

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

BOE TECHNOLOGY GROUP CO., LTD.,

Petitioner,

v.

OPTRONIC SCIENCES LLC,

Patent Owner.

Case No.: IPR2024-01132

Patent 7,586,121

PATENT OWNER'S SUR-REPLY

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Cases

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Rules

37 C.F.R. § 1.56(b) 17
37 C.F.R. § 11.106(c) 17
37 C.F.R. § 42.11 17

Patent Owner's Exhibit List for IPR2024-01131

Pursuant to 37 C.F.R. § 42.63(e), Patent Owner Optronics Sciences LLC hereby submits its exhibit list associated with the above-captioned *inter partes* review of U.S. Patent No. 7,586,121.

Ex. No.	Description
2001	Declaration of Benjamin T. Wang in Support of Motion to Appear <i>Pro Hac Vice</i>
2002	Declaration of Andrew D. Weiss in Support of Motion to Appear <i>Pro Hac Vice</i>
2003	Declaration of Christian W. Conkle in Support of Motion to Appear <i>Pro Hac Vice</i>
2004	Declaration of Paul A. Kroeger in Support of Motion to Appear <i>Pro Hac Vice</i>
2005	Declaration of Dr. Eric Bretschneider in support of Patent Owner's Response ("Bretschneider Decl.")
2006	<i>Curriculum vitae</i> of Dr. Eric Bretschneider
2007	April 17, 2025, Deposition Transcript of Dr. Dean Neikirk, IPR2024-01132, IPR-2024-01315
2008	Roel. J. Theeuwes, <i>Surface passivation approaches for silicon, germanium, and III-V semiconductors</i> , J. VAC. SCI. TECHNOL., A.42, 060801 (2024).
2009	Mark LaPedus, <i>Capping Tools Tame Electromigration</i> , Semiconductor Engineering (2012) (https://semiengineering.com/capping-tools-tame-electromigration) (Wayback Machine capture from June 20, 2014, available at https://web.archive.org/web/20140620152135/https://semiengineering.com/capping-tools-tame-electromigration , accessed May 6, 2025).
2010	Excerpts from WILEY ELECTRICAL AND ELECTRONICS ENGINEERING DICTIONARY (2004).
2011	Excerpts from William S. Rees, CVD OF NONMETALS (1996).
2012	Excerpts from MCGRAW-HILL DICTIONARY OF SCIENTIFIC AND TECHNICAL TERMS (5th Edition) (1994).

2013	<i>Passivation (chemistry)</i> , WIKIPEDIA, available at https://en.wikipedia.org/wiki/Passivation_(chemistry) (last accessed Sept. 15, 2025).
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I. Introduction

Petitioner's Reply provides more evidence that further exposes the fundamental problem: the prior art lacks the claimed "passivation layer" and the claimed "capping layer." None of the new dictionaries provided by the Petitioner say that either a "passivation" layer or a "capping" layer is merely an insulator or a planarization layer. Reply at 3.

In fact, the Reply has now disproven the assumption used in the original Petition, which was that "POSITA would understand from the 121 patent that there is no special meaning ascribed to passivation layer and capping layer other than they are two separate layers of insulation material." Petition at 19. The definitions in Petitioner's Reply provide special meanings, such as requirements "for protection," "to provide electrical stability by isolating the surface from the electrical and chemical conditions," "protects it from contamination from unwanted impurity atoms or molecules," or to be of "a process (physical or chemical) by means of which a metal becomes passive." Reply at 3. The Board need not resolve which of these special properties are attributed to a "passivation" layer. But Petitioner's original assumption of "no special meaning" for these terms was wrong—and that is enough reason to deny the Petition.

II. Claim Construction

A. Passivation Layer

Petitioner urges that “there is no special meaning applied to ‘passivation layer’ other than it is an insulation material.” Reply at 1. This is simply not the case. As explained below, the Board should reject Petitioner’s construction, which is inconsistent with the intrinsic and extrinsic evidence (including the very definitions Petitioner cites) and is broader than the plain and ordinary meaning of the term as used in the art. The evidence makes it abundantly clear that “passivation” and “capping” mean something *more* than mere insulation. The Board need not resolve exactly what more is required.

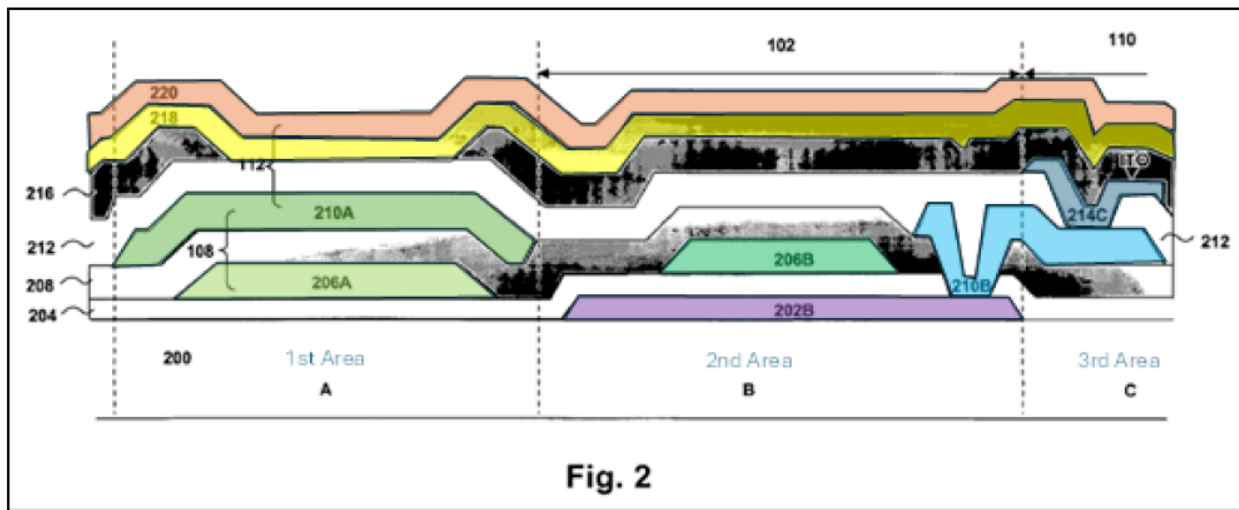
1. Intrinsic Claim Differentiation Requires a Narrower Construction than Mere “Insulation”

Claim differentiation through dependent claims disproves Petitioner’s proposed construction that “passivation” means mere “insulation.” Specifically, independent claim 1 recites, in part, “a second dielectric layer.” Ex. 1001. A “dielectric” layer is merely an insulating layer in a capacitor. Dependent claim 3, which depends from claim 1, further recites “wherein the second dielectric layer comprises a passivation layer and a capping layer.” Ex. 1001. Thus, dependent claim 3 narrows the original dielectric layer to specifically require a passivation layer and a capping layer because these words have narrower meanings. Dependent claim

3 does not merely recite additional “dielectric” layers, nor does claim 3 simply recite additional “insulating” layers. Thus, “passivation” and “capping” layers refer to special types of insulating layers.¹ See *Intel Corp. v. Qualcomm Inc.*, 21 F.4th 801, 810 (Fed. Cir. 2021) (“It is highly disfavored to construe terms in a way that renders them void, meaningless, or superfluous”). The claims also draw a distinction between a “passivation layer” and a “capping layer.” If the inventor did not intend distinct meanings (i.e., that they are just insulation materials, as Petitioner contends), the inventor could have simply claimed a second dielectric layer containing two layers.

Moreover, the intrinsic record shows that the passivation layers 212 and capping layers 216 are not merely planarization layers because they rise up and down; they are not consistently planar. See Petition at 2 (identifying these layers and annotating Figure 2, below). Thus, neither “passivation” nor “capping” are coextensive synonyms of “planarization.”

¹ Similarly, Petitioner urges “there is no special meaning ascribed to ‘capping layer’ other than it is an insulation material.” Reply at 5. Petitioner is thus urging that the terms “passivation,” “capping,” and “dielectric” are synonymous, which cannot be the case. The ’121 Patent uses the different terms, which have different meanings, to claim different things, as Patent Owner explains.



Thus, Petitioner’s proposed construction cannot be correct.

2. The Extrinsic Evidence Supports A Different Construction

Petitioner’s definition of “passivation” as simply an insulating material is improper and ignores context of semiconductor devices. Indeed, in its Reply, Petitioner’s proposed definition is inconsistent with the technical definitions that Petitioner provided. *See* Reply at 3. In fact, the definitions cited by Petitioner consistently define “passivation” in terms of its unique function: rendering the underlying surface stable. A passivation layer is not just an insulating material—it also renders the surface of the layer below chemically passive or unreactive.

For example, Ex. 1012 explains that passivation involves not just “an insulating material,” but the growth of certain materials (i.e., “an oxide or nitride layer”) *to provide electrical stability* by isolating the surface from electrical and chemical conditions in the environment. Ex. 1012 at 140. Similarly, Petitioner’s

citation to Ex. 1013 highlights passivation's role as providing an isolating "skin" that protects the device from "unwanted impurity *atoms or molecules*."² Reply at 3 (citing Ex. 1013 at 542) (emphasis added). These definitions emphasize that passivation stabilizes the surface by rendering the surface layer below chemically passive or unreactive, not simply just interposing any insulating layer. The definition cited in Ex. 1014 further underscores this point, defining passivation as the process "by means of which a metal becomes passive."³ This language reflects the core principle that the process is directed to rendering the underlying surface inert or unreactive, not simply placing an insulating material on top of an underlying layer. In other words, "passivation" has a functional meaning distinct from

² Referring to the fifth definition. The seventh definition, cited by Petitioner, describes a "circuit or circuit element" and does not fit the semiconductor context, and even if it did, it additionally requires "to protect the surface from contaminants, moisture, or particles." Notably, the semiconductor context (definition 5) does not support Dr. Neikirk's broad opinion—he relies on the seventh definition. Further, this shows "contamination, moisture, or particles" (all macro concepts) apply to the chip context and "atoms or molecules" (micro concepts) apply to the semiconductor context.

³ Petitioner's misreads Ex. 1014. Reply at 3-4. While that definition states that passivation may be achieved through a "physical or chemical" process, the point is not the mechanism but the result—"by means of which a metal becomes passive." Ex. 1014, at 798 (emphasis added). In other words, regardless of whether the process involves a chemical reaction (such as oxide growth) or a physical deposition (such as nitride deposition), the *defining characteristic of passivation is that it renders the underlying surface chemically passive or unreactive*.

insulation: it is the use of a protective layer to make the surface of the layer below chemically passive or unreactive.

Other technical dictionaries also support Patent Owner’s construction. For example, Ex. 2012 states that passivation is “[g]rowth of an oxide layer on the surface of a semiconductor to provide electrical stability by isolating the transistor surface from electrical and chemical conditions in the environment” Indeed, even the Wikipedia page on “passivation” shows that passivation, in the context of semiconductor devices, is directed towards reducing the chemical reactivity of the surface, which includes tying up dangling bonds:

In physical chemistry and engineering, passivation is coating a material so that it becomes “passive”, that is, less readily affected or corroded by the environment.

. . .

In the context of the semiconductor device fabrication, such as silicon MOSFET transistors and solar cells, surface **passivation refers not only to reducing the chemical reactivity of the surface but also to eliminating the dangling bonds and other defects** that form electronic surface states, which impair performance of the devices.

Ex. 2013 (emphasis added).

Thus, the record shows that while an insulating layer *might be* used as passivation layer *in particular circumstances, when further conditions are met*, the concepts are not coextensive. Petitioner’s definition wrongly collapses passivation

into the broader category of insulation, ignoring the technical distinctions. Indeed, the definitions cited by Petitioner further confirm that a “passivation layer” is not just any insulation material, but rather a layer applied or grown with the purpose and effect of rendering the surface below chemically passive or unreactive.

3. Petitioner’s Criticisms of Dr. Bretschneider Are Misplaced and Irrelevant

Petitioner’s argument that Dr. Bretschneider would not opine on whether the passivation layer in the 121 patent meets his own construction is misplaced and irrelevant.

At a high level, it does not matter if the Board adopts Dr. Bretschneider’s exact construction. The Board can adopt any dictionary definition of “passivation” provided by Petitioner, or a combination of these definitions, and the Petition would still fail because all of these definitions require more than being a mere insulator.

Petitioner’s criticisms of Dr. Bretschneider are an irrelevant side-show, but in context, the criticisms have no merit because they mischaracterize Dr. Bretschneider’s testimony. Petitioner asked Dr. Bretschneider if “passivation silicon nitride 212 passivate[s] the ILD,” to which Dr. Bretschneider responded he hadn’t expressed an opinion on that. Ex. 1015 at 34:2–35:8. An ILD, as Dr. Bretschneider explained, is not a conductive layer—in other words, it would not have dangling bonds to passivate. *See id.* (explaining ILD is a dielectric). Further, with respect to

the metal layers below passivation SiN 212, Dr. Bretschneider made clear that “[s]ilicon nitride can be used to passivate metal surfaces” but explained he wanted to review the ’121 Patent to confirm the overall context. Ex. 1015 at 36:3–14. The metal layers that the passivation layer in the ’121 Patent are deposited on have dangling bonds and, in fact, are passivated by the passivation layer. *See* Ex. 1014 (defining passivation as the process “by means of which *a metal* becomes passive”) (emphasis added).

B. Capping Layer

Petitioner’s assertion that a “POSITA would understand from the 121 patent that there is no special meaning ascribed to ‘capping layer’ other than it is an insulation material” is unfounded. Reply at 5. If a “capping layer” were simply an insulating layer, then claim 3 of the ’121 Patent, which narrows the claimed dielectric layer to including both a capping layer and a passivation layer, would not be needed to specify both “capping” and “passivation” layers using distinct, different words. Dependent claim 3 does not merely call for additional “insulation” layers. Accordingly, Petitioner’s proposed construction should be rejected and the Petition fails with respect to claims 3 and 4.

1. The Intrinsic Evidence Supports Patent Owner's Construction

Contrary to Petitioner's assertions, the '121 Patent supports Patent Owner's proposed construction that the "capping layer" is "a layer of hard material to protect a layer underneath, like how a hard 'cap' can be worn to protect the head."

Petitioner takes the position that nothing in the '121 Patent "discloses or even suggests that capping layer 216 is a layer of hard material." Reply at 6. However, as noted by Petitioner, the Patent's exemplary embodiment uses SiN as the capping layer, which is a hard material. *See id.*

2. Petitioner Focuses On An Irrelevant Detail

The Reply focuses on whether a capping layer must be "hard." Reply at 8. This argument ignores the other half of Patent Owner's proposed construction: "a layer of hard material *to protect a layer underneath*, like how a hard "cap" can be worn to protect the head. Regardless of whether the capping layer must be "hard," the Petition fails to show that any prior art teaches a capping layer that protects the layers underneath.

3. Patent Owner's Construction Is Not Indefinite

Contrary to Petitioner's assertions, Patent Owner's proposed construction is not indefinite. Dr. Bretschneider explained that "if you want a capping layer, you want something that is reasonably durable or capable of protection." Ex. 1015 at

43:3–5. A POSITA would have understood what materials are “reasonably durable” and “capable of protection” based on the context of the surrounding semiconductor layers.

III. Ground 1 (Anzai – § 102) (Claims 1–3, 5)

Anzai does not disclose a “passivation layer” or a “capping layer” as recited by claim 3 under any reasonable construction. *See* Ex. 1001, Claim 3 (“The device of claim 1, wherein the second dielectric layer comprises a passivation layer and a capping layer”). Accordingly, Anzai does not anticipate claim 3.

A. Petitioner Disproved Its Originally Asserted Construction of “passivation layer” (claim 3)

Petitioner’s Reply makes the fatal mistake of attacking Dr. Bretschneider’s proposed construction of “passivation layer” by arguing that *both parties’* proposed constructions were wrong. Reply at 3 (offering dictionary definitions that differ from both parties’ proposals). But Petitioner had the burden of proving invalidity under Petitioner’s original theory—that a passivation layer is nothing more than an insulation layer. Petition at 19 (“there is no special meaning ascribed to passivation layer and capping layer other than they two separate layers of insulation material.”) If the Board decides that both parties’ proposed constructions are wrong, then the Petitioner has failed to show that Anzai anticipates claim 3.

B. The Reply's Argument About Organic Resins is Illogical and Irrelevant

Petitioner's Reply about organic resins is based on facially erroneous reasoning and mischaracterizations of both Patent Owner's Response and Dr. Bretschneider's testimony. For example, Petitioner's Reply argues (1) Azai's organic resin is an organic layer, (2) some organic layers may be passivation layers (referencing other AUO patents), so (3) Anzai's organic resin is a passivation layer. *See* Reply at 10–13. Such assertions are akin to the flawed logic present in stating that (1) squares are rectangles, (2) some rectangles have sides of different lengths, so (3) squares have sides of different lengths.

As is clear from Patent Owner's Response and explained further in Dr. Bretschneider's testimony, it is un rebutted that *(1) not all organic layers are organic resins and (2) organic resins don't passivate*. *See* POR at 11; Ex. 1015 at 48:20–49:5 (“Q Is your opinion that the organic resin of Anzai does not passivate because it's made of an organic material? . . . [A] Again, organic resins don't react. They don't tie up dangling bonds at the surface. And, therefore, they don't passivate.”), 84:7–10. Indeed, Dr. Bretschneider explained numerous times that, although organic **resins** are organic **materials**, not all organic **materials** are organic **resins**. Ex. 1015 at 66:22–67:1 (“Q Can a layer of organic resin, as contemplated by Anzai be an organic compound? . . . [A] The best I could say is that the resin could contain

organic compounds. The issue is their resin is a mixture. . .”), 54:13–16 (“I’m unaware of an organic resin used as a planarization film that would serve as a passivation layer”), 57:20–58:9 (“Q So [the ’801 patent is] saying the -- an organic dielectric layer can serve as a passivation layer; right? . . . [A] I have to point out, the language here is organic dielectric, not organic resin. . . .”), 84:7–10 (“Q Are all organic materials organic resins? A No. Q Are all organic layers organic resins? A No.”). Thus, it is undisputed that while some organics may serve as passivation layers, ***organic resins*** do not passivate.

Petitioner’s Reply does not identify any organic resins that act as a passivation layer but simply argues that other types of organics (not organic resins) can serve as passivation layers. *See* Reply at 11–13. Accordingly, Petitioner’s argument fails because it improperly conflates “organic resins” with other organic layers, and Patent Owner has submitted unrebutted evidence that ***organic resins*** (including the organic resin of Anzai’s planarization layer 17) do not passivate. Petitioner’s entire argument is irrelevant.

C. Anzai Does Not Disclose a “capping layer” (claim 3)

The Reply again fails to cure the deficiency identified in the Response, that the planarization layer relied upon by Petitioner is not a “capping” layer. Dr. Neikirk admitted that “capping” is not synonymous with “planarization,” and Petitioner admits that Anzai’s material used for the planarization layer is unknown. Ex. 2007,

51:18–52:4; Petition at 20. The Reply did not cure these fundamental defects with the Petition.

Petitioner’s Reply rests on the assertion that Dr. Bretschneider took “polar opposite positions (capping layer should be harder than the layer it’s protecting to defend his claim construction opinion, yet one would not use a hard material over a soft material to defend his opinions on Anzai).” Reply at 15. This assertion again mischaracterizes the testimony of Dr. Bretschneider.

Specifically, Petitioner identifies two excerpts as being purportedly contradictory. This is not the case, and in fact, the passages further illustrate why Anzai does not anticipate the ’121 Patent. Talking about a capping layer, Dr. Bretschneider explained “that if the capping layer were softer than the material its protecting, then ‘it would seem obvious that it would not do a very good job protecting.’” Reply at 14–15 (citing Ex. 1015 at 44:3–8). The portion of the transcript the Reply cites to as being purportedly contradictory discusses *planarization layers* and explains why having a hard SiN layer on top of a soft, organic resin layer would not work *if the SiN layer undergoes planarization processing*:

[Q] Why would it not have been obvious to use silicon nitride for [planarization] layer 19 [of Anzai]?

...

THE WITNESS: Reviewing briefly the section, both Anzai and Yamazaki talk about using organic materials. Yamazaki talks about use of spin-coating or ink jet printing. These take advantage of the liquid state of resin materials. Again, what you're doing for silicon nitride is a much more sophisticated and expensive process.

The organic resin materials 17 is going to be a softer, less durable material than silicon nitride. So if I have a rigid ceramic over a soft material and, *during chemoco -- chemical-mechanical polishing, you have to apply pressure and a sheer force*, you're -- it's similar, if you're familiar with how telescope mirrors are ground. You have a -- a spinning -- something spinning and applying pressure, whether it's the substrate or something on top of it -- I'll leave that out. That's a process variation. *But pressure and sheer force is being applied.*

So if I'm doing that to something hard and rigid over something soft, I don't know that I'm going to get something flat. I don't know that I'm not going to crack it. I don't know that it's not going to flake and peel off. So if 19's an organic material, I know I can do that.

Ex. 1015 at 71:13–72:13 (emphasis added).

Indeed, Anzai specifically calls for a “planarization layer 19” while the '121 Patent does not require that the SiN “capping layer” be planarized—indeed, figure 2 illustrates clearly an embodiment that is not planarized. See Ex. 1001, Fig. 2. The evidence in the record shows that Anzai's planarization layer 19 cannot be a capping layer because the planarization process for a hard layer (like SiN) would destroy the organic resin of Anzai's planarization layer 17. Petitioner's argument for this

section of its Reply is thus based on mischaracterizations of Dr. Bretschneider's testimony and should be given no weight.

Further, Petitioner admitted that "Anzai does not disclose the material for planarization layer 19." Petition at 20. A capping layer is a hard material intended to protect components underneath—because Petitioner admits that Anzai does not disclose the material of planarization layer 19, Petitioner cannot show that Anzai's planarization layer 19 is strong or hard enough to protect layers underneath. Even if the Board omits the "hard" requirement from the construction of "capping" layer, Petitioner cannot show that Anzai's planarization layer 19 protects the layers underneath.

D. Conclusion

Claim 3 is not anticipated by Anzai for at least the reasons discussed above.

IV. Ground 2 (Azai in View of Yamazaki – § 103) (Claim 4)

A. Claim 4 Depends from Claim 3, Which is Not Invalid

Contrary to Petitioner's assertions, Anzai in view of Yamazaki does not cure Anzai's failure to disclose claim 3, and Petitioner makes no assertion that it does so. *Contra* Reply at 15.

B. No Motivation to Combine

Petitioner's attempts to articulate a persuasive motivation to combine are unavailing.

1. Silicon Nitride is Undisputedly Less Suitable for Planarization than Organic Resin

Patent Owner has submitted un rebutted evidence that an organic resin is easier, cheaper, and higher yield to use as a planarization layer than silicon nitride. Ex. 1015 at 69:13–71:10 (Dr. Bretschneider explaining why an organic resin is better suited for a planarization layer than silicon nitride, including that using an organic resin is “cheaper, easier, and higher yield”). Petitioner does not dispute this and instead contends “there are competing factors when choosing materials.” *Compare* Reply at 16 *with* POR at 13–15. Petitioner’s attempt to point to the fact that silicon nitride has a higher dielectric constant than organic materials does not explain why a POSITA would use silicon nitride for Anzai’s *planarization layer* (rather than a non-planarized dielectric layer) when it is a more difficult, more expensive, and lower yield material to *planarize* than the organic resin called for by Anzai (and, indeed, Anzai explicitly chose organic resin for its planarization layer).

Indeed, Petitioner’s own expert opined that Anzai used silicon nitride for certain layers. Ex. 1002, ¶ 78 (citing Ex. 1003, Fig. 2A, 4:8–10 and 17–24). Accordingly, Anzai was aware of the properties of silicon nitride and chose *not* to use it as the material in planarization layer 17. Unsurprisingly, Anzai chose the easier-to-planarize organic resin material for its planarization layer.

Further, the Reply still does not articulate why a POSITA would have chosen silicon nitride out of the list of materials offered by Yamazaki. *See* Reply at 16. Indeed, the Reply highlights that it would not have been obvious to change Anzai's explicit teaching of an *organic resin* as a planarization layer, as Yamazaki's list is "broken down by organic and inorganic materials" and silicon nitride was included as part of the "list of *inorganic* materials." Reply at 16. Petitioner has not articulated an adequate reason that a POSITA would be motivated to replace Anzai's *organic* resin with an *inorganic* material that is more difficult and more expensive to planarize than organic resin.

2. Petitioner is Withholding Inconsistent Arguments in Violation of its Duty of Disclosure

In the parallel District Court case, Petitioner is advancing a theory that is inconsistent with the arguments Petitioner made in this proceeding. 37 C.F.R. § 11.106(c) states "[a] practitioner shall disclose to the Office information necessary to comply with applicable duty of disclosure provisions." 37 C.F.R. § 1.56(b) imposes a duty of disclosure when a practitioner has "information material to patentability" such as information that "refutes, or is inconsistent with, a position." Petitioner violates its duty of disclosure and candor under 37 C.F.R. § 11.106(c) and 37 C.F.R. § 42.11 by refusing to de-designate the marking of "Confidential -- Attorneys Eyes Only" or agree to redactions necessary to bring the inconsistent

statement before the Board. Patent Owner does not believe that the withheld information is confidential at all, and that Petitioner is using the designation solely to shield BOE's inconsistent arguments. Petitioner's arguments made in its withheld interrogatory responses are inconsistent with its purported motivations to modify Anzai.

The Board should issue sanctions against Petitioner. Patent Owner requests the Board terminate this proceeding based on Petitioner's violation of its duty of candor and fair dealing. *See, e.g.*, IPR2021-00847, Paper 114 (entering adverse judgment for violations of the duty of candor and fair dealing before the Board), Paper 113. Alternatively, the Board should at least strike Petitioner's theories related to combining Yamazaki and Anzai.

3. Yamazaki's Does Not Disclose Using Silicon Nitride a Planarization Layer

As explained in depth in Patent Owner's Response, Petitioner's rationale for combining Yamazaki and Anzai fails. POR at 6, 13–18. Specifically, Petitioner's expert incorrectly opines that "Yamazaki teaches using silicon nitride for use as a planarization film for flattening the surface," citing "upper and lower surfaces of insulation layer 30" and Ex. 1004 at 11:22–12:20. Ex. 1002, ¶ 78. However, these citations do not support this assertion. Yamazaki at 11:22–12:20 only discloses that insulating material 30 can be a wide variety of materials and that the only important

characteristic is that it is an insulator, but this part of Yamazaki does not say anything regarding insulating materials that are further suitable for *planarizing*.

The only reference to whether a surface is flat is a discussion of Yamazaki's first electrode 28a, which is not insulating materials 30 (or covered by insulating materials 30, *see* Yamazaki at Fig. 2). Yamazaki then explains that the first electrode 28a "may be flattened by a chemical or mechanical grinding treatment (typically CMP technology or the like)." Ex. 1004 at 11:32–11:34. This disclosure would be unnecessary if the underlying layer 30 was a planarization layer and provided a planar surface. Further contradicting Dr. Neikirk's opinion that insulation layer 30 is planar (let alone a planarization layer) is that Yamazaki expressly discloses that insulating materials 30 could have "a curved surface with a curvature on its upper end portion." Ex. 1004 at 11:59–62. A POSITA would know that a curved surface is not planar and that insulation layer 30 is not a planarization layer. Accordingly, Yamazaki itself does not support Petitioner's assertion that a POSITA would not have been motivated to select SiN for one of Anzai's *planarization* layers 17 or 19.

C. Conclusion

Claim 4 is not rendered obvious by Anzai and Yamazaki for at least the reasons discussed above.

V. Ground 3 (Yamazaki in View of Anzai – § 103)

A. No Motivation to Add a Layer as Proposed (Claims 3, 4, 7)

As an initial matter, the Reply does not address Patent Owner's observation that an additional layer would reduce capacitance due to increased thickness. *See* POR at 19 (citing Pet. at 26) (stating the motivation is to achieve "higher capacitance per unit area"). Thus, a POSITA would not be motivated to combine Yamazaki and Anzai for that reason alone and for the additional reasons set forth below.

1. Petitioner Repeatedly Mischaracterizes Dr. Bretschneider's Testimony

Petitioner opines that Dr. Bretschneider "provided remarkably naïve testimony" by explaining that it does not make sense to add a second planarization layer to a layer that is already planarized. This is a mischaracterization of Dr. Bretschneider's testimony. Specifically, Dr. Bretschneider testified as follows:

[Q] Would a POSITA ever consider achieving the flatness requirement specification using a two-layer technique?

...

[A] I haven't considered that. And, again, what I've stated many times, I'm trying to struggle as to why anyone would consider doing that. ...

Q In your experience in the field, have you ever seen a process flow where the flatness requirement was met using a two-layer technique?

...

[A] For a single layer, no.

Ex. 1015 at 82:19-93:9.

For example, this concept is highlighted by referring to figures 2A/2B and 3A/3B of Anzai, Anzai has a second planarization layer *that provides planarization over additional structures* (that were deposited on top of the first planarization layer):

FIG.2A

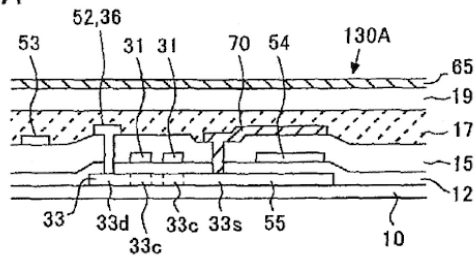


FIG.3A

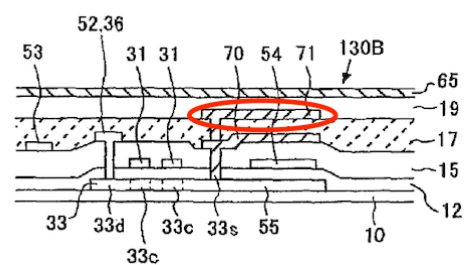


FIG.2B

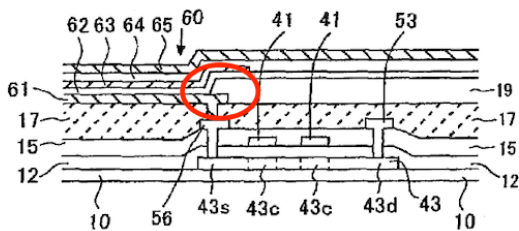
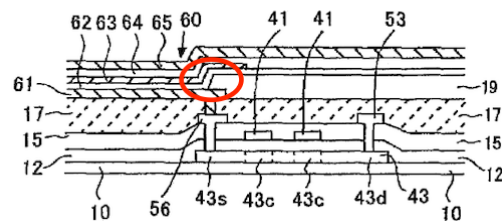


FIG.3B



Ex. 1003 at Figs 2A-3B (annotated to show where additional structures were deposited before the second planarization layer). Anzai is not simply using a two-step process to achieve planarization of **the same** layer, as Petitioner implies.

Indeed, as Dr. Bretschneider testified, in all his years in industry, he has never “seen a process flow where the flatness requirement was met using a two-layer technique” for a single layer. Ex. 1015 at 83:5–9; *contra* Reply at 20 (“putting a planarization layer on a planarization layer simply means the first layer has an upper surface that is more planarized than the underlying topology or layer, and the second

layer has an upper surface that is more planarized than the upper surface of the first layer”).

Petitioner attempts to further mischaracterize Dr. Bretschneider’s testimony, stating “Patent Owner’s expert had no opinion on whether all planarization layers are perfectly flat.” Reply at 20 (citing Ex. 1015 at 79:19–23). However, Dr. Bretschneider explained to Petitioner:

Where I am getting stuck is, when you say is it perfectly flat, nothing can be perfectly flat. Everything is made of atoms. There’s a technique called atomic force microscopy that you can actually see difference in height because -- are you measuring on top of an atom or a space in between two adjacent atoms? So if you want to go to the limit, we can’t make a surface perfectly flat. If it’s a planarization layer, it has met planarization requirements. It’s met the flatness requirements. There’s no reason to improve on meeting the requirements.

Ex. 1015 at 80:8–18. Dr. Bretschneider also explained “if it is a planarization layer, it has met the requirements for being planar.” *Id.* at 79:24–78:1; *see also id.* at 78:10–21 (“[I]f a planarization layer is put down and it’s not planar, then why on Earth would you suspect that trying a second time would fix it? It didn’t work the first time. Why would you do it twice? . . . So [Petitioner’s] whole scenario just makes no sense. . . . There’s no reason to improve the flattening properties of a planarization layer unless it’s not a planarization layer.”), 83:5–9.

The Petition, by contrast, suggests that a POSITA would use an additional layer to further planarize a planarization layer in Yamazaki simply for the sake of further flattening the planarizing layer directly below it. As Dr. Bretschneider testified at length, he has *never seen such a thing done in his 30+ years in industry*, and a POSITA would not add a second planarization layer directly on top of a first planarization layer to further flatten the first planarization layer. *See* Ex. 1015 at 82:19–93:9; *see also* Ex. 2005 at 2.

Thus, Petitioner’s arguments fail and were crafted from hindsight. Petitioner has not shown any motivation to combine Anzai with Yamazaki because a POSITA would not simply add a second planarization layer to an already planarized layer.

2. Petitioner is Withholding Inconsistent Evidence in Violation of its Duty of Disclosure

As discussed above in Section IV(B)(2), in the parallel District Court case, Petitioner is advancing arguments that are inconsistent with the arguments made in this proceeding, and Petitioner is improperly withholding evidence material to patentability. That evidence is inconsistent with Petitioner’s asserted motivations to modify Yamazaki. Accordingly, the Board should terminate this proceeding or at least strike Petitioner’s theories related to combining Yamazaki and Anzai.

B. Claims 4 and 7: No Capping Layer

In addition to the lack of a motivation to combine Yamazaki and Anzai as proposed, Anzai does not disclose the claimed “capping layer.” Petitioner’s Reply simply states that Patent Owner’s construction should be rejected. Reply at 20–21. If Patent Owner’s construction is adopted even in part (e.g., that a capping layer protects a layer underneath, regardless of hardness), then the Petition has no argument against claims 4 and 7 because Petitioner relies on the erroneous construction that “capping layer” is nothing more than an insulating material. Further, claim 4 is valid due to its dependence from claim 3, which is valid for the reasons explained above.

C. Conclusion

Claims 3, 4, and 7 are not rendered obvious by Yamazaki and Anzai for at least the reasons discussed above.

VI. Conclusion

For the reasons set forth above, Patent Owner respectfully requests that the Board find all challenged claims patentable.

Date: September 17, 2025

Respectfully submitted,

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CERTIFICATION REGARDING WORD COUNT

Pursuant to 37 C.F.R. §42.24(d), Patent Owner hereby certifies, in accordance with and reliance on the word count provided by the word-processing system used to prepare this **PATENT OWNER'S SUR-REPLY**, that the amount of words in this paper is 5,171. Pursuant to 37 C.F.R. § 42.24, this word count is in compliance with the 5,600 word limit set forth in 37 C.F.R. § 42.24(c)(2) excluding the portions exempted under 37 C.F.R. § 42.24(a)(1).

Date: September 17, 2025

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CERTIFICATE OF SERVICE (37 C.F.R. § 42.6(e)(1))

The undersigned hereby certifies that the above document was served on September 17, 2025, by filing this document through the Patent Trial and Appeal Board End to End system as well as delivering a copy via electronic mail upon the following attorneys of record for the Petitioner:

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