore, Ms. Key was not able to “confirm either way” whether an embargo was placed on Dr. Stowers’ dissertation. *Id.* at 1. In addition, this exhibit is submitted without an affidavit under oath or declaration under penalty for false statements, unlike other testimony of record regarding public accessibility of the reference. *Compare* Ex. 2012, 1 (Ms. Key’s

email), *with* Ex. 2013, 4 (Ms. Stewart’s declaration). For these reasons, we do not view Exhibit 2012 as reliable evidence that Stowers 2008 was available from OSU as of October 2008 and accord it little weight with regard to the public accessibility of Stowers 2008 as of that date.²¹

Similarly, the email provided in Exhibit 1042 is not sworn testimony in the form of an affidavit or declaration regarding the public accessibility of Stowers 2008. This email also appears to be unaware of an embargo or address that issue, which is reasonable given that embargo information for this period appears to have been lost. Ex. 1042; Ex. 2012, 1. We therefore accord little weight to Exhibits 1041 and 2012 with regard to the date when Stowers 2008 was publicly accessible.

Dr. Hall-Ellis’ one-year testimony about the entry and indexing of Stowers 2008 at the OSU library does not address or appear to consider whether that dissertation was under an embargo. Ex. 1006 ¶¶ 44–50, 67. Given the evidence of the embargo discussed above, it would appear that Dr. Hall-Ellis was unaware of the embargo placed upon Stowers 2008.²² Such an inference is reasonable in light of the evidence that records for embargoes, requested prior to 2017, were lost at OSU. Ex. 2012, 1. For all of these

²¹ Exhibit 2012 is interesting for its acknowledgment that there is no embargo data at OSU for Stowers 2008, because OSU migrated to a new software program in 2017, “the record of prior embargo dates wasn’t retained through the migration” and, as a result, embargo information was lost by OSU “for anything earlier than 2017.” Ex. 2012, 1. That casts further doubt on dates gleaned by Petitioner from Ms. Key’s email (Ex. 2012, 5) and Dr. Hall-Ellis’ testimony (Ex. 1006 ¶¶ 47–48).

²² Dr. Hall-Ellis did not obtain a copy of Stowers 2008 or otherwise testify that the same copy of Stowers 2008 would have been available from OSU. Ex. 1006 ¶¶ 46–50. Her comments about OSU’s records seem to assume that the same copy would be available from OSU, but that assumption is not proven by any competent evidence on this record.

reasons, we accord Dr. Hall-Ellis' testimony little weight regarding the accessibility of Stowers 2008 from OSU.

Considering the totality of the cited evidence, a preponderance of the evidence supports a finding that an embargo was in place for Stowers 2008 for at least ProQuest and that Stowers 2008 (Ex. 1008) was not publicly available until December 2009. We further view that a preponderance of the evidence demonstrates that the embargo applied also to OSU.²³

As a result, Stowers 2008 was made available less than one year before the '564 patent's effective filing date of August 5, 2010, for the proposed substitute claims. As noted above, we apply AIA § 102 for the proposed substitute claims. Applying the AIA, Stowers 2008 is not prior art under § 102(a)(1) because Stowers 2008 is a disclosure made less than one year (December 2009) before the effective filing date of the '564 patent, August 5, 2010 (Ex. 1001, code (63)), and because Stowers 2008 was disclosed by Jason K. Stowers (Ex. 1008, 2), a joint inventor of the '564 patent (Ex. 1001, code (72)). 35 U.S.C. § 102(b)(1)(A).

Also as noted above, Petitioner argues that Stowers 2008 was available from both OSU and ProQuest and the versions of Stowers 2008 from these sources are "materially identical," with the Petition relying "on the public accessibility of Stowers 2008 from the OSU library." Pet. Supp. Br. 1–4. According to Petitioner, "Petitioner's counsel attested to downloading copies from both OSU and ProQuest, and presented them to

²³ Perhaps the strongest evidence advanced by Petitioner in favor of OSU having made Stowers publicly accessible prior to the critical date is Dr. Hall-Ellis' testimony (Ex. 1006 ¶¶ 47–48). But as discussed above (*supra* n.22), Dr. Hall-Ellis assumes that OSU published materially the same version of Stowers 2008 that is reflected in the ProQuest version (Ex. 1008) without any competent evidence of record that proves this.

ProQuest’s witness during her deposition” and redline comparisons showed the only differences were in the footer and on the copyright page. *Id.* at 2 (citing Ex. 1049; Ex. 1051; Ex. 1050, 35:8–17; Ex. 1052; Ex. 1053).

In Patent Owner’s view, however, Petitioner belatedly shifts position by arguing that Stowers 2008 was available from OSU in identical form to the version from ProQuest (and which supports the challenges) and, in any event, “[t]he OSU packet shows that the embargo request was made and is tied to both OSU and ProQuest.” PO Supp. Br. 4–5 (citing Ex. 2020, 1, 3). Patent Owner contends that Petitioner’s Exhibit 1051 is relevant only to the current availability of Stowers 2008 because Petitioner’s counsel downloaded it from an OSU website to prepare Petitioner’s comparison copies of Stowers 2008. PO Resp. Supp. Br. 3–4.

To the extent the embargo applies only to ProQuest and not OSU, we again observe that Petitioner’s challenge to the proposed substitute claims (like the original claims) relies on Exhibit 1008, which is a ProQuest copy of Stowers 2008. Pet. 19; Opp. 15. Patent Owner appears to be correct that Petitioner’s counsel downloaded a present-day copy of Stowers 2008 from OSU’s website after the final hearing to argue there are no material differences between copies available from ProQuest and OSU. Pet. Supp. Br. 2; Ex. 1050, 35:8–17. That present-day copy of the OSU publication²⁴

²⁴ Here again, we observe that Dr. Hall-Ellis did not obtain a copy of Stowers 2008 or otherwise sufficiently explain why the same copy of Stowers 2008 would have been available from OSU by the effective filing date of the proposed substitute claims. Ex. 1006 ¶¶ 46–50. To the extent Dr. Hall-Ellis’ testimony regarding OSU’s record and cataloging of Stowers 2008 assumes that the same copy would be available from OSU as from ProQuest, Dr. Hall-Ellis does not provide evidence to support such a conclusion. *Id.*

does not demonstrate that the ProQuest copy of Stowers 2008 (Ex. 1008) was publicly available by the effective filing date of the proposed substitute claims or that this OSU version was available by that date.

Parties often provide evidence and custodian testimony from the Internet Archive (a.k.a., “the Wayback Machine”) to demonstrate that a reference was available from a website by a certain date. *See Hulu*, IPR2018-01039, Paper 29, 18; *see supra* n.18 (further discussion). Petitioner has produced no similarly probative evidence to demonstrate an internet publication date for the asserted OSU copy of Dr. Stowers’ dissertation, in its effort to show that such a copy is materially the same as the ProQuest copy of Stowers 2008 (Ex. 1008) upon which the challenges depend.

For the above reasons, we determine that Petitioner fails to establish by a preponderance of the evidence that Stowers 2008 qualifies as prior art against the proposed substitute claims. Accordingly, on this record, the grounds based on Stowers 2008 are insufficient to establish that any proposed substitute claim is unpatentable.

c) Anticipation or Obviousness over Trikeriotis

Petitioner provides arguments regarding the new limitation added in proposed substitute claim 13 but otherwise relies upon arguments presented in the Petition for the remaining limitations and claims. Opp. 14 (citing the Petition’s ground 5 over Trikeriotis), 16–17.²⁵ Therefore, we view Petitioner

²⁵ Petitioner does not provide a clear statement of which proposed substitute claims are challenged over Trikeriotis or how they are unpatentable. We view Petitioner’s statement (Opp. 14), referencing the Petition’s Ground 5 over Trikeriotis, as relying on the original arguments in the Petition over Trikeriotis, taken together with new arguments (Opp. 16–17) addressing the new limitation in substitute claim 13.

as arguing that proposed substitute claims 13, 15, 18, 20, 22, and 23 (which correspond to original claims 1, 3, 7, 9, and 11–12) would have been anticipated or obvious in view of Trikeriotis. Pet. 3; Mot. 1–3 (Patent Owner requesting cancellation of claim 6 and not substituting a new claim for claim 6, which was challenged in view of Trikeriotis).

The parties’ dispute surrounds whether Trikeriotis qualifies as prior art. Pet. 23; Prelim. Resp. 28–30; Resp. 28–30; Reply 19; Sur-reply 18–19. We set aside the question of whether Trikeriotis qualifies as prior art to first address the parties’ patentability arguments.

With regard to claim 13’s “radiation sensitive ligands,” Petitioner contends that Trikeriotis teaches “that ‘a variety of organic ligands can be used to control the surface chemistry of the final product’” and that “[t]he absorption coefficient of the films depends on the ligand.” Pet. 58 (quoting Ex. 1024, 15, 18) (emphases omitted); Reply 22. In view of this, Petitioner argues, Trikeriotis teaches radiation sensitive ligands. Pet. 59 (citing Ex. 1002 ¶ 152); Reply (citing Ex. 1040 ¶ 60).

Patent Owner asserts that Petitioner’s arguments are conclusory and does not explain how Trikeriotis teaches this limitation. Prelim. Resp. 50; Resp. 50–51 (citing Ex. 2009 ¶¶ 44–47); Resp. 51. In Patent Owner’s view, moreover, another reference cited by Petitioner elsewhere in the Petition (Ober (Ex. 1027)) contradicts Petitioner’s position that Trikeriotis discloses “radiation sensitive ligands.” Prelim. Resp. 51–55 (citing Ex. 2009 ¶¶ 55–59); Resp. 51–55. Specifically, Patent Owner asserts that Ober shows that it is a photoactive compound in the film that is radiation sensitive, not the film’s ligand. Prelim. Resp. 52–55; Resp. 51–55.

Petitioner replies that “Trikeriotis explains that the ‘absorption coefficient of the films depends on the ligands,’ which is an indication of the

material's radiation sensitivity,” and “[b]ecause the extinction coefficient changes with the use of different organic ligands, a POSA would understand the organic ligands to be ‘radiation sensitive.’” Reply 22 (citing Ex. 1024, 18; Ex. 1040 ¶¶ 59–60). Petitioner further disputes Patent Owner's assertions regarding Ober, contending that “Ober shows that the ‘photochemical reactions’ take place within the organic ligand shell.” *Id.* at 22–23 (citing Ex. 1027, 1). In addition, Petitioner directs us to Ober's teaching “that when photoactive compounds are used, ‘displacement of the starting ligands by new ligands, which are produced by the photoactive compounds,’” as shown in Ober's Figure 2. *Id.* at 23–24 (citing Ex. 1027, 2; Ex. 1040 ¶ 61) (emphasis omitted). According to Petitioner, “Dr. Banerjee admits that the ‘new ligands’ are ligands which are modified by radiation.” *Id.* at 24 (citing Ex. 1033, 181:19–182:7, 183:15–20).

Petitioner also argues that Krysak demonstrates that Ober's resist system “works through *either* a photoactive generator-free mechanism which ‘involves a ligand ejection by photo decarboxylation’ *or* the ‘ligand exchange mechanism’ described in Figure 2 of Ober” and Krysak shows that “radiation causes decarboxylation of the ligands.” *Id.* at 24–25 (citing Ex. 1036, 1, 5–6; Ex. 1040 ¶ 62).

Patent Owner counterargues that Petitioner's “decarboxylation” theory is based on a new reference, Krysak, which should have been raised in the Petition to avoid prejudice against Patent Owner. Sur-reply 19–20. Patent Owner reiterates its position regarding Ober and asserts that Petitioner “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.’” *Id.* at 20–22 (citing Reply 24; Ex. 1033, 182:19–184:20). Patent Owner also

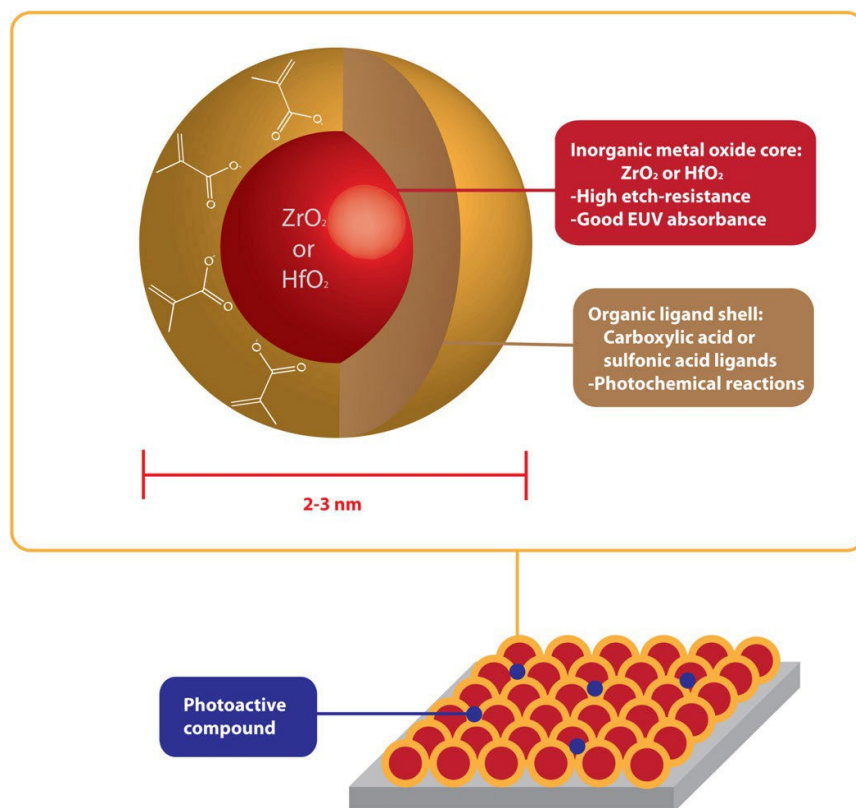
submits that Trikeriotis’ “mechanism requires a non-ligand (DPAP) that is photosensitive, and which breaks to form a sulfonic acid ligand that displaces the carboxylic acid ligand, methacrylate.” *Id.* at 22 (citing Ex. 1027, 2).

In our Preliminary Guidance, we indicated Petitioner did not show a reasonable likelihood of success for this challenge. Prelim. Guid. 13–14. Having considered the parties’ arguments and the entirety of the record since that guidance, we determine that Petitioner has not met its burden for this challenge for a different reason.

Trikeriotis teaches that “[t]he absorption coefficient of the films depends on the ligand and the synthesis method that was used.” Ex. 1024, 18. Dr. Holland explains that a photoresist typically contains components that may or may not absorb light but do not undergo chemical reactions due to exposure. Ex. 1040 ¶ 53 (citing Ex. 1035, 679); *see also id.* ¶ 59. Dr. Holland further explains that when a photoresist does not undergo a chemical reaction, it is not radiation sensitive. *Id.*

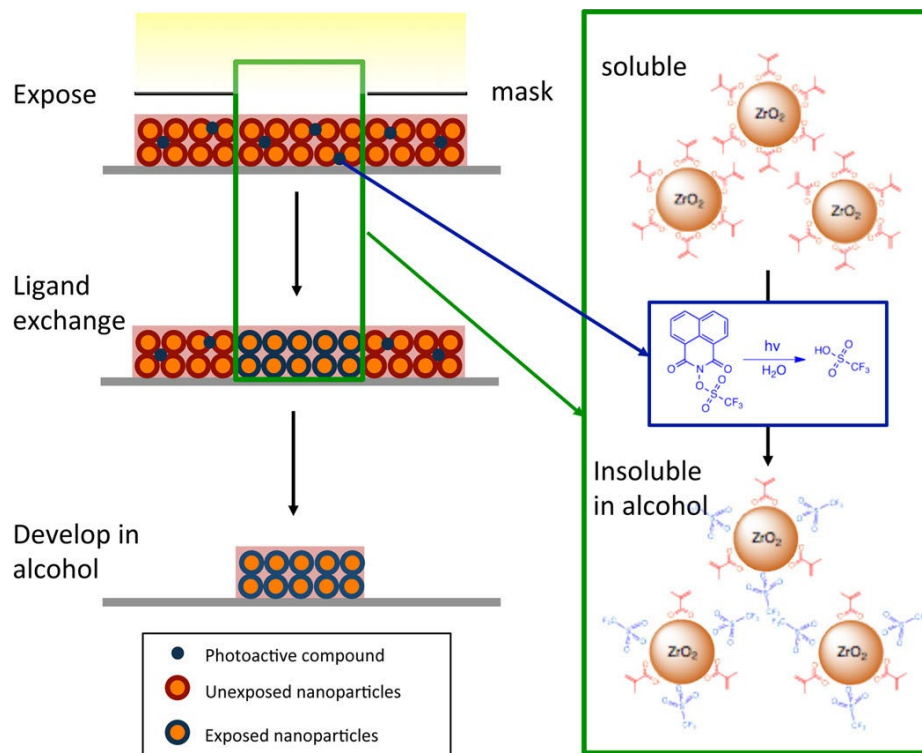
However, when presenting arguments for dependent claim 12, Petitioner cites Ober and acknowledges that it refers “to the films of Trikeriotis.” Pet. 62 (citing Ex. 1027). Petitioner does not dispute this acknowledgement. Reply 22–25. To the contrary, Petitioner’s own witness, Dr. Holland, opines that Trikeriotis’ coating material includes “radiation sensitive ligands” in view of Ober’s teachings. Ex. 1040 ¶ 62 (stating “[a]ccordingly, the organic ligands of Trikeriotis (i.e., the red ‘starting ligands’ shown in Ober (EX1027)) are ‘radiation sensitive ligands.’”). On this record, there is no dispute that Ober’s teachings regarding its coating are applicable to Trikeriotis.

Ober depicts a photoresist film in Figure 1, which is reproduced below. Ex. 1027, 1.



As shown by Ober's annotations above, the film includes a metal oxide core surrounded by a ligand shell. However, the film also includes a photoactive compound, as shown in the lower portion of Figure 1.

Ober's Figure 2, which we reproduce below, illustrates "the ligand-displacement patterning mechanism for negative-tone pattern formation." *Id.* at 2 (italicized in original).



Ober's Figure 2 shows that it is the photoactive compound that absorbs radiation (depicted within the innermost box on the right hand side of Figure 2) and a ligand exchange occurs, as shown on the left hand side of Figure 2. Ober states "[d]etailed studies of the patterning process suggest that the solubility change that occurs on exposure is in part due to the displacement of the starting ligands by new ligands, which are produced by the photoactive compounds." *Id.*

Ober further states, "[f]or example, the sulfonic acid produced by photoacid generators (e.g., triphenylsulfonium triflate) displaces the methacrylate ligands used in many of our compositions" and "[t]his ligand displacement is associated with a solubility change." *Id.* Therefore, Ober's teachings indicate that a photoactive compound in the photoresist film absorbs radiation, not the starting ligand.

Dr. Holland testifies that Ober's Figure 1 indicates that it is the ligand shell that is susceptible to photochemical reactions, which means it is

radiation sensitive, and that Krysak shows that Ober's film can be used without the photoactive compound, which demonstrates that "the organic ligands of Trikeriotis (i.e., the red 'starting ligands' shown in Ober (EX1027)) are 'radiation sensitive ligands.'" Ex. 1040 ¶¶ 61–62. This testimony overlooks Ober's explanation that the photoactive compound is what absorbs radiation, which results in the photoactive compound producing a new ligand. Ex. 1027, 2, Fig. 2.

Further, Dr. Holland opines that "[w]hile Ober shows that photoactive compounds can be added, those too are radiation sensitive ligands" because Ober shows the photoactive compounds are cleaved by radiation exposure, causing red ligands to be displaced by blue ligands, and that "Ober describes the red ligand as the 'starting ligand' and the blue ligand as the 'displacing ligand.'" Ex. 1040 ¶ 61 (citing Ex. 1027, 2) (Dr. Holland's emphasis omitted). This testimony relies on Ober describing the product of radiation exposure as a ligand but does not sufficiently explain why the photoactive compound, which absorbs the radiation (the remaining blue ligand does not), is a radiation sensitive ligand.

For instance, on that point, Dr. Holland does not cite to Ober referring to the photoactive compound as a ligand. Instead, as noted above, Ober indicates in Figure 2 that the photoactive compounds absorb radiation ("hv") and that the new ligands "are produced by the photoactive compounds." Ex. 1027, 2. Petitioner and Dr. Holland do not sufficiently explain why the new ligands produced from the photoactive compound

would be radiation sensitive, as the proposed substitute claims require, or how the photoactive compound functions as a ligand.²⁶

Further, we do not view Dr. Banerjee as admitting that the new ligands produced from Ober's photoactive compound are radiation sensitive ligands. Ex. 1033, 181:19–182:7 (explaining that Ober's blue photoactive compound undergoes a photochemical reaction that results in ligand displacement of the starting pink ligands), 183:7–9 (explaining that the BPAP photoactive compound displaces pink ligands), 183:15–20 (simply identifying the starting ligand and the replacement ligand). Dr. Banerjee's cited testimony comports with Ober's teachings regarding its photoactive compound producing a new ligand that displaces starting ligands. Ex. 2009 ¶¶ 57–59, n.5.

We next consider Petitioner's arguments regarding Krysak. Krysak states that “[p]reviously, Ober et. al. reported a ligand exchange mechanism, in which the generated triflic acid exchanges with a methacrylate ligand” and “[w]hile this is likely occurring during exposure of the resist composition containing PAG, it *may be* part of a set of chemical reaction occurring simultaneously, based on data presented in the paper.” Ex. 1036, 5 (emphasis added).

Krysak further states:

Both the spectroscopic and patterning data obtained *have led to the formulation of a complex patterning mechanism, illustrated in figure 7*. The PAG-free mechanism, following the right side of the mechanism flow, involves a ligand ejection by photo

²⁶ Petitioner (on page 22 of the Reply) cites Dr. Holland's testimony at Exhibit 1040 ¶ 60, but that testimony relates to different ligands and does not support the arguments presented (Reply 22), which relate to a different disclosure in Trikeriotis.

decarboxylation. *This mechanism* has recently been reported for Group IV metal oxo-cluster resists, and *is a plausible theory* for the dissolution contrast observed in the absence of a PAG.

Id. at 6 (emphases added). Krysak's Figure 7 is reproduced below.

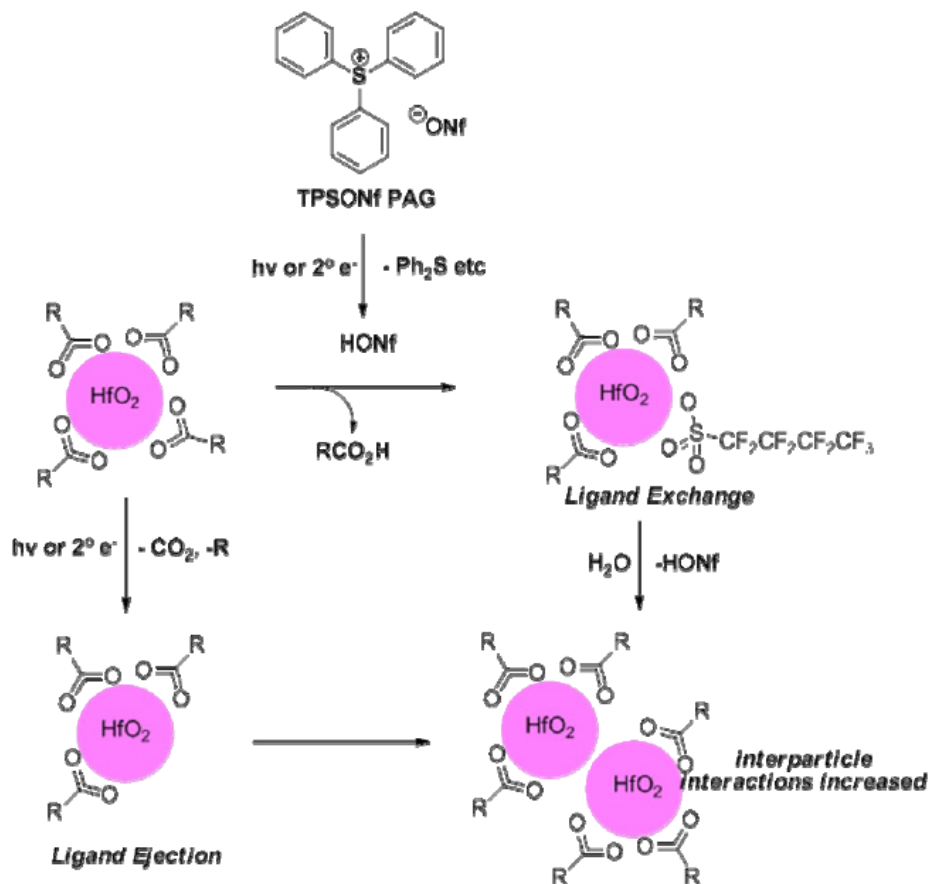


Figure 7. Schematic of proposed patterning mechanisms

Petitioner's witness, Dr. Holland testifies that Krysak shows that Trikeriotis' "coatings can be patterned 'with and without' a photoactive compound (which Krysak refers to as a photoacid generator, or 'PAG')," "Krysak explains that the 'PAG-free mechanism' works by 'ligand ejection by photo decarboxylation,'" "[t]he 'PAG-free' mechanism is shown on the left half of Figure 7 and the PAG 'ligand exchange' method is shown [sic] on the right half of Figure 7" and "Krysak explains that even when PAG is

present, both mechanisms take place simultaneously.” Ex. 1040 ¶ 62 (citing Ex. 1036, 5).

As noted above, however, Krysak merely describes this mechanism as “a plausible theory” and indicates, further, that the ligand exchange based on Ober’s photoactive PAG “may be part of a set of chemical reaction occurring simultaneously.” Ex. 1036, 5–6. In other words, Krysak’s teachings regarding a PAG-free mechanism is, at best, a theory or speculation that other reactions take place besides those described by Ober.

Dr. Holland’s testimony appears to rest entirely upon that theory or speculation, without adequate explanation of why one of ordinary skill in the art would understand that the PAG-free mechanism occurs in the coatings described by Ober and Trikeriotis, much less any persuasive evidence that the PAG-free mechanism has occurred. Ex. 1040 ¶ 62. For these reasons, we give less weight to Krysak and Dr. Holland’s testimony regarding Krysak than to Ober’s teachings and the cited testimony regarding Ober.

Considering the totality of the evidence presented, including Ober’s teachings, Krysak’s teachings, and the cited testimony, a preponderance of the evidence indicates that the coatings described by Ober (and, therefore, Trikeriotis) do not include “radiation sensitive ligands” because a photoactive compound of the coatings absorbs radiation, producing a new ligand that displaces the starting ligand. On this record, Petitioner advances evidence insufficient to demonstrate persuasively that the photoactive compound is a ligand, that the new ligand is radiation sensitive, or that the starting ligand functions as a radiation sensitive ligand. As a result, Petitioner has not shown by a preponderance of the evidence that proposed substitute claims 13, 15, 18, 20, 22, and 23 would have been unpatentable in view of Trikeriotis.

d) Anticipation and Obviousness in view of Keszler

Petitioner argues that proposed substitute claims 13–18 and 20–23 are anticipated by Keszler and proposed substitute claim 19 would have been obvious in view of Keszler. Opp. 17. We begin our analysis by focusing on the parties’ contentions for proposed substitute claim 13, the independent claim.

(1) The Parties’ Arguments

Petitioner asserts that “Keszler discloses ‘patterning a device using a photoresist’ by ‘providing a structure’ which comprises a ‘resist layer.’” Opp. 17 (citing Ex. 1038, 4:16–25) (emphasis omitted). More specifically, Petitioner cites Keszler’s Example 4 as disclosing thin films deposited on silica substrates via spin coating precursor solutions and Keszler’s Example 7 as disclosing an inorganic film including a peroxide that has been coated onto a substrate. *Id.* at 17–18 (citing Ex. 1038, 40:8–20, 42:8–10).

For proposed substitute claim 13’s radiation sensitive ligands, Petitioner cites Keszler’s Example 4 as disclosing the use of a precursor solution including hafnium or zirconium ions with peroxide ligands. *Id.* at 18 (citing Ex. 1038, 38:6–63; Ex. 1040 ¶¶ 93–94). Petitioner argues that Example 4’s peroxide is a radiation sensitive ligand and inclusion of peroxide into precursor solutions “provides a ‘new lithographic method.’” *Id.* at 18–19 (citing Ex. 1038, 28:9–12; Ex. 1040 ¶¶ 95–96). Petitioner further contends that Example 4’s “precursor solutions contain the same components as the precursor solutions used to make the coating materials in the Examples of the ’564 patent (i.e., HfOCl_2 or ZrOCl_2 , H_2O_2 and H_2SO_4) and other publications discussing the photosensitivity of the peroxide ligands in HafSO_x and ZircSO_x .” *Id.* at 19 (citing Ex. 1040, ¶¶ 97–

100). According to Petitioner, “[a]ny differences in the precursor solutions or processing conditions are immaterial.” *Id.*

With regard to coating thickness, Petitioner argues that “Keszler discloses depositing the precursor solutions as ‘a thin film (from about 1 nm to about 100 nm)’” and “films having thicknesses ‘from 3 to 25 nm.’” *Id.* at 19–20 (citing Ex. 1038, 32:3–15, 40:1–2, 40:13–14) (emphasis omitted).

With regard to exposure of the coating material altering the chemical properties of the coating material, as proposed substitute claim 13 recites, Petitioner asserts that “Keszler discloses that patterns are formed by changing the chemical structure of the resist layer via radiation, which creates a coating material with differential dissolution rates between exposed and un-exposed regions.” *Id.* at 20 (citing Ex. 1038, 8:1–12, 28:15–21). Petitioner further submits that the “Example 4 precursor solutions are the same in all material aspects to those in the Examples of the ’564 patent and other publications discussing the mechanism of HafSO_x and ZircSO_x photosensitivity” and, therefore, “radiation exposure must also cause a chemical change resulting in differential dissolution in the Keszler HafSO_x and ZircSO_x resists.” *Id.* at 20–21 (citing Ex. 1040 ¶¶ 97–100, 105–108).

Patent Owner responds that Petitioner “applies a mix-and-match analysis that is inappropriate for anticipation.” PO Reply MTA 10. Specifically, Patent Owner argues that Keszler describes “several independent embodiments” and “[w]here embodiments are related, Keszler includes an explicit reference,” because Example 2 references Example 1, Example 3 also references Example 1, and Example 5 refers “to ‘the approach described above.’” *Id.* (citing Ex. 1038, 3, 38–39, 42).

Patent Owner contends that Petitioner “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.’” *Id.* (citing Opp. 17–25). Patent Owner further asserts that Petitioner cites to Keszler’s background without explaining how one would understand that it applies to Keszler’s Examples 4 and 7. *Id.* According to Patent Owner, Petitioner cites the “new lithographic method” described on page 28 but does not explain how this relates to Example 4 when the former relates to “‘interdiffusion of stacked films’ and a ‘bilayer diffusion.’” *Id.* at 10–11 (citing Opp. 18–19; Ex. 1038, 28:3–9). Patent Owner also argues that Dr. Holland confirmed this when deposed. *Id.* at 11 (citing Ex. 2017, 123:16–124:22). Patent Owner argues that Petitioner “fails to prove Keszler’s Example 4 films are the same as the ’564 patent films, particularly given their facial differences.” *Id.* at 11 (citing Opp. 19–20, 22, 24).

Petitioner disputes that it has applied a “mix-and-match” analysis because it has “analyzed the express teachings of Keszler and used the details of the examples to fully comprehend those teachings.” Pet. Sur-reply MTA 11. Petitioner further asserts that “the general subject matter of Keszler is the creation of HafSO_x and ZircSO_x films,” Keszler specifically teaches that these films can be deposited in a single layer on a substrate and then patterned,” “[b]ut the general disclosure of Keszler does not provide the specific details regarding the process used to make or pattern those films—those details are provided by the examples.” *Id.* (citing Ex. 1038, 1, 4:17–32, 8:1–12).

In Petitioner’s further view, Keszler’s Example 4 “teaches how to make a *single layer* of a HafSO_x or ZircSO_x film of 25 nm in thickness” and “Example 7 teaches how to pattern a single layer film having similar thicknesses (*e.g.*, about 30 nm) as the films in Example 4.” *Id.* at 11–12

(citing Ex. 1038, 40:8–20, 44:8–21). According to Petitioner, this does not “combine separate embodiments in Keszler to ‘cobble together’ various embodiments” and “a review of the general teachings of Keszler in light of the details provided in the working examples show that Keszler anticipates each and every limitation of the proposed substitute claims with the exception of Claim 19.” *Id.* at 12. Petitioner asserts that Dr. Holland’s testimony explains “that the Keszler films are identical in all material aspects to those from the patent” and this testimony regarding inherency is un rebutted. *Id.* (citing Ex. 1040 ¶¶ 97–100).

(2) *Analysis*

“[D]ifferences between the prior art reference and a claimed invention, however slight, invoke the question of obviousness, not anticipation.” *Net MoneyIN, Inc. v. VeriSign, Inc.*, 545 F.3d 1359, 1371 (Fed. Cir. 2008) (emphasis added). Further:

[F]or the instant rejection under 35 U.S.C. § 102(e) to have been proper, the [prior art] reference must clearly and unequivocally disclose the claimed [invention] or direct those skilled in the art to the [invention] without *any* need for picking, choosing, and combining various disclosures not directly related to each other by the teachings of the cited reference.

In re Arkley, 455 F.2d 586, 587 (CCPA 1972).

Here, Petitioner cites to different portions of Keszler’s disclosure, including Keszler’s Example 4, Example 7, and a disclosure on page 28 of Keszler. Opp. 17–21.

As noted above, Petitioner contends that “the general disclosure of Keszler does not provide the specific details regarding the process used to make or pattern those films—those details are provided by the examples.” Pet. Sur-reply MTA 11 (citing Ex. 1038, 1, 4:17–32, 8:1–12). Therefore,

Petitioner acknowledges that it relies upon Keszler's examples in combination with Keszler's disclosure for anticipation.

Because this is a situation in which various disclosures, including different examples, of a reference are relied upon, we do not view this as a situation in which an asserted reference clearly and unequivocally teaches the claimed invention. *Arkley*, 455 F.2d at 587. We, therefore, consider whether Keszler directs one of ordinary skill in the art to the claimed invention without a need to pick, choose, and combine "various disclosures not directly related to each other by the teachings of the cited reference." *Id.*

Petitioner contends that Keszler's Example 4 "teaches how to make a *single layer* of a HafSO_x or ZircSO_x film of 25 nm in thickness" and "Example 7 teaches how to pattern a single layer film having similar thicknesses (*e.g.*, about 30 nm) as the films in Example 4." Pet. Sur-reply MTA 11–12 (citing Ex. 1038, 40:8–20, 44:8–21). Patent Owner has the better argument here, however, in terms of how Keszler relates its examples.

Specifically, Patent Owner argues, and we agree, that Keszler makes explicit references to other examples in Examples 2 and 3 and references other teachings in Example 5. PO Reply MTA 10 (citing Ex. 1038, 3, 38–39, 42). Keszler makes no such references for Examples 4 and 7. Ex. 1038, 42:8–9, 44:8–9. Petitioner merely asserts that Examples 4 and 7 are "similar." Pet. Sur-reply MTA 11–12. This does not sufficiently explain how or why Keszler, through any disclosure, directly relates Examples 4 and 7, in a manner that would support a finding that Keszler teaches the claimed invention without picking, choosing, and combining Examples 4 and 7.

For these reasons, on this record, we determine that Petitioner's anticipation arguments require picking, choosing, and combining various disclosures that are not directly related to each other by Keszler. Petitioner's

obviousness arguments for proposed substitute claim 19 regard the optimization of peroxide content and do not involve cure this deficiency in the challenge for proposed substitute claim 13, which is the independent claim. Opp. 23. As a result, Petitioner does not demonstrate by a preponderance of the evidence that Keszler anticipates or renders obvious proposed substitute claims 13–23.

5. *Conclusion on Petitioner’s Patentability Challenges For Proposed Substitute Claims*

For the above reasons, we determine that Petitioner does not show by a preponderance of evidence that the subject matter of proposed substitute claims 13–23 would have been unpatentable.

IV. CONCLUSION²⁷

For the foregoing reasons, we conclude that Petitioner has shown by a preponderance of the evidence that original claims 1–12 of the ’564 patent are unpatentable. As discussed above, Patent Owner has met its regulatory burden for proposed substitute claims 13–23 and Petitioner has not shown that proposed substitute claims 13–23 would have been unpatentable by a preponderance of the evidence.

²⁷ Should Patent Owner wish to pursue amendment of the challenged claims in a reissue or reexamination proceeding subsequent to the issuance of this decision, we draw Patent Owner’s attention to the April 2019 *Notice Regarding Options for Amendments by Patent Owner Through Reissue or Reexamination During a Pending AIA Trial Proceeding*. See 84 Fed. Reg. 16,654 (Apr. 22, 2019). If Patent Owner chooses to file a reissue application or a request for reexamination of the challenged patent, we remind Patent Owner of its continuing obligation to notify the Board of any such related matters in updated mandatory notices. See 37 C.F.R. § 42.8(a)(3), (b)(2).

We, therefore, grant Patent Owner’s Motion to Amend as to the request to add substitute claims 13–23.

In summary:

Claims	35 U.S.C. §	Reference(s)	Claims Shown Unpatentable	Claims Not Shown Unpatentable
1–12	102	’888 Publication	1–12	
1–5, 7– 10, 12	102	Stowers 2008 ²⁸		
1–10, 12	103	Stowers 2008		
8	103	Stowers 2008, Stowers 2009		
1, 3, 6, 7, 9, 11, 12	102 or 103	Trikeriotis		
Overall Outcome			1–12	

²⁸ Because the challenged claims are unpatentable over Petitioner’s first ground, we do not reach the second, third, fourth or fifth grounds.

Motion to Amend Outcome	Claim(s)
Original Claims Cancelled by Amendment ²⁹	
Substitute Claims Proposed in the Amendment	13–23
Substitute Claims: Motion to Amend Granted	13–23
Substitute Claims: Motion to Amend Denied	
Substitute Claims: Not Reached	

V. ORDER

It is

ORDERED that Petitioner has shown that claims 1–12 of the '564 patent are unpatentable;

FURTHER ORDERED that Patent Owner's Motion to Amend is granted as to the request to add proposed substitute claims 13–23 to the '564 patent; and

FURTHER ORDERED that because this decision is final, a party to the proceeding seeking judicial review of the decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

²⁹ Patent Owner requested cancellation of claim 6 in its contingent motion to amend. Mot. 1–2. We reach that contingent motion because the original claims (including claim 6) are found unpatentable herein. Accordingly, claim 6 is unpatentable, not cancelled.

For PETITIONER:

Dion Bregman
Michael Lyons
Ahren Hsu-Hoffman
Alison Slaughter
Zachary Miller
MORGAN, LEWIS & BOCKIUS LLP
dion.bregman@morganlewis.com
michael.lyons@morganlewis.com
ahren.hsu-hoffman@morganlewis.com
alison.patitucci@morganlewis.com
zachary.miller@morganlewis.com

For PATENT OWNER:

Naveen Modi
Phillip Citroen
Eric Dittmann
Isaac Ashkenazi
Paul Anderson
Daniel Zeilberger
Michael Wolfe
PAUL HASTINGS LLP
naveenmodi@paulhastings.com
phillipcitroen@paulhastings.com
ericdittmann@paulhastings.com
isaacashkenazi@paulhastings.com
paulanderson@paulhastings.com
danielzeilberger@paulhastings.com
michaelwolfe@paulhastings.com