

UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE PATENT TRIAL AND APPEAL BOARD

RUNERGY USA INC., RUNERGY ALABAMA INC., MUNDRA SOLAR PV
LTD., ADANI SOLAR USA INC., and CANADIAN SOLAR (USA) INC.¹

Petitioners,

v.

TRINA SOLAR CO., LTD.,

Patent Owner.

Case No. IPR2025-00007
U.S. Patent No. 9,722,104

PATENT OWNER'S SUR-REPLY

¹ Mundra Solar PV Ltd. and Adani Solar USA Inc. were joined as petitioners in this proceeding based on a petition and motion for joinder filed in IPR2025-00187, which was granted. Canadian Solar (USA) Inc. was joined as a petitioner in this proceeding based on a petition and motion for joinder filed in IPR2025-00917, which was granted

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TABLE OF EXHIBITS

Exhibit	Description
2001	Expert Declaration of Dr. Martin Peckerar
2002	Transcript from the June 20, 2025 Deposition of Dr. Sanjay Banerjee
2003	U.S. Patent No. 5,989,718 to Smith et al.
2004	Yousuf et al., “A Review on TOPCon Solar Cell Technology,” Current Photovoltaic Research 9(3) 75-83 (2021)
2005	Yousuf et al., “Tunnel Oxide Deposition Techniques and Their Parametric Influence on Nano-Scaled SiO _x Layer of TOPCon Solar Cell: A Review,” Energies 2022
2006	Glunz et al., “Silicon-based passivating contacts: The TOPCon route,” Prog Photovolt Res Appl. 2021: 1-19 (2021)
2007	Kreig et al., “Wet Chemical Poly-Si(n) Wrap-Around Removal for TOPCon Solar Cells,” EPJ Photovoltaics 15, 9 (2024).
2008	Yamaguchi et al., “Characterization of Tunnel Oxide Passivated Contact Fabricated by Sputtering and Ion Implantation Technique,” Japanese Journal of Applied Physics 62 SK1024 (2023)
2009	Christiansen, “Thermal Oxidation of structured Silicon Dioxide,” ECS Journal of Solid State Science and Technology, 3 (5) N63-N68 (2014)
2010	Transcript from the November 20, 2025 Deposition of Dr. Sanjay Banerjee

I. INTRODUCTION

Patent Owner Trina Solar Co., Ltd. submits this sur-reply in further opposition to the Petition and in response to Petitioner's Reply (Paper 20) relating to U.S. Patent No. 9,722,104 ("the '104 patent").

The Reply confirms—again and again—that the Petition in this proceeding is premised on nothing more than impermissible hindsight. Rather than explaining why a POSITA would have been motivated to stitch together the different prior art teachings relied on throughout the Petition to achieve the claimed subject matter, Petitioner does nothing more than point out that these teachings are simply among many potential options in the prior art that could possibly be used. No reason is provided. No explanation of why a POSITA would expect to succeed is given. Indeed, Petitioner leaves the majority of Patent Owner's expert testimony explaining why a POSITA would not have combined the art discussed in the Petition uncontested. Petitioner did not even bother to take the expert's deposition. Even more problematically, Petitioner relies repeatedly on the '104 patent itself as a guide. The fact that the '104 patent omits tunnel oxide from its "isolation portion" does not show that it would have been obvious to do the same with Jin and Feldmann or Chang and Jim. Petitioner's attempts to leverage the '104 patent's disclosure is improper. Petitioner has not met its burden. The patentability of the '104 patent's claims must be confirmed.

II. ARGUMENT

Petitioner has failed to show that the claims of the '104 patent are obvious.

A. Jin and Feldmann Do Not Render the Claims Obvious

The Petition began by discussing the combination of Jin and Feldmann. *See* Petition (Paper 1), 23-47. Patent Owner responded by pointing out that there are several fundamental technical issues with the Petition's argument regarding these references. In particular, Jin and Feldmann are incompatible and discuss completely different types of solar cells. *See* Response (Paper 16), 16. And even more problematically, in attempting to stitch Jin and Feldmann together, the Petition made several inexplicable and unsupported technical choices. *See, e.g., id.*, 16-39. Patent Owner supported all this with comprehensive expert testimony explaining the issues with Petitioner's combinations. *See* Ex. 2001. Petitioner did not depose Patent Owner's expert and simply accepts most of what the expert says.

Apparently recognizing the significance of these issues, Petitioner deprioritized the Jin and Feldmann combination by moving it to the back of its reply. *See* Reply, 16-29. It also dropped its similar Jin and Feldmann arguments in the parties' co-pending ITC action. Patent Owner submits that this constitutes a tacit admission that this ground lacks merit. Jin and Feldmann do not (and cannot) render the '104 patent's claims obvious. The Petition—and the reply—fall well short.

Once again, Jin and Feldmann relate to very different types of solar cells. Jin teaches a standard, old-fashioned solar cell with a backside layer doped into the cell's silicon substrate. See Jin, ¶ [0026]; Fig. 3. Feldmann, however, relates to a more modern TOPCon solar cell employing a very thin tunnel oxide layer and a doped polysilicon layer grown and deposited on top of the back of the substrate. See Feldmann, 272. In attempting to combine these two different references, the Petition posited that a POSITA purportedly would have made a series of very specific manufacturing and design choices. Each of these choices is **fundamental** to the Petition's argument. And each is **required** to arrive at the '104 patent's claimed subject matter.

More particularly, according to the Petition (and Petitioner's reply), a POSITA purportedly would have: (1) attempted to form a tunnel oxide layer on the backside of Jin's substrate via CVD, (2) believed that a tunnel oxide layer formed via CVD has the potential to trap "impurities" and create "p-type inversion" in the substrate, (3) would have then attempted to address this supposed "impurities" trapping problem by using a shadow mask when depositing the tunnel oxide to eliminate it from an "isolation portion," and (4) would have discarded virtually all of Feldmann's and Jin's teachings about the key structural elements of their respective solar cells. **All** these choices are required to produce the claimed subject matter. If **any one** of the choices is not made, the Petition's argument fails. But,

besides noting that TOPCon cells, CVD, masks, and different cell designs were generally known in the prior art, the Petition **never explains** why a POSITA would have been motivated to do any of this. Indeed, the Petitioner **failed to even respond** to the bulk of the points made by Patent Owner and its expert.

First, Patent Owner highlighted that neither Jin nor Feldmann employ CVD to form their backside layers as Petitioner does in its proposed combination. *See* Response, 20-21, 29-31. Jin forms its backside layer using “heat diffusion,” “laser doping,” or “ion implantation.” Jin, ¶¶ [0084], [0094]. It does not even include a tunnel oxide layer. While Feldmann includes a tunnel oxide, it is not formed via standard CVD. Instead, it is “grown” using a “wet chemical” process. Feldmann, 271. This—as Patent Owner’s expert explained—is consistent with how such a layer was typically formed in the art: tunnel oxides were grown on the entire substrate backside via either a thermal or chemical process. *See* Response, 31-32 (citing Ex. 2001, ¶¶ 199-200).

Petitioner failed to dispute this. It simply points out that CVD was known and **could** have been used to deposit a tunnel oxide. *See, e.g.*, Reply, 22 (noting that “Chang discloses that tunnel oxides can be formed using CVD”); Ex. 2010, 20:22-21, 27:13-28:13 (Petitioner’s expert relied on the use of PECVD or ALD with a mask—and not thermal oxidation—when forming a tunnel oxide layer. No explanation was provided, however, of **why** a POSITA would have departed from

the standard methods of the prior art and used other, unusual methods instead. This absence of explanation is particularly inexplicable given that Petitioner's chosen methods supposedly introduce problems that would not be present if the standard methods were used.

Second, Patent Owner highlighted that the Petition's sole basis for excluding tunnel oxide from the "isolation portion" (as all the '104 patent claims-at-issue require) in the combination of Jin and Feldmann was the unsupported opinion of its expert. See Response, 27. According to Petitioner's expert, removing the tunnel oxide from the "isolation portion" of a solar cell is necessary because a CVD deposited tunnel oxide layer can supposedly "trap impurities and create negative fixed oxide charges, which could then create a p-type inversion in the n-type based substrate, leading to a leakage path...." *E.g.*, Ex. 1003, ¶ 113; Ex. 2010, 24:3-21 (Petitioner's expert confirming that it is only the presence of negative fixed charges that would require oxide removal). Neither Jin nor Feldmann—nor any other prior art for that matter—identifies any issues whatsoever with "trap[ping] impurities" in a tunnel oxide layer, or the supposed creation of "negative fixed oxide charges," or "p-type inversion[.]" Indeed, Petitioner cited nothing in support of its expert's assertion despite the fact that it is central to its obviousness argument. Patent Owner pointed out—with supporting expert testimony—that there would be no such issue if the tunnel oxide were grown on the cell substrate backside as it typically is in the

prior art. *See* Response, 27 (*citing* Ex. 2001, ¶¶ 155-162). Moreover, Patent Owner also highlighted that impurity trapping cannot be a problem because even if the tunnel oxide is left out of the “isolation portion,” this area of the solar cell is filled with a passivation layer in a later step that can be made from the same oxide material. *See* Response, 27-28. So, in sum, the Petition employed an unusual tunnel oxide forming technique (CVD) that creates a supposed issue that no other art recognizes or expresses any concern about (impurity trapping).

Petitioner also failed to meaningfully respond to (or even dispute) any of this. The reply points to nothing showing that the prior art would have recognized any sort of issue with “trap[ping]” impurities in a tunnel oxide. It also does not dispute Patent Owner’s expert’s explanation that there is no impurity trapping issue (and thus no reason to exclude the tunnel oxide) when a tunnel oxide is grown on the backside of the cell substrate as it typically is in a TOPCon solar cell.

Petitioner’s reply does cite to its expert declaration—which itself cites a handful of published articles not otherwise discussed in the reply—in an attempt to buttress its argument. *See, e.g.*, Reply, 21-22 (*citing* Ex. 1037, ¶¶ 50-56). There are numerous issues with this. To begin, it constitutes an improper incorporation by reference. Evidence must be in Petitioner’s briefing, not merely an expert declaration. The reply makes none of the points—and cites none of the evidence—discussed in the declaration. *See* 37 CFR 42.6(a)(3) (“[a]rguments must not be

incorporated by reference from one document into another document”); *see also* *Cisco Sys., Inc. v. C-Cation Techs., LLC*, Case IPR2014-00454, Paper 12, at 10 (P.T.A.B. Aug. 29, 2014) (Informative). Next, it was improper for Petitioner to first introduce evidence necessary to carry its burden in reply. Again, the only reason the Petition identified for excluding a tunnel oxide from the “isolation portion” of a solar cell is that including the oxide in this area supposedly has the potential to result in “negative fixed charges” in the oxide and “p-type inversion” in the substrate. Because this point was fundamental to the Petition’s argument, all required evidence was required to be part of the petition. *VidStream LLC v. Twitter, Inc.*, 981 F.3d 1060, 1064 (Fed. Cir. 2020) (noting that a “[p]etitioner may not submit new evidence or argument in reply that it could have presented earlier”).

Finally, the evidence identified in Petitioner’s untimely expert declaration—even if considered—simply serves to confirm why it would not have been obvious to combine the art in the manner the Petition suggested. As explained by Petitioner’s expert, a POSITA would have recognized that “negative fixed charges” only appear when an oxide layer is deposited via CVD. “[T]hermal growth results in positive fixed charges.” Ex. 1037, ¶ 52; *see also id.*, ¶¶ 55-56; Ex. 2010, 26:12-27:11 (Petitioner’s expert confirming that use of thermal oxidation does not produce the “p-type inversion” issue discussed in his declaration). It follows that a POSITA would have been dissuaded from using CVD in the first place (as this creates a

substrate inversion issue) and would have instead preferred thermal oxidation (the standard method used in the art) when forming a tunnel oxide layer. But when thermal oxidation is used, there is **no longer a reason** to exclude the oxide from the “isolation portion” of the solar cell (nor is it possible to do so via a mask). In sum, all that Petitioner does is show that it has chosen and relies on a non-standard tunnel oxide deposition method (CVD) for the sole purpose of creating an otherwise avoidable problem (negative fixed charges) that purportedly needs the ’104 patent’s solution.

Petitioner’s reply also makes yet another unexplained choice. To avoid creating an inconsistency between its suggestion that the tunnel oxide be removed from the “isolation portion” and the separate claim requirement that there be a rear “passivation layer” (which can be silicon oxide) in this same area, Petitioner argues that Jin’s rear passivation layer could be made from “several different materials” besides silicon oxide. Reply, 22. But again, no explanation is provided of **why** a material other than silicon oxide would be chosen.

Third, Patent Owner pointed out that no prior art employed a mask when forming the tunnel oxide layers employed by a TOPCon solar cell. See Response, 29-31. This—like the rest of the Response—was supported both expert testimony and industry publications summarizing available TOPCon manufacturing processes. See *id.* (citing Ex. 2001, ¶¶ 179-183; Exs. 2004, 2005, 2006, 2008).) Patent Owner

also explained—again with supporting evidence and expert testimony—that a POSITA would have considered it virtually impossible to form a thin tunnel oxide with a shadow mask. *See* Response, 30-32 (citing Ex. 2001, ¶¶ 193-198; Exs. 1031, 2005, 2009.)

Once again, Petitioner failed to dispute Patent Owner’s evidence. It points to nothing showing that masks were used during TOPCon cell formation prior to the ’104 patent’s filing. It points to nothing showing that ultrathin layers can be successfully formed using a mask. Instead, Petitioner’s only response was that masks were “generally” known in the “solar cell design” field and thus could conceivably have been used to form a tunnel oxide when combining Jin and Feldmann. *See* Reply, 23-25.

Fourth, Patent Owner pointed out—and its expert confirmed—that the Petition’s combination eliminates virtually all the solar cell efficiency benefits and key design features set forth in both Jin and Feldmann. Jin employs areas of increased doping adjacent to its finger electrodes to increase efficiency. *See* Response, 35-36 (citing Jin, ¶¶ [0006], [0032], [0042]-[0043]).) And Feldmann employs a metallization layer that covers the entire backside of its solar cell to improve contact efficiency. *See* Response, 36-37 (citing Feldmann, 272-273). Further, Feldmann explains that the tunnel oxide is “vital” and should be present across the entire rear surface of a solar cell to achieve “excellent passivation.”

Feldmann, p. 270. It also explains that use of a rear “insulating dielectric layer” “contradict[s]” its “TOPCon structure.” *Id.*, p. 273. The Petition’s combination includes none of these features: because it replaces Jin’s backside layer with Feldmann’s, it no longer includes areas of increased doping. *See* Response, 37. But it also does not employ Feldmann’s improved rear metallization. *See id.* And it fails to follow Feldmann’s teaching regarding maximization of the size of the “vital” tunnel oxide and includes the very type of dielectric layer Feldmann says “contradict[s]” its teachings. The Response and Patent Owner’s expert explained why this would have had a detrimental impact on the efficiency of the combined solar cell. Response, 36-37 (citing Ex. 2001, ¶¶ 237-256).

Petitioner’s response to this is simply more of the same. It failed explain why a POSITA would have been motivated to combine Jin and Feldmann in the specific way set forth in the Petition. Despite the fact that both references prefer other designs, Petitioner posits that it was free to pick and choose whatever “various important features” and “productive teachings” from Jin and Feldmann it wanted. Reply, 29. It was also somehow Patent Owner’s burden to provide a “quantitative analysis” showing that Petitioner’s stitched together version of Jin and Feldmann is “less efficient.” *Id.*

So, in sum, all that the Petition has done here is point to the presence of what it considers to be “important” teachings spread throughout the prior art. The art

generically references the use of CVD to solar cell layers. The art references the use of masks. The art references TOPCon solar cells. Both finger contacts and full rear metallization was known. The Petition picks and chooses from all this in an attempt to achieve the claimed subject matter. But “[o]bviousness concerns whether a skilled artisan not only could have made but **would have been motivated** to make the combinations or modifications of prior art to arrive at the claimed inventions.” *Belden Inc. v. Berk-Tek LLC*, 805 F.3d 1064, 1073 (Fed. Cir. 2015) (emphasis added). The mere fact that various concepts were “known” or listed among potential options in the prior art is not enough. “It does not suffice to simply be known. A **reason** for combining must exist.” *Virtek Vision Int’l ULC v. Assembly Guidance Sys., Inc.*, 97 F.4th 882, 888 (Fed. Cir. 2024); *see also InTouch Tech, Inc. v. VGO Commc’ns, Inc.*, 751 F.3d 1327, 1349 (Fed. Cir. 2014) (explaining that it is improper to combine art “like separate pieces of a simple jigsaw puzzle” without “explain[ing] what reason or motivation” a POSITA “would have had to place these pieces together”). This is what is missing here: the required explanation of **why** a POSITA **would have made** the series of choices the Petition did to arrive at the claimed subject matter. Indeed, the record is replete unrebutted evidence showing that a POSITA **would not** have made the series of choices necessary for Petitioner’s argument to succeed.

If all this were not enough, Petitioner repeatedly points to the '104 patent itself in a misguided effort to show obviousness. According to Petitioner, because the patent itself excludes both the tunnel oxide and polysilicon layer from its “isolation portion” and does not articulate any “unexpected results,” it must have been obvious to arrange Jin and Feldmann in the way the claims require. *See, e.g.*, Reply, 23 (“The POR ... provides no unexpected results by the 104 Patent’s removal of the tunnel oxide” supposedly “support[ing] the finding that the claimed invention was obvious”). “The inventor’s own path itself never leads to a conclusion of obviousness; that is hindsight.” *Otsuka Pharm. Co. v. Sandoz, Inc.*, 678 F.3d 1280, 1296 (Fed. Cir. 2012). Petitioner was required to show why the prior art would have led a POSITA to the claimed subject matter. It did not do so.

Not only does Petitioner’s showing fall short, but Patent Owner pointed to several affirmative reasons why a POSITA would have included tunnel oxide in the “isolation portion” of Jin’s / Feldmann’s solar cell. In particular, doing so would have improved efficiency, and reduce the incidence of short circuit and unwanted dopant diffusion. *See* Response, 22-25; Ex. 2010, 34:2-10 (Petitioner’s expert agreeing that “even a thin oxide would block diffusion to a greater degree than having no oxide at all”). This—like the rest of Patent Owner’s response—was supported by expert testimony. *See* Response, 22-25. In reply, Petitioner disputes whether a tunnel oxide “prevents electrical contact and diffusion of dopants into the

substrate.” Reply, 21. Even if true, this does not supply the missing motivation. The mere absence of benefit does not mean that it would have been obvious to remove the tunnel oxide from the “isolation portion.” In any event, Petitioner failed to respond to the Response’s points and associated expert testimony. As Patent Owner explained, for there to be a short circuit, charge would need to tunnel diagonally from Jin’s/Feldmann’s polysilicon layer through tens of thousands of nanometers of tunnel oxide to reach the sides of the solar cell. *See* Ex. 2001, ¶ 154. Patent Owner’s expert explained why this is not possible. *See id.*; Ex. 2010, 22:23-24:1 (Petitioner’s expert agreeing that tunneling occurs across—not laterally through—tunnel oxide). Moreover, Patent Owner’s expert explained why excluding the tunnel oxide from the “isolation portion” would increase surface recombination thus reducing cell efficiency. *See* Ex. 2001, ¶¶ 139-141. It would also allow doped polysilicon to contact the substrate surfaces. *See id.*, ¶¶ 218-220. Petitioner offered no response to these points. It failed to depose or otherwise challenge this expert testimony effectively conceding that these are all reasons to **not** combine the art in the way it proposes.

B. Chang and Jin Do Not Render the Claims Obvious

While it attempts to disguise this by moving the ground to the front of its reply, Petitioner’s arguments regarding Chang and Jin are even **more** deficient. Petitioner once again does not explain why a POSITA would have employed CVD

and a mask when forming Chang's tunnel oxide (or why this would have been expected to succeed). Moreover, it also fails to explain why a POSITA would have pulled the various teachings from Chang and stitched them together in the way necessary to arrive at the claims.

First, the Response pointed out that Chang does not include an "isolation portion" in any of the example solar cells shown in its figures. *See* Response, 41-43. It also explicitly states that its solar cell is intended to be structured such that the "necessity of performing an isolation process ... is eliminated." *Id.* (quoting Chang, ¶ [0076].) In reply, Petitioner argues this is "a specific embodiment different than the one relied on by the Petition." Reply, 6. Per Petitioner, the Petition relies only on an "embodiment" in Chang where "thermal diffusion" is used in place of "ion implantation" to form the frontside emitter. *See id.* at 6-8; Ex. 2010, 13:20-14:7 (Petitioner's expert opinion relies on use of a method like thermal diffusion and not ion implantation). There is, however, no "embodiment" that employs "thermal diffusion" in Chang to form the type of structure shown in Petitioner's reply (*i.e.*, one where dopant extends down the sides of a solar cell). Thermal diffusion is simply listed among a laundry list of options that can potentially be used when forming the layers of a solar cell. *See, e.g.*, Chang, ¶ [0098]; Ex. 2010, 29:3-30:5 (Petitioner's expert agreeing that Chang references and employs ion implantations in certain of its embodiments). So, Petitioner has once again chosen a particular

manufacturing method—thermal diffusion—for the specific purpose of creating a problem that it then solves using the ’104 patent’s isolation method. But Petitioner never explains why a POSITA would have chosen thermal diffusion in the first place (particularly since Chang undeniably prefers other methods that “eliminat[e]” the need for isolation). See Ex. 2010, 14:9-21 (Petitioner’s expert agreeing that “you would not need an isolation” if ion implantation used). Moreover, thermal diffusion does not even necessarily result in dopant in the sides of a solar cell. See *id.*, 14:23-15:14 (noting that cites of substrate can be masked avoiding doping). Petitioner offered no explanation—besides an apparent desire to achieve the claimed subject matter—why a POSITA would have used thermal diffusion in a way that creates the types of doping problems on which the Petition relies instead of simply avoiding these problems in the first place. Even more questionably, while Petitioner and its expert rely on use of a thermal method to form the frontside emitter, they purposely and inconsistently did not consider use of thermal methods on the backside surface (as this would have eliminated the need to exclude tunnel oxide from the “isolation portion”).

Second, the Response pointed out—and Petitioner’s expert confirmed—that while Chang does state that certain of its layers can be omitted from the “periphery region” or “isolation region” of a solar cell, this is not necessarily referring to the very edge of the solar cell as the ’104 patent’s claims require. See Response, 44.

Petitioner does not dispute that it was known that isolation can be present in an area other than the edge. *See generally* Reply, 8-10. Instead, it simply points out that it can be located at the very edge (as shown by Jin). Once again, there is no explanation of why a POSITA would have been motivated to locate isolation there apart from the fact that it is one possibility among many.

Third, the Response also highlighted that to the extent a POSITA did for some reason “exclud[e]” layers from “pre-designated or inevitably formed regions such as periphery region, isolation region or the like,” the same could be done on both the frontside and backside of the solar cell. Response, 44-45 (quoting Chang, ¶¶ [0045], [0051], [0056], [0062].) When there is isolation on both surfaces, the ’104 patent’s claims are not satisfied (as any backside isolation would then not be “for preventing a contact between the polysilicon layer and the emitter region”). *Id.*, 45. Petitioner does not deny that such a structure falls outside the claim scope. Instead, its only reply is that “[t]he Petition does not rely on embodiments in Chang that have a front isolation region.” Reply, 10; Ex. 2010, 17:20-19:22 (Petitioner’s expert relied on implementation of Chang where layers are excluded only from the rear surface but nowhere else). Once again, there are no “embodiments” in Chang that include isolation. All of Chang’s figures show the solar cell’s various layers proceeding to the very edge of the substrate. So, what the Petition has done is taken Chang’s separate, broad definition of the term “entirely formed” (which it argues embraces

layers that do not cover the “periphery region, isolation region or the like”) and then selectively applied it to Chang’s actual embodiments (which include no such isolation). But as it does throughout the Petition and Reply, Petitioner does not explain why a POSITA would have been motivated to make this specific choice. No explanation is provided of why isolation would be applied only to the back but not the front besides the fact that this is purportedly one possible permutation when Chang’s many different cell arrangement teachings are combined.

This is not even the only unexplained layer design choice made by Petitioner. While it argues that Chang’s tunnel oxide and polysilicon layers would be excluded from a solar cell’s periphery, Petitioner nonetheless argues that the “passivation film 31” would for some reason continue to cover the entire back surface of the solar cell, including the “periphery isolation region.” Reply, 4. Petitioner proposes this arrangement because the ’104 patent’s claims require a “passivation film” that “covers the first surface of the semiconductor substrate and the isolation portion together.” ’104 patent, claim 1. But Chang explicitly states that its passivation film is meant to be coextensive with the “back surface field area 30.” Chang, ¶ [0063]. Petitioner never explains why a POSITA would have both (1) excluded Chang’s tunnel oxide and polysilicon layers from the solar cell periphery, but then (2) ignored Chang’s teaching that the passivation film should be co-extensive with these two backside field layers. This is yet another example of improper hindsight-based

analysis: Petitioner picks-and-chooses from Chang solely for purposes of arriving at the claims (and not because this is the design path a POSITA would have followed).

Fourth, Petitioner once again fails to explain why a POSITA would have employed CVD when forming Chang's tunnel oxide (and not more traditional growth methods), why a POSITA would have attempted to use a mask (when no such mask was used in the art), or where the prior art recognizes any sort of issue with "impurity" trapping and supposed "p-type inversion." *See supra* Section II.A. It also does not dispute that not forming tunnel oxide over the entirety of the backside of Chang's substrate would (1) decrease efficiency and (2) risk getting doped polysilicon on the substrate surface. Nor does it explain why a POSITA would omit tunnel oxide from portions of Chang's substrate despite the fact that Chang repeatedly explains that this layer is necessary to "prevent[]" "damage to the semiconductor substrate" and eliminate "recombination sites." Chang, [0074], [0092].

So, in sum, Petitioner has simply pointed to separate, distinct portions of the prior art without providing any meaningly explanation of why the art would be assembled in the way the claims require. This, however, is a fundamental, required part of any obviousness analysis. The Petition must articulate the "reason for combining." *Virtek Vision Int'l*, 97 F.4th at 888. Simply pointing to the fact that a POSITA could apply isolation only to the backside layers but not the front, could

use thermal diffusion to form the frontside emitter thus potentially triggering a need for isolation, could use CVD to form a tunnel oxide, and could try to use a mask is **not** enough to establish that the '104 patent's claims are obvious. Both a reason why a POSITA **would** have made all these choices, and an explanation of **why** a POSITA would expect to succeed was required. The Petition and Reply provide neither.

Moreover, as it does in its Jin and Feldmann ground, Petitioner repeatedly references the '104 patent itself when trying to show that the claims are obvious. *See, e.g.*, Reply, 5 (pointing to the '104 patent's use of "thermal diffusion" as evidence that it would have been obvious to employ this method with Chang), 11 (noting that the fact that the "104 Patent similarly disclose[s] not having the tunnel oxide in the substrate's edge portion" confirms that Chang would also be implemented this way), 12 (referencing "[t]he lack of unexpected results" in an effort to show obviousness). This does not satisfy Petitioner's burden. Instead, it serves to confirm that Petitioner's analysis is nothing more than improper hindsight. *See, e.g., Otsuka Pharm.*, 678 F.3d at 1296.

C. Claim 6 Is Not Obvious

The Response separately explained why neither Jin/Feldmann or Chang/Jin render claim 6 obvious. Response, 40, 46-47. As noted, when a mask is used during formation of a tunnel oxide and polysilicon layer (the Petition employs a mask to produce the required "isolation portion"), both layers will extend beneath the mask.

Since the polysilicon layer is thicker, it will extend well into the area petition identified as the claimed “isolation portion.” *See id.* Patent Owner supported this with expert testimony. *See* Ex. 2001, ¶¶ 258-264.

Petitioner does not dispute that a solar cell’s layers will form in the manner discussed in the Response (with polysilicon accumulating under the mask and on the substrate surface in what the Petition labeled as the “isolation portion”). Instead, the Reply abandons its original argument and proceeds to identify a different portion of the solar cell as the claimed “isolation portion.” Rather than pointing to the same masked portion of the substrate discussed throughout the Petition, Petitioner posits that the claimed “isolation portion” is now just whatever substrate area remains uncovered by polysilicon. *See* Reply, 13-16. This change in position was improper. “[T]he petition [is] the centerpiece of the proceeding both before and after institution.” *SAS Inst., Inc. v. Iancu*, 138 S.Ct. 1348, 1358 (2018). A Petitioner is prohibited from presenting new invalidity arguments in reply. *See Ariosa Diagnostics v. Verinata Health, Inc.*, 805 F.3d 1359, 1367 (Fed. Cir. 2015) (explaining that the Board properly rejected a reply’s presentation of new theories from applied prior art). That is exactly what Petitioner attempts to do here.

Moreover, Petitioner’s new arguments are substantively deficient. The claims require an “isolation portion,” not just an area where both tunnel oxide and polysilicon are absent. Petitioner fails to explain—and provides no evidence

showing—why a solar cell that includes polysilicon touching the substrate surface in proximity to the solar cell’s sides includes “isolation.” Among other things, there is no discussion of how far apart the polysilicon is from adjacent conductive structure, or whether this separation is sufficient to effect “isolation.” Simply labeling structure an “isolation portion” with no other explanation—which is all Petitioner does—falls well short of the required showing.

III. CONCLUSION

For the reasons explained above, Petitioner has not met its burden to show obviousness. The patentability of all of the challenged claims should be confirmed.

Respectfully submitted,

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Dated: December 1, 2025

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CERTIFICATE OF WORD COUNT

The undersigned certifies that the foregoing reply complies with the type-volume limitation in 37 C.F.R. § 42.24. According to the utilized word-processing system's word count, the reply contains 5,063 words.

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