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 RESPONSE

Table of Contents

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Cases

Patent Owner's Exhibit List for IPR2024-01132

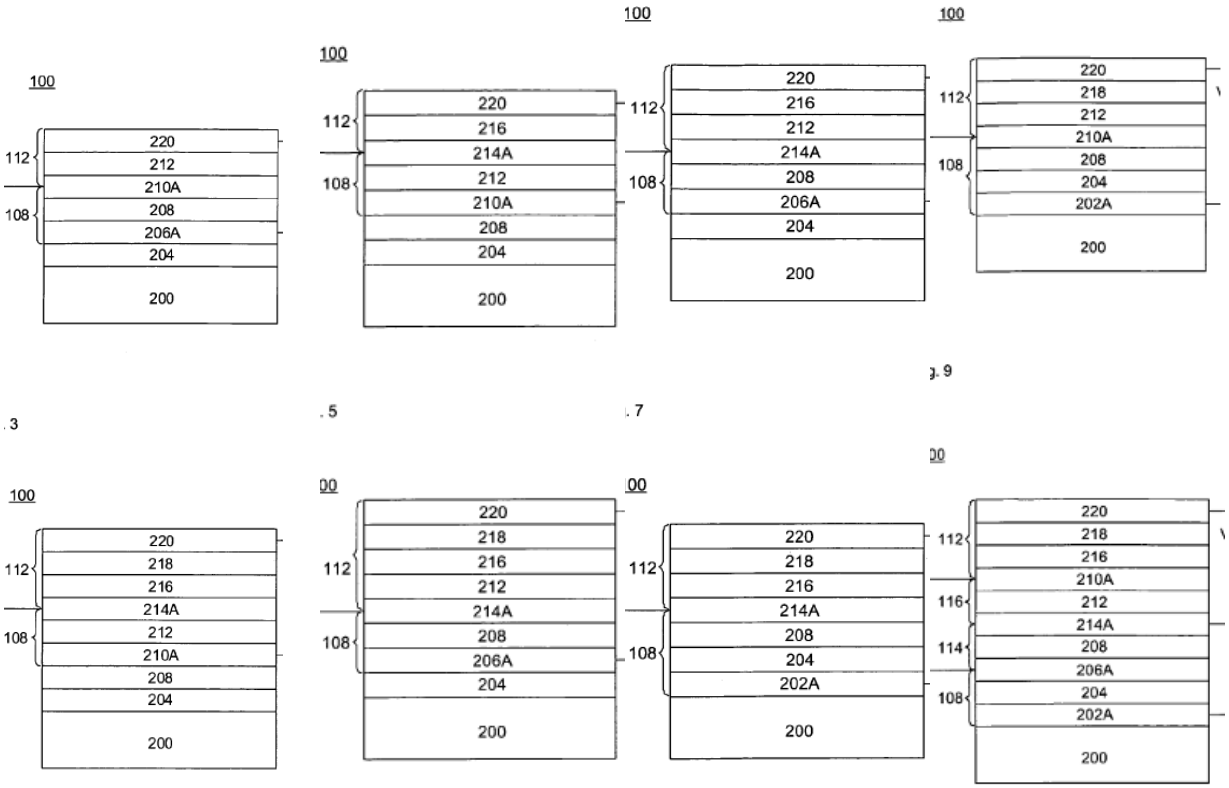
Pursuant to 37 C.F.R. § 42.63(e), Patent Owner Optronics Sciences LLC hereby submits its exhibit list associated with the above-captioned *inter partes* review of U.S. Patent No. 7,586,121.

Ex. No.	Description
2001	Declaration of Benjamin T. Wang in Support of Motion to Appear *Pro Hac Vice*
2002	Declaration of Andrew D. Weiss in Support of Motion to Appear *Pro Hac Vice*
2003	Declaration of Christian W. Conkle in Support of Motion to Appear *Pro Hac Vice*
2004	Declaration of Paul A. Kroeger in Support of Motion to Appear *Pro Hac Vice*
2005	Declaration of Dr. Eric Bretschneider in support of Patent Owner's Response ("Bretschneider Decl.")
2006	*Curriculum vitae* of Dr. Eric Bretschneider
2007	April 17, 2025, Deposition Transcript of Dr. Dean Neikirk, *IPR2024-01132*, *IPR-2024-01315*
2008	Roel. J. Theeuwes, *Surface passivation approaches for silicon, germanium, and III-V semiconductors*, J. VAC. SCI. TECHNOL., A.42, 060801 (2024).
2009	Mark LaPedus, *Capping Tools Tame Electromigration*, 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).

I. Introduction

The ’121 patent provides an innovative design for an electroluminescent device like an OLED. Specifically, the ’121 Patent teaches a novel arrangement of specific layers and the implementation of a capacitor in that arrangement. Ex. 1001 at 1:5–10, 1:26–37, Fig. 2. By stacking two capacitors that share an electrode vertically above each other, the storage capacitance can be increased without increasing the chip area and without needing additional masks during manufacturing. *Id.* Abstract, 5:5–6:49.

While the two capacitors are a focus of the disclosure, the innovative disclosure is not merely limited the two capacitors, as the surrounding context is also important. There are three areas—one for the capacitors, one for a transistor, and one for a light emitting device. The interplay of layers of materials between the three areas is important as this affects how many masks are needed to manufacture the device, which directly affects the cost of manufacture. Thus, the patent shows many different embodiments with different orderings and different combinations of specific layers. *Id.* at Figs. 3–9, 11. Specific embodiments of materials and/or layers are captured in the dependent claims. For example, some embodiments show passivation layer 212 and/or capping layer 216; other embodiments do not.



Id. at Figs. 3–9, 11 (showing excerpts of different combinations of layers). The prior art fails to anticipate or render obvious at least the specific teachings of the passivation layer and capping layer.

According to the Petition, "The 121 patent provides no meanings for 'passivation layer' and 'capping layer.' . . . A POSITA would understand from the 121 patent that there is no special meaning ascribed to passivation layer and capping layer." Petitioner and its expert apparently do not know what a "passivation layer" and "capping layer" are, so Petitioner naturally failed to identify a passivation layer and capping layer in the prior art.

II. Background of the '121 Patent

The '121 Patent relates to an "electroluminescence device and, more particularly, to a storage capacitor of an electroluminescence device and a method for forming the storage capacitor." Ex. 1001, 1:6–9. "Capacitors 108 and 112 are shown to be formed over an area A of substrate 200, transistor 102 is shown to be formed over an area B of substrate 200, and part of OLED 110 is shown to be formed in an area C of substrate 200." Ex. 5:18–21.

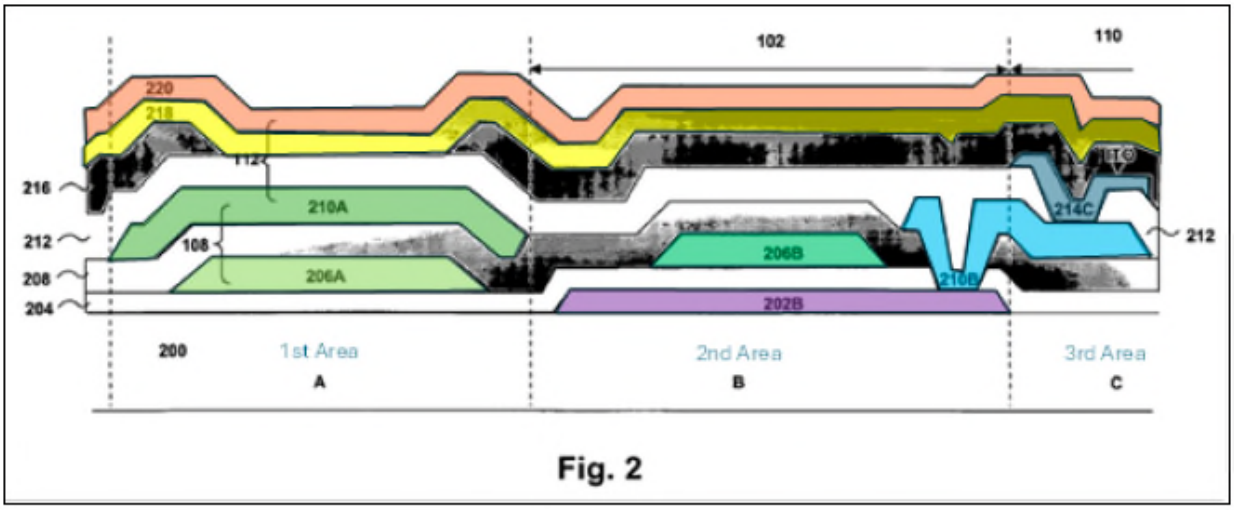


Fig. 2

Petition at 2 (annotating figure 2 of the '121 Patent).

> [D]oped polysilicon 202B and intrinsic polysilicon 202 [are formed] over area B of substrate 200. A layer of gate oxide 204 is formed over all of areas A, B, and C. A layer of first metal is deposited over gate oxide 204 and patterned to form first metal patterns 206A and 206B over areas A and B, respectively. A layer of interlayer dielectric (ILD) 208 is formed over first metal patterns 206A and 206B. A layer of second metal is deposited over ILD 208 and patterned to form second metal patterns 210A over area A and 210B over both areas B and C, wherein second metal pattern 210B contacts polysilicon pattern 202B through a via hole (not numbered) in ILD 208 and gate oxide 204. A

> layer of ***passivation silicon nitride (SiN) 212*** is formed over ILD 208 and second metal patterns 210A and 210B. A layer of indium tin oxide (ITO) is formed over passivation SiN 212 and patterned to form an ITO pattern 214C over area C of substrate 200, wherein ITO pattern 214C contacts second metal pattern 210B through a via hole (not numbered) in passivation SiN 212. A layer of ***capping SiN 216*** is deposited to cover passivation SiN 212 and ITO pattern 214C. A layer of organics 218 [yellow] is deposited over all of areas A, B, and C. Over area A, capping SiN 216 is also patterned to expose a portion of passivation SiN 212.

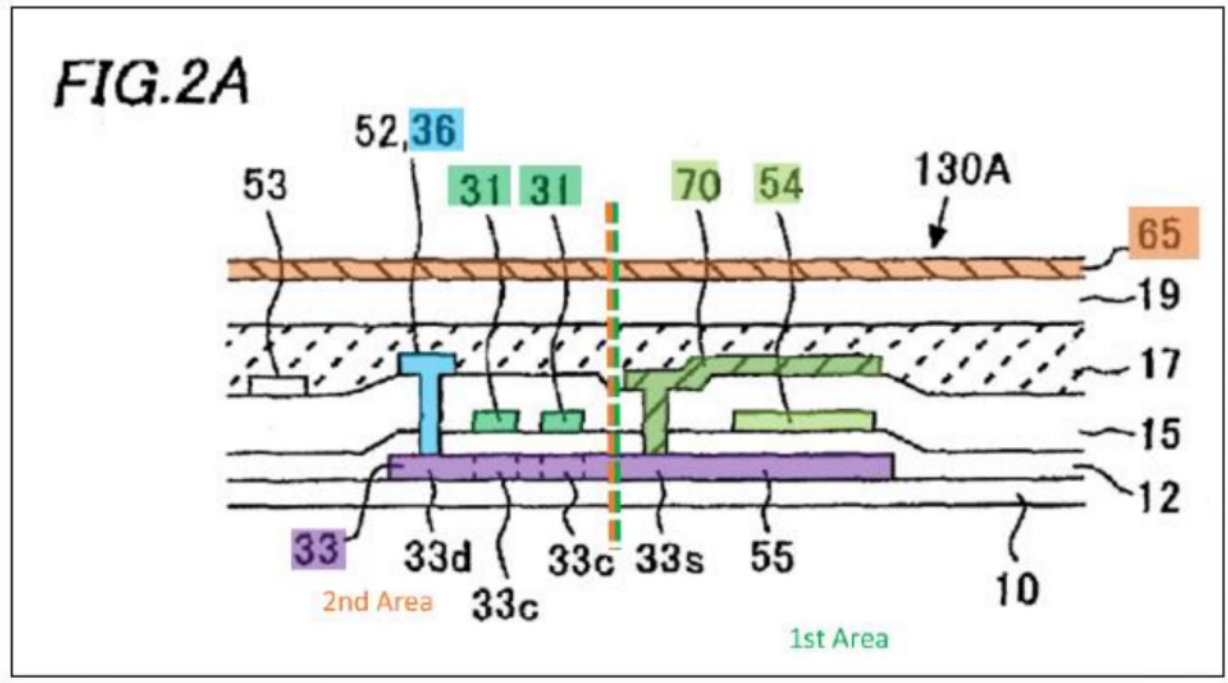
Ex. 1001, 5:22–44 (coloring and emphasis added).

Capacitors 108 and 112 share the second conductive layer 210A. Ex. 1001, 6:17–23. "[C]apacitor 112 comprises second metal pattern 210A, passivation silicon nitride 212, and third metal 220, while capacitor 108 comprises first metal pattern 206A, ILD 208, and second metal pattern 210A." Ex. 1001, 6:29–32.

III. Overview of Prior Art

A. Anzai

Anzai relates to "an electroluminescent display device with a storage capacitance element for holding a video signal supplied to a gate of a driving transistor." Ex. 1003, 1:7–10. Anzai discloses that the device is fabricated using sequentially deposited layers, including a "first planarization film 17" that is made of an organic resin and a "second planarization film 19." *Id.* at 5:3–12. Anzai teaches that "first planarization film 17 [is] made of an organic resin for flattening the surface." *Id.* at 4:22–25.



Petition at 10. As admitted by Petitioner, "Anzai does not disclose the material for planarization layer 19." Petition at 20.

B. Yamazaki

Yamazaki "relates to a light emitting device using a light emitting element having a layer that contains an organic compound between a pair of electrodes." Ex. 1004, 1:7–9. Notably, Yamazaki discloses a single insulation layer 30 is disposed between cathode electrode layer 32 and the electrodes 46, 47, 48, 24, 23:

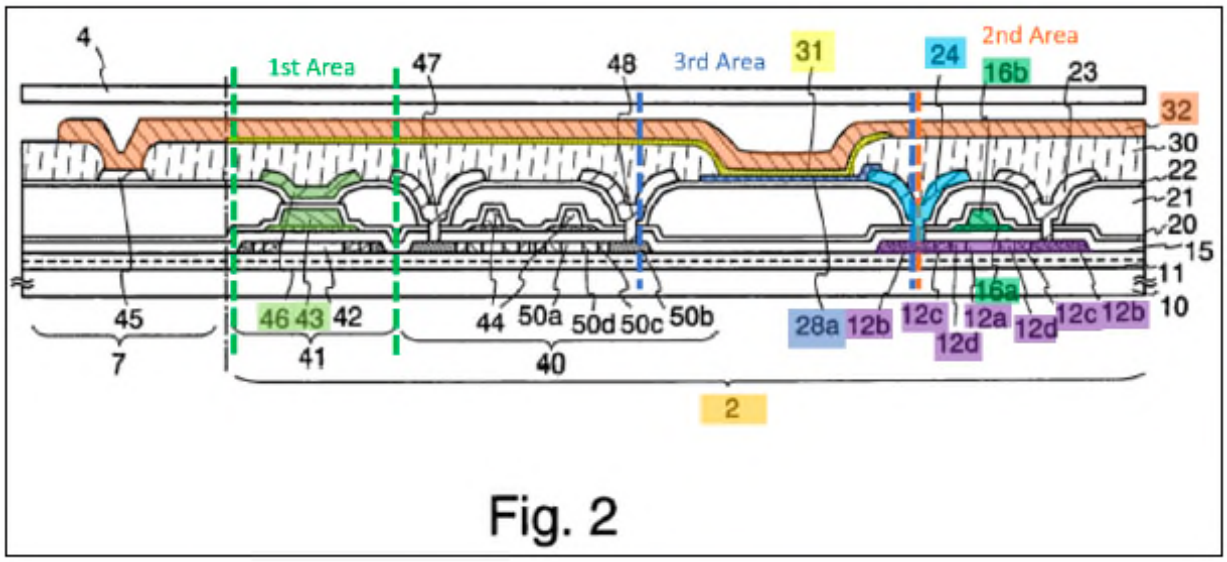


Fig. 2

Petition at 23 (annotating figure 2 of Yamazaki). Yamazaki teaches that "insulating material 30 may be a photosensitive or non-photosensitive organic material (such as polyimide, acrylate, polyamide, polyimide amide, resist, or benzocyclobutene), an inorganic material (such as silicon oxide, silicon nitride, or silicon oxynitride) with a CVD method, a sputtering method, or coating method, or a laminate thereof." Ex. 1004, 11:45-50. Yamazaki also teaches that the flat top surface of insulation layer 30 can be achieved by CMP (chemical mechanical polish), which can be performed after the formation of insulating material 30. *Id.,* 20:17-24.

IV. Claim Construction

The Federal Circuit has held that "only those terms need be construed that are in controversy, and only to the extent necessary to resolve the controversy." *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999). This

principle applies equally to IPR proceedings. *See, e.g., Apple Inc. v. Uniloc Luxembourg S.A.*, IPR2018-00420, Paper 7 at 8 (PTAB, Aug. 6, 2018).

"Passivation layer" has a plain and ordinary meaning in the art. A passivation layer is a layer of a material that renders the surface layer below chemically passive or unreactive, especially by tying up dangling bonds. Ex. 2005, ¶ 66; *see also* Ex. 2010 at 556 ("passivation[:] The protection of . . . layers, or surfaces of semiconductors by depositing a material which renders them chemically passive or unreactive. . ."); *see also* Ex. 2011 at 256–57 (describing passivation and planarization). A dangling bond is an electron on the surface of a semiconductor crystal that lacks a neighboring atom to bond with, which creates an electrically active surface state that negatively impacts the performance of the semiconductor. Ex. 2005, ¶ 66; *see also* Ex. 2008 at 7 ("an unsatisfied silicon atom bonded to three silicon atoms [is] often referred to as a dangling bond."). Dangling bonds are passivated with an inorganic dielectric layer (such as silicon nitride or silicon dioxide) that is designed to chemically and electrically stabilize the semiconductor surface by neutralizing dangling bonds. Ex. 2005, ¶66; Ex. 2008 at 9 ("silicon nitride . . . may be used for passivation of silicon"). This is consistent with the '121 Patent's disclosure of a "passivation silicon nitride" layer. *See* Ex. 1001, 5:34–36.

Passivation is a distinct word from "insulation" and "planarization." Ex. 2011 at 265–266 (literally discussing "Passivation" and "Planarization" under separate

headings). Thus, a passivation layer is not the same as an "insulator" (a layer that electrically insulates) and is not the same as a "planarization layer" (a layer that makes a flat, planar surface on top). *Id.*

A "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. Ex. 2005, ¶ 67. This is consistent with the '121 Patent's disclosure of silicon nitride ("SiN") as the capping layer, as SiN is a hard, durable material. *Id.*; Ex. 1001, 5:40–42. Further, as acknowledged by Petitioner's expert, "capping" is distinct from the word "planarization." *See* Ex. 2007, 51:18–52:4

Otherwise, all other claim terms should be construed according to their plain and ordinary meaning to a POSITA at the time of the '121 Patent.

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

Anzai discloses neither a "passivation layer" or a "capping layer" as recited by claim 3. *See* Ex. 1001, Claim 3 ("The device of claim 1, wherein the second dielectric layer comprises a passivation layer and a capping layer").

A. Anzai does not disclose a "passivation layer" (claim 3)

Petitioner points to Anzai's first planarization layer 17 as the claimed "passivation layer." Petition at 19. Azai discloses that first planarization film 17 is "made of an organic resin for flattening the surface," which the Petition acknowledges. Ex. 1003, 4:20–24; *see* Petition at 20. The Petition admits that

"Anzai does not disclose the material for planarization layer 19" and speculates that "it must be made of an insulation material." Petition at 20. The Petition merely states that "[t]he first planarization film 17 is formed over the entire surface for flattening, which will protect the semiconductor surface from the surrounding environment (for passivation)" and that "[a]s such, a POSITA would understand that Anzai's planarization film 17 is a passivation layer." Petition at 20.

Petitioner and its expert do not appear to know what a "passivation layer" is. Petitioner and its expert seemingly equate a planarizing film that is made of an organic resin and a passivation layer, stating that "the 121 patent provides no meanings for 'passivation layer'" and that a POSITA would understand it to simply be a "layer[] of insulation material." Petition at 19; *see also* Ex. 2007, 50:9–13; *contra* Ex. 2007, 54:23–55:2 ("Q Is there any difference between a passivation layer and an insulation layer? A Yes, there can be."). Dr. Bretschneider reviewed the Petition's assertions and the testimony of Petitioner's expert's assertions, and disagrees with Petitioner's expert for the following reasons.

First, a passivation layer is a layer of a material that renders the surface layer below chemically passive or unreactive, especially by tying up dangling bonds. Ex. 2005, ¶¶ 66, 71; *see also* Ex. 2008 at 9 ("silicon nitride . . . may be used for passivation of silicon); *see* Section IV, above (construing "passivation layer"). A dangling bond is an electron on the surface of a semiconductor crystal that lacks a

neighboring atom to bond with, which creates an electrically active surface state that negatively impacts the performance of the semiconductor. Ex. 2005, ¶¶ 66, 71; *see also* Ex. 2008 (describing passivation techniques). Dangling bonds are passivated with an inorganic dielectric layer (such as silicon nitride or silicon dioxide) that is designed to chemically and electrically stabilize the semiconductor surface by neutralizing dangling bonds. Ex. 2005, ¶¶ 66, 71; *see* Ex. 2008 at 9 ("silicon nitride . . . may be used for passivation of silicon). This is consistent with the '121 Patent's disclosure of a "passivation silicon nitride" layer. *See* Ex. 1001, 5:34–36.

Second, a planarization layer is not inherently a passivation layer. A planarization layer refers to a layer that flattens the surface, as explained by Dr. Bretschneider and as noted explicitly in Anzai. Ex. 2005, ¶ 72; Ex. 1003, 4:20–24 ("first planarization film 17 is formed over the entire surface ***for flattening***"). Thus, a flattened surface is a planar surface—hence "planarization." Petitioner's expert agreed, explaining that a planarization layer "is deposited and, if necessary, further processed so that its top surface will be relatively flat." Ex. 2007, 47:1–4.

Petitioner's expert further testified that "passivation" and "planarization" are not synonymous, but that "in many cases, the same sheet of material can perform both functions." *Id.* at 50:17–21. Petitioner's expert testified that there is a distinction between a passivation layer and an insulation layer. Ex. 2007, 54:23–55:2 ("Q Is there any difference between a passivation layer and an insulation layer?

A Yes, there can be."). While Petitioner's expert is correct that the same sheet of material ***can*** perform both planarization and passivation functions, not all materials actually ***do*** perform both functions. *See* Ex. 2005, ¶ 72. For example, Anzai's planarization film 17 is made of organic resin, which ***only*** planarizes but does not passivate. *Id*. This is because ***organic resin does not passivate***. However, the mere ability of a material to *possibly* be what is claimed does meet the standard for anticipation under Section 102.

Third, an insulator is not inherently a passivation layer. Organic resin, while it is an insulating material, does not passivate the surface of a semiconductor. Ex. 2005, ¶ 72. Specifically, organic resin does not tie up dangling bonds, as organic resin lacks the chemical reactivity and appropriate atomic bonding characteristics needed to neutralize the electrically active surface states and dangling bonds. *Id.*; *see generally* Ex. 2008 (describing inorganic passivation materials).

Thus, Anzai's planarization film 17 cannot also be a passivation layer because it is made of organic resin, which is not a suitable material for a passivation. Ex. 2005, ¶¶ 69–73. Accordingly, Anzai does not anticipate the claimed "passivation layer" and claim 3 of the '121 Patent is valid.

B. Anzai does not disclose a "capping layer" (claim 3)

Petitioner asserts that a POSITA would have understood that Anzai's "second planarization film 19" is the claimed "capping layer" because it is "disposed on the

first planarization film 17." Petition at 20. As admitted by Dr. Neikirk, a "capping layer" carries a meaning that is not synonymous with a "planarization layer." Ex. 2007, 51:18–52:4.

As admitted by Petitioner, "Anzai does not disclose the material for planarization layer 19." Petition at 20. Dr. Bretschneider explains that a capping layer is a hard material intended to protect components underneath—such as the silicon nitride layer described by the '121 Patent. Ex. 2005, ¶ 74; *see also* Ex. 1001, 2:31–33, 5:40–44. 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.

Anzai does not describe planarization film 19 as performing any such role, and there is no reason a POSITA would understand that planarizing film 19 is a capping layer. Rather, the disclosure of Anzai simply supports that planarizing film 19 is just a layer that provides a flattened topography—it does not describe using a material suitable for capping. Accordingly, Anzai does not disclose a "capping layer" and cannot anticipate the '121 Patent.

C. Conclusion

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

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

A. Claim 4 Depends from Claim 3

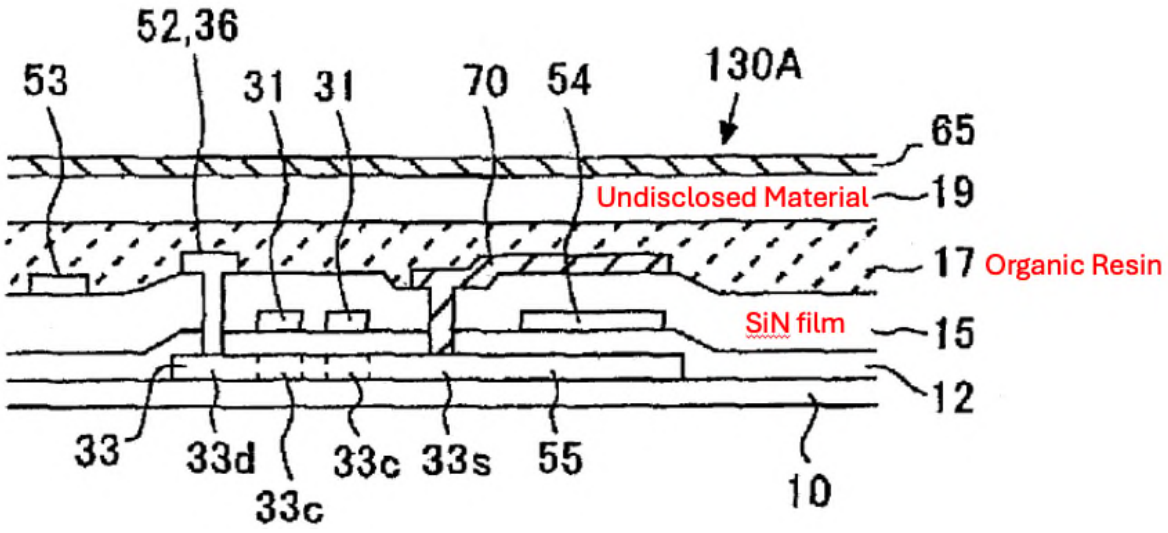
Anzai in view of Yamazaki does not cure Anzai's failure to disclose claim 3, and Petitioner makes no assertion that it does so. *See* Petition at 22 (stating only "*see* claim 3 above" in reference to Anzai's failed anticipation of claim 3). Thus, claim 4 is not invalid for at least the same reasons discussed above in Ground 1 for claim 3.

B. No Motivation to Combine

Petitioner proposes modifying Anzai such that one of planarizing films 17 and 19 is made of silicon nitride, but does not identify a motivation to do so. Petitioner simply states that a "POSITA would have understood the issue involved, namely what material(s) can be used to form the first and second planarization layers 17 and 19 for the second capacitor of Anzai." Petition at 25. Petitioner does nothing more than invent a problem to justify its hindsight-based combination.

First, Dr. Bretschneider explains that Anzai explicitly taught that planarization layer 17 is an organic resin—and a POSITA would have recognized that an organic resin is a perfectly suitable material for insulation in Anzai's configuration. Ex. 2005, ¶ 78; Ex. 1003, 4:23–24, 5:3–5. Thus, the POSTIA would have had no reason to deviate from Anzai's teaching (at least, not without hindsight). In fact, Anzai discloses using an "SiN film" elsewhere in its structure (to "form the interlayer

insulating film") but specifically teaches using an organic resin material for planarization layer 17. *See id.* at 4:17–18, 4:23–24.



Id. at Fig. 2A (annotated).

In fact, a POSITA would have preferred an organic resin over silicon nitride for a planarization layer. Ex. 2005, ¶ 79. This is because organic resins flow more easily to fill out dips in the surface below, whereas silicon nitride is usually deposited via chemical vapor deposition or sputtering and requires additional steps (like chemical mechanical polishing) to make flat. *Id.*; Ex. 1004 at 11:34–37; Petition at 25. Organic resins are also softer than silicon nitride, so organic resins are less likely to crack or delaminate. *Id.* Organic resins can be spin coated and cured at lower temperatures—a cheaper process than chemical vapor deposition of silicon nitride. *Id.* In summary, silicon nitride is more difficult and more expensive to planarize than an organic resin.

Indeed, this appears to have been Anzai's thinking. As noted by Petitioner, Anzai explicitly taught the use of silicon nitride in interlayer insulating film 15 between the second and third capacitance electrode layers 54 and 70, and in gate insulating film 12 (Petition at 26), but Anzai teaches that "planarization film 17 [is] made of an organic resin for flatting the surface." Ex. 1003 at 4:22–24. Thus, Anzai taught the use of silicon nitride *for layers 15 and 12 that are not flat*, and the use of an organic resin for layers that are flat—especially layer planarization film 17.

Next, Petitioner's use of hindsight is evident from the teaching of Yamazaki. Yamazaki actually teaches:

> The insulating material **30** may be a photosensitive or non-photosensitive organic material (such as polyimide, acrylate, polyamide, polyimide amide, resist, or benzocyclobutene), an inorganic material (such as silicon oxide, silicon nitride, or silicon oxynitride) with a CVD method, a sputtering method, or coating method, or a laminate thereof. In the case of using the photosensitive organic material as the insulating material **30**, useful photosensitive organic materials may be roughly grouped into two types. That is, the one is a negative type which becomes insoluble to an etchant by photosensitive light irradiation and the other is a positive type which becomes soluble to the etchant by light irradiation. According to the present invention, both types can be appropriately used.

Ex. 1004 at 45–58. Petitioner offers no justification for picking out silicon nitride and no methodology for picking a material out of this huge range of choices—it is

clear Petitioner did so solely because these words matched the material recited in claim 4 of the '121 Patent example. This is particularly true when Anzai explicitly teaches using an organic resin for its ***planarization*** layer (as opposed to Yamazaki's "insulating material," which may or may not be planarized). *See* Ex. 1004, 11:22–33 (stating that insulating material 30 "***may*** be flattened by a chemical or mechanical grinding treatment").

Finally, the teaching of Yamazaki relates to **a single** layer 30 and is not applicable to **both** layers 17 and 19 of Anzai. There is no reason explaining why a POSITA would have thought that a material from **one** layer in Yamazaki should be used for **two** different layers 17 and 19 of Anzai. The Petition and its expert both appear to recognize this problem and thus carefully limits word its proposed combination as: "It would have been obvious to a POSITA to combine the teachings of Anzai and Yamazaki to use silicon nitride as the material for **at least one** of the planarization films 17 or 19 of Anzai." Petition at 25 (emphasis added); Ex. 1002 ¶ 76. Even if Petitioner's hindsight justification supported changing one the material of Anzai's planarization films 17 or 19, there is no explanation of how a POSITA would have looked at **one** layer of Yamazaki and found it obvious to change **two** different layers of Anzai.

Indeed, Petitioner's proposal does not even follow its own reasoning. Petitioner argues that a "POSITA would have been motivated to use silicon nitride

to form at least one of the first and second planarization layers 17 and 19 of Anzai because (1) Yamazaki teaches using silicon nitride as the insulating layer 30 under its cathode layer" 32. Petition at 25–26. The application of this principle in Anzai would mean that only Anzai's planarization layer 19, which is under the cathode layer 65, would be made of silicon nitride. This does not supply any reason to modify Anzai's organic resin planarization layer 17.

If Anzai's planarization layer 19 were modified to be capping silicon nitride, then there is still no evidence that Anzai's layer 17 is made of a suitably passivating material to be a "passivation layer." Indeed, Petitioner admitted that "Anzai does not explicitly state what material(s) are used to form planarization layers 17 and 19 (other than an organic resin for layer 17)." Petition at 23. Thus, the "planarization layer" element would still not be met because organic resin is not a passivating material, as explained above.

Alternatively, if Anzai's planarization layer 17 were modified to be passivating silicon nitride, then there is still no evidence that Anzai's layer 19 is made of a suitably protective material to be a "capping layer." Indeed, Petitioner admitted that "Anzai does not explicitly state what material(s) are used to form planarization layers 17 and 19 (other than an organic resin for layer 17)." Petition at 23. Thus, the "capping layer" element would still not be met because Petitioner admitted that Anzai's layer 19 is merely a planarization layer of unknown material.

So, assuming for the sake of argument that Anzai were modified as proposed by petitioner, so that **one** of the planarization films 17 or 19 of Anzai were made of silicon nitride, that result in only **one** of the claimed "capping layer" or "passivation layer" elements of claims 3 and 4 being met.

C. Conclusion

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

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

A. Claim 3: Proposed Combination Has No "Capping Layer"

Claim 3 requires both "a capping layer" and "a passivation layer," and this would not be met by the proposed combination. Ex. 2005 ¶¶ 84–88.

In Ground 3, Petitioner relies on Anzai's planarization layer 19 for the claimed "capping layer." Petition at 42. Indeed, the Petition provides its explicit mapping: "a passivation layer (Yamazaki insulating material 30) and a capping layer (Anzai's planarization layer 19)." *Id.*; *see also id.* at 45 ("Anzai also discloses . . . a capping layer (second planarization layer 19)"). Then, Petitioner proposes: "a POSITA would have been motivated to add planarization layer 19 from Anzai above the

insulating material 30 of Yamazaki because[1] both insulating layer 30 and planarization layer 19 serve the same purpose of flattening the surface of the pixel area." Petition at 46.

But as explained in Ground 1 above, Anzai's planarization layer 19 is of an unknown material, so Petitioner has not proven that Anzai's planarization layer 19 is a "capping layer" that is capable of protecting the layers underneath. Petition at 23 ("Anzai does not explicitly state what material(s) are used to form planarization layers 17 and 19 (other than an organic resin for layer 17)"); *see* Section V.B, above. Thus, if Yamazaki were modified to add Anzai's planarization layer 19 as Petitioner proposes, there would still not be the claimed "capping layer."

B. Claim 4: Still no "Capping Layer"

Claim 4 recites "The device of claim 3, wherein at least one of the passivation layer and the capping layer comprise silicon nitride." Because Petitioner failed to provide that claim 3 is obvious, Petitioner has also failed to prove that dependent claim 4 is obvious. Ex. 2005 ¶¶ 84–88.

[1] Additionally, Petitioner's motivation to modify does not make sense. Why add another planarization layer if the insulating layer is already planarized? This would add manufacturing steps, complications, and cost. An additional layer would also reduce capacitance due to increased thickness. Petition at 26 (motivation is to achieve "higher capacitance per unit area").

Moreover, Petitioner's theory for claim 4 does not change the fact that Anzai's planarization layer 19 remains of an unknown material, so Petitioner still cannot prove that Anzai's planarization layer 19 would act as the claimed "capping layer." Ex. 2005 ¶¶ 84–88.

In its argument for claim 4, Petitioner repeats its proposed modification that it "would have been obvious to combine the teachings of Yamazaki and Anzai to add planarization layer 19 from Anzai to be formed on top of insulating material 30, as capping layer and passivation layer respectively." Petition at 47. The Petition asserts that "silicon nitride is a suitable material for insulation 30 . . . . Therefore, Yamazaki discloses that at lease [sic] the passivation layer (insulation material 30 of Yamazaki) comprises silicon nitride." Petition at 47.

This does not change the fact that Anzai's planarization layer 19 is not a capping layer. As explained in Ground 1 above, Anzai's planarization layer 19 is of an unknown material, so Petitioner has not proven that Anzai's planarization layer 19 is a "capping layer" that is capable of protecting the layers underneath. Petition at 23 ("Anzai does not explicitly state what material(s) are used to form planarization layers 17 and 19 (other than an organic resin for layer 17)"); *see* Section V.B, above. Thus, if Yamazaki were modified to add Anzai's planarization layer 19 as Petitioner proposes, there would still not be the claimed "capping layer."

C. Claim 7: Still no "Capping Layer"

Claim 7 also recites a "capping layer," and Petitioner's theory suffers the same flaws as discussed for claims 3 and 4. Ex. 2005 ¶¶ 84–88.

D. Conclusion

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

VIII. Conclusion

For the reasons set forth above, Patent Owner respectfully requests that the Board find at least claims 3–4 patentable.

In summary, Anzai did not teach the claimed "passivation layer" and the claimed "capping layer"—only organic resin layer planarization layer 17 and planarization layer 19 of unknown material. Yamazaki taught the use of *one* silicon nitride layer—not a separate capping and a separate planarization layer.

Thus, neither reference taught both the "capping layer" and "passivation layer." Modifying Anzai's design to use Yamazaki's *one* layer would not result in the claimed invention. Replacing Yamazaki's one layer with Anzai's organic resin planarization layer 17 and unknown material planarization layer 19 would also not result in a device with both a "capping layer" and "passivation layer."

Moreover, there is no reason to combine the references. Petitioner and Dr. Neikirk fundamentally failed to understand what "passivation layer" and "capping

layer" meant—instead believing that these phrases have "no special meaning"—so Petitioner proceeded with a hindsight driven analysis based on silicon nitride.

Date: May 7, 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 RESPONSE**, that the amount of words in this paper is 4,779. Pursuant to 37 C.F.R. § 42.24, this word count is in compliance with the word limit set forth in 37 C.F.R. § 42.24(b)(2) excluding the portions exempted under 37 C.F.R. § 42.24(a)(1).

Date: May 7, 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 May 7, 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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