

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.: IPR2024-01131

Patent 7,226,801

PATENT OWNER'S RESPONSE

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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. 7,226,801.

Ex. No.	Description
2001	Docket Control Order from <i>Optronics Sciences LLC v. BOE Tech. Group Co., Ltd.</i> , No. 2:23-cv-00549-JRG, Dkt. 33 (E.D. Tex. Aug. 5, 2024).
2002	Optronics Sciences LLC's Infringement Contentions from <i>Optronics Sciences LLC v. BOE Tech. Group Co., Ltd.</i> , No. 2:23-cv-00549-JRG (E.D. Tex. July 19, 2024).
2003	BOE Technology Group Co., LTD's Invalidity Contentions from <i>Optronics Sciences LLC v. BOE Tech. Group Co., Ltd.</i> , No. 2:23-cv-00549-JRG (E.D. Tex. Oct. 25, 2024).
2004	Declaration of Benjamin T. Wang in Support of Motion to Appear <i>Pro Hac Vice</i>
2005	Declaration of Andrew D. Weiss in Support of Motion to Appear <i>Pro Hac Vice</i>
2006	Declaration of Christian W. Conkle in Support of Motion to Appear <i>Pro Hac Vice</i>
2007	Declaration of Paul A. Kroeger in Support of Motion to Appear <i>Pro Hac Vice</i>
2008	Declaration of Dr. Eric Bretschneider in support of Patent Owner's Response ("Bretschneider Decl.")
2009	<i>Curriculum vitae</i> of Dr. Eric Bretschneider
2010	Sze, VLSI TECHNOLOGY (2nd Ed. 1988)
2011	April 18, 2025, Deposition Transcript of Dr. Dean Neikirk, <i>IPR2024-01131</i>
2012	April 17, 2025, Deposition Transcript of Dr. Dean Neikirk, <i>IPR2024-011312, IPR2024-01315</i>
2013	Disclosure of Dr. Eric Bretschneider in Compliance with P.R. 4-3(B), <i>Optronics Sciences LLC v. BOE Tech. Group. Co., Ltd.</i> , No. 2:23-cv-005549-JRG (E.D. Tex.).

2014	<i>Viewsonic VX2000 20.1" LCD Monitor</i> , AMAZON, available at https://www.amazon.com/Viewsonic-VX2000-20-1-LCD-Monitor/dp/B00006LLIM .
2015	<i>Monitor</i> , AUO, available at https://www.auo.com/en-global/products/index/Display_Panel_Products/Monitor .
2016	U.S. Patent No. 6,246,179 B1 to Yamada.
2017	April 2, 2025, Deposition Transcript of Dr. Jacob Baker, <i>IPR2024-01130, IPR2024-01133, IPR2024-01134</i> , Volume 1.
2018	U.S. Pat. Pub. No. 2012/0162053 to Lee.
2019	U.S. Pat. Pub. No. 2014/0183502 to Song.

I. Introduction

The '801 Patent provides an “improved method of encapsulating an LCD apparatus.” Ex. 1001, 1:26–27. To do this, it claims a specific “method for forming a sealant region pattern of a liquid crystal display,” involving specific substrates and layers, including “an organic material pattern layer having a sawtooth opening” and the use of “a predetermined angle.” *Id.* at 3:40–51. Some of the dependent claims recite specific angle ranges. *Id.* at 4:1–4, 4:28–42.

The combination of the claimed layers, the use of the sawtooth pattern and the specific angles improve the sealing of the LCD. *Id.* at 1:5–52. The inventive technique “reduces reliability and integrity problems” such as “[p]eeling of sealant, uneven cell gaps, and formation of voids in sealant regions during assembly.” *Id.* at 47–50; Ex. 2008 ¶ 28–31. The combination of the use of sawtooth patterns and predetermined angles in an organic material pattern layer also allow for the sealant strength to be achieved in a smaller area of an LCD, for example, as shown in Figures 1A and 1B, by providing for a greater contact surface to the sealant and by reducing voids or bubbles that form in the sealant:

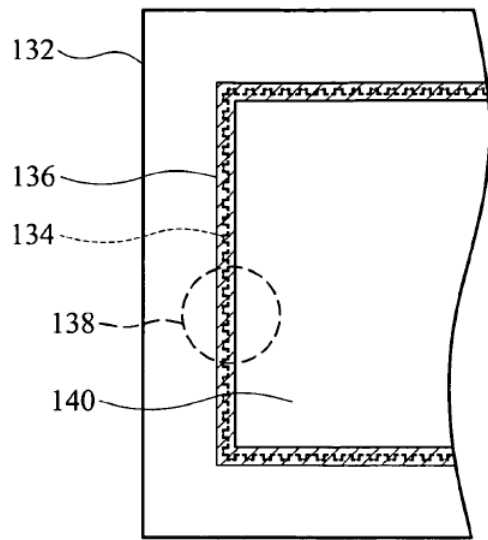


FIG. 1A

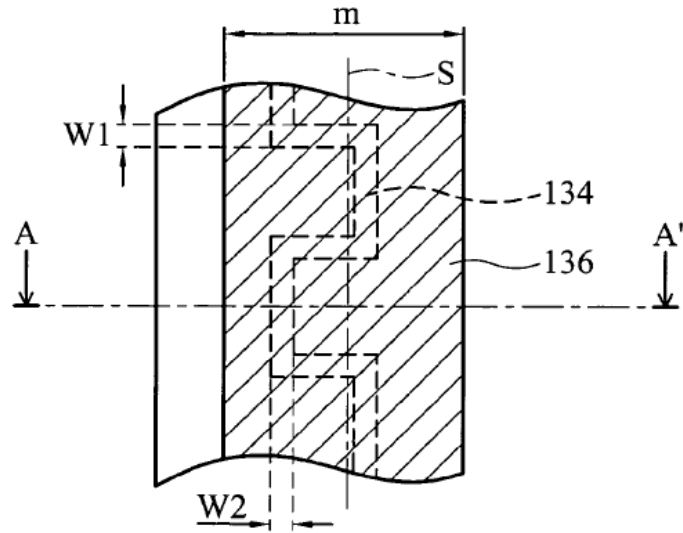


FIG. 1B

Ex. 1001 at 2:34–40, Figs. 1A, 1B. This technology is important for reducing the width and thickness of the bezel in LCD displays over the years. Ex. 2008, ¶ 54.



See Ex. 2014 (representative bezel from 2002, left); Ex. 2015 (modern LCD with bezel that is both thinner and narrower); Ex. 2008 ¶¶54–55.

The '801 technology was new and nonobvious. Under the correct claim construction, Kwak does not anticipate independent claim 9 in Ground I under Section 102. The remaining Grounds 2–8 allege obviousness, but Petitioner and Dr. Neikirk formed their obviousness theories in hindsight and/or based on a mistake.

The hindsight is evident because Petitioner and Dr. Neikirk searched for secondary references that merely match keywords of the '801 patent but whose techniques cannot be combined with or are inapplicable to the primary references. *See* Ex. 2008, ¶¶ 160–203.

The mistake in Grounds 6–8 is evident because Petitioner and its expert overlooked that Zhang taught two separate embodiments—one of which is taught away from—and instead cite to Zhang as though Zhang taught one continuous disclosure. Although the Board appears to have given Petitioner the benefit of the doubt at the institution stage, suggesting that Petitioner might have had some theory that combined Zhang's conventional LCD that was taught away from with the organic layer of Zhang's improved LCD, deposition revealed that this was not the case. Paper 15 at 30–31 (agreeing with Patent Owner that Zhang's covering layer 380a is **not** organic in the embodiment of Figure 3B but interpreting the Petition to rely on a combination of Zhang 2B and 3B). Deposition revealed that Dr. Neikirk *was genuinely mistaken about Zhang's teaching* of the layers in Zhang 3B, and he believed that Zhang's Figure 3 *already included* the claimed organic layer. The

Petition did not propose a coherent combination, nor did Petitioner articulate a motivation to modify Zhang, because Petitioner simply misunderstood the reference.

11 So with that clarification, is it your
12 understanding that Zhang explicitly discloses that a
13 part of 380a in Figure 3B is an organic photoresist
14 material?

15 MR. LONEY: Objection. Form.

16 THE DEPONENT: So given Zhang's teachings
17 about the use of photoresist, yes, I believe there is
18 sufficient teaching there. So this would be

Ex. 2011 at 107:11–18; *see also id.* at 101–109 (providing context).

II. Disclosure of the '801 Patent

The '801 Patent teaches embodiments that reduces the “[p]eeling of sealant, uneven cell gaps, and formation of voids in sealant regions during assembly” and increase the reliability of the display. Specifically, the '801 Patent discloses “forming an organic material pattern layer having a saw tooth opening” where the saw tooth opening exposes the “surface of the predetermined material layer underneath” and forms a “predetermined angle.” Ex. 1001 at 1:36–40.¹

¹ All coloring here are annotations by at least one of the parties.

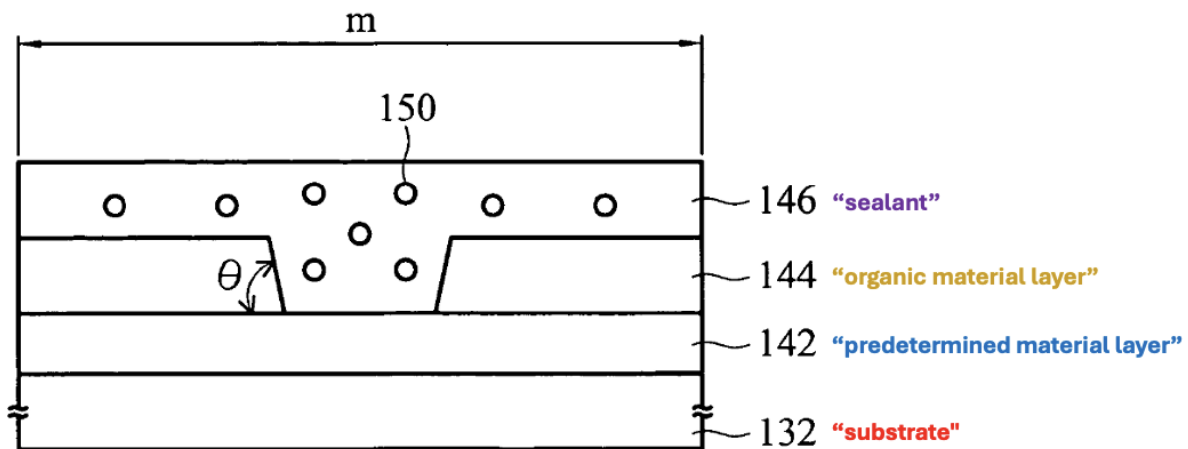


FIG. 1C

Id. at Fig. 1C (annotated according to 2:27–36).

To make this sealant region, the **substrate** (e.g., TFT array substrate 232) is provided, and a “**predetermined material layer** such as **silicon nitride layer 242** is **formed on** the TFT array substrate 232.” *Id.* at 2:44–50 (emphasis added). Then, an “**organic material layer 244** is **formed on** the **silicon nitride layer 242**.” *Id.* at 2:56–57 (emphasis added).

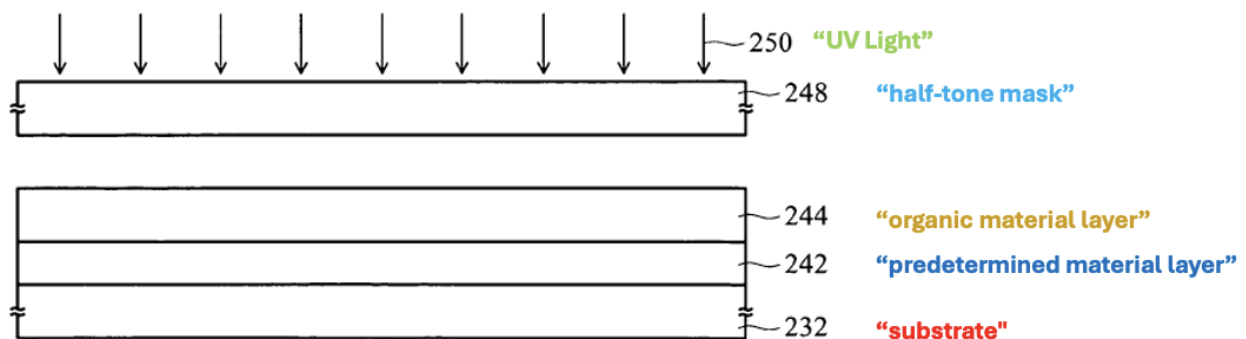


FIG. 2A

Id., Fig. 2A. Then, “saw tooth opening 234 are formed in the organic material layer 244 by etching.”² *Id.* at 2:66–67.

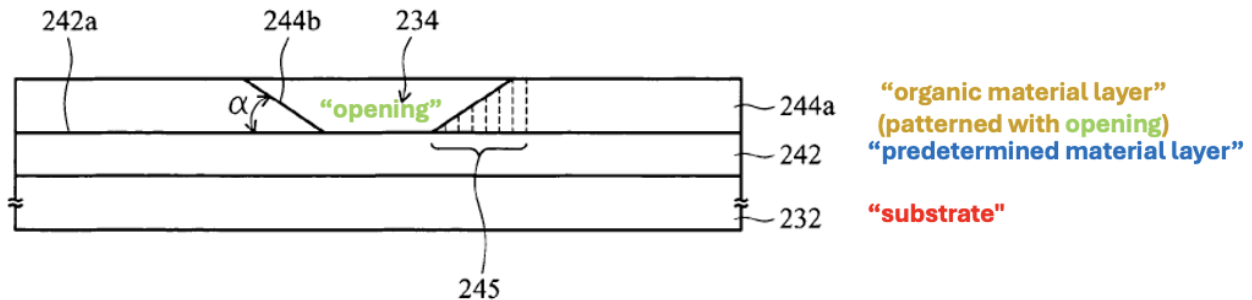
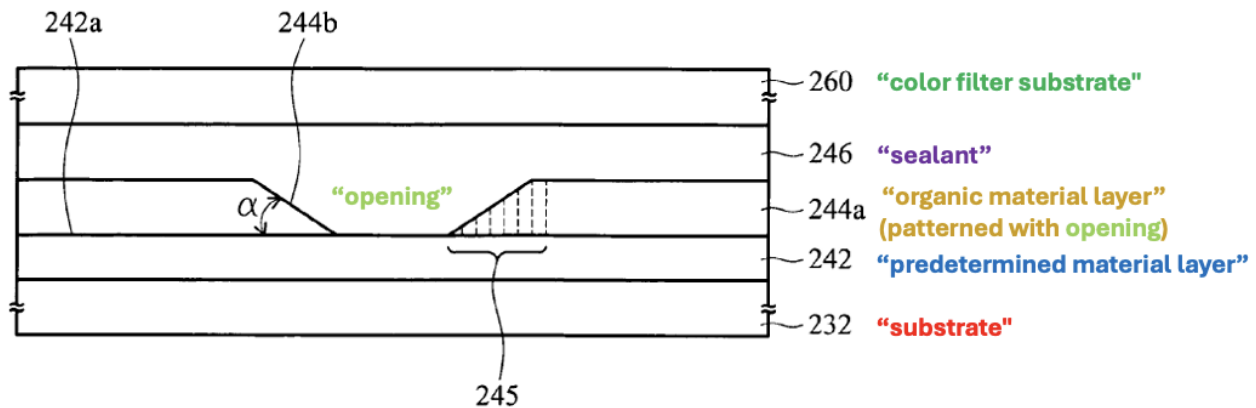


FIG. 2B

Id., Fig. 2B.

Then, the sealant and color filter substrate are added on top. “In FIG. 2C, a predetermined sealant 246 is placed in the saw tooth opening 234 or in the corresponding position of the saw tooth opening 234 of the TFT-LCD substrate 232 for attaching the color filter substrate 260 with the TFT-LCD substrate 232.” Ex. 1001 at 3:22–26. When sealant is applied, “air exhausts easily via the tapered profile of the saw tooth opening,” which avoids the formation of voids or bubbles in the sealant. *Id.* at 3:27–30. These voids or bubbles may be formed during application of the sealant due to the angle between the sidewall of the sawtooth opening and the surface of the silicon nitride layer 142 exceeding 60 degrees. *Id.* at 2:37–40. Accordingly, in some embodiments and some dependent claims, the predetermined angle is less than 60 degrees. *Id.* at claims 2–3 and 10–11.

² The POPR misidentified this process.



Id. at Fig. 2C.

III. Overview of Prior Art

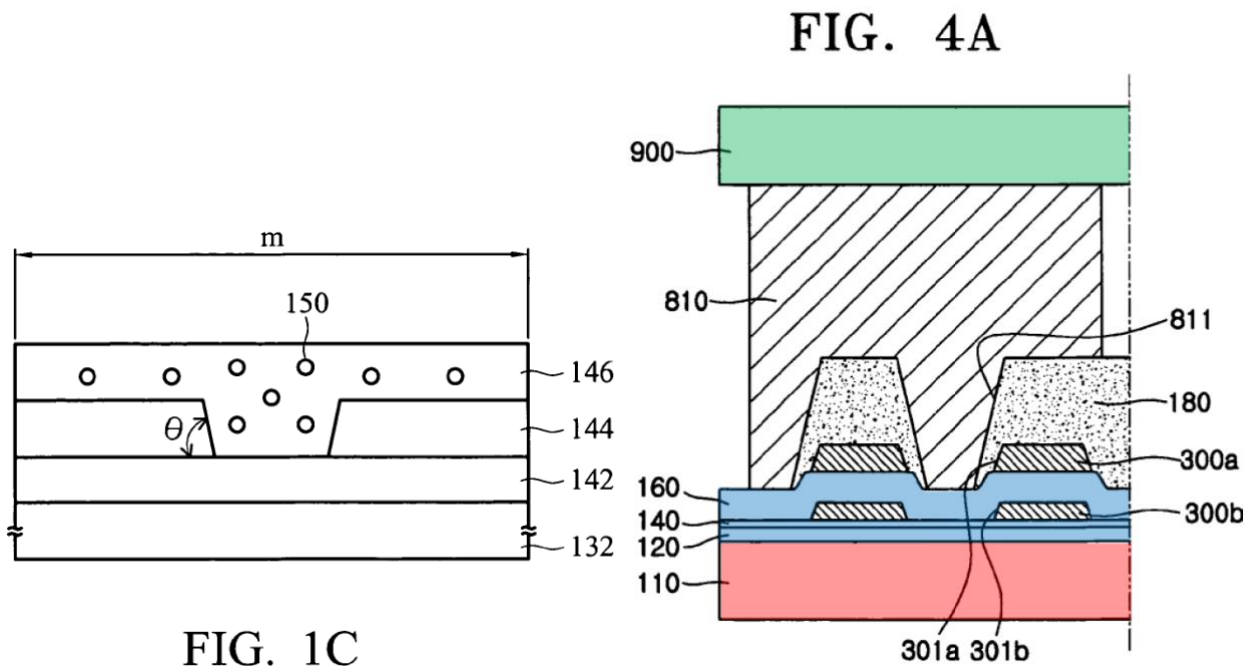
A. Kwak (Ex. 1005)

Kwak teaches an LCD design that results in a thicker, multi-layer LCD than the what the '801 Patent teaches. Kwak does **not** teach the '801 Patent's techniques for improving the seal of an LCD while limiting both the width and thickness, for example, by forming the specifically claimed order of layers on each other, nor does Kwak teach the claimed predetermined angles. Rather, Kwak's disclosure focuses on improving sealing strength by 1) increasing the *depth* of a via hole for the sealant and 2) using various patterns for the sealant, as shown in Figures 5A–5E.

Kwak contemplates that increasing contact area may increase adhesive strength, so Kwak adjusts the *depth* of sealant in penetration holes (vias). Ex. 1005 at 10:50–56 (“When *the depth* of the via hole 811 is increased, the contact area with the sealing portion 810 increases and the adhesive strength between the substrate

110 and the encapsulation substrate 900 can be increased. However, if the substrate 110 is exposed, it can receive stress, and thus *an appropriate depth* of the via hole should be determined in consideration of design specifications.”) (emphasis added); Ex. 2008, ¶ 36–42. Kwak is silent about the angles of its via holes. *Id.*, ¶ 41; Ex. 1005. Nowhere does Kwak disclose or suggest using predetermined angles to increase contact area or avoid the formation of voids or bubbles in the sealant. Ex. 2008 ¶ 40–42; Ex. 1005.

Kwak teaches many layers of the LCD—each of which adds thickness and provides for room for greater depth of the sealant in the via hole. *See* Ex. 2008, ¶ 40. This is different from the ’801 Patent, which shows fewer layers formed on each other:

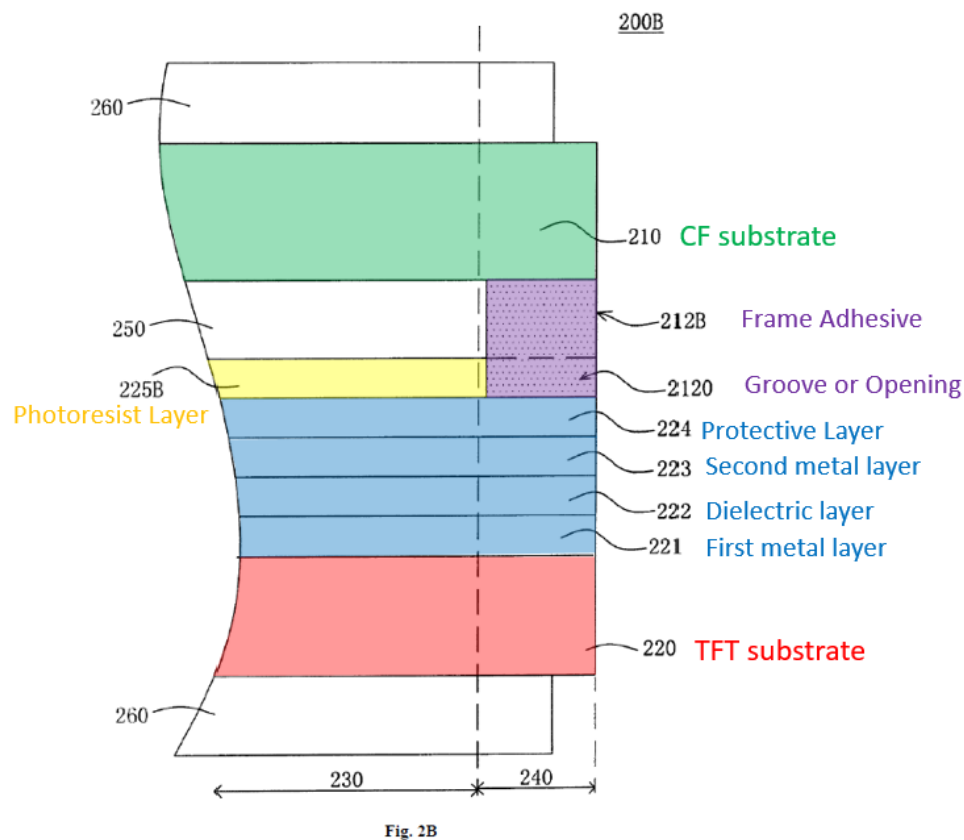


Ex. 1001 at Fig. C (left, fewer layers); Ex. 1005 at Fig. 4A (right, more layers).

B. Zhang (Ex. 1006)³

Zhang relates to a “display panel frame adhesive structure.” Ex. 1006, 4.

Critically, Zhang’s disclosure contains “Background” Section 2 that describes disparaged “conventional” LCD panels with respect to Figures 1A–2B. Ex. 1006 at 5–7, 13–15. In part, Zhang’s background describes Figure 2B, which includes an organic photoresist layer 225B:



Petition at 7 (annotating Ex. 1006, Fig. 2B).

³ All Zhang citations to page numbers on bottom right. Paper 15 at 31 n.16.

Zhang explicitly teaches away from these “conventional” embodiments from Background Section 2, *including the Figure 2B embodiment*, for not providing a strong enough seal:

However, the bonding strength of the assembled liquid crystal display panels 100, 200A, and 200B is insufficient. During reliability tests or drop tests, the panels are prone to developing cracks at the contact interface between the TFT substrate and the CF substrate due to impact or vibrational forces. This results in damage to the display panel, significantly affecting the quality of the display panel.

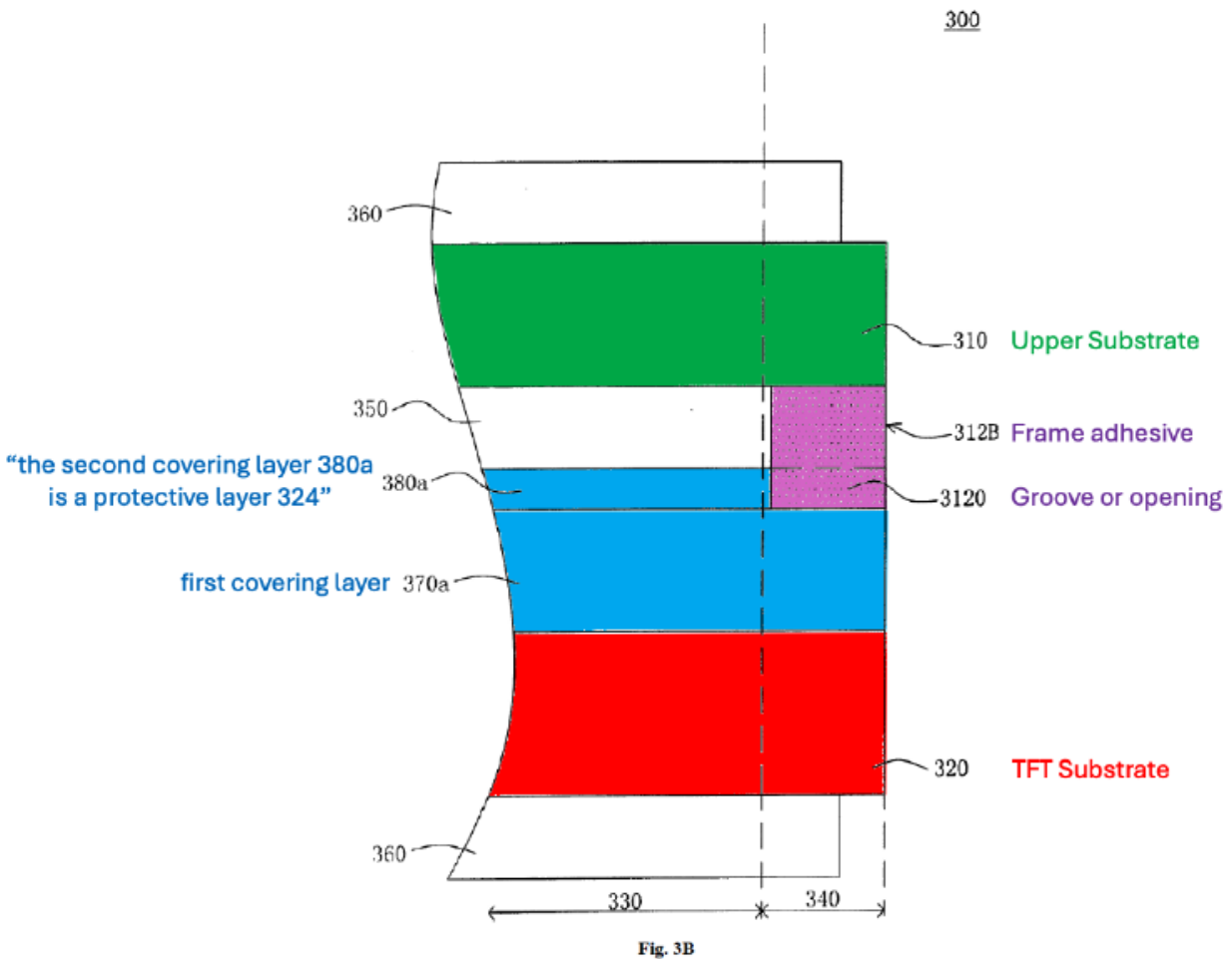
Id. at 6. Zhang then continues that “[i]n view of this, the purpose of the present invention is to provide a display panel frame adhesive structure with greater bonding strength.” *Id.* at 8.

The rest of Zhang then describes Zhang’s distinct, improved embodiment for achieving greater bonding strength, including the embodiments of Figures 3A–6B, in sections 3–5 of its disclosure under the headings “Summary,” “Drawings,” and “Embodiments.” *Id.* at 8–12, 15–25. One of the improvements is that the Figure 3 improved embodiments of Zhang **do not use** the organic photoresist layer 225 of the “conventional” LCD that had insufficient bonding strength. Instead, Zhang explicitly teaches that in Figure 3, the layer 380a is silicon dioxide (SiO₂) or silicon nitride (Si₃N₄). Ex. 1006, p. 9 (“... the protective layer 324 is composed of silicon dioxide (SiO₂) or silicon nitride (Si₃N₄). . . . the second covering layer 380a refers to

the protective layer 324.”). In other words, Zhang disparages the sealing strength of conventional designs that uses an organic layer, so Zhang improves sealing strength by using an inorganic material (either silicon dioxide or silicon nitride). *See id.* at 6 (“the bonding strength of the assembled liquid crystal display panels 100, 200A, and 200B is insufficient.”).

As Dr. Bretschneider explains, a POSITA would have known that organic layers are soft, and silicon nitride (Si_3N_4) is hard. Ex. 2008, ¶¶ 81, 191. Thus, a sealant would form a more secure bond with a hard, non-squishy layer like a silicon nitride layer than to an organic layer. *Id.*

Otherwise, “[t]he main approach of the present invention is to increase the contact area of the frame adhesive, allowing more adhesive to penetrate into the groove or opening, thereby enhancing the bonding strength between the TFT substrate and the CF substrate.” Ex. 1006 at 9. Zhang further teaches “enlarging the openings successively to lower layers achieves the goal of increasing the contact area of the frame adhesive, enabling more adhesive to penetrate into the openings and thus enhancing the bonding strength between the TFT substrate and the CF substrate.” *Id.* Zhang teaches other differences in the construction of the Figure 3 improved embodiment over the conventional LCDs from the background, however, these details are less important. Patent Owner provides its annotated version of Zhang Figure 3B, which does not use the misleading colors of the Petition:



C. Vaganov (Ex. 1007)

Vaganov is not related to LCDs at all. Vaganov does not contain the words “liquid crystal display” or the acronym “LCD.” See Ex. 1007.; Ex. 2008 ¶ 56.

Instead, Vaganov’s title is “Methods for wafer to wafer bonding using microstructures.” Ex. 1007, title. Vaganov is directed toward wafer-to-wafer bonding. *Id.*, 1:5–12. Wafer-to-wafer bonding is a different problem than LCDs. Ex. 2008, ¶¶ 53–59.

Vaganov teaches to improve wafer-to-wafer bonding by “profiling one or both of the wafer surfaces being bonded to define microstructures therein.” Ex. 1007, abstract. The “bonding process with profiled wafer surfaces in accordance with the invention in general includes several major steps: micromachining the bonding area (on one or both of the wafers) to define cavities therein; depositing bonding material,” and other steps. *Id.* at 3:35–44. “Microprofiling (‘profiling’) refers to, prior to bonding, micromachining the surface area of the wafer(s) to be bonded to define therein microstructures, e.g., ridges, trenches, pyramids, poles, cavities, etc.” *Id.* at 3:1–4.

For example, cover Figure 4 “shows wafer profiling with trenches and ridges for wafer-to-wafer bonding,” and Figure 11B shows another variation:

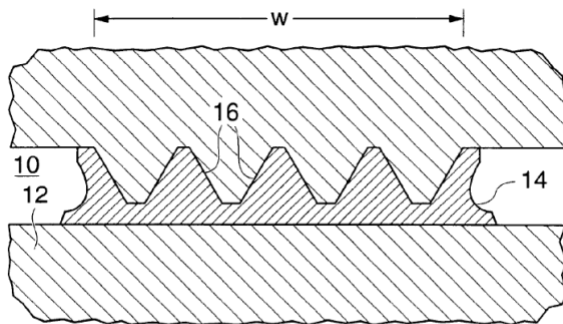


FIG. 4

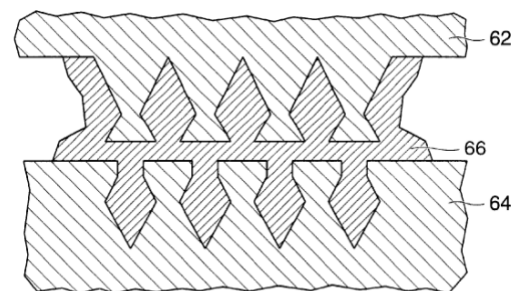


FIG. 11B

Id. at Figs. 4, 11B. In each of these, one or both **wafer(s)** is/are micromachined before being bonded together with a bonding material (14 or 66). These wafers have particular crystalline orientations, making it possible to etch them in specific directions. *Id.* at 4:63-67, cl. 1, 5, 6, 7, 10–13, 16 (specifying “etching at least a

portion of a principal surface of a first *crystalline substrate*”); *see also id.* at Figs. 57–64 (designating specific orientations using “(100),” “(111)” and the like); Ex. 2008, ¶ 53–54.

These microstructure techniques are only effective on such single crystal structures. *See* Ex. 2008, ¶¶ 54, 57, 59. The method described in Vaganov would not work in Kwak or Zhang because the etching of Vaganov is dependent on the orientation (crystal plane associated with the primary face). *Id.* Further, the types of etches in Vaganov “*do not significantly attack organic films and are not compatible with such materials.*” *Id.* Indeed, Vaganov does not include the word “organic” at all. Ex. 1007. There is nothing in Vaganov about forming vias in organic material layers, nor is there anything in Vaganov about the angles of the sidewalls of vias formed in organic material layers. There is nothing in Vaganov that teaches that an organic material layer of Zhang or Kwak has a crystalline structure that can be micromachined.

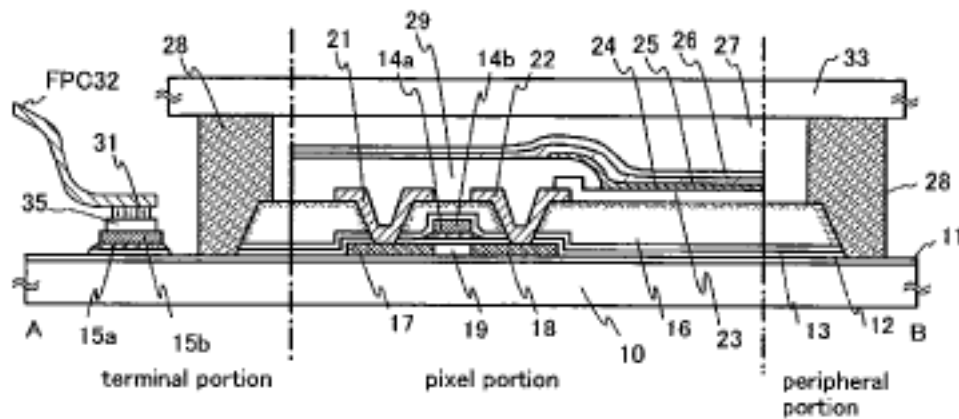
D. Kim (Ex. 1008)

Kim is directed “to a contact structure for a semiconductor device as well as for a thin film transistor array substrate” for an LCD. Ex. 1008, [0002]. Nowhere does Kim describe sealing for an LCD. Kim is concerned with trying to avoid undercutting and enhancing wiring contacts. *Id.*, [0045]. For example, as Petitioner’s own expert stated in his declaration, “Kim explains that creating

openings with such angles allows for the smooth creation of later layers formed on top of the organic layer. In this way, the organic insulating layer may remain sufficiently thick while simultaneously *allowing for better contacts through the openings.*” Ex. 1003, ¶ 157 (citations omitted) (emphasis added). Nothing in Kim concerns sealing or adhesion. *See* Ex. 1008.

E. Yamazaki 336 (Ex. 1009)

Yamazaki 336 relates to “a semiconductor device having a circuit including a thin film transistor (hereinafter referred to as a TFT), and to a method for manufacturing the same.” Ex. 1009, 1:8–11. The object of the invention was “to provide a high reliable EL display device and a manufacturing method thereof by shielding intruding moisture or oxygen . . . without enlarging the EL display device.” *Id.* at abstract. Yamazaki seeks to prevent moisture or oxygen from deteriorating an EL device. *Id.* at 3:29–33. Yamazaki teaches that “an edge portion or an opening portion is formed to have a tapered shape.” *Id.* at 3:51–52. “When the sealant is arranged as to cover the side surface of the edge portion . . . an EL display device with a high reliability can be obtained by shielding intruding moisture . . . without enlarging an EL display device. *Id.* at 5:50–59.



Id., Fig. 2. Indeed, Yamazaki focuses specifically on tapering the *edge portion*. See, e.g., *id.* at 4:15–18 (“intrusion of moisture or oxygen is prevented by **forming the edge portion** of the high thermostability planarizing film to have a tapered shape”) (emphasis added).

Yamazaki’s tapering is used **for ion implantation, not for adhesion**. Ex. 1009, 12:42-47 (“In addition, the side surface of the high thermostability planarizing **film 16 is formed to have a tapered shape so as to be doped.**”), 5:45-49 (“However, when the inert element is added by using plasma treatment or oblique doping, a side surface of the high thermostability planarizing film can be modified **without forming the edge portion to have a tapered shape.**”) (emphasis added); Ex. 2008, ¶¶ 61–75.

This last part is key: when **ion implantation** is **not** used, Yamazaki teaches the POSITA to **not** taper the edge.

F. “State of the Art” References: Evidence of Hindsight

None of the “state of the art” references are relevant.

Petitioner appears to have found these references by searching for prior art for the “predetermined angle” claim limitation—regardless of the context of usage. These “state of the art” references have no relevance to any anticipation or obviousness argument because they do not further elaborate on the techniques used in Kwak/Zhang, nor does Petitioner propose to use their techniques to further modify Kwak/Zhang. Ex. 2011, 26:1–33:17. Instead, this dump of angle-related prior art is evidence that Petitioner engaged in hindsight analysis to find prior art that disclose keywords related to a “predetermined angle” in irrelevant contexts.

Shigeno. Contrary to Petitioner’s assertions, Shigeno’s disclosure of a 45° angle is for an oxide layer, *not an organic film*, that is etched using a buffered hydrofluoric acid (BHF) etch solution. *See* Ex. 2008, ¶¶ 83–86; *see also* Ex. 1010, ¶ [0140]. Nowhere does Shigeno disclose a sidewall angle for any organic film. Ex. 2008, ¶ 83–88. Not only is it not an organic layer, but the sidewall portion with the disclosed angle (shown in dashed red lines below) does not even have a sealant touching it:

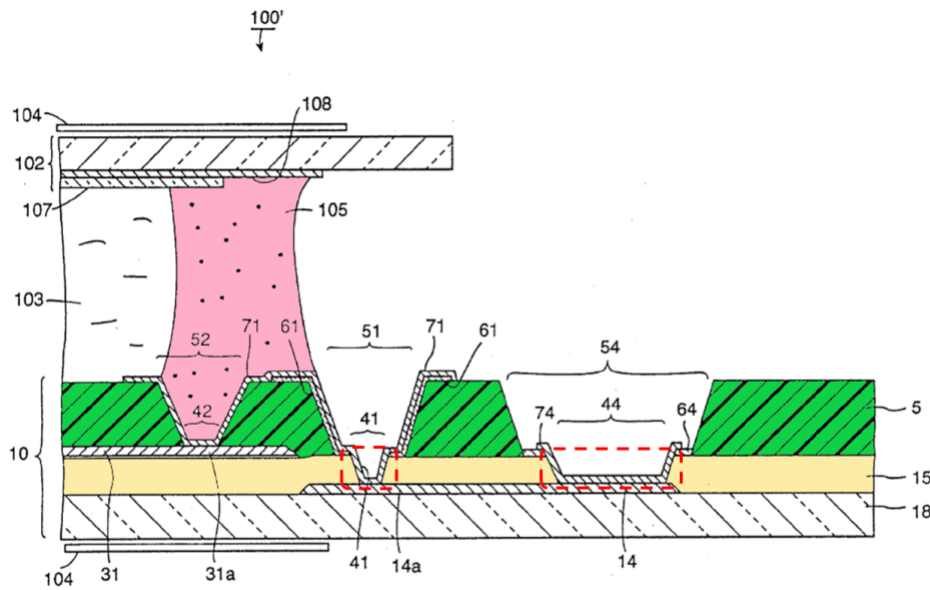
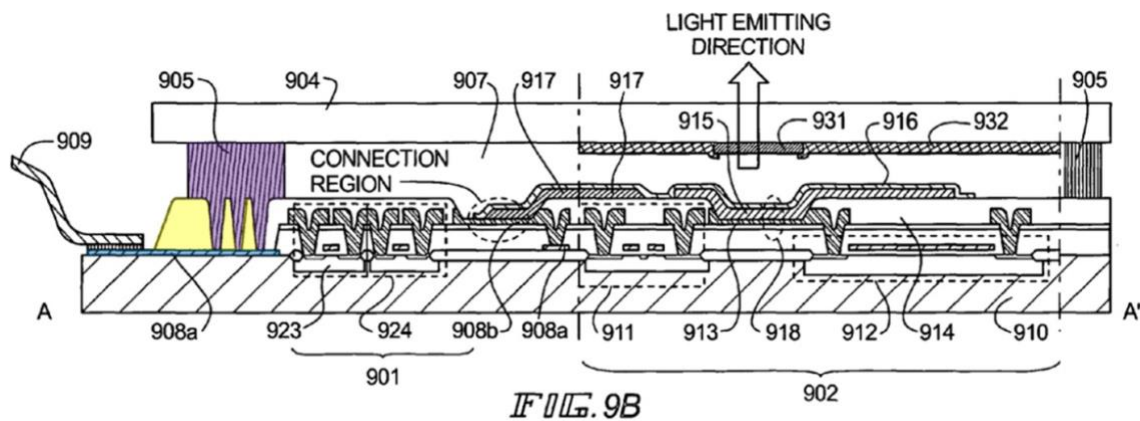


FIG. 4

Id., ¶ 87 (annotating Ex. 1010, Fig. 4).

Yamazaki 496. Petitioner's annotated figure (reproduced below) shows the sealant of Yamazaki 496 is highlighted in purple touching something (not numbered) in yellow.



Petition at 16 (annotating Ex. 1011, Fig. 9B); Ex. 2008 ¶¶ 89–90. The Petition's description of Yamazaki 496 is highly misleading because Yamazaki never states

that the yellow portion touching the purple has sidewall angles “from 35° to 55°” as the Petition is suggesting. *See* Petition at 16 (misleading that “The insulation layer taught by Yamazaki 496 may . . . a ‘taper angle’ from ‘from 35° to 55°’”). This is misleading because Petitioner did not use yellow to annotate the “insulation” in Figure 9B, which is element 914. Ex. 1011 at 44–51.

Rather, the “insulation layer” with angles from 35° to 55° (45° +/- 10°) is designated with numeral 19 in Figure 1A and is described in Col. 9:66–10:24. *Compare* Ex. 1011 at 9:66–10:24, *with* 2:13–21. The insulation 19 is shown in a completely different place:

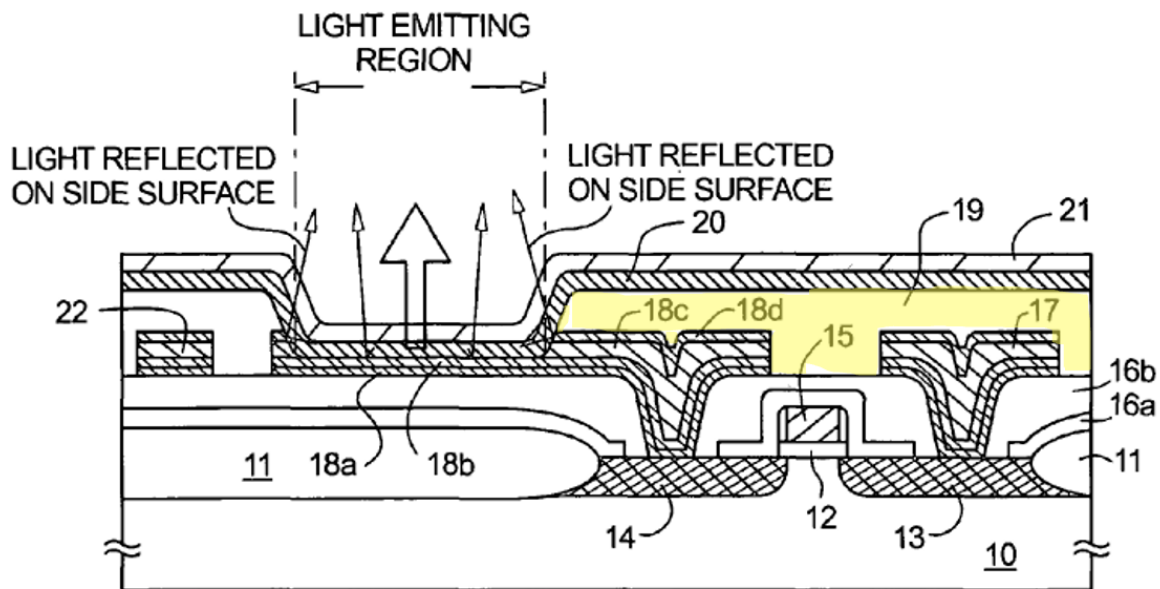


FIG. 1A

Ex. 1011 at Fig. 1A; Ex. 2008 ¶¶ 91–95.

Shimada 722. Shimada 722 teaches using angled reflectors for light control, not for sealant and not for increasing sealing strength. *See* Ex. 2008, ¶ 96–100 (citing Ex. 1012 18:55–67). The relevant part states:

The contact holes 142 are formed at predetermined positions through the interlayer insulating film 136 by a predetermined method. An angle θ of an inclined inner wall of each contact hole 142 is preferably between about 45° or more and less than about 65°. A diameter ϕ of the contact hole 142 is preferably in the range of about 3.5 μm to about 6 μm , typically about 4 μm . With the above settings, the storage capacitor electrode 126 can effectively prevent light leakage from the reverse tilt domain 154 as described above.

Ex. 1012 at 18:55–63. There is no actual evidence to support the Petition’s contention Shimada’s interlayer insulating film comprises an organic layer. Petition at 16 relies on Ex. 1003 at 44, which interprets the word “or the like” as something that “*indicates* that the layer *may*” comprise an organic layer with no reasoning behind this speculation upon speculation (emphasis added). *See* Ex. 2008, ¶ 100. Thus, the angle of walls of contact holes for light reflection in Shimada 722 has nothing to do with the angles of walls of organic material layers for sealing.

Shimada 376. As with Shimada 722, Shimada 376 (with the same inventor) is using angled reflectors of contact holes in the same way—for light control and to prevent light leakage. Ex. 1013 at 2:9–18, 36–45. Again, the angle of walls of

contact holes for light reflection has nothing to do with the angles of walls of organic material layers for sealing. Ex. 2008, ¶ 101.

Kim 935. Kim 935, likewise, teaches angled reflectors and has nothing to do with the angles of walls of organic material layers for sealing. Indeed, nowhere does it mention sealing. *See* Ex. 1014; Ex. 2008, ¶ 102.

Tanaka. Petitioner states that Tanaka demonstrates that the benefits of utilizing predetermined angles were well known at the time—this is tainted by hindsight. *See* Petition at 20. As put by Dr. Bretschneider, “[t]his is a truly remarkable conclusion as Tanaka does not teach any specific predetermined angle.” Ex. 2008, ¶¶ 103–105. Tanaka’s teaching is that any etch process that does not produce an undercut would suffice in the range of $90^\circ < \theta < 180^\circ$, not that any predetermined angle is necessary. *Id.*; *see also*, Ex. 1016 2:54-60 (describing that an obtuse angle is preferable).

Miyoshi. Whatever “Miyoshi” or “EXMIYOSHI” is, it is not in evidence. Petition at vi, 21. What it *does* indicate, however, is that the Petition and its expert declaration have been copied and pasted from each other with the same placeholders. Petition at 21 (“EXMIYOSHI”); Ex. 1003 ¶ 89 (“EXMIYOSHI”).

Conclusion. All Petitioner has done is shown that other, non-organic layers in other contexts outside of an LCD can be made with various angle ranges using incompatible processes for other purposes that do not relate to sealing strength. They

are completely irrelevant, except to dump prior art that hit angle-related keywords from a hindsight search.

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).

Although the Institution Decision included in a preliminary claim construction at the POPR stage, the Board did not have all of the evidence. Paper 15, *passim*; *AFG Indus., Inc. v. Cardinal IG Co.*, 239 F.3d 1239, 1249 (Fed. Cir. 2001) (“This case presents a good example of how extrinsic evidence can and should be used to inform a court's claim construction, and how failure to take into account the testimony of persons of ordinary skill in the art may constitute reversible error.”). The Board should reconsider the preliminary claim constructions in view of the expert declarations, deposition cross-examination, and legal authority now provided.

A. “layer” (all claims)

Patent Owner respectfully submits that the term “layer” should be given its plain and ordinary meaning, which is a “film of a material created during manufacturing.” This is consistent with Patent Owner’s arguments in the district

court, and a copy of Dr. Bretschneider's opinions in the District Court regarding claim construction is attached as Exhibit 2013. Ex. 2008 ¶ 144.

1. Intrinsic Evidence, Supported by Dr. Bretschneider

Claim 9, for example, uses the term in its plain and ordinary meaning to refer to single layers of material, such as a “predetermined material layer” and an “organic material pattern layer.” Dr. Bretschneider declares this is consistent with how a POSITA would understand that modern electronic circuits are built using “successive layers of insulating, conducting, and semiconducting material.” Ex. 2010 at 467–68 (Sze is a seminal textbook for how to build modern electronic circuits); Ex. 2008, ¶ 145. Each layer is individually built according to the intended purpose of the layer, such as using a layer of SiO₂ if an insulating layer is desired. *Id.* A simple manufacturing process for a MOS capacitor is described on pages 469–70 of Ex. 1010 and summarized in this figure:

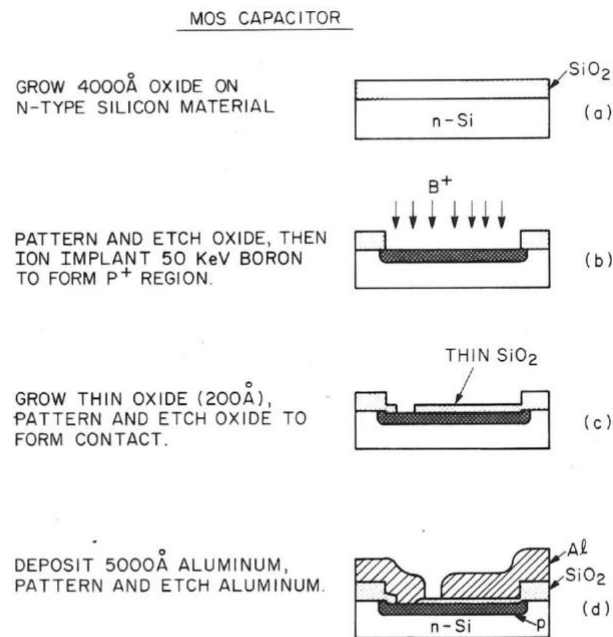


FIGURE 2.
Steps to form an MOS capacitor.

A simple capacitor is formed through laying of materials, doping, and etching. Ex. 2008, ¶ 146. “The capacitor that results from this sequence of steps will only work properly if the individual layers are isolated from each other except where an intentional contact is made.” Ex. 1010 at 470. This can be seen where the aluminum layer (shown in Fig. 2(d)) is only allowed to contact the conductor (the doped part of the n-type silicon material layer). The remainder of the aluminum layer is insulated from the conductor by the layer of insulting SiO₂ material. Ex. 2008, ¶ 146.

The dependent claims of the '801 patent also support this construction. See Ex. 2008, ¶ 147. Dependent claims 12 and 13 further refine the “predetermined material layer” to having a particular purpose, such as a passivation layer (relating

to insulation and shielding of lower layers from environmental effects) or a metal electrode layer. Dependent claim 14 further refines “organic material pattern layer” to using either a polymethyl methacrylate or a photosensitive-methylsilsequiazane.

None of the claims of the '801 Patent anything contrary to Patent Owner's proposed construction. Some of the dependent claims specify a particular type of “predetermined material layer,” such as a “passivation layer,” a “metal electrode layer,” “PMMA” or “PS-MSZ.” *Id.* at claims 4–5, 8, 12–14. None of these dependent claims state that the predetermined material layer includes a plurality layers or a plurality of different materials, so the dependent claims do not conflict with Patent Owner's proposed construction.

Further, the specification similarly uses “layer” in its plain and ordinary sense to refer to a single film of material created during manufacturing using techniques similar to those described in *Sze*. For example, the specification describes forming silicon nitride layer 242 on substrate 232, and then forming organic material 244 on top of that:

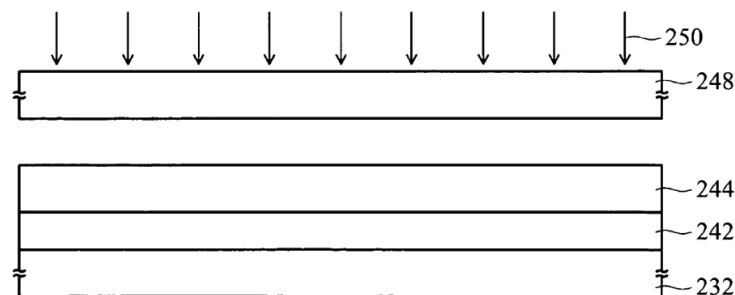


FIG. 2A

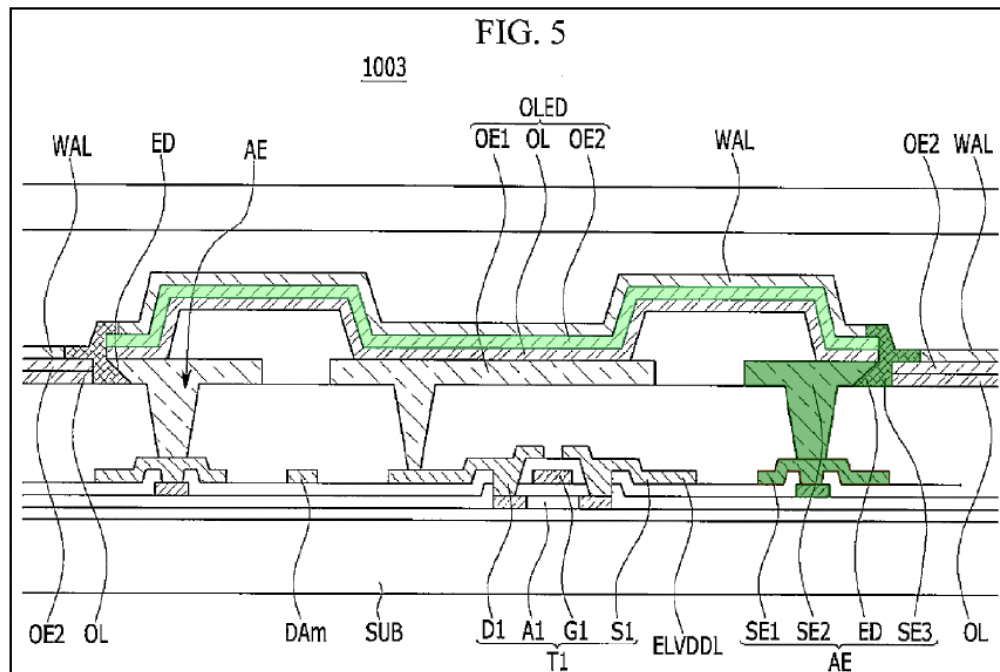
Ex. 1001 at Fig. 2A, 2:46–65. A similar usage of layers is shown in Fig. 1C and the related specification description. Ex. 1001 at 2:25–33. Dependent claim 6 discusses forming and patterning an organic material layer. Nothing in the file histories is inconsistent with this construction. *See* Ex. 2008, ¶ 149.

A POSITA would understand that the “predetermined material layer” cannot be “one or more layers.” The term “a” can be understood as “one or more” unless the claim language suggests a different construction to a POSITA. In the context of the intrinsic evidence, a POSTIA would not understand the “predetermined material layer” to actually be multiple layers. In claim 1, only a single layer can be formed “on the first substrate.” Subsequent layers would be formed on previous predetermined materials layer. Claims 4 (the predetermined material layer is a passivation layer) and 5 (the predetermined material layer is a metal electrode layer) similarly would inform a POSITA that the predetermined material layer is a single layer given the dependent claims’ reference to a specific function. The specification similarly discloses embodiments where the predetermined material layer is a single layer. Ex. 1001 at Figs. 1C, 2A-2C, 2:27-33, 2:46-65.

2. Extrinsic Evidence From Petitioner’s Other Expert

Petitioner’s other expert (Dr. Baker) in related IPR2024-01133 testified generally (*i.e.*, not specific to the ’801 Patent) that his understanding of layer supports this construction. *See* Ex. 2017 at 164:21–168:1 (testifying about the

ordinary meaning of layer; for example, “if they’re different materials, they’re different layers”); 180:21–24 (“Q Would you consider SE1, SE2 and SE3 to be different layers? A They may be the same material, but they’re different places in the process, so yes.”) (referring to the figure reproduced below):



Ex. 2019, Fig. 5 (annotated with coloring). Dr. Baker testified that a layer is “something you pattern”—referring to a specific manufacturing step of patterning.

Ex. 2017 at 164:21–165:25.

3. Petitioner’s Cited Case Supports Patent Owner’s Construction

Petitioner cites *AFG Indus., Inc. v. Cardinal IG Co.* in its reply brief to argue its proposed construction of “formed on.” See Paper 13 at 2 (citing 239 F.3d 1239). But this case rules against Petitioner’s interpretation of the term “layer.”

The Federal Circuit concluded that “layer” should be interpreted as “a thickness of material of substantially uniform chemical composition . . .” *AFG* at 1250. The Circuit made “no determination as to whether a chemical compound that has been deposited in multiple separate, sequential applications, without intervening layers or interlayers, constitutes a single ‘layer.’” *Id.* Thus, while the Federal Circuit did not find it necessary to opine on whether a layer could be multiple separate depositions of the *same material* but affirmatively decided that materials of *different compositions* are different layers. Accordingly, although the same extent of the construction was not necessary in *AFG*, the position taken by the Federal Circuit generally supports Patent Owner’s proposed construction of the term “layer,” which is a “film of a material created during manufacturing.” Any argument by Petitioner that a “layer” may encompass multiple different types of materials manufactured in different steps cannot be correct under *AFG*.

4. Petitioner’s Proposal Makes Words Meaningless

An important principle of claim interpretation, is: “It is highly disfavored to construe terms in a way that renders them void, meaningless, or superfluous.” *Intel Corp. v. Qualcomm Inc.*, 21 F.4th 801, 809–10 (Fed. Cir. 2021) . Petitioner’s proposal that “layer” could mean multiple layers would make it so that the word “layer” loses the concept of being one layer in a multi-layer semiconductor device. Petitioner’s definition of layer would potentially encompass dozens of layers made

of different materials (insulators, glass, conductors) deposited one after another using different fabrication steps, with different fabricated features, and used for the purpose of doing different things (e.g., insulating, passivating, transmitting signals, conducting power, semiconducting). *See* Ex. 2008, ¶ 151.

Accordingly, the term “layer” should be construed under its plain and ordinary meaning, which is a “film of a material created during manufacturing.”

B. “formed on” (claim 9); “forming . . . on” (claim 1)

Patent Owner respectfully submits that the term “formed on” be given its plain and ordinary meaning, which is which is “forming in a manner directly touching the below layer or substrate.” Ex. 2008, ¶ 153. It does not mean formed “anywhere above.”

1. Intrinsic Evidence, Supported by Dr. Bretschneider

Nothing in the '801 Patent alters the plain and ordinary meaning of the term “formed on,” which includes Petitioner’s own expert understood the plain and ordinary meaning of the term.

Claim 9 is written consistent with this plain and ordinary meaning. The predetermined material layer is “formed on” the first substrate, and the organic material pattern layer is then “formed on” the predetermined material layer. Nothing in the claim language supports BOE’s apparent argument that “formed on” should be read as formed “anywhere above” regardless of the contact between the layers.

The specification is similar, discussing layers being formed on another layer to result in a structure where the various layers are touching. For example, this is demonstrated in Fig. 1C, and the various layers are described at 2:27–33:

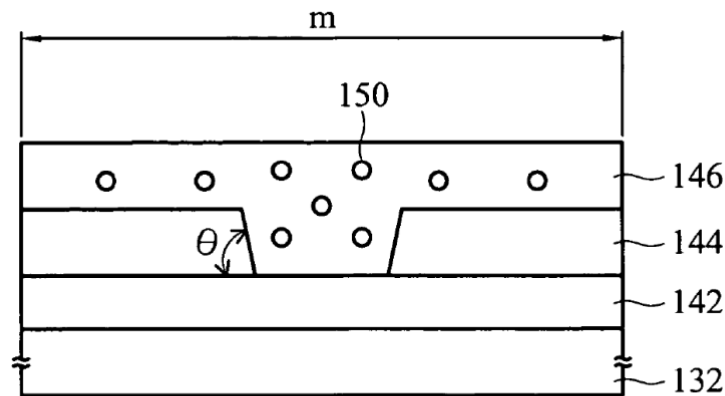


FIG. 1C

Fig. 2C and its related description includes a similar disclosure:

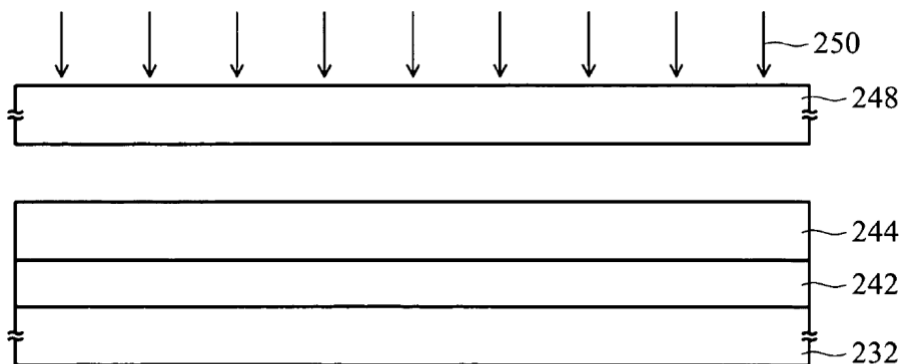


FIG. 2A

Ex. 1001 at Fig. 2A, 2:46-65. The specification is therefore consistent with “formed on” referring to layers directly formed on the preceding layer. Nothing in the file history changes this construction.

2. Extrinsic Evidence, Supported by Petitioner’s Experts

As described above in § IV.A, a POSITA would have understood the relevant manufacturing process. This process involves building layers of materials and doing other processes to create the sought after functionality. Each layer is “formed on” the next.

Petitioner’s expert here and Petitioner’s other expert in a related case both naturally used “formed on” to mean “formed directly on.”

Dr. Neikirk’s understanding of the plain and ordinary meaning of “formed on” may be seen from his testimony in related IPR2024-01315. Ex. 2012 at 87:25–88:2 (“Q Is 17 formed on 32? A . . . 17 is formed on 15 in Figure 4B.”), 89:3–6 (“Q Is 63 formed on 19? . . . [A] As shown in Figure [4]B, it’s shown on 62. 62 is on 19.”) (referring to the figure reproduced below):



Ex. 2016, Fig. 4B.

Petitioner’s other expert in related IPR2024-01133 naturally used the term “formed on” to mean “formed directly on”:

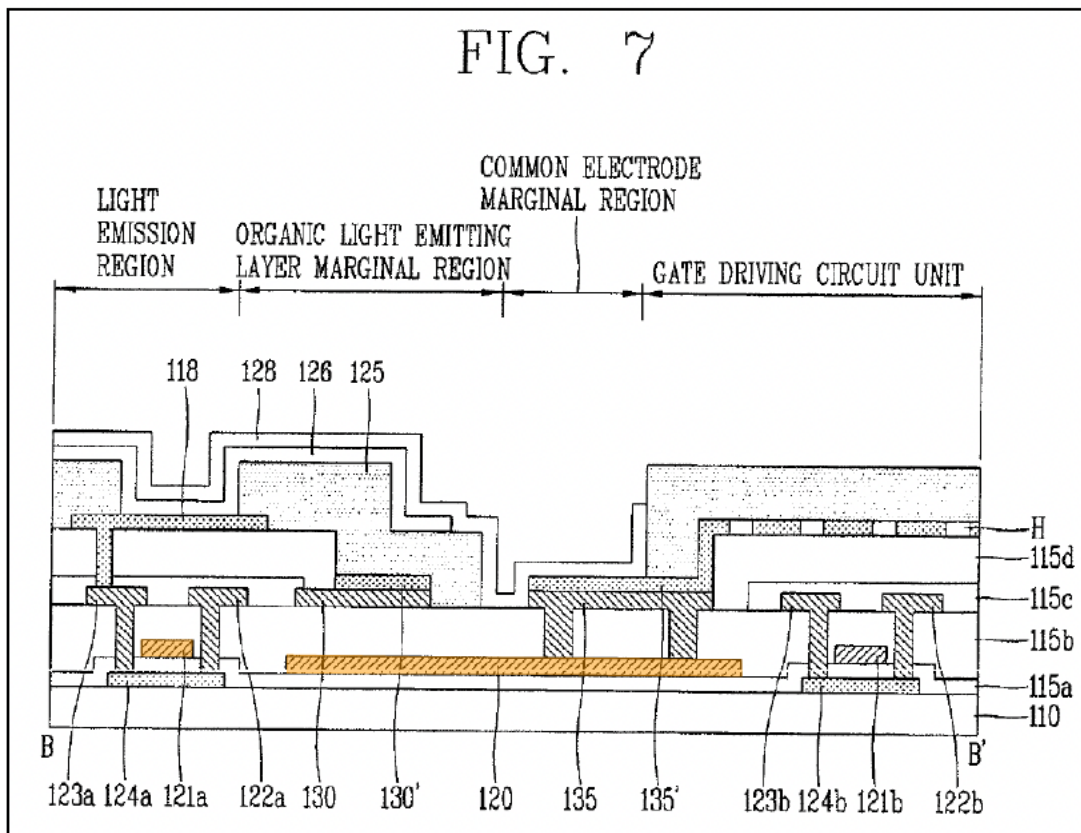
13 Q And by the words "on layer 115A," you meant
14 that these were directly stacked on top of 115A;
15 correct?

16 A They're formed on top of layer 115A, yes.

17 Q Are you suggesting that there is any other
18 layer between layer 115A and either the gate
19 electrode 121 or the wiring 120?

20 A No.

Ex. 2017, 177:18–25 (referring to the statement “The first gate electrode 121A and the dummy wiring 120 are both formed on layer 115A,” of the figure reproduced below):



Ex. 2018, Fig. 7 (annotated with coloring); *see also* Ex. 2017, 177:18–25; *see id.* 168:2–177:25 (noting that “formed on” could be construed as not directly touching if the patent used it in such a way, but that that “most of my [Dr. Baker’s] examples were directly touching.”).

Thus, Petitioner’s experts plain use of the term “formed on,” when not consciously trying to invalidate a patent with the aid of hindsight, supports that the proper meaning of the term is “formed directly on.”

3. Legal Support, *Toshiba* Distinguishes *AFG*

Petitioner cites *AFG Indus., Inc. v. Cardinal IG Co.* (“*AFG*”) in arguing for its proposed definition of “formed on.” See Paper 13 at 2 (citing *AFG Indus., Inc. v. Cardinal IG Co.*, 239 F.3d 1239, 1251 (Fed. Cir. 2001)). Petitioner’s analogy to this case is inept. Later cases with technology closer to the technology of the ’801 Patent distinguish *AFG* and support Patent Owner’s position. See, e.g., *Toshiba Corp. v. Imation Corp.* (“*Toshiba*”), No. 09-CV-305-SLC, 2010 WL 1881125 at 10 (W.D. Wis. May 10, 2010) (explicitly distinguishing *AFG*). The relevant patent in *Toshiba* was directed generally to “optical discs on which information is recorded” and claimed, in relevant part, “[a]n optical disc comprising: a circular substrate . . . [and] **a reflecting layer formed on said substrate . . .**” *Id.* at 3 (emphasis added). The Court ruled that this mean “reflecting layer coated **directly** on the substrate.” *Id.* at 10.

Plaintiff in *Toshiba* proposed that “Reflecting layer formed on said substrate” should be constructed as a “reflecting layer formed directly on or indirectly on the substrate” and cited to *AFG* in support of their argument. *Id.* at 10. The court rejected the attempt to analogize *AFG*, noting first that “[i]n *AFG Industries*, the court of appeals interpreted a patent related to **window coating technology**.” *Id.* (emphasis added). The court in *Toshiba* rejected the analogy to *AFG*, holding *AFG* “is not helpful in this case because nothing in the [relevant] patent suggests the

presence of a layer between the substrate and the reflecting layer. The [relevant] patent discloses only reflecting layers coated directly on the substrate.” *Id.* The court concluded that the construction “reflecting layer coated directly on the substrate” captured the meaning of the claimed “reflecting layer formed on said substrate” as used in the relevant patent and adopted that construction. *Id.*

Here, the technology is much more similar to *Toshiba*’s “optical discs on which information is recorded” than to *AFG*’s window coatings. Further, the claimed language of *Toshiba* parallels the claimed language at issue here. *Compare Toshiba* at 9 (construing “[r]eflecting layer formed on said substrate”) with Claim element 9[b] (“a predetermined material layer formed on the first substrate”). Further, the specification of the ’801 Patent is analogous to that of the relevant patent in *Toshiba*. Like *Toshiba*, the specification of the ’801 Patent discloses only that *a single predetermined material layer*, with no intervening layers, is formed on the substrate. *See e.g.*, Ex. 1001, 2:47–49 (“A predetermined material layer such as a silicon nitride layer 242 is formed on the TFT array substrate 232”); *Toshiba* at 10 (“there is no language or figure in the [relevant] patent that even hints at extra layers between the reflecting layer and the substrate”).

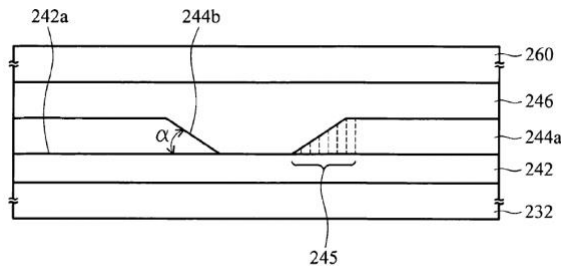
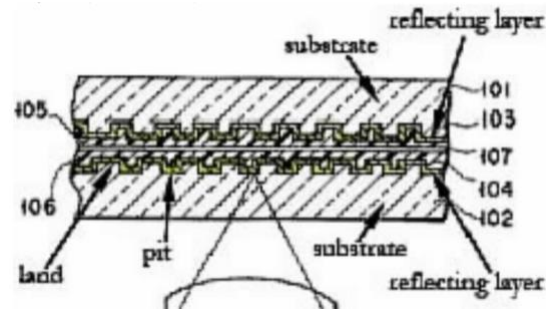


FIG. 2C



Ex. 1001, Fig. 2C (left); *Toshiba* at 10 (right, reproducing Figure 16B from the relevant patent). As in *Toshiba*, the '801 Patent does not have “extra layers.” See, e.g., Ex. 1001, 2:28–30, 2:47–49, Figs. 1C, 2A, 2B, 2C.

Thus, “formed on” should be given its plain and ordinary meaning, which is which is “forming in a manner directly touching the below layer or substrate.” See *Toshiba* at 10 (constructing “Reflecting layer formed on said substrate” as “reflecting layer coated directly on the substrate”).

4. Petitioner’s Proposal Makes Words Meaningless

An important principle of claim interpretation, is: “It is highly disfavored to construe terms in a way that renders them void, meaningless, or superfluous.” *Intel Corp. v. Qualcomm Inc.*, 21 F.4th 801, 809–10 (Fed. Cir. 2021). Petitioner’s proposal would make “a predetermined material layer formed on the first substrate” meaningless.

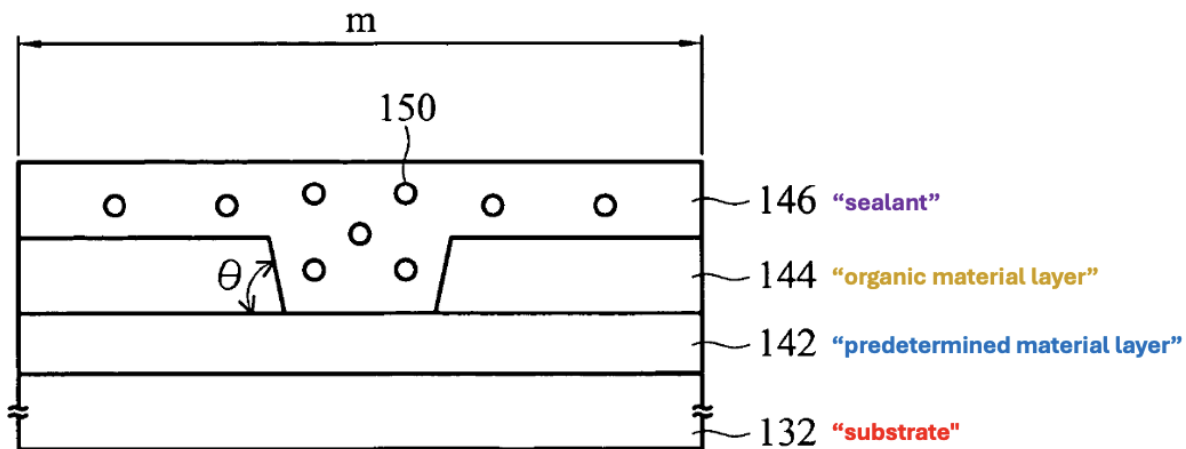


FIG. 1C

Ex. 1001 at Fig. 1C. The substrate is implicitly at the bottom. *All* the other layers are above it; only the predetermined material layer is “formed on” the substrate. If the inventor wanted to allow for an indirect relationship between the substrate and the predetermined material layer, there would have been no need to claim “a predetermined material layer *formed on the first substrate*.” The inventor could have simply written ““a predetermined material layer” (that is still comprised within the same LCD from the preamble) and left it at that.

5. Conclusion

For the reasons discussed above, Patent Owner respectfully submits that the extrinsic evidence, including the declaration of Dr. Bretschneider, the cross-examination testimony of both of Petitioner’s experts, and the legal authority provided herein, support that “formed on” means “forming in a manner directly

touching the below layer or substrate.” *See AFG*, 239 F.3d at 1249 (“This case presents a good example of how extrinsic evidence can and should be used to inform a court's claim construction, and how failure to take into account the testimony of persons of ordinary skill in the art may constitute reversible error.”).

C. “predetermined angle” (Claims 1–3, 9–11)

Patent Owner agrees with the Petition that this term is “not limited to any particular range of angles.” Petition at 3. However, Patent Owner respectfully submits that the plain and ordinary meaning this phrase requires a predetermination of the angle. In other words, if designer merely used a selected technique for making an opening without caring about what angle would result, this would not be a “predetermined” angle. A “predetermined” angle does not inherently result from “forming . . . a saw tooth opening” as recited in claim 1 because “form a predetermined angle” is recited as a separate and distinct limitation that is entitled to its own separate and distinct weight.

V. Ground 1 (Kwak § 102) (Claim 9)

Kwak does not anticipate claim 9 for several reasons. First, Kwak does not teach the “predetermined angle” of element [9c]. Second, Petitioner presented multiple theories of how Kwak anticipates elements [9b]-[9c], but Petitioner’s

arguments fail under the proper claim construction of “formed on” and “layer.”⁴ Dr. Neikirk’s opinions were formed only based on his original understanding of “formed on” and “layer.” Ex. 1011, 75:23–77:8. There is no evidence or argument that Kwak anticipates under Patent Owner’s proposed constructions. If the Board adopts Patent Owner’s constructions, then Ground 1 must fail.

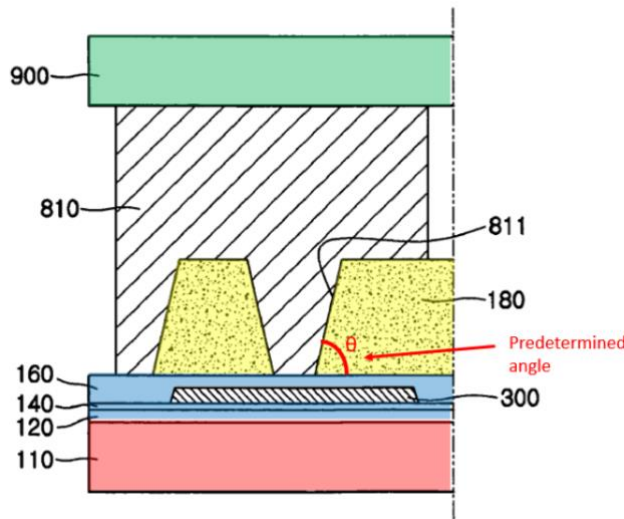
A. Kwak Does Not Disclose a “Predetermined Angle” ([9c])

Kwak fails to disclose “an organic material pattern layer having a saw tooth opening formed on the predetermined material layer to expose the surface of the predetermined material layer underneath, wherein the surface of the predetermined material layer and the sidewall of the organic material pattern layer form a predetermined angle.”

Kwak does not disclose using a predetermined angle anywhere—thus it cannot anticipate claim 9. Petitioner simply points to the sidewalls of the via and asserts that they were formed “at a predetermined angle” but cannot identify any explicit disclosure in Kwak that this angle was predetermined. Ex. 2008, ¶ 160.

⁴ The Institution Decision assumed that Petitioner’s constructions were right. Paper 15 at 23–25.

FIG. 2D



Petition at 28–29. Petitioner has indeed identified an angle, but there is no disclosure that this angle is predetermined. Ex. 2008, ¶ 163–68. At best, Petitioner argues that “Kwak consistently discloses implementing openings with the same, less-than-90° angle across its embodiments. *See, e.g.*, EX1005, Figs. 2B-D, 3A-C, 4A-C.” Petition at 28. None of these cited figures contain any disclosure about when the angle was determined, so 35 U.S.C. § 102 is not met. *See* MPEP § 2125(II) (“When the reference does not disclose that the drawings are to scale and is silent as to dimensions, arguments based on measurement of the drawing features are of little value.”).

Kwak is silent about predetermined angles because, unlike the ’801 Patent, Kwak did not realize that the use of particular angles may reduce the formation of voids or bubbles in the sealant, which reduces sealing strength. Ex. 1001 at 2:37–40;

Ex. 2008, ¶ 166. Instead, Kwak taught POSITAs to extend the depth of the via to be filled with sealant, not that the POSITA should care about the angle at all. Ex. 1005 at 10:50–56 (“When the depth of the via hole 811 is increased, the contact area with the sealing portion 810 increases and the adhesive strength between the substrate 110 and the encapsulation substrate can be increased. . . . thus an appropriate depth of the via hole should be determined in consideration of design specifications”). Thus, Kwak teaches a predetermined *depth*, not a predetermined *angle*.⁵

B. Kwak Fails to Disclose a Predetermined Material Layer Formed on the First Substrate ([9b])

Kwak does not disclose a predetermined material layer under the plain and ordinary meaning of the term “layer”, which is a “film of a material created during manufacturing,” nor does Kwak disclose that it is formed on the first substrate under the plain and ordinary meaning of the term “formed on”, which is a “forming in a manner directly touching the below layer or substrate.” See §IV, *supra*; Ex. 2008, ¶¶ 160–62.

Petitioner points to Kwak’s “interlayer 160, gate insulating layer 140, buffer layer 120, or a combination of the same” as the claimed “predetermined material layer.” Petition at 23 (citing Ex. 1005 at 6:52–60, Figs. 2B–D, 3A–C, 4A–C).

⁵ Petitioner appears to concede this in a different ground. Petition at 32 “To the extent that Kwak does not explicitly disclose . . . a predetermined angle”

FIG. 2D

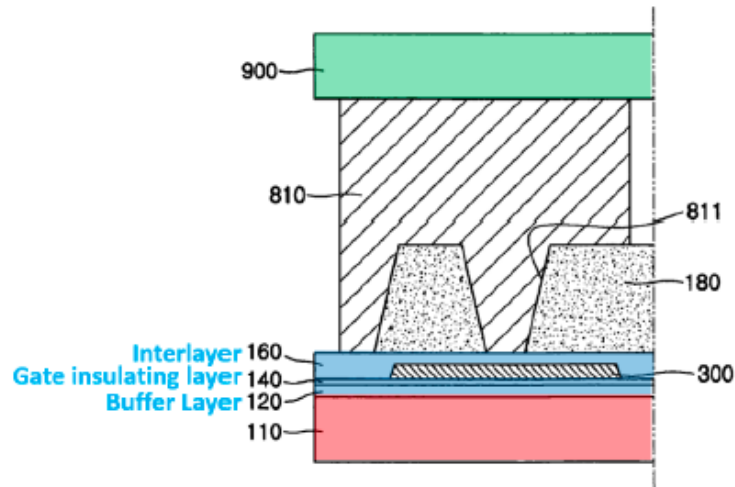


FIG. 3A

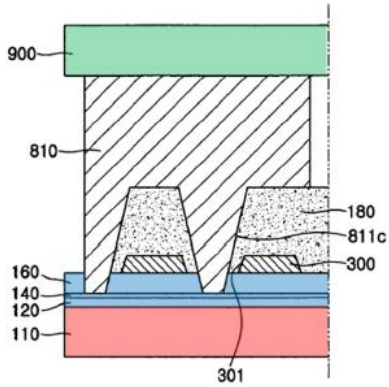


FIG. 3B

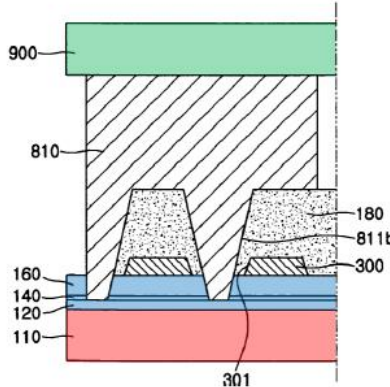
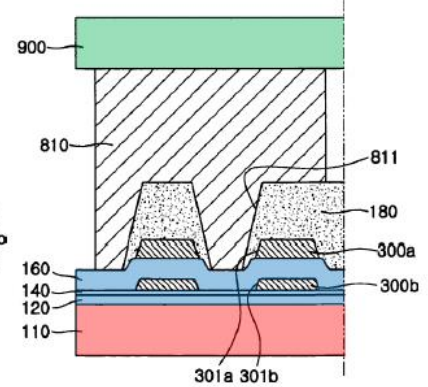


FIG. 4A



Petition at 24 (annotating Ex. 1005, Fig. 2D, 3A, 3B, 4D).

FIG. 2D

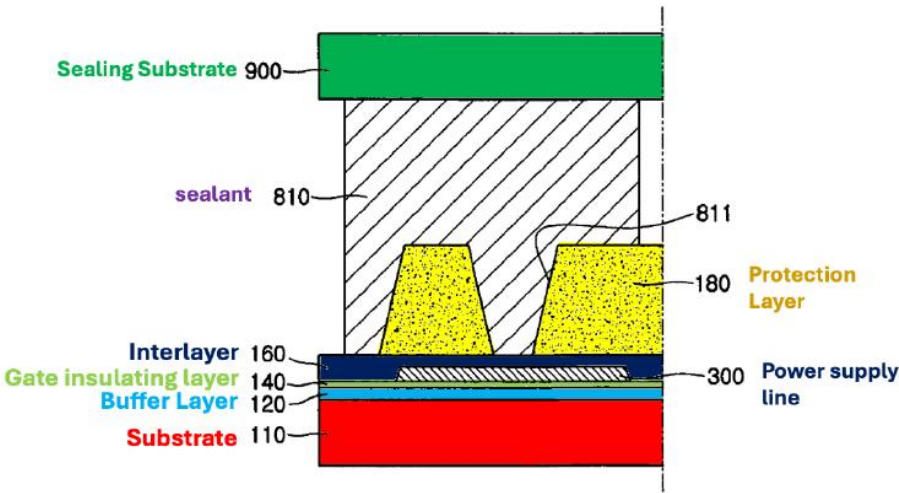


FIG. 3A

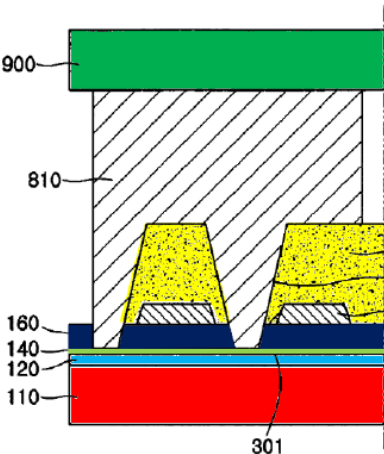


FIG. 3B

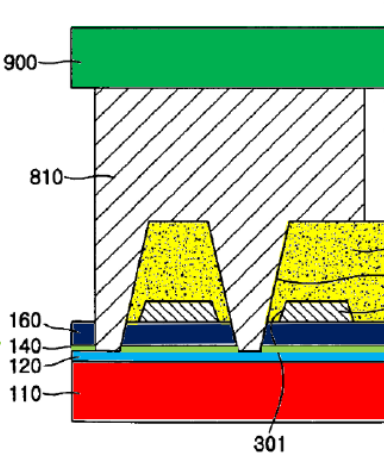
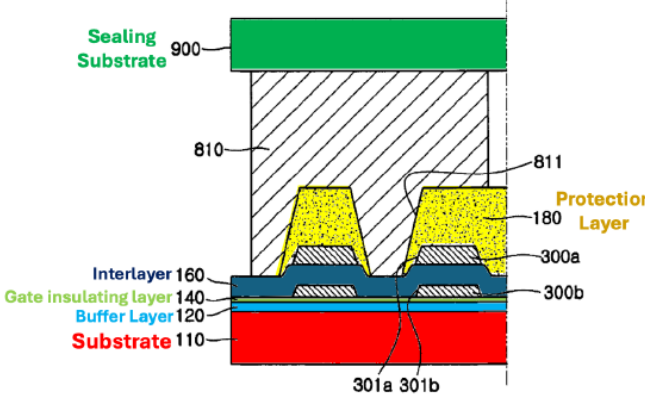


FIG. 4A

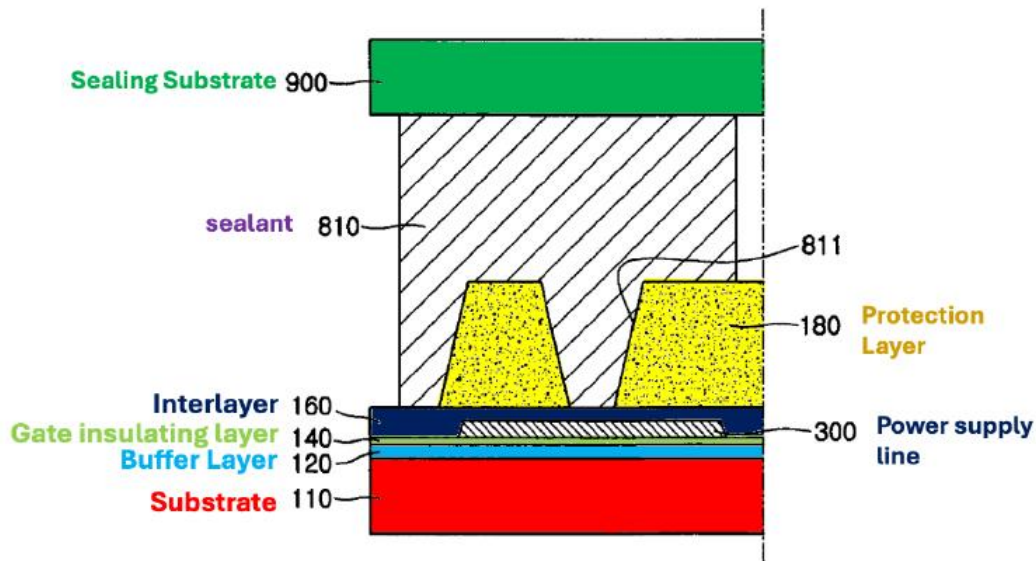


At deposition, Petitioner’s expert elaborated on the theory with respect to the figures of Kwak: “for embodiment in 2D, there are two things that would satisfy ‘predetermined material layer’ on the substrate: 160 alone or a layer comprising 160, 140 and 120.” Ex. 2011 at 62:8–10. In Figure 3A “layers 160, 140 and 120, combined, would still satisfy the requirement for a predetermined material layer. . . . In the alternative, layer 160 alone could satisfy that, or 160 and 140 would satisfy the requirements.” *Id.* at 62:14–19. Similarly, referring to Figure 3B, “160 alone would satisfy it; 160 and 140 combined would satisfy the requirement for the predetermined material layer; 160, 140 and 120 would; and in that example, it’s my opinion that 120 standing alone would also satisfy it.” *Id.* at 63:4–8. Again, for Figure 4A, “the layer 160, 140, 120 would satisfy the requirement. 160 alone would satisfy the requirement when I did 2D, I should have done 160, 140 and 120, and 160. So the same for Figure 2D and 4A.” *Id.* at 62:12–16.

1. Layer 160 alone (all embodiments)

Layer “160 alone” is not “formed on” the substrate under Patent Owner’s construction of “formed on.” Dr. Neikirk concedes this. Ex. 1011 at 66:25–67:5. Layer 160 is plainly “formed on” layer 140 and driving power supply line 300 under the plain and ordinary meaning of the term. *See* § IV.B, *supra*.

FIG. 2D



Under the plain and ordinary meaning of the term “formed on,” layer 160 of Kwak’s 2D is formed on layer 140, not on the substrate and does not meet the claimed element. Ex. 2008, ¶ 160.

2. A layer comprising 160, 140 and 120 (all embodiments)

Under this theory, Petitioner improperly points to three distinct layers that are successively formed on each other as the claimed “predetermined material layer.” A POSTIA would have understood that layers 160, 140, and 120 are formed at different manufacturing steps. Ex. 2008, ¶ 160. Specifically, interlayer 160 is a film of a material created during manufacturing that is formed on gate insulating layer 140 *and* driving power supply line 300. Likewise, gate insulating layer 140 is a film of a material created during manufacturing that is on buffer layer 120. Buffer layer

120, in turn, is a film of a material created during manufacturing that is formed on substrate 110.

“Interlayer 160, gate insulating layer 140, buffer layer 120, or a combination of the same” cannot be the claimed “predetermined material layer formed on a first substrate” under the correct construction of “layer.” Any attempt to do requires an interpretation of the terms “layer” that is inconsistent with the plain and ordinary meaning of the terms and the disclosure of the ’801 Patent because they are different films that were created during different manufacturing steps. *See* §IV, *supra*, Ex. 2008, ¶ 160.

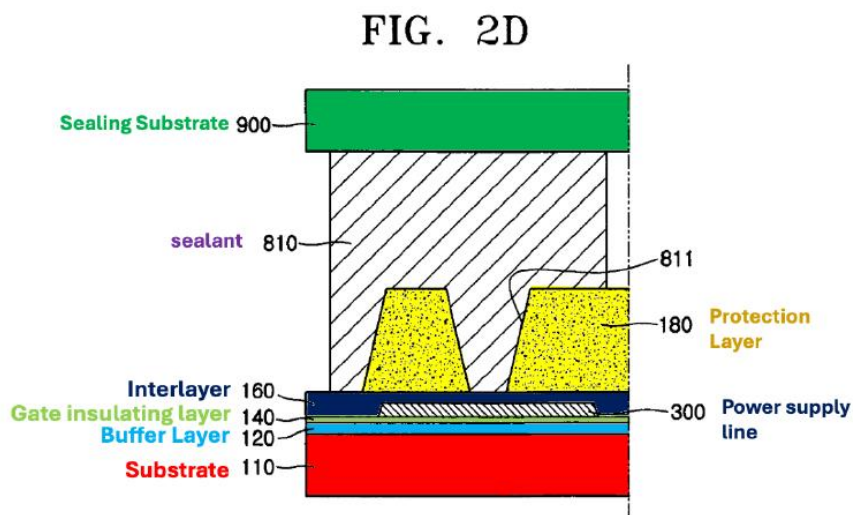
3. A layer comprising 160 and 140 (Figs. 3A/B)

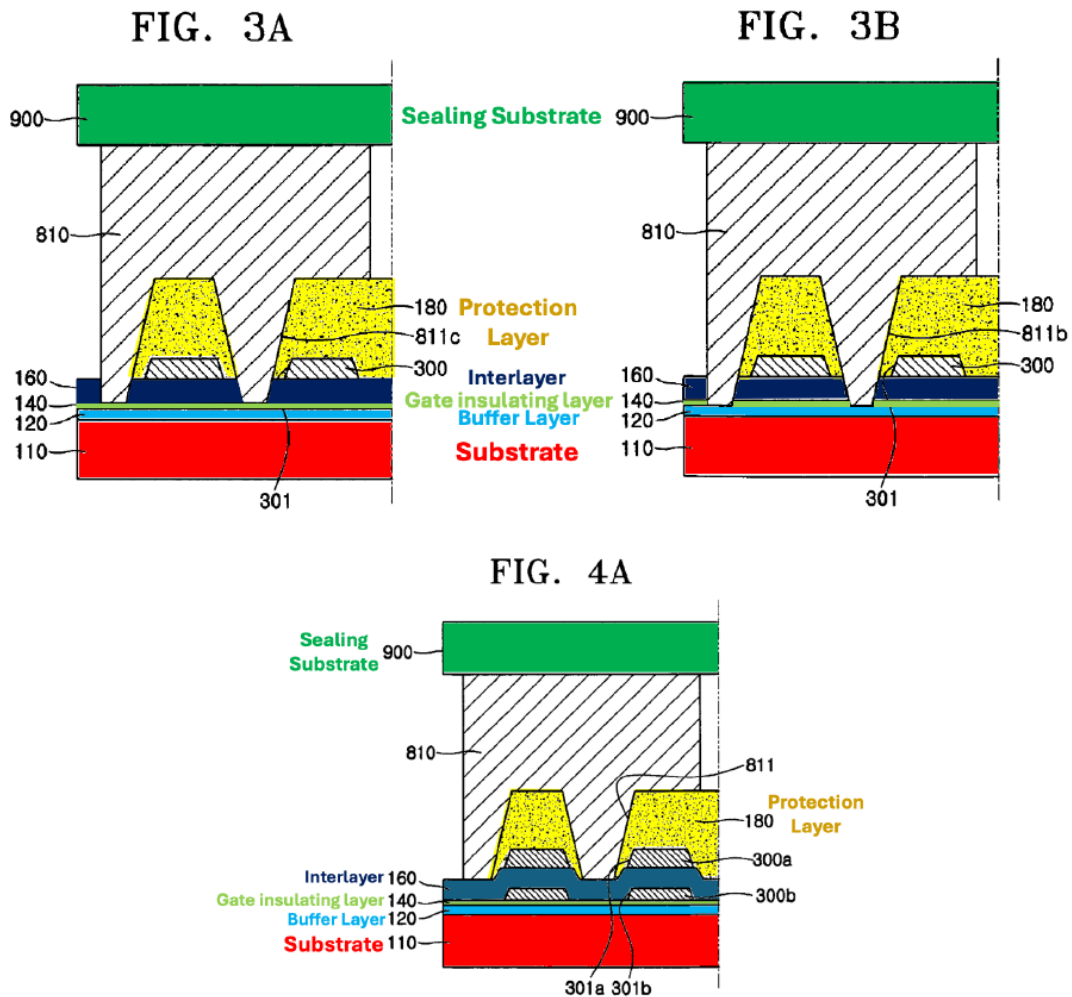
Petitioner’s position that layers 160 and 140 correspond to the claimed predetermined layer is wrong because it is not a “layer” under the plain and ordinary meaning of the term. As noted above, layers 120 and 140 are different films that were created during different manufacturing steps and cannot be the claimed “predetermined layer.” Ex. 2008, ¶ 160.

Indeed, Kwak does not disclose any layer or combination thereof that meets the claim elements under the plain and ordinary meanings of the “formed on” and “layer,” as proposed by Patent Owner, for the reasons described above.

C. Kwak Fails to Disclose an Organic Material Pattern Layer Formed on the Predetermined Material Layer ([9c])

Claim element 9[c] recites “an organic material pattern layer . . . formed on the predetermined material layer to expose the surface of the predetermined material layer underneath.” Nothing in Kwak meets this limitation because, under Patent Owner’s proposed construction of “formed on,” Kwak’s protection layer 180 is not formed on buffer layer 120 in any embodiment of Kwak. Specifically, all the relied-upon figures of Kwak (Figures 2D, 3A, 3B, and 4A in Petition at 26) show that the protection layer 180 is formed on the surface of the interlayer 160 and/or formed on power supply line 300. None of these figures show a protection layer formed on the buffer layer 120, nor does Kwak disclose any such embodiment. Ex. 2008, ¶183.





The figures of Kwak show that the protection layer 180 is formed, in part, on the surface of interlayer 160, but interlayer 160 is not “formed on” the substrate 110 under Patent Owner’s proposed construction of the term “formed on.” For this to meet claim element 9[c], Petitioner must rely on a construction that includes interlayer 160, gate insulating layer 140, buffer layer 120 (as well as the layers between them, including semiconductor layer 130, gate electrode 150, and power supply line layer 300) are collectively considered to be a single layer that meets the “predetermined layer” requirement from claim [9b]. Under Patent Owner’s

construction, these are several different layers and cannot meet the claimed “predetermined material layer” for the same reasons discussed above in §V.B. Accordingly, Kwak fails to render disclose organic material pattern layer formed on the predetermined material layer and does not anticipate claim element [9c]. Ex. 2008, ¶ 161.

D. Conclusion

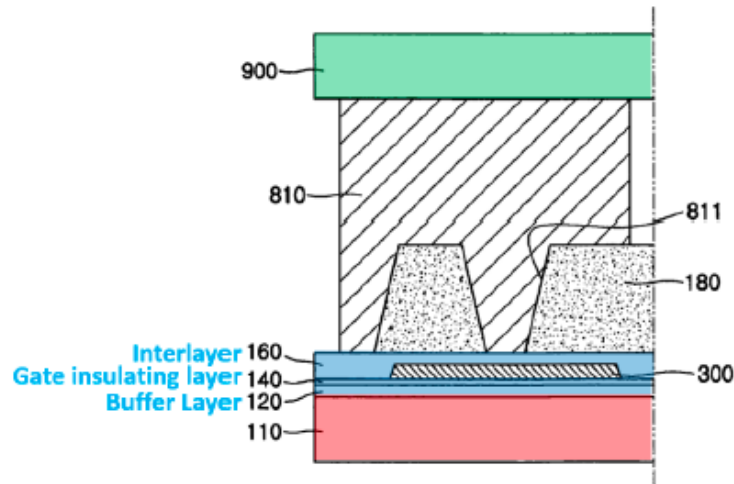
Kwak does not disclose all elements of claim 9, as discussed above. Thus, Kwak does not anticipate claim 9 of the '801 Patent.

VI. Ground 2 (Kwak § 103) (Claims 1–6, 8–14)

A. Kwak Fails to Render Obvious a Predetermined Material Layer Formed on the First Substrate

As discussed above in § V.B, Kwak fails to disclose or render obvious a “predetermined material layer formed on the first substrate” under the plain and ordinary meaning of the terms “layer” and “formed on”, and Petitioner makes no assertion that it does so. Indeed, Kwak’s three separate layers (interlayer 160, gate insulating layer 140, buffer layer 120) could not be or a combined into a single layer that is formed on the substrate, as this would eliminate driving power supply line 300.

FIG. 2D



Petition at 24 (annotating Ex. 1005, Fig. 2D). Thus, Kwak does not render obvious a “predetermined material layer formed on the first substrate” as claimed by the ’801 Patent.

B. Kwak Fails to Render Obvious a Predetermined Angle ([9c])

As discussed above in § V.A, Kwak fails to disclose or “an organic material pattern layer having a saw tooth opening formed on the predetermined material layer to expose the surface of the predetermined material layer underneath, wherein the surface of the predetermined material layer and the sidewall of the organic material pattern layer form a predetermined angle.” Further, Petitioner simply states that “the angles disclosed by Kwak would have been created using known techniques resulting in corresponding predetermined angles” and that “the angled openings of Kwak could take many forms.” Petition at 32–33. Petitioner misconstrues the teachings of Kwak.

Kwak *does not disclose any angles*. Kwak discloses a via, which is concerned with creating a connection through vertical layers—the angle of the sidewall is not predetermined, as the goal of a via is simply to reach a desired depth. *See* Ex. 2008, ¶ 163–165.

Further, Petitioner simply states that there were “known techniques resulting in corresponding predetermined angles.” Petition at 32–33. However, as noted above in § III.F, none of the Petition’s state of the art references are relevant. *See also* Ex. 2008, ¶¶ 82–106. For example, (1) Shinego does not teach an angle in an organic layer—only in an oxide layer, (2) Yamazaki 496 discloses angles for reflecting light, not for sealing, of an insulator in a different position, (3) Shimada 722 similarly teaches using angles to reflect light, not for sealing, (4) Shimada 376 also teaches using angles to reflect light, not for sealing, (5) Kim 935 teaches using angles to reflect light, not for sealing, (6) Tanaka teaches that using any etch process that does not result in an undercut will suffice without specifying any angle, and (7) Miyoshi is not in evidence. *Id.*; § III.F, *supra*. All Petitioner has done is shown that other, non-organic layers in other contexts outside of an LCD can be made with various angle ranges for other purposes that do not relate to sealing strength. Moreover, Vaganov’s technique applies only to crystalline structures, not to the organic layers of Kwak. Ex. 2008 ¶¶ 54–59. None of these references are relevant to

whether or not a via in Kwak's organic layer was made with a predetermined angle for sealing.

Additionally, Kwak discloses adjusting the depth of a via to maximize contact area for the sealant. *See* Ex. 1005, 10:50–55. The concern of a via is the depth, not the angle of the sidewalls. Ex. 2008, ¶ 165. Unless there is a call to create a specific angle, the angle of the sidewall is simply a by-product and is not predetermined. *Id.*

There is no motivation to adjust the angles of the via under the express teachings of Kwak. Kwak teaches maximizing contact area of via hole 811 by increasing depth. *See* Ex. 1005, 10:50–55 (“When the depth of the via hole 811 is increased, the contact area with the sealing portion 810 increases and the adhesive strength between the substrate 110 and the encapsulation substrate 900 can be increased. However, if the substrate 110 is exposed, it can receive stress, and thus an appropriate depth of the via hole should be determined . . .”); Ex. 2008, ¶¶ 36–51.

Additionally, creating a predetermined angle in Kwak (for example, using a half tone mask) would decrease the contact area—that is, any attempt to create a specific, predetermined angle of a via, the angle would be shallower than if a POSITA simply wanted to create a via. *See* Ex. 2008, ¶ 51. Creating shallower angles in the via is contrary to the express teachings of Kwak, which seeks to maximize contact area. *Id.* ¶¶ 43–51. Thus, a POSITA would not be motivated to

attempt to create a predetermined angle in Kwak and the Petitioner uses hindsight to minimize the inventive concepts of the '801 Patent.

Kwak does not render obvious “the surface of the predetermined material layer and the sidewall of the organic material pattern layer form a predetermined angle.”

C. Claim 10: “wherein the predetermined angle is less than about 60 degree.”

Petitioner’s expert’s purported motivation is that a POSITA understood that using “angles would provide the same benefits sought by Kwak.” Ex. 1003 at 117. As Dr. Bretschneider has explained, using shallower angles decreases the total contact area for the sealant and is contrary to the express teachings of Kwak. Ex. 2008, ¶¶ 65–71. Indeed, Kwak seeks to *maximize* the contact area of the sealant by altering the *depth* of the via, not by changing the angles. Ex. 1005, 10:50–55. Petitioner can identify no motivation to use predetermined angles, as discussed above, much less “predetermined angles less than about 60 degree.” Such assertions are based on nothing but hindsight and Kwak does not render obvious the claimed angle.

Petitioner’s reliance on “the knowledge of a POSITA” here is improper. Dr. Neikirk clearly and repeatedly stated that he was not using these references to propose a modification to Kwak. Ex. 2011, 25:24–33:17. Thus, any argument that

a POSITA would have modified Kwak to adjust the angle of Kwak's sidewalls is rebutted by Petitioner's own expert.

None of the other references inherently teach that an angle of Kwak's via through an organic layer should have any particular or predetermined value. The Petitioner relies on a scattershot of Vaganov, Kim, Yamazaki 366, Tanaka, and Miyoshi. Petition at 34–35. As explained above in § III(E)-(F), each of these references relates to an angle of a wall in a different material, made using a different technique, for a different purpose. All Petitioner has done is shown that other, non-organic layers in other contexts outside of an LCD can be made with various angle ranges for other purposes that do not relate to sealing strength. None of these references are relevant to whether or not a via in Kwak's organic layer was made with a predetermined angle. *See id.*

D. Claim 11: “wherein the predetermined angle is less than about 60 degree.”

Kwak fails to render claim 11 obvious for the same reasons discussed with respect to claim 10 above in § VI.C.

E. Additional Claims

Claims 12–14 depend from claim 9 and are not obvious for at least the same reasons.

Claim 1 recites similar elements to claim 9 and is not obvious for the same reasons as claim 9.

Claims 2–6, and 8 depend from claim 1 and are not obvious for at least the same reasons.

VII. Ground 3 (Kwak, Vaganov § 103)

A. Kwak and Vaganov Fails to Render Obvious a Predetermined Material Layer Formed on the First Substrate

As discussed above in § V.B, Kwak fails to disclose or render obvious a “predetermined material layer formed on the first substrate” under Patent Owner’s constructions of the terms “layer” and “formed on” discussed above, and Vaganov does not cure this deficiency. Indeed, Petitioner makes no assertion that Vaganov does so. Thus, Vaganov does not cure the deficiencies of Kwak, and the combination cannot render the ’801 Patent obvious.

B. No Motivation to Combine

Vaganov is directed to *wafer-to-wafer bonding*, not sealing an LCD—a POSITA would not combine Vaganov with Kwak. *See* Ex. 1007, 1:10–11; Ex. 2008, ¶¶ 53–59, 195–98. Vaganov describes bonding wafers to wafers, particularly crystalline structures, which is distinct from sealing an LED. *Id.* Further, as explained by Dr. Bretschneider, the crystalline structures described Vaganov have unique properties that allows for “types of etches [that] *do not significantly attack organic films and are not compatible with such materials.*” Ex. 2008, ¶¶ 54, 175.

Petitioner does not, and cannot, provide any motivation to combine Kwak and Vaganov—they simply assert “Vaganov discloses methods for creating openings in similar materials that result in specific angles . . . A POSITA would have recognized the similar structures, materials, methods, and goals between the two and would have found it routine and straightforward to combine Vaganov’s specific angled opening with Kwak’s angled opening with a reasonable expectation of success.” Petition at 44. As shown above, Kwak does not teach an angled opening, and a POSITA would not be motivated to reduce the angle of Kwak as this would decrease the contact area—Kwak focuses on changing the *depth*. Further, Vaganov’s methods are specific to single crystalline structures and could not be combined with Kwak because Vaganov’s etches *do not significantly attack organic films and are not compatible with such materials*. Ex. 2008, ¶¶ 54, 175.

C. The Remaining Claims are Not Obvious

Patent Owner incorporates grounds 1 and 2, and further asserts a lack of motivation to combine Kwak and Vaganov. Claims 10 and 11 depend from claim 9 and are not obvious for at least the same reasons discussed above. Claims 2, 3, and 6 depend from claim 1 and are not obvious for at least the same reasons discussed above.

VIII. Ground 4 (Kwak, Kim § 103)

A. Kwak and Kim Fails to Render Obvious a Predetermined Material Layer Formed on the First Substrate

As discussed above, Kwak fails to disclose or render obvious a “predetermined material layer formed on the first substrate” under the plain and ordinary meaning of the terms “layer” and “formed on” discussed above, and Kim does not cure this deficiency. Indeed, Petitioner makes no assertion that Kim does so. Thus, Kim does not cure the deficiencies of Kwak and the combination cannot render the ’801 Patent obvious. *See* Ex. 2008, ¶¶ 177.

B. No Motivation to Combine Kwak and Kim

Again, Petitioner misstates that Kwak discloses angled openings—Kwak discloses vias and adjusting the *depth* to maximize contact area to seal an LCD. Ex. 2008, ¶¶ 178–181. Kim, on the other hand, *is completely unconcerned with sealing* and is directed towards “allowing for better contacts” through openings in a substrate (to use Petitioner’s expert’s summary). Ex. 1003, ¶ 157; *see* Ex. 1008, ¶ [0002] (“The present disclosure relates to a contact structure for a semiconductor device as well as for a thin film transistor array substrate” for an LCD.”). Petitioner does not, and cannot, provide a motivation to combine the references. *See* Petition at 46.

Petitioner simply states, “the gradually inclined sidewalls of Kim would increase the contact area for layers (including sealant layers) created on top of the

organic layer,” but cannot provide an explanation as to how this would be reconciled with the teachings of Kwak. Petition at 47. Kwak discloses a via and changing the depth of the via to increase contact area—changing the angle of Kwak’s via would reduce the contact area. Thus, Petitioner can provide no reasonable motivation as to why a POSITA would have been motivated to combine the references without relying on hindsight. Ex. 2008, ¶¶ 178–181.

C. The Remaining Claims Are Not Obvious

Patent Owner incorporates grounds 1 and 2, and further asserts a lack of motivation to combine Kwak and Kim for the reasons explained above. Claims 10, 11 and 14 depend from claim 9 and are not obvious for at least the same reasons. Claims 2, 3, and 6 depend from claim 1 and are not obvious for at least the same reasons. Claim 8 depends from claim 6 and is not obvious for the same reasons.

IX. Ground 5 (Kwak, Yamazaki 336 § 103)

A. Kwak and Yamazaki Fails to Render Obvious a Predetermined Material Layer Formed on the First Substrate

As discussed above, Kwak fails to disclose or render obvious a “predetermined material layer formed on the first substrate” under the plain and ordinary meaning of the terms “layer” and “formed on” discussed above, and Yamazaki does not cure this deficiency. Indeed, Petitioner makes no assertion that

Yamazaki does so. Thus, Yamazaki does not cure the deficiencies of Kim and the combination cannot render the '801 Patent obvious.

B. No Motivation to Combine

Again, contrary to Petitioner's assertions, Kwak teaches creating vias of predetermined *depths* to increase contact area, not creating predetermined angles. Yamazaki 336 describes tapering an *edge portion* (i.e., center to outside). Ex. 1008, 4:13–20. Further, as explicitly taught by Yamazaki and explained in detail by Dr. Bretschneider, Yamazaki's tapering is formed for *ion implantation*, not for adhesion. Ex. 1009, 12:42-47 ("In addition, the side surface of the high thermostability planarizing *film 16 is formed to have a tapered shape so as to be doped.*"). Yamazaki explicitly teaches that when other techniques are used, the edge will be formed without a tapered shape. *Id.*, 5:45-49 ("However, when the inert element is added by using plasma treatment or oblique doping, a side surface of the high thermostability planarizing film can be modified *without forming the edge portion to have a tapered shape.*") (emphasis added); Ex. 2008, ¶¶86–97. Thus, in the absence of a call for ion implantation, there would be no reason to use Yamazaki's tapered shape. Ex. 2008, ¶ 182–86.

Here, nothing there is no disclosure that Kwak's layers are made using ion implantation. If a POSITA were to apply Yamazaki's teaching of what to do when

ion implantation is not used, the POSITA would not form any edge to have a tapered shape. *Id.*

Further, the object of Yamazaki was “to provide a high reliable EL display device and a manufacturing method thereof by shielding intruding moisture or oxygen . . . without enlarging the EL display device.” Ex. 1009 at abstract. Adding a taper to the vias of Kwak would necessarily enlarge the device, as reducing the angles of Kwak’s via (without adjusting the depth) requires more lateral space. Further, adding angles would reduce the surface area of Kwak. Ex. 2008, ¶¶ 43–52, 184–85.

C. The Remaining Claims Are Not Obvious

Patent Owner incorporates grounds 1 and 2 and further asserts a lack of motivation to combine Kwak and Yamazaki. Claims 10 and 11 depend from claim 9 and are not obvious for at least the same reasons. Claims 2, 3, and 6 depend from claim 1 and are not obvious for at least the same reasons.

X. Ground 6 (Zhang § 103)

Although the Institution Decision gave the Petitioner the benefit of the doubt, it turns out that all along, Dr. Neikirk had misread and misunderstood the teaching of Zhang. As Patent Owner argued, and as the Board acknowledged, Zhang’s “improved” embodiments do not use the organic layer that was originally present in the conventional LCD displays. *See* POPR; Paper 15 at 31; *see also* § III, *supra*.

Deposition revealed that Dr. Neikirk simply misunderstood this.

11 So with that clarification, is it your
12 understanding that Zhang explicitly discloses that a
13 part of 380a in Figure 3B is an organic photoresist
14 material?

15 MR. LONEY: Objection. Form.

16 THE DEPONENT: So given Zhang's teachings
17 about the use of photoresist, yes, I believe there is
18 sufficient teaching there. So this would be

Ex. 2011 at 107:11–18; *see also id.* at 97:16–120:14 (for more context).

Petitioner made the same mistake, for example, believing that “Zhang discloses an opening (opening 3120) in the organic material layer (second covering layer 380a comprising at least organic photoresist layer 225B and potentially other layers).” Petition at 58; Petition at 59 (“a POSITA would have understood Zhang to teach . . . an opening through organic photoresist and additional layers (e.g., Figs. 3B-E)”). Because Dr. Neikirk and Petitioner believed that 3B of Zhang already included an organic photoresist, they did not and could not have proposed modifying Figure 3B to include the organic layer from the conventional LCD that Zhang teaches away from. *Cf.* Paper 15 at 31. Similarly, there is no theory in the Petition that a POSITA would have started with the conventional LCD of Zhang Figure 2 and then selectively modified it with some, but not all, of the improvements that

Zhang discusses with respect to Figure 3. The Petition does not propose either theory, and the Petition provides no motivation for either theory.

Instead, what the Petition did was to scatter-cite sections from Zhang's background that disparaged the conventional LCD and separately Zhang's improved LCD, without regard for the fact that these are distinct embodiments. This type of hindsight fails as a matter of law. *See, e.g., Abiomed, Inc. v. Maquet Cardiovascular, LLC*, IPR2017-01204, -01205, Paper 8 at 8-12 (holding "Petitioner has failed to establish sufficiently that the features of those different embodiments are interchangeable or provide sufficient rationale to combine the teachings of those different embodiments").

Additionally, the Petition should fail because there is no evidence of what a POSITA would have found obvious based on a correct reading of what the prior art actually teaches. Neither Section 102 nor Section 103 allow for invalidating a patent because a prior art reference reads on a claim when misinterpreted in a specific way.

The Supreme Court's guidance from *Graham v. John Deere Co.*, 383 U.S. 1, 17 (1966) is dispositive: "Under § 103, the scope and content of the prior art are to be determined; differences between the prior art and the claims at issue are to be ascertained; and the level of ordinary skill in the pertinent art resolved." Here, Petitioner failed to correctly describe the scope and content of the prior art because they failed to acknowledge the separate "conventional" embodiment in Zhang's

background that is taught away from. Thus, Petitioner failed to ascertain the difference between Zhang Figure 2, Zhang's Figure 3, and the claims at issue. There is no admission in the Petition along the lines of "Zhang's improved embodiments fail to explicitly teach the claimed organic layer" before proposing how to cure this defect with an allegedly obvious modification. Thus, the Petition fails under *Graham*.

When guided by *Graham*, practitioners should make obviousness arguments using the format of 1) describing the teachings of a primary reference 2) admitting to the shortcoming⁶ of that reference, 3) proposing some allegedly obvious modification to the reference 5) explaining the allegedly obvious rationale for making that modification and 6) mapping the result to the claims.

Here, there is no theory in the Petition along the lines of "A POSTIA would have started with the conventional LCD from Fig. 2 of Zhang's background, but it does not meet claim element [x]; nonetheless a POSITA would have modified it with [change] for [these reasons]." Petition, Section X. Nor is there any theory in the Petition explaining, "A POSITA would have started with the improved LCD from Fig. 3 of Zhang, but this does not meet the "organic" limitation, but a POSTIA would

⁶ See Petition at 32 ("To the extent that Kwak does not explicitly disclose . . . a predetermined angle").

have backtracked to use the disparaged material of an organic layer anyway because [reasons].” Petition, Section X.

There is no proposal or motivation for modifying the organic layer because Petitioner and Dr. Neikirk simply believed it the organic layer was already in Zhang’s embodiment of Figure 3.

A. No coherent theory (claims 1 and 9)

Petitioner fails to set forth a coherent obviousness theory that respects the distinct embodiments of Zhang. For example, for the preamble, Petitioner string cites across “Figs. 1A-B, 2A-B, 3A-E, 4, 5A-B, and 6A-B before showing Figure 3B. Petition at 52–53. Here, the Petition has not clarified whether the POSITA is starting with the “conventional” LCD of Figs. 1A-2B and modifying it, or whether the POSITA is starting with improved LCD of Figs. 3A-6B and backtracking to add features that are being taught away from.

For element 9a, the Petition cites the improved embodiment of Figs. 3A-E, explicitly relying on layers 320 and 310 of Figure 3 for mapping to the claim elements of 9a. Petition at 53. Although the Petition includes a “*see also id.* Figs. 1B, 2A-B” citation with no further explanation, **the Petition does not assert that any layers from Figure 2 as mapping to 9a.** Petition at 53. Thus, the Petition has **no theory** for which parts of Zhang’s conventional Figure 2 LCD map to the “first substrate” and the “second substrate” as recited in the context of Figure 2.

For element 9b, the Petition explicitly relies on layers 370 and 320, 340, 380, and 330 of Figure 3 for mapping to the claim elements of 9b. Petition at 54. Although the Petition includes a “*see also id.* Figs. 1B, 2A-B” citation with no further explanation, **the Petition does not assert that parts of Figure 2 map to 9b.** Petition at 54.

For element 9c, the Petition’s analysis is an incoherent scattershot of citations to different parts of Zhang. Petition at 55–66. It cannot be discerned what the exact modification is because the Petition never concedes that Zhang’s Figure 3 is missing the organic layer to begin with; the Petition is simply mistaken.

For example, the Petition asserts that “Zhang alone or in view of the knowledge of a POSITA discloses . . . second covering layer 380a, which Zhang discloses or renders obvious would have comprised photoresist layer 225B.” Petition at 55. There is no explanation for this theory and no motivation to revert to a design that Zhang taught away from for this layer because Petitioner and its expert misunderstood it.

Confusingly, during the analysis of 9c, the Petition flips and begins arguing that “A POSITA would have understood Zhang to teach that the second covering layer 380a would, when implemented in conventional reflective LCDs, consist of or comprise organic photoresist layer 225B.” Petition at 57. At face value, this means a POSITA would taken the “second covering layer 380a” (which has no organic

layer) from Figure 3A–3E and implemented it Zhang’s “conventional” LCD of Figure 2, which would result in a conventional LCD that still has no organic layer. Not only that, but Petitioner has also not shown that Zhang’s conventional LCD from Figure 2 met the previous claim limitations 9a and 9b. This is incoherent—Petitioner is either mistaken about Zhang’s teachings or just citing parts of Zhang with no regard for its distinct conventional and improved embodiments.

The closest the Petition comes to articulating a coherent modification is on page 59: “To the extent the disclosure is not explicit, a POSITA would have understood that the teachings of Zhang, as depicted in Figures 3A-3E, would be applied to conventional reflective LCDs with an organic photoresist layer.” Again, *the teaching depicted in Figure 3A-3E is to not use a soft organic photoresist layer, and to instead use a hard material like silicon nitride (Si_3N_4).* See Paper 15 at 31; see also § III, *supra*. If this teaching were “applied to a conventional reflective LCD,” that would mean replacing any organic photoresist layer originally present in the conventional reflective LCD with non-organic silicon nitride. Moreover, there is no analysis about whether this “conventional reflective LCD” would have met claims 9a or 9b before or after this modification.

The only part of Petitioner’s obviousness theory that makes some sense (and why Petitioner is relying on Section 103 obviousness) is Petitioner’s theory that

“Zhang could be modified to form alternative groove patterns in other sawtooth-like shape.” Petition at 62.

B. No Motivation to Swap an Organic or Inorganic Layer (claims 1 and 9)

The closest the Petition comes to articulating a motivation to swap the inorganic layer over a conventional organic layer (or vice versa) is on pages 59–60.

To the extent the disclosure is not explicit, a POSITA would have understood that the teachings of Zhang, as depicted in Figures 3A-3E, would be applied to conventional reflective LCDs with an organic photoresist layer to obtain similar improvements in adhesion and would have had a reasonable expectation of success doing so. EX1003, ¶192. For example, a POSITA would have understood Zhang to teach both an opening through an organic photoresist layer (e.g., Figs. 2A-B) as well as an opening through an organic photoresist and additional layers (e.g., Figs. 3B-E), such as a protective layer, to expose the underlying layers. *Id.* A POSITA would have been motivated to implement Zhang’s teachings within a

conventional reflective LCDs to increase the contact area and allow more sealant to penetrate the groove or opening to create a stronger bond. *Id.*

Petition at 59–60 (highlighting added). There are two alleged motivations.

First, the motivation to “obtain similar improvements in adhesion” is achieved in part by *not adhering to a soft organic layer, and to instead use a hard material like silicon nitride (Si_3N_4)*. See Paper 15 at 31; Ex. 2008, ¶212–214; see also § III, *supra*. This is a motivation to NOT use organic layers.

Second, the motivation to “increase the contact area and allow more sealant to penetrate the groove or opening to create a stronger bond” has nothing to do with changing a material type from organic to inorganic. Ex. 2008, ¶ 190–92. For example, Zhang shows how the sealant penetrates into progressively deeper grooves across Figures 3C–3E to increase the contact area. This technique is independent of material type.

Thus, neither of these proposed motivations indicate any reason a POSITA would use the soft organic layer that Zhang taught away from instead of silicon nitride. MPEP § 2144.05(III)(B), § 2145.

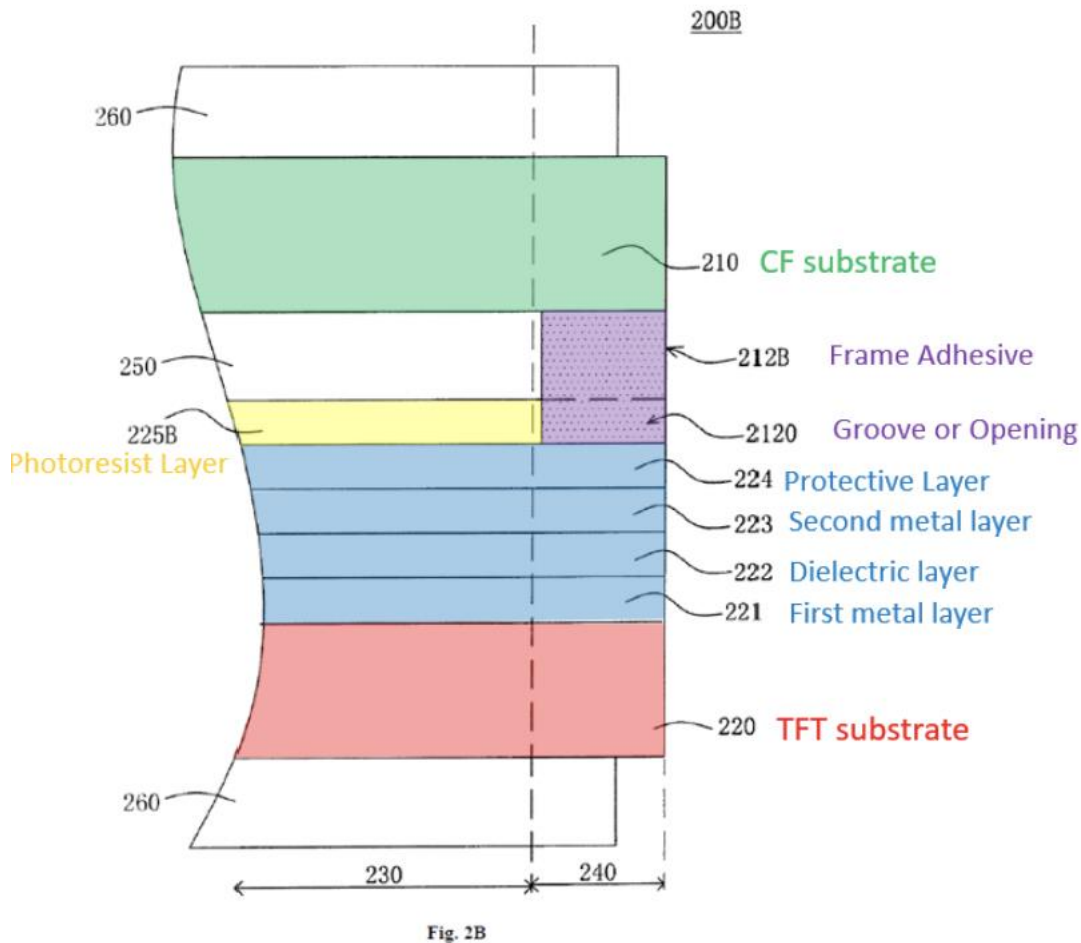
C. Affirmative Evidence Against the Combination (claims 1 and 9)

As Dr. Bretschneider explains in his declaration, Zhang discloses an organic material pattern layer as part of the prior art but *explicitly includes only inorganic materials in the actual embodiments of the invention*. Ex. 2008, ¶ 191. Ex. 1006, at 6 (“photoresist layer 225A can be composed of an organic material”). With respect to the embodiments of the invention, Zhang states, “the second covering layer 380a

is a protective layer 324.” Ex. 1006 at 10; *see also id.* at Fig. 3C (explicitly labeling protective layer 324). Zhang also states, “the protective layer 324 is composed of silicon dioxide (SiO₂) or silicon nitride (Si₃N₄).” *Id.* at 10. Indeed, Zhang explicitly teaches that “the bonding strength of the assembled liquid crystal display panels 100, **200A, and 200B is insufficient**. During reliability tests or drop tests, the panels are prone to developing cracks at the contact interface between the TFT substrate and the CF substrate due to impact or vibrational forces. This results in damage to the display panel, significantly affecting the quality of the display panel.” Ex. 1006 at 7. As such, a POSITA would have recognized that Zhang explicitly teaches away from conventional LCDs that implements an organic layer, and a POSITA would not have been motivated to use an organic layer in place of silicon nitride. MPEP 2144.05(III)(B).

D. Modified Zhang Figure 2 Does Not Meet Claim Elements 9[b] or 9[c]

Even assuming a POSITA would have modified Zhang figures 2A-2B, for some unarticulated reason that neither Petitioner or it’s expert can explain, it would still fail to meet claim elements [9b] and [9c] because there are too many intervening layers.



Ex. 1006 at Fig. 2B.

Under Patent Owner’s construction of the term “layer,” which is a “film of a material created during manufacturing,” the figures 2A/B of Zhang includes too many layers to be the claimed “predetermined material layer.” *See* § IV.A. Further, under Patent Owner’s construction of the term “formed on,” which is “forming in a manner directly touching the below layer or substrate,” the figures 2A/B of Zhang show that photoresist layer 225B is formed on protective layer 224, and that protective layer 224 is formed on second metal layer 223. *See* § IV.B. In other

words, protective layer 224 cannot be the claimed “predetermined material layer” because is *not formed on the substrate as required by claim [9b]*.

Alternatively, claim [9c] is not satisfied because only first metal layer 221 is formed on the substrate and the photoresist layer 225B is not formed on the first metal layer. Thus, first metal layer 221 cannot be the “predetermined material layer.”

The same analysis applies to Zhang figure 2A. Thus, any modification proposed by petitioner to Zhang figure 2A or 2B is not only improper but does not meet the language of claim elements [9b] and [9c].

E. None of the Other Claims are Obvious

Claim 9 is not rendered obvious by Zhang for the reasons discussed above in § X and throughout.

Claim 10 is not rendered obvious because it depends from claim 9 and further because Petitioner has provided no reasoning that a POSITA would have used a predetermined angle less than about 60 degree but rather states generally that angled openings less than 60 degrees were known in the art. Petition at 68. As explained throughout, none of the references Petitioner has identified are for sealing. *See, e.g.,* § III, *supra*. Specifically, Vaganov relates to wafer to wafer bonding of specific crystalline structures; Kim 452 is related to allowing a better contact structure and does not mention sealing; Yamazaki 336 discloses tapering for ion doping, not

sealing. Further, (1) Shinego does not teach an angle in an organic layer as claimed, (2) Yamazaki 496 discloses angles for reflecting light, not for sealing, (3) Shimada 722 similarly teaches using angles to reflect light, not for sealing, (4) Shimada 376 also teaches using angles to reflect light, not for sealing, (5) Kim 935 teaches using angles to reflect light, not for sealing, (6) Tanaka teaches that using any etch process that does not result in an undercut, and (7) Miyoshi is not in evidence. Thus, claim 10 is not rendered obvious by Zhang.

Claim 11 is not obvious for at least the same reasons as claim 10.

Claim 12 and 13 depend from claim 9 and are not obvious over Zhang for at least the same reasons.

Claim 1 recites similar elements to claim 9 and is not obvious for the same reasons as claim 9.

Claim 2–6 depend from claim 1 and are not obvious for the same reasons.

XI. Ground 7 (Zhang, Vaganov § 103)

A. Vaganov Fails to Cure Zhang’s Deficiency Regarding Using an Organic Layer (claims 1 and 9)

As discussed above in § 0, Zhang fails to disclose or render obvious using an organic layer. Nothing in Vaganov cures this deficiency and Petitioner makes no assertion that it does so. *See* Ex. 2008, ¶ 196. Thus, the combination of Zhang and Vaganov do not render the ’801 Patent obvious.

B. No Motivation/Ability to Combine (claims 1 and 9)

For similar reasons to those discussed above in relation to Ground 3, a POSITA would not seek to combine Zhang and Vaganov because they apply in different circumstances. Ex. 2008, ¶¶ 197–99. More specifically, the teachings of Vaganov are directed specifically to inorganic single crystal wafers and there is no teaching that the techniques of Vaganov, which require a single crystalline structure like that of a semiconductor wafer, could be used with a non-crystalline, non-wafer organic layer. *Id.* They cannot be used on an organic layer.

C. The Other Claims Are Not Obvious

Patent Owner incorporates its response to ground 6 and further asserts a lack of motivation to combine Zhang and Vaganov. Claims 10 and 11 depend from claim 9 and are not obvious for at least the same reasons. Claims 2, 3, and 6 depend from claim 1 and are not obvious for at least the same reasons.

XII. Ground 8 (Zhang, Yamazaki § 103)

A. Yamazaki Fails to Cure Zhang’s Deficiency Regarding Using an Organic Layer

As discussed above in § 0, Zhang fails to disclose or render obvious using an organic layer. Nothing in Yamazaki cures this deficiency and Petitioner makes no assertion that it does so. Thus, the combination of Zhang and Yamazaki do not render the ’801 Patent obvious.

B. No Motivation to Combine

As discussed above in §§ III.E and IX.A, Yamazaki's tapering is formed for *ion implantation*, not for adhesion. Ex. 1009, 12:42-47 ("In addition, the side surface of the high thermostability planarizing *film 16 is formed to have a tapered shape so as to be doped.*"), 5:45-49 ("However, when the inert element is added by using plasma treatment or oblique doping, a side surface of the high thermostability planarizing film can be modified *without forming the edge portion to have a tapered shape.*") (emphasis added); Ex. 2008, ¶¶87–96. Thus, in the absence of a call for ion implantation, Yamazaki teaches away from forming the tapered shape. Ex. 2008, ¶¶ 200–03.

Further, the object of Yamazaki was "to provide a high reliable EL display device and a manufacturing method thereof by shielding intruding moisture or oxygen . . . without enlarging the EL display device." Ex. 1009 at abstract. Adding a taper to the vias of Kwak would necessarily enlarge the device, as reducing any angles of Kwak's via without adjusting the depth would require more space in a lateral direction.

C. The Claims are Not Obvious

Patent Owner incorporates ground 6 and further asserts a lack of motivation to combine Zhang and Yamazaki. Claims 10 and 11 depend from claim 9 and are

not obvious for at least the same reasons. Claims 2, 3, and 6 depend from claim 1 and are not obvious for at least the same reasons.

XIII. Conclusion

For the reasons set forth above, Patent Owner respectfully requests that the Board find all challenged claims not unpatentable.

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 13,305. 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).

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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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