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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

RUNERGY ALABAMA INC. AND RUNERGY USA INC.,
MUNDRA SOLAR PV LTD., ADANI SOLAR USA INC., AND
CANADIAN SOLAR (USA) INC.,
Petitioner,

v.

TRINA SOLAR CO., LTD,
Patent Owner

IPR2025-00006 (Patent 10,230,009 B2)
IPR2025-00007 (Patent 9,722,104 B2)

Record of Oral Hearing
Held: January 29, 2026

BEFORE: GRACE KARAFFA OBERMANN, AVELYN M. ROSS, and DEBRA L. DENNETT, Administrative Patent Judges.

APPEARANCES:

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The above-entitled matter came on for hearing on January 29, 2026, commencing at 1:00 p.m.

P R O C E E D I N G S

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JUDGE DENNETT: Good afternoon, or to those of you in our western time zones, good morning. We are on the record. We are here for the final hearing in IPR2025-0006, -00187, and -00917, joined with the 0006 case, all concerning U.S. Patent 10,230,009, as well as the hearing in IPR2025-0007 and its joined cases, 00186, and 00918, all concerning U.S. Patent Number 9,722,104.

I am Judge Dennett. And Judge Obermann and Judge Ross are joining me today. This hearing is being held remotely; thus, everyone is virtual and no one today is present in a courtroom. As a result, please be aware that there may be slight delays or lags in either the audio or video feeds. Also, please make every effort to speak clearly and avoid speaking over others to assist our court reporter, Lindsay McElhinney.

During your presentation, please reference your slide number that you're referring to, to help ensure the record is clear. We have access to the entire case file if you need to refer to papers or exhibits that are not part of your presentation.

Having heard no objection, we authorized a public line for today's hearing, so please be aware that members of the public may be joining. Petitioner will have 60 minutes to present their argument, and Patent Owner will also have 60 minutes to present theirs. Because Petitioner bears the burden of persuasion, Petitioner will go first. Patent Owner will then have a chance to respond. You may each reserve time for rebuttal.

I have a timer available, but I encourage you to keep track of your

time as well. I will try to give each party warnings when you're near the end of your allotted argument time, but that possibly may not happen in a timely manner, given that first and foremost we're focusing on the arguments at hand.

Before you begin your argument, please remember to introduce yourself and those in your party, and let us know how much time you'd like to reserve for rebuttal.

That said, Counsel for Petitioner, please proceed when you're ready.

MR. TIU: Good afternoon, Your Honor. Samuel Tiu with Sidley Austin, representing the Petitioner, Runergy USA and also Canadian Solar USA that has been joined to this proceeding. Also with me is my colleague, Michael Roberts.

JUDGE DENNETT: Okay. Thank you.

MR. TIU: So Your Honor, may I proceed with the arguments? I have a demonstrative that I'd like to share.

JUDGE DENNETT: You may. Do you wish to reserve any kind of --

MR. TIU: Yes, Your Honor. Maybe 10 minutes.

JUDGE DENNETT: Ten minutes. Okay. Thank you. Yes, go ahead at your ready.

MR. TIU: All right. I'm going to start on Slide 2, Your Honor. And just to level set, there are two challenged patents in this case. They're from the same family and their claims are substantially similar, that's the '009 and the '104. The prior art that we're relying for these proceedings are the Jin, Feldmann, and Chang references, as highlighted on the Slide 2. And

they're the same reference for both proceedings, attacking both -- challenging both the two patents. And the disputed issues are the same for the arguments today, and so we'll apply the focus of our arguments today on the '009 Patent, but -- they equally apply to the '104 and our citation is in the '006 IPR proceeding, just for simplicity at this point.

And before we begin, I wanted to move to Slide 3 and discuss what are undisputed in this case. First of all, TOPCon solar cells were already known in the art prior to the challenged patents. And that's undisputed and it's admitted in Patent Owner's response on page 6. And so what the inventors of the challenged patents have done is simply take TOPCon solar cells, which is known, and include a conventional feature already used in the solar cells to solve a known problem, which is that feature being an isolation portion on the backside edge of a solar cell.

Now, Patent Owner does not dispute satisfaction of most of the claim elements by the prior art relied by Petitioner, except for, number one, the isolation portion limitation in Independent Claim 1. Second, the opening form in the first passivation layer in Independent Claim 1 but only challenging that limitation in the Jin-Feldmann combination.

There's no dispute that that's met in the Chang and Jin combination. And third, they dispute that there's this limitation progressively decreasing toward the isolation portion, which is a limitation found in Dependent Claim 8 of the '009 and Claim 6 of the '104. Those are the disputed limitations.

Now, as we will discuss, all these limitations are disclosed in the prior art that we relied here. And notably, I wanted to point out that secondary considerations weigh in favor of obviousness. This is an

obviousness case, and there is no commercial success, no evidence of commercial success, no nexus, there is no unexpected results, no long felt or unresolved need here, rather, the inventors were simply following conventional wisdom as shown by the prior art that we will go into.

I'm going to move to Slide 4. The timing of the prior art reference is very informative in this case. And like hypothetical arguments that Patent Owner raises, the progression of the prior art through time demonstrate objectively that the '009 and '104 patents were obvious and that there was a motivation to combine the prior art references.

So as explained by -- in the petition and Dr. Banerjee -- and our expert, Dr. Banerjee, the ideas focusing on the top part of the timeline -- the ideas that eventually led to the TOPCon structure in 2014 by Feldmann originated even further back in the 1980s. In 1985, Linholm demonstrated that the benefits of replacing a backside diffused emitter, called the backside -- diffused back surface field, sorry, or BSF, with a polysilicon -- Kwark then showed that if you add a tunnel oxide layer in between that polysilicon and substrate, you would further improve the passivation of the solar cell.

So in 2014, Feldmann expressly said, I'm applying the teaching of Linholm and Kwark to construct a TOPCon solar cell that includes a tunnel oxide and a polysilicon layer for backside surface passivation instead of the diffused-type back surface field.

Now, Feldmann's back -- TOPCon was a monofacial cell, that means that it only absorbs light from the front side. And it doesn't absorb light from the backside because the backside is completely covered with metal. But bifacial cells, meaning a solar cell that absorbs light from the front and also from the back, those were already known in the art, including

1 those with a backside edge isolation region.
2 If we look at the second row, that was disclosed -- the bifacial solar
3 cell has been disclosed, for example, in Jin, in the patent publication filed by
4 LG and published in 2013 even before Feldmann. And Jin solar cell had a
5 diffused backside surface field, a BSF, just like the structure that Linholm,
6 Kwark, or Feldmann taught to replace.
7 And so after Feldmann showed the benefits of applying Linholm
8 and Kwark teaching to replace the diffused emitter with a TOPCon structure.
9 LG filed another patent, Chang, that published in October 2014 after
10 Feldmann. And Chang followed Feldmann seeing -- Jin and Feldmann
11 followed Feldmann and implemented TOPCon structure in a bifacial solar
12 cell.
13 And importantly, Chang also expressly disclosed that on the
14 backside, there must be an isolation region, like Jin, to exclude both the
15 tunnel oxide layer and the polysilicon from the periphery of the substrate.
16 So here, even before the two patents that we're challenging here, a TOPCon
17 solar cell with an isolation portion on the backside peripheral region of the
18 solar cell, that's the edge of the solar cell, was obvious in light of Jin and
19 Feldmann.
20 And in fact, the prior art confirmed that by -- with Chang, which
21 came after Jin and Feldmann and disclosed that. Petitioner submitted under
22 these facts, these patents should be found unpatentable and obvious.
23 I'm going to move to Slide 5 and talk about the disputed issues.
24 Here, for the Jin and Feldmann combination, Patent Owner disputes the
25 motivation to include an isolation portion, it disputes the exclusion of the
26 tunnel oxide at the edge portion, and the motivation to implement the

TOPCon in a bifacial cell, as we will discuss in a minute.

Patent Owner and its expert are wrong in all three. In fact, as we just saw, all three motivations, Chang is the direct evidence showing that a person of ordinary skill in the art would be motivated to include an isolation portion in the TOPCon cell, would be motivated to exclude the tunnel oxide at the edge, and would be motivated to apply TOPCon to a bifacial cell.

And so as I go through my presentation, I will address the evidence of the Chang disclosing the backside isolation portion that exclude both those layers. And on a reasonable expectation of success, I'll also discuss the evidence on the use of shadow mask in the solar cell industry and the Patent Owner's admission that the use of shadow mask more likely results in the isolation portion, though they dispute -- they raise that as a dispute.

But I want to emphasize on the reasonable expectation of success that this -- Patent Owner is disputing reasonable expectation of success only for the Jin and Feldmann combination. They're not disputing a reasonable expectation of success for the Chang and Jin combination, which is the second ground that we have.

And then we move to Slide 6. To understand why an isolation portion is needed in a solar cell, let's begin our discussion with the problem of electrical shorting in a solar cell. When you fabricate a solar cell, you form a front emitter layer on the front side of the substrate. A common technique that is used to perform this frontside emitter layer is called a thermal diffusion process.

And as Dr. Banerjee explains in paragraph 71 of his open declaration, in this process, the cell is exposed to a dopant gas at high temperature. And the key point is the dopant penetrate into the substrate, but

not just on the frontside but also on the exposed lateral sides of the substrate. And this is shown expressly in Figure 7B on the left hand -- upper left-hand figure that we accepted here from Jin. Figure 7B of Jin shows that when you have that front emitters, then you also form this dopant layer on the lateral side of the substrate.

Now, one thing we -- move to Slide 7. So when you have that, you -- when you now put the back surface field and applied that on the backside, there will be shorting. Because the dopant layer being present on the side walls of the substrate will now be in contact with the back surface field on the backside, so you will have electrical shorting.

And it does not matter whether you have the back surface field as implanted into the substrate or deposited over the substrate. The key here, as explained by Dr. Banerjee in his opening report, paragraph 73, and also described by Jin in paragraphs 58 to 60, is that the conduit for this shorting is the dopant being present on the sidewalls due to the thermal diffusion process that was used to form the front emitter layer.

So I'm going to move to Slide 8. Now, there is no dispute that the prior art - Jin, Feldmann, Chang -- and also the challenged patents all disclose thermal diffusion to make the front emitter layer. In fact, Claim 5 of the '009 Patent claims exactly that, diffusion of these impurities on the second surface -- second surface being the frontside. As we discussed, when you do the diffusion on the frontside, you also diffuse the dopants into the lateral side.

And there is no dispute because Patent Owner is not challenging that any of the prior art -- Jin, Feldmann, and Chang -- discloses this diffusion to make the emitter layer that satisfies Claim 5. This is discussed

in our petition in page 42 and 70. And so all three would potentially suffer from this shorting problem. Petitioner reemphasized this again in our reply brief on page 20 to 21.

So moving to Slide 9. In particular, because Jin and Feldmann both use thermal diffusion on the front emitter, maintaining an isolation portion would be necessary and obvious. It would simply be obvious because you apply a known technique, which is Feldmann TOPCon structure and as -- to a similar device, Jin solar cell with an isolation region, to address a known problem, which is recombination and electrical shorting. Note here that in --

JUDGE DENNETT: Let me -- can I --

MR. TIU: Yes, Your Honor.

JUDGE DENNETT: Pardon me, this is Judge Dennett. Can I just quickly ask one question? Now, the illustration you've got in in Slide 9 here shows Feldmann. It does not -- and you said Feldmann creates its emitter layer by thermal diffusion.

MR. TIU: Right.

JUDGE DENNETT: Why do we not see that in (CROSSTALK)?

MR. TIU: Good question, Your Honor. If you will notice in Jin, there is a wavy break line.

JUDGE DENNETT: Mm-hm.

MR. TIU: So in Jin, they're showing that you're truncated the middle portion of the solar cell, and so you have a wavy break line. And in Feldmann, you're only showing the middle portion of the solar cell and not the entire width of the solar cell, all the way to the lateral side. And Dr. Banerjee actually explains that, and I have later slides to discuss that.

JUDGE DENNETT: Yeah. So I picked that up as clearly as you just explained, so thank you.

MR. TIU: So one thing to note here is that in Jin, the diffused back surface layer does not extend all the way to the edge of the substrate. There is a gap, called the gap T, that Jin thought to keep it separate -- and separate by it from range of 2 microns to 300 microns to prevent the electrical shorting. And as we discussed, the prior art, as the history tells us, teaches that you replace the diffused back surface field with a TOPCon structure.

So if you replace the diffused back surface field that does not extend to the edge with the TOPCon structure, then naturally, the TOPCon structure does not extend to the edge as well, and that's what -- the proposed combination that we have. And in fact, as we will see in a minute, that's what Chang teaches and what -- that's what Chang says to do, as we will discuss later.

Now, I would move to Slide 10. And let's address some of Patent Owner's arguments. Now, Patent Owners argues that, first, Jin is using a ion implantation on the backside surface field. And so if you remove the back surface field, then there's isolation removed -- the need for isolation is also removed. But as we just discussed, it doesn't matter if whether the back surface field is ion implanted or deposited, there will be shorting. Because it's the front emitter portion, when formed with the dope thermal diffusion that also dopes and contaminates the sidewalls, that's what then allowing the shorting to contact the back surface field.

Now, Patent Owner also argues that, well, tunnel oxide already is present, separates the two, it can act as an insulator and the diffusion

1 blocker, so you don't need the isolation portion. Those arguments also do
2 not hold up and they're wrong.
3 Moving to Slide 11. As Dr. Banerjee explains, and supported by
4 the reference, the tunnel oxide layer does not prevent shorting. The tunnel
5 oxide layer allows current to actually pass through. Well, the reason why
6 that oxide layer is called a tunnel layer is because electrons and other charge
7 carriers can still pass through this layer through what's called a quantum
8 mechanic effect of tunneling.
9 And this layer does not block the transport of electrons and
10 carriers. And Dr. Banerjee explains that in his supplemental declaration in
11 paragraph 5. These are expressly stated in the prior reference we relied upon
12 here. Chang in paragraph 57 says, the tunnel layer facilitate transfer of
13 carriers, that's the electrons of holes that constitute the current through the
14 tunnel -- tunneling effect. Feldmann also says the same thing on page 272,
15 tunnel oxide layer does not block the transport of carriers across this layer.
16 So imagine if you have a tunnel oxide layer that somehow does not
17 allow current to pass, as Patent Owner would say it's an insulator, then the
18 TOPCon cell would not even work because no current will be collected,
19 even in the middle portion of the of the backside, away from the peripheral.
20 So clearly, that's not the case in Feldmann, Chang, or the patent.
21 Going to Slide 12. On the issue of TOPCon being a diffusion
22 blocker, Patent Owner says, well, it's diffusion blocker, so you don't need an
23 isolation portion. Sorry, Slide 12. But again, Dr. Banerjee, supported by the
24 prior art reference, disclosed that because the tunnel oxide is thin, it does not
25 prevent diffusion of dopants across it, particularly when you expose it at the
26 very high temperature used in solar cell manufacturing.

Chang in paragraph 149 expressly supports this point, disclosing that the dopant is diffused from the first portion 330A into the substrate to form portion for 30B. Noteworthy, the tunnel layer is between 30A and 30B in Figure 16C. Same thing, Dr. Banerjee provided additional prior art reference, for example, the Yablonovitch Paper, that is Exhibit 1039, that shows that the tunnel oxide doesn't block diffusion. Actually, during when you heat it up, the phosphorus will diffuse 20 to 50 angstrom into the substrate through the tunnel oxide, another reference is the Kwark Exhibit 1024.

And moving to Slide 13. Among the experts, there's no dispute on this. Patent Owner's expert actually agrees with Dr. Banerjee. He testified in his deposition that to be an effective diffusion blocker, the silicon oxide layer, which that's the question this SiO2, the silicon oxide layer would have to be considerably thicker than the tunnel layer.

So here, the tunnel layer is thin, so it's insufficient to block diffusion. And so the Patent Owner's argument there, there's no need for an isolation portion because you already have a tunnel layer separating the two. It simply doesn't hold up.

And in fact, if we look at the actual evidence, right -- and I'm on Slide 14, Chang, we kept talking about -- Chang implemented Feldmann TOPCon structure with an isolation portion. Chang provides direct evidence that the person of ordinary skill in the art would have implemented the TOPCon structure with the claim isolation portion.

In paragraphs 56 and 67 of Chang expressly discusses these two layers, the top -- the tunnel layer and the polysilicon layer. And Chang said that these two layers are formed entirely over the back surface but excluding

inevitably formed regions such as the periphery region, isolation region. Now, these two terms, periphery region, isolation region, they're very specifically listed and mentioned, and they're well understood in the art.

At this time, I'm going to segue -- I'm going to Slide 15. We're going to segue into discussing the disclosure of Chang because since we're -- we talk of Chang a lot. Once we have a proper understanding of Chang, it cuts through many of the arguments the Patent Owners have with respect to Jin and Feldmann, and it resolves also the Petitioners ground with respect to the Chang and Jin combination. So let's talk about what Chang does. We just mentioned the periphery region and the isolation region disclosed in Chang.

In Slide 16. We'll talk about the isolation region. Dr. Banerjee explains that when Chang mentions that you exclude the tunnel oxide and the polysilicon from the isolation region, isolation refers to an introduction of a nonconductive separation. That's a well understood term in -- by a person of ordinary skill in the art. And so when you have a exclusion of those two region, it creates a physical gap, and that is -- gap prevents shorting. Patent Owner does not dispute this understanding of isolation -- of a separation.

And if we look at -- I'll move to Slide 17. Where is this isolation region located? Well, Chang tells us that you exclude it in the periphery region, right? So Dr. Banerjee, again, allows -- helps us explain and said, patent -- a person of ordinary skill in the art would understand periphery to mean the perimeter, the outer limit or edge, just as the ordinary dictionary definition of Webster and Oxford would define them.

So by not forming the tunnel oxide and the polysilicon on the

perimeter. Chang solar cell would have a peripheral isolation region on the perimeter of the backside that excludes both the tunnel oxide and the polysilicon, just like the claim isolation portion.

Now, Patent Owner provides nothing to dispute this understanding of peripheral isolation region. At some point, they suggest that, well, Chang may not necessarily be at the edge in terms of its isolation portion but has no response to this point that Chang specifically mentioned excluded in the periphery region, which means the perimeter or the outer limit.

And I should also point out that since Chang discloses excluding both tunnel oxide and polysilicon in this peripheral isolation region, the law does not require a finding of motivation why Chang would do so. Chang already disclosed and tells us to do it that way. We cited a Federal Circuit case called Realtime Data versus Iancu, a 2019 Federal Circuit decision to support this proposition. We cited this in our reply brief at page 11.

And in fact, just last Friday, January 23rd, 2026, the Federal Circuit reaffirmed this legal principle that there is no need to find a motivation or reason to combine when the limitation is already disclosed in the prior art reference, and that's in the Guardant Health versus University of Washington case, case 24 --2024-1129, decided just last Friday.

JUDGE DENNETT: Sorry, this is Judge Dennett. And let me just ask you a quick question here. Now, your argument about Chang disclosing exclusion of these layers in the periphery isolation region is based on the definition in Chang where it says explicitly, entirely formed means -- I'm going to read it here, "Formed in an entire area, excluding predesignated or inevitably formed regions, such as periphery region, isolation region, or the like." Am I correct in that that's what you're relying on?

MR. TIU: Yes, Your Honor. That's what Chang says --

JUDGE DENNETT: Okay.

MR. TIU: -- expressly, that it's excluded in those regions.

JUDGE DENNETT: Okay. Is there anything about the predesignated -- sorry, predesignated or inevitably formed regions such as -- that needs to be addressed?

MR. TIU: Well, when you -- when we recall how you make this, right, when you put the mask, the shadow mask, onto it, that would be a predesignated area, right? And therefore, you -- inevitably, when you block that region and not form it in that region, then you will lead to a peripheral isolation region because you're blocking it and not forming in those regions when you --

JUDGE DENNETT: And Chang is using a mask?

MR. TIU: Well, Chang --

JUDGE DENNETT: Or combination --

MR. TIU: Combination with Jin, right.

JUDGE DENNETT: -- in the proposed -- okay.

MR. TIU: Note, Your Honor, is that both Jin and Chang were filed by LG. So one person of skill in the art looking at Chang would say, oh, LG filed this just right after they filed Jin, and so they would be looking -- okay, how would they be looking to do this? Jin teaches how to do.

JUDGE DENNETT: Okay.

MR. TIU: Okay.

JUDGE OBERMANN: Counsel, just to be clear --

MR. TIU: Yes.

JUDGE OBERMANN: -- in paragraph 62, when Chang says there

are basically, you know, two things you can do. You can form it over the entire surface, or you can form it over an area that excludes some surfaces. That second way of doing it doesn't that imply masking, or is there some other way of doing that?

MR. TIU: That implies masking, that you don't form it in certain areas, and that implies that you're masking it, you're blocking it so that you don't form it in the area.

JUDGE OBERMANN: In a sense, Chang does disclose masking, and you're using the other reference only to show how to mask was (CROSSTALK)?

MR. TIU: Yes, Your Honor. Correct.

JUDGE OBERMANN: Thank you.

MR. TIU: Yeah. I'm going to move to Slide 17. And the reason is that, you know, the Patent Owner and the expert dismisses these two paragraphs, right? But they're misreading Chang. Because during his deposition, Patent Owners admit that when he reads fully form or entirely form, his reading is in the ordinary meaning of the term, not as the meaning defined by Chang, right? And it's as a matter of patent law, it's a bedrock principle that when a reference or inventor, they can act as their own lexicography and express -- and provide an express definition, and that express definition in Chang should control.

Now, let's move to Slide 19. Patent Owner's argument mainly relies on paragraph 76, and it reads this paragraph 76 as disclosing the elimination of the need for an isolation portion. But Patent Owner is not reading paragraph 76 correctly. Because as the Board recognized in its institution decision, this paragraph does not say that the isolation portion is

not needed in every situation, rather, it's only in a situation when the front and the back surface field are not adjacent to each other, right? So this applies only to certain nonadjacent embodiments in Chang.

But in Chang, there are also adjacent embodiments where the emitter and the back surface field are adjacent to each other. Can a person of ordinary skill in the art identify these embodiments? Yes.

Moving to Slide 20. In paragraph 98 of Chang, it says, in conjunction with Figure 8, Chang discloses the front emitter layer could be formed by thermal diffusion or ion implantation. And as we discussed before, Patent Owner does not dispute that the thermal diffusion satisfies Claim 5 and that thermal diffusion dopes also the lateral sides of the substrate. And so you would have the emitter and the back surface field being adjacent to each other.

In contrast, Chang disclosed an alternative way forming the emitter layer via ion implantation as well. And in ion implantation, as explained by Dr. Banerjee, there's no sidewall doping. So there's no adjacent between the emitter and the back surface when you use ion implantation, so that's the nonadjacent embodiment in Chang. There's no dispute among the experts on this again.

During his deposition, the Patent Owner's expert was asked, Chang disclosed a technique for preventing the emitter from diffusing to the sidewall, right? Yeah, right. What technique is that? Answer, ion implantation. Question followed up, and Chang uses ion implantation that results in a side wall not being contaminated with dopants.

Yeah, that's what he's disclosing, that's the answer from the Patent Owner's expert. And in terms of diffusion, in Slide 22, Patent Owner's

1 expert was asked, if Chang, instead of using iron implantation, use gas
2 diffusion, right, process, would then that need isolation portion? Well, he
3 said, well, I, you know, I have to look at the process. But in general, if you
4 use gas diffusion, you're going to contaminate the sidewalls.
5 And as we see, if you contaminate the sidewalls, you will have an
6 adjacent back surface field because of the sidewalls. And the Board
7 recognized this in this institution decision around Slide 23, that page -- in
8 page 27 of the Board's decision - in the institution decision, Chang
9 paragraph 76 was directed -- or if not directed -- to every single
10 embodiment, but only to certain nonadjacent embodiment.
11 Moving to Slide 24, the ID also recognized on page 28 that based
12 on Dr. Banerjee's testimony in the petition, that the isolation region would be
13 advantageous. Because the emitter layers in Jin and Chang are forming the
14 same matter, the thermal diffusion method, where not only the front but the
15 lateral side surfaces of the substrate that it's emphasized in the decision, the
16 lateral side surface are also dope.
17 And this is -- goes back to the question that Judge Dennett asked,
18 which is what -- Patent Owner says, well, in Chang there's no figures that
19 shows the isolation portion, right? And there is no need -- the law does not
20 require that every feature needs to be shown in the figures. This is what we
21 pointed out in our brief and reply too, and the case is Krippelz versus Ford
22 Motor.
23 But even if we scrutinize that argument carefully, it doesn't make
24 any sense. Because Chang -- if we look at paragraph 26, Chang actually
25 says in paragraphs 30 and 31 that embodiments may be modified in various
26 forms and parts of the solar cell are not illustrated for clear and brief

1 description, right?
2 So the figures are not being -- illustrating the side surface of the
3 substrate, only the middle portion. How do we know this? Because Jin
4 -- remember Jin and Chang are filed by LG, same company, Jin is a perfect
5 example. Figure 2 of Jin does not have a wavy line, and it does not show the
6 isolation region or the side surfaces.
7 That's just like the figures in Chang. Because Figure 2 is only a
8 cross section along lines AA, which is the middle portion of the solar cell,
9 right? The solar cell has many metal electrodes, as you can see from Figure
10 1. And here in Figure 2, it's only showing three, right? So it clearly is not
11 showing the entire substrate.
12 In Figure 3, when you have this wavy break line where Figure 3 is
13 expressly saying that we're showing lines along lines BB, the entire thing.
14 Now, you see the side surfaces and the edge isolation region in Figure 3 of
15 Jin. And so Chang and Feldmann, all those schematics are only showing the
16 middle portion. It doesn't have the wavy line that we see in Figure 3, where
17 it will indicate to you where we're truncating the middle portion. So that
18 explains some of the figures in Chang and Feldmann.
19 Now, I'm going to segue back to Jin and Feldmann after we talked
20 already about Chang and this issue about, well, Patent Owner is disputing
21 whether you can exclude the tunnel oxide at the edge or you include it. And
22 they would argue -- Patent Owner argues that the most natural result of Jin
23 and Feldmann teaching is that you do not exclude at the edge and you extend
24 the tunnel oxide all the way to the edge.
25 But it is not supported by any evidence, and it's also legally
26 irrelevant in the obviousness analysis. Why is it legally irrelevant?

Because, as we mentioned in our brief, reply brief, on page 19 and 20, there's two options here: one, you extend all the way; and one, you don't extend all the way to tunnel oxide. Either way, it doesn't -- it's not necessary for obviousness to show that the combination is the best option, only the suitable option. And those are the cases we cited, Intel versus Qualcomm, Intel versus PACT from the Federal Circuit.

And how do we know that option two, that you don't extend all the way is suitable? Chang tells us in -- I'm moving to Slide 30. Chang tells us to exclude the tunnel oxide in paragraph 56 in the peripheral region. So Chang is the direct evidence that shows that when a person of ordinary skill in the art, looking at Jin and Feldmann, would exclude the tunnel oxide at the edge as well because that's what Chang says to do.

Now, another -- I'm going to move to Slide 32. Patent Owner is to say, well, you know, if you don't extend the tunnel oxide to the end, you'll have that exposed and becomes a recombination site. And so you will, you know, have passivation -- you won't have passivation there. But that's not true.

Because in the Feldmann -- Jin-Feldmann combination, Jin -- because remember, it's a bifacial cell, there's an extra passivation layer that is added, that's the green part 160 after the polysilicon. Because in -- and that's explained by Dr. Banerjee in his expert declaration, it's at the antireflection layer in Jin.

Because it's bifacial, it also acts as a passivation layer, and it will then cover up that site that is left behind by the tunnel oxide. As we see in paragraph 50 of Jin, Jin says that if your substrate is N-type, the antireflection layer 160 doubly functions as a passivation layer.

What's the substrate in Feldmann? It's an N-type substrate, right? So that surface right there will also be passivated. And so Patent Owner's argument doesn't hold up.

I want to emphasize here that Patent Owner doesn't have any objective indicia of obvious -- nonobviousness. There's no evidence that somehow somebody tried extending it and it didn't work and the claim invention now then proved that, you know, you have to not extend it all the way. There's no -- none of that. There's no unexpected results when all they're doing is following what Chang has said to do.

Now, I'm going to move to the -- another issue on the Jin-Feldmann combination motivation is this issue of bifacial and monofacial cell. And this relates to the limitation called the opening in the passivation layer. Let me explain a little bit using Slide 34.

So in the claim of the challenged patent, on the left -- upper left figure here, the claim language says, first electrode -- which is the metal on the back -- connected to the polysilicon layer through the opening in the first passivation film. That means that there is a passivation film on the backside that the metal punches through. And this is because it's a bifacial cell, right?

When you have a monofacial cell, like Feldmann -- which is on the right figure -- the metal covers the entire part of the polysilicon, so you don't need an additional antireflection passivation layers. And that metal just directly contacts the polysilicon and to conduct the current. But it doesn't mean that when you combine Jin and Feldmann that that's not obvious because Jin is bifacial cell.

And when you combine it, you could see Chang did exactly that, it combined a TOPCon structure into a bifacial cell where now the metal is

puncturing through the opening in the passivation layer, that is 31 and 32. So this issue that, well, you know, you wouldn't be doing it in a monofacial cell -- or you wouldn't do it, bifacial cell does not hold up.

And the reason why Patent Owner says that you wouldn't do it in a bifacial cell is really faulty. And I'm going to move to Slide 35. They criticize Feldmann and said, well, Feldmann just like a point contact cell and -- I'm sorry, Feldmann criticizes a point contact cell and say that, you know, that's inferior, blah-blah-blah. But then Jin is not a point contact cell.

So the criticism of Feldmann doesn't really apply to Jin. And we pointed this out in our reply brief, and Dr. Banerjee provides explanation for why Jin and point contact cells are very different.

Here's to highlight the point, Patent Owner's expert lacks the expertise and credibility because he's not a solar cell expert. He has not done any solar cell work since the early 1970s. You could look at his declaration, paragraph 8, and he could not tell the difference between a point contact cell and the bifacial cell. And Jin is not a point contact cell.

And I'm moving to Slide 36. Why do you want to do a bifacial cell for a TOPCon? And the reason is simple, bifacial cell absorbs light from both sides. So when you absorb light from both sides, you boost the power output. And that's exactly what, you know, the prior art Exhibit 1022, which is a handbook on photovoltaic says, bifacial cells are designed to collect light on both sides, which allows it to boost power.

And Dr. Banerjee explains that if you -- allows it, the light comes from both sides, it more than make up for the power that you'd get from internal reflection in a monofacial cell. So clearly, Chang did TOPCon cell in bifacial cells.

I'm going to move to the last issue. I know I'm quickly running out of time. But I want to touch on this reasonable expectation that says using the shadow mask. Slide 39. And here, we're not talking about reasonable expectation of success, we're not talking about motivation to combine (INDISCERNIBLE). So now, we're talking about how with -- faced with the art, how would the person of ordinary skill in the art accomplish what the prior art says to do, which is to form this isolation portion?

Now, Petitioner, in their opposition, actually admits that using the mask would more likely result in the claim isolation portion. Remember, the isolation portion is at the edge, and it does not have the polysilicon or the tunnel oxide. And in their brief, Patent Owner quibbles a little bit about whether the polysilicon is going to extend further or it's going to -- or the silicon oxide is going to extend further with the mask.

But that doesn't matter. As their own brief shows, the mask -- when you use the mask, even though with the overspray, you're going to get a region at the periphery where you don't have the polysilicon touching the sidewalls and you do not have that -- region does not have the polysilicon and tunnel oxide. And this admission applies equally well to Claim 8 and 6 of the '104, where it requires that the polysilicon edge progressively decrease toward the edge.

There is no dispute that if you use the mask, you'll get a small amount of overspray. And that overspray will be in a shape where you progressively decreases the shape of that edge at the end of the polysilicon.

But as their own brief shows, when you have that edge, you still have this isolation portion where you don't have contact between the edge dopant and the polysilicon and that region does not have -- exclude both the

1 tunnel oxide and the poly silicon. And in context, there's no dispute as to
2 how big should this isolation portion be.
3 We provided evidence in Jin. Jin taught that it is 2 microns to 300
4 microns, and that's in satisfaction of Claim 7 of the patent. Patent Owner
5 does not dispute that. And so if we go back and take a look in Slide 39,
6 Patent Owner says, Feldmann is -- polysilicon is about 20 nanometers, right,
7 and then you have a small overspray.
8 In context, the range is from -- the range of the isolation region is
9 from 2 microns to 300 microns; 2 microns is 2,000 nanometers. That's 100
10 times wider than the thickness of the polysilicon at the low end; and at the
11 high end, 300 microns. That's 300,000, that's 15,000 times larger than the
12 thickness of the polysilicon. And as we know, you know, patent figures are
13 not drawn to scale but just give that in context with respect to understanding
14 this issue.
15 Now, Patent Owner in Slide 41 -- I mean, in Slide 41 says, well,
16 Jin uses the ion implantation only for the mask, and it doesn't refer to CVD
17 deposition process. But if you look at the citation that they have, 83 to 84,
18 Jin didn't say that limited to ion implantation. Jin said the mask, which is
19 used to form the fourth area 152, you could use it with heat diffusion, laser
20 doping, ion implantation, as well as other methods, right?
21 And we provided evidence to Dr. Banerjee to explain that using
22 PECVD with the mask, that is well known in the art that you could deposit
23 very accurate layers in solar cells. And this is Exhibit 1031, where he talks
24 about the Scherff reference and this is in Dr. Banerjee's paragraph 119 to
25 120. And using this PECVD method, you could then deposit the -- both the
26 funnel oxide and the polysilicon layer in the area not covered by the mask,

so you would have an isolation region.

So Patent Owner is going to argue, well, you know, PECVD, that's a very atypical technique. Well, if we look at Slide 45, Patent Owner's response itself on page --

JUDGE DENNETT: Pardon me, just briefly, you have five minutes.

MR. TIU: Thank you, Your Honor. Patent Owner's response itself says that TOPCon solar cells are mainly employing PECVD oxidation to deposit the thin layer of silicon oxide. So they admit that it's not an atypical technique. In fact, Chang, in paragraph 146, uses PECVD to deposit the tunnel oxide layer as well as the chemical as well as the polysilicon layer.

So with that, Your Honor, I'm going to stop here and reserve the remaining time for rebuttal. I appreciate Your Honor's attention.

JUDGE DENNETT: Thank you.

MR. DE BLANK: Good afternoon, Your Honor. Bas de Blank for Patent Owner. I would reserve 10 minutes for rebuttal if I could.

JUDGE DENNETT: Certainly.

MR. TIU: Thank you. May I proceed?

JUDGE DENNETT: You may.

MR. DE BLANK: Thank you. With respect to Petitioner, the presentation we just heard bears little resemblance to the arguments that were presented in the petition itself. Today, they are raising new arguments for the first time, such as that Chang is a motivation to combine Jin and Feldmann. That was not an argument they presented in the petition or before.

They argue now that Patent Owner's expert is not qualified in the

1 art. That's not an argument that they made before. In fact, they didn't even
2 take his deposition in this proceeding. The fact that they are relying on new
3 arguments and trying to present new evidence is itself shows that the
4 Petitioner has failed to carry its burden of proof with the arguments actually
5 before the Board that were raised in the petition.
6 I'll address both the -- what was actually at issue in the petition and
7 the Petitioner's new arguments, but I wanted to kind of flag for the Board the
8 shift in positions. I will, like Petitioner, make reference to a single set of
9 slides that -- or are kind of substantially identical for both proceedings. I
10 will reference Exhibit 2011 from the 006 IPR proceeding, which is for the
11 '009 Patent. We have an identical -- or substantially identical set of slides
12 for the 007 proceeding. The only difference is the citations to the column
13 and line numbers and the patents and that kind of thing. So I'll make my
14 argument with respect to the '009 Patent and the Slides 2011 (sic) from the
15 006 proceeding if I could.
16 Starting with Slide 2. The patents and the asserted claims relate to
17 a specific type of solar cell, here, the TOPCon cell. And the parties
18 generally agree on what a TOPCon cell is. What makes a TOPCon solar cell
19 a TOPCon cell is the tunnel layer that's between the substrate and the doped,
20 conductive, or polysilicon region.
21 Turning to Slide 3. The patent -- inserted patents identified
22 -- sorry, explain why the TOPCon layer is critical to these kinds of solar
23 cells. It functions as a barrier for the electrons or the holes, so it allows them
24 to be more efficient. It allows either the electrons or the holes to pass, but
25 not both. And it can also function as a diffusion barrier, which can help
26 during manufacturing. And we provide the citations and the support on

Slide 3 to the patents themselves.

Now, Patent Owner --

JUDGE DENNETT: I'm sorry, Mr. de Blank, let me just ask a quick question. This is Judge Dennett. The tunnel oxide layer does -- as I understand, it does allow certain electrons and holes to move through, they just have to be the more energetic ones; is that right?

MR. DE BLANK: Yes, Your Honor. It --

JUDGE DENNETT: It restricts this lower level on -- okay. I just wanted to clarify that. Thank you.

MR. DE BLANK: Correct, Your Honor. It's not a completely insulating layer. It doesn't prevent any electrical contact. As Petitioner explained, there's -- can be a quantum effect where certain kind of more energetic, either electrons or holes, can cross that barrier itself.

JUDGE DENNETT: Thank you.

MR. DE BLANK: But it also provides -- as the patent notes, it can function as a diffusion barrier that can assist in the manufacture of the device by preventing the dopants from being diffused into the substrate. Now, Petitioner argues that it may not be effective as a diffusion barrier because the -- of the thinness of the layer. That's inconsistent with the teachings of the patent. And it's also inconsistent, as we cite in our sur-reply with the testimony from Petitioner's expert.

We know on page 12 of our sur-reply, citing his deposition 2010 at 34, 2 through 10, that Petitioner's expert agrees that, quote, "Even a thin oxide layer would block diffusion to a greater degree than having no oxide at all." So the patent -- the tunnel oxide is an important layer, is important to the TOPCon solar cells. And the patents teach that the tunnel oxide layer

could be made, for example, out of silicon oxide, which has excellent passivation characteristics.

Moving to Slide 4. The patents identify and then solve a specific problem for TOPCon cells. As the patents identify -- and shown in the peach-colored text -- that the impurities could be diffused from the -- during the formation of, for example, the emitter region into the side walls, and that could short out the cell. And that problem can be fundamentally prevented by removing the first conductive type semiconductor region 170, that's the back surface polysilicon region, from the edge of the back surface.

So the problem that -- the problem the patents were addressing was the potential shorting between the -- if the dopants were doped into the sidewall and the back -- the polysilicon on the back. And the solution to that problem is to remove the polysilicon, to remove the first conductive-type material.

Separately, the patents also teach and require that the tunnel oxide is excluded from the isolation portion. But there is no reason -- sorry, with respect to the shorting problem, the removal of the tunnel oxide isn't solving that problem. That problem is solved, as taught by the patents, by removing the conductive material, the polysilicon, not the tunnel oxide. The patents require that the tunnel oxide be removed. That's part of the claim, but that's not the solution.

And if you look at Slide 5, Figure 2, of the patents illustrates an embodiment of the claimed invention, where you can see the emitter region in green 120 on the top. And while not shown, it's described as it could be diffused into the sidewalls. And if it were diffused into the sidewalls, it could contact that red N-type semiconductor region 170 on the bottom.

And the solution, therefore, is to remove the semiconductor region 170 on the bottom from that isolation portion. And then the patents also describe and claim separately -- or in addition, that the tunnel oxide layer 160, that very thin layer that's separating the polysilicon from the substrate, is also excluded from the isolation portion. And this is all shown on the claims on Slide 6, where it requires the isolation portion excludes the oxide layer and the polysilicon layer.

And the reason I want to kind of focus on that, and what the requirement that it exclude both and the separate explanation kind of that the reason that the that the exclusion of the polysilicon is what is solving the problem of the potential shorting is because Petitioners have to assume that the tunnel oxide in their combinations would also be excluded.

And yet they do not provide an answer for why. They don't say why a person of ordinary skill in the art would be motivated to exclude not just the polysilicon -- that exclusion would prevent shorting -- but would also exclude the tunnel oxide layer as well. And that failure to answer the question of why, why would a person of ordinary skill in the art be motivated to do that is fatal to Petitioner's arguments.

Now, just to orient the Board on page -- Slide 7, we list the grounds. And like Petitioner, there really are only two grounds the Board needs to focus on. In this proceeding, it's Grounds 1 and 3 and the other -- for the other patent, I believe it's Ground 1 and 2, but it's a combination of Jin and Feldmann and the combination of Chang and Jin. Those are the only grounds that address the Independent Claim 1 and also address -- the only grounds that also address the dependent claim at issue. The other grounds stand or fall with those.

1 So turning to Slide 8. I'm going to focus on three different things.
2 First, the Jin-Feldmann combination, and why Petitioners failed to show a
3 person of ordinary skill in the art would have been motivated to combine
4 that art in the way they assume and why that combination would not meet
5 the claims. Second, I'll do the same with Chang and Jin. And then finally,
6 I'll address the dependent claim, it's Claim 8 of the '009 Patent, or Claim 6 of
7 the '104 Patent, and the additional reasons why that's valid.
8 I do want to correct one possible misstatement by Petitioners. I
9 believe that they suggested that there was no argument made with respect to
10 Chang and Jin on the likelihood of success of the combinations. That's not
11 correct.
12 We make the same arguments for Chang and Jin as we do for Jin
13 and Feldmann, that a person of ordinary skill in the art would not likely
14 succeed in trying to use a shadow mask to form this very thin tunnel oxide
15 layer. And we address that, for example, on page 45 of the Patent Owner
16 response, where we explain how the same argument that we had previously
17 explained for Jin and Feldmann applies equally to the Chang and Jin
18 combination.
19 So I'll begin with the Jin-Feldmann combination. And turning to
20 Slide 9. The fundamental issue or the error that Petitioner seems to invite
21 the Board to make is to confuse the possibility that a person of ordinary skill
22 in the art could have done something with the question of whether they
23 would have been motivated to do that thing.
24 Obviously, the person of ordinary skill the art could have done the
25 invention of the patents using the patents as a template and working
26 backwards. The patents describe all the elements, and the patents describe

how this is done. The question as -- is made clear in the Federal Circuit decisions that we cite on Slide 9 is not whether a person could have done this, but, quote, "Obviousness concerns, whether a skilled artisan not only could have made but would have been motivated to make the combination or modifications of prior art to arrive at the claimed invention."

And it does not suffice to simply be known a reason for combining must exist. And that is the heart of the failure in the arguments that Petitioner makes. It focuses on whether a person of ordinary skill in the art could have done a thing and ignores the vital question of whether that person of ordinary skill in the art would have been motivated to do that. It is their burden. And having failed to meet that burden, their arguments must be rejected.

Turning to Slide 10. Petitioner cannot meet its burden for essentially four reasons. First, they ignore the fact that the types of solar cells that Jin and Feldmann address are completely different. Jin is an old fashioned non-TOPCon solar cell. It does not have a TOPCon layer. It does not have a -- it has a diffused back surface field.

And Jin teaches the specific benefits and specific reasons why a person of ordinary skill in the art might be motivated to change the depth and the diffusion concentration under the metal contacts and the efficiency that that could relate to. It has nothing to do with TOPCon cells. Feldmann is completely different, it is a TOPCon cell.

And the reason why that matters is because the types of techniques that were being used to manufacture these cells are different. In a TOPCon cell, because you've got that oxide layer in between the polysilicon and the substrate, you cannot diffuse the dopants directly into the substrate like Jin

1 does. The oxide layer is between. You have to instead deposit or grow or
2 form the polysilicon in a different manner.
3 Now, as we'll explain in more detail, the Petitioner also makes a
4 series of atypical technical choices to try to justify its combination.
5 Essentially, what it does is it creates a problem that doesn't exist in
6 Feldmann and then tries to solve it in a way that would be counterintuitive
7 and not how a person of ordinary skill in the art would have done.
8 And in so doing, the Petitioners virtually -- eliminate virtually all
9 of the benefits of both Feldmann and Jin. And the reason that they do this is
10 because they are essentially using the asserted patents or the challenged
11 patents as a map and improperly relying on hindsight to work backwards
12 from the claims to try to justify how a person of ordinary skill in the art
13 could have done something that might be similar to the claims again not
14 answering the question of whether that person would have been motivated to
15 do so.
16 So turning to Slide number 11, starting with the fundamentally
17 different teachings of Jin and Feldmann. Slide 11 shows Jin on the top and
18 Feldmann on the bottom. And as I explained, in Jin, the layers 120 and 150
19 are doped into the substrate. There is no tunnel oxide. There is no rear side
20 metallization. And it includes this rear passivation layer across it all.
21 And Jin teaches that the benefit of doing that -- the benefit that a
22 person of ordinary skill would get from Jin is the varying -- by having the
23 higher doping concentrations under the metal contacts, you can increase the
24 efficiency. Feldmann is fundamentally different. Feldmann has -- the point
25 of Feldmann is a tunnel oxide structure. It includes that light blue tunnel
26 oxide on the bottom and then has the red polysilicon P-doped layer, and then

1 a entire full rear side metallization has no passivation layer and has a full-
2 size metallization layer.
3 And in fact, Feldmann explains that that tunnel oxide is vital. It
4 says it is needed. It says that the rear metallization layer improves the
5 efficiency. And it says that using a passivating film in between would be
6 contrary to the idea of TOPCon, so Feldmann is teaching very differently
7 than what Jin does.
8 So turning to Slide 12. What that means is that the Petitioner and
9 this expert have to use a very atypical or unusual tunnel oxide layer
10 formation method to try to meet their combination. So in the petition, they
11 say the skilled artisan could -- again, not the motivation would, but could
12 have placed a metal shadow mask in the shape of Jin's Figure 9 mask on the
13 substrate to cover the periphery before forming the tunnel oxide and the
14 phosphorus-doped polysilicon regions using PECVD.
15 So they're assuming that a person of ordinary skill in the art would,
16 for some reason, have been motivated to have used a shadow mask but also
17 have been used to use a PE or a plasma-enhanced CVD technique to try to
18 form the tunnel oxide and phosphorus-doped layers. Now, that's not how
19 Feldmann does it. Feldmann, again, is the only teaching in this combination
20 that provides any explanation for TOPCon. And Feldmann describes
21 growing the oxide layer, the thin oxide layer across the entire surface of the
22 substrate, not using PECVD.
23 And Jin, of course, doesn't suggest using PECVD to form a tunnel
24 oxide layer because Jin has no discussion of tunnel oxide layers whatsoever.
25 So the mere fact that Petitioners believe that a POSITA or a person of
26 ordinary skill in the art could have used a shadow mask to try to do this

1 doesn't meet their burden to try to explain why they would have done that.
2 Why would a person of ordinary skill in the art not have grown the oxide, as
3 Feldmann teaches, and instead try to use a PECVD process to form the
4 tunnel oxide and then try to use a shadow mask with that PECVD process?
5 Turning to Slide 13. The Patent Owner provided and submitted
6 contemporaneous evidence explaining that the tunnel oxides would be
7 formed by oxidizing similar or like Feldmann's technique, not using a mask.
8 That's Exhibits 2004 and 2006 cited on Slide 13 and referenced in our Patent
9 Owner response and also in the sur-reply.
10 And those references, those teachings, would inform a person of
11 ordinary skill in the art that if they want to try to form a tunnel oxide layer,
12 they would use the wet growth growing method of Feldmann, or that they
13 would grow the thin one or thermally develop it. There's nothing saying that
14 they would use -- or motivation why they would want to try to use a CVD or
15 chemical vapor deposition process.
16 Turning to Slide 14. Again, this is the quote from Feldmann
17 describing how Feldmann does it. And a person of ordinary skill in this art
18 -- in the art in this combination would be looking to the teachings of
19 Feldmann to understand how to form TOPCon if they were going to even try
20 to add it to Jin. And Feldmann says that an ultra-thin wet chemical oxide
21 layer was grown with a thickness determined to be about 14 angstroms.
22 And the reason why that's significant, the reason why that's
23 important and why Petitioners are forced to ignore it, is because if you are
24 growing the tunnel oxide, like Feldmann describes or as described in the
25 contemporaneous art at the time of Slide 13, you can't use a shadow mask to
26 limit where that is grown. You're essentially growing it from the bottom up,

1 rather than depositing it from the top down. The shadow mask could be
2 used to block something that's being deposited from the top down but would
3 not exclude the tunnel oxide if it's being grown, as it's described in
4 Feldmann or described in the other contemporaneous art.
5 So there's no explanation from Petitioner as to why a person of
6 ordinary skill in the art would be motivated to ignore Feldmann's teachings
7 to grow the tunnel oxide and why they would try to use a different
8 technique, chemical vapor deposition and try to use a shadow mask instead.
9 And the use of the thermal oxidization or Feldmann's wet chemical methods
10 is incompatible with the mask.
11 Turning to Slide 15. Patent Owner, in fact, provided unrebutted
12 expert testimony that typical prior art methods would be used during the
13 tunnel oxide formation. That's Dr. Peckerar's declaration, Exhibit 2001,
14 which we cite on paragraphs 199 and 200 and show on Slide 15.
15 And again, Petitioner didn't even depose Dr. Peckerar. But as Dr.
16 Peckerar explained, a person of ordinary skill in the art would not have tried
17 to employ the convoluted process Petitioner proposes using chemical vapor
18 deposition in the shadow mask, and instead would have manufactured the
19 combined TOPCon cell if they were motivated to even try to do so using the
20 processes actually taught in the art. And that result would be that the tunnel
21 oxide would be formed over the entire back surface of the substrate and
22 would not be excluded from the isolation portion, as required by the claims.
23 Turning to Slide 16. Petitioner does not explain why. They don't
24 provide the why would a person of ordinary skill in the art have been
25 motivated to exclude the tunnel oxide. In the petition, there's a single
26 sentence -- and that's shown on Slide 16 -- that just says, and because

Feldmann's emitter, like Jin's, is formed by diffusion, it is acceptable to shorting and would benefit from Jin's gap T isolation region. Indeed, following Feldmann, Chang disclosed a bifacial solar cell with Feldmann's TOPCon structure and Jin's isolation region.

Now, as the patent talked and as I explained at the beginning, to the extent you're concerned about shorting, the solution to that is to exclude the polysilicon, the conductive region from the back (INDISCERNIBLE - TECHNICAL DIFFICULTY). That, as the patent teaches, prevents shorting. There's no reason, no motivation, why a person of ordinary skill in the art would also have chosen to exclude the tunnel oxide.

And that's critical because the claim expressly requires the exclusion of not just the conductive polysilicon region, but also the tunnel oxide. And because a Petitioner cannot answer the question of why a person of ordinary skill in the art would have tried to exclude the tunnel oxide, their combination fails.

JUDGE DENNETT: Let me just ask you a quick question. This is Judge Dennett. If Petitioner is talking about masking off the backside to get the polysilicon on there, can you -- I'm literally asking, you know, how this is done. And I don't want to put you on the spot, you can pass. But if you're going to mask it, would -- I mean, do you mask it -- do you put down the tunnel oxide and then mask it and then put the polysilicon on, or would you mask the backside and then deposit the tunnel side and the masking?

MR. DE BLANK: No. That --

JUDGE DENNETT: Thank you.

MR. DE BLANK: Sorry, I didn't mean to cut you off.

JUDGE DENNETT: No, you go.

MR. DE BLANK: I apologize. No. That's a great question. And the answer to that is -- really, highlights the failure of Petitioner's argument. Each element of these cells is created separately. So you are not forming the polysilicon and the tunnel oxide in one single step. You're first forming the tunnel oxide. And then you have to form the polysilicon. And you have to do the polysilicon after the tunnel oxide because the tunnel oxide is in between the substrate and the polysilicon.

And when you form the -- sorry, when you form the tunnel oxide, like Feldmann teaches, using a wet growth process or the prior art processes where it's grown, it would form across the entire substrate -- across the entire surface everywhere. It would not be excluded anywhere. And that's consistent with Feldmann's emphasis that the tunnel oxide is vital, that it's needed, that that's the important -- kind of contribution of the tunnel oxide.

Now, Petitioners are arguing that you would use a mask, and you would use the same mask in a very particular technique to deposit, first, the tunnel oxide using that mask and then the polysilicon using that mask. And they do that in order to try to exclude the tunnel oxide as well as exclude the polysilicon from the isolation portion.

They need to do that to meet the claims. But they provide no explanation or motivation why a person of ordinary skill in the art would have excluded the tunnel oxide -- would have used a mask to try to exclude the tunnel oxide from the -- what they say are the isolation portions.

Does that answer your question? I can try again if it doesn't.

JUDGE DENNETT: Yes, it does. Thank you.

MR. DE BLANK: Thank you, Your Honor. As I was referring to Slide 16, Petitioner doesn't explain why the tunnel oxide would be excluded.

All they do is say that the Feldmann's emitter could be formed by diffusion.

Now, Petitioner's expert agrees that even if you're forming it by diffusion, that doesn't mean it's doped into the sidewalls. That's on the quote from Dr. Banerjee's deposition. It's on Slide 30. We'll get to that in a moment. But everyone agrees that you could form it by diffusion and still not have the problem of doping into the sidewalls. Critically, there's no argument in the petition, no explanation for why a person of ordinary skill in the art would be motivated to exclude the tunnel layer -- not just the polysilicon, but also the tunnel layer from that gap.

JUDGE DENNETT: One more question here. Judge Dennett again. So if I understand, you're telling -- you're saying that you would not exclude the tunnel layer from the gap. There would be no reason to do it, and it would be difficult -- at least difficult to do it. It would seem to me that's exactly what the '009 Patent is teaching. There's a disconnect here.

Now, I realize, you know, we are not just straying into hindsight, I'm marching with jackboots. But it's got to be possible because you did it. And if you get a chance to address that later on, I just -- I'd appreciate some more information on that. Thank you.

MR. DE BLANK: Sure. I think we will get to that, but just to very briefly address it now. That is the issue that we raised -- and we'll get to in a moment -- that Petitioner is using hindsight. They're using the '009 Patent as the explanation for why you would exclude the tunnel oxide.

And they said in their petition -- sorry, in their oral argument earlier that '009 Patent doesn't provide any unexpected results, it doesn't provide any explanation. And because they say there's no unexpected result, therefore, it must be obvious.

But that is the track of hindsight. They are literally using the '009 Patent and its description of excluding the tunnel oxide layer and removing it and saying that is what makes it obvious to a person of ordinary skill. And respectfully, for Petitioners, what they need is evidence that in Jin and Feldmann that a person of ordinary skill in the art would have been motivated to remove the tunnel oxide.

Of course, it could be done. It was done by the '009 Patent. But that's the difference between the could it be done and the question of obviousness, which is would it have been obvious? Would a person have been motivated to do it?

JUDGE DENNETT: Okay.

MR. DE BLANK: And turning looking at -- so the --

JUDGE ROSS: So my question is, why was it done in the '009 Patent and the '104 Patent? Why was the tunnel oxide --

MR. DE BLANK: Sure. So --

JUDGE ROSS: -- excluded at the edges?

MR. DE BLANK: Yeah. So the '009 and the '114 (sic) Patent clearly exclude it. And they describe a process for excluding it and then the claim excluding it. I don't believe much discussion or explanation of why that was done. I don't want to speculate, but I do believe that it would -- could relate to the particular manufacturing processes that the Patent Owner was deploying itself.

But that's the reason for why the claim was done is not the issue. The question is whether there would be a motivation to do it in the manner that the -- that was claimed. And there is nothing in the prior art or in the petition and -- as we'll see in a second -- in Dr. Banerjee's declaration that

1 provides any sort of motivation to do so.
2 Turning to Slide 17. The petition cited Dr. Banerjee's declaration
3 at paragraph 116 and -- for the notion that the tunnel oxide could have been
4 excluded. And again, Dr. Banerjee, in that declaration, doesn't actually
5 provide much of a reason why. He says -- and we've highlighted it on Slide
6 17 -- if the tunnel oxide layer were to extend to the edge, the exposed
7 portion of the oxide could trap impurities and create negative fixed oxide
8 charges, which could then create a P-type inversion and the N-type substrate,
9 leading to leakage as to the P-type emitter on the front of the solar cell.
10 So there's at least two coulds in that sentence that maybe this is
11 something that might happen. There's no support for the sentence at all. It's
12 just naked expert opinion. And there's not even a suggestion that this, even
13 if true, would have been known to a person of ordinary skill at the art. But
14 what Dr. Banerjee at least is suggesting is that the risk -- the fact that there
15 could be these fixed negative charges and that might create this P-type
16 inversion might be a reason why the tunnel oxide could be excluded.
17 So let's look at that. If we turn to Slide 18, Dr. Banerjee agrees
18 that the P-type inversion, the only possible reason why he gives that a person
19 might exclude the tunnel oxide at all is not a problem if you thermally grow
20 the oxide. So if you form that tunnel oxide layer by growing it, just like the
21 prior art -- sorry, not the prior, the contemporaneous art, the art that we rely
22 on and the Feldmann patent describes, if you're growing that, then you don't
23 get this P-type inversion problem. You only get this P-type inversion
24 problem if you're trying to use something like chemical vapor deposition to
25 form the tunnel oxide layer.
26 So what Petitioners are doing is essentially, first, creating a

1 problem that doesn't exist. They're replacing the way that the -- a person of
2 ordinary skill in the art would have used -- would have formed the tunnel
3 oxide layer. Instead of growing it, they're saying, we're going to use CVD.
4 They don't explain why. They provide no motivation. Then they say, oh,
5 now that we're using CVD, now we've created a problem. And then they
6 say, okay, now that we've created this problem, maybe we could solve it by
7 removing the tunnel oxide.
8 And respectfully, the simplest solution is the correct one, that a
9 person of ordinary skill in the art, to the extent that they were aware and
10 concerned of this P-type inversion problem at all would simply have done
11 exactly what Feldmann describes, which is grow the tunnel oxide, or as
12 shown in the other contemporaneous art, rather than using the atypical
13 manufacturing process that Petitioners assume.
14 So turning to Slide 19. The next problem for the Petitioners is that
15 the claims require that the first passivation film covers the isolation portion.
16 So the claims require that you have the substrate. You've excluded the
17 tunnel oxide and also excluded the polysilicon. So you have exposed
18 portions of the substrate. And then you have a first passivation film that
19 covers not just the polysilicon but also covers the isolation portion where the
20 tunnel oxide was excluded. That's what the claims require.
21 And the Petitioners assume that a person of ordinary skill in the
22 art, if they were motivated to remove or exclude the tunnel oxide from the
23 isolation portion, would then have covered it with the -- Jin's passivation
24 film. And again, that doesn't -- they don't explain why -- they don't explain
25 the -- why someone would be motivated to this. And their argument is
26 internally inconsistent.

The passivation film and the tunnel oxide layer can both be made, for example, out of silicon oxide. And they're suggesting that the silicon oxide is going to cause a problem, it's going to cause this P-type inversion it needs to be excluded. And then the next step they would say is, but we're going to cover that where we just excluded the tunnel oxide and now replace it with, for example, a silicon oxide passivating film.

Again, they don't provide any explanation for why a person of ordinary skill the art, if they were motivated to exclude the tunnel oxide in the first place, which we don't think they are, would then have been motivated to cover that same area with potentially the same materials and why that doesn't create the same negative fixed impurity problem that Dr. Banerjee says.

Petitioner's Slide 31 --

JUDGE DENNETT: Are the -- sorry, Judge Dennett again. Let me just ask you. Now, does Petitioner actually argue that that passivation layer 160 in Slide 19 would be silicon oxide?

MR. DE BLANK: I believe that Jin describes that the -- that passivation film, it could be made of various materials, including silicon oxide.

JUDGE DENNETT: Okay. Thank you.

MR. DE BLANK: I don't -- yeah, turning to Slide 20. In fact, the unrebutted expert testimony -- sorry, switching gears slightly. Petitioner also assumes that the -- if they're going to use a CVD process, they could use shadow masks to form the tunnel oxide layer. And the unrebutted expert testimony is that shadow masks were not used and could not be used in this manner to form a tunnel oxide layer because that tunnel oxide layer is so

1 incredibly thin.

2 Now, Petitioner points to other teachings that show shadow mask
3 being used in other contexts for -- to form other materials, thicker materials,
4 and that was known. But the unrebutted expert testimony from Dr. Peckerar
5 in Exhibit 2001, paragraphs 196 and 197, explains that a person of ordinary
6 skill in the art would have recognized that use of a shadow mask when
7 forming the tunnel oxide layer would likely result in a significant layer
8 variation around the mask edges, and that this could cause separation kind of
9 variations in the thickness of the mask and could worsen device uniformity
10 and performance.

11 And in fact, he explains in the next paragraph, paragraph 197, that
12 no TOPCon cell manufacturer researcher had or even could have employed a
13 masking process to even -- that even remotely resembles that proposed by
14 Petitioner and Dr. Banerjee. And again, Patent Owner did not even depose
15 Dr. Peckerar on this.

16 And this testimony is, I believe, unrebutted. The reason why is
17 that the tunnel oxide layer is so incredibly thin that if you're trying to form it
18 with a shadow mask, you're going to get these variations you're going to
19 -- it's going to cause the problems that Dr. Peckerar describes.

20 And turning to Slide 21. Patent Owner's unrebutted expert
21 testimony explains -- kind of illustrates and explains this problem. And this
22 is the same figure that Petitioners used with respect to the dependent claim.
23 But what it's showing there is how the -- you would have these angle
24 -- you'd have these overspray.

25 The material would form underneath the mask. And that's a
26 known feature of shadow masks, that it's going to form underneath. And the

amount that it forms underneath is going to be a function of how thick the layer is and how long you do the deposition process. If you do the deposition process for a longer period of time, it's going to extend further and further underneath the shadow mask.

If you do it for a very short amount of time for a very thin layer, it might extend under the shadow mask only by a little bit. And Petitioner's expert, Dr. Banerjee, agrees with this. We cite this in our Patent Owner response at page 33, citing his testimony, Exhibit 2002 at 59, lines 10 through 60, line 16.2 But what that result is going to be something that looks like the demonstrative on page -- Slide 21, where the polysilicon -- the red polysilicon is extending on the blue tunnel layer.

And the problem is that the polysilicon is going to do -- has to do one of two things. It's either going to contact the doped regions in the edges where there's -- and therefore have the shorting that all of this process is intended to avoid. If it gets so close to the edge that it can make an electrical contact with the doped regions on the sidewall, it will have that shorting. How close it gets to the edge is going to be a function of the height of the mask and how long that process forms.

But at a minimum, it's going to extend beyond the tunnel oxide. And therefore it's going to be contacting the substrate. And remember, the whole point of TOPCon, the whole point of the tunnel oxide layer is to prevent the polysilicon from contacting the substrate, to be that barrier in between that only allows the really energetic charged particles to cross the quantum effect. If you're going to have -- use a shadow mask and you're forming the polysilicon beyond the tunnel oxide, it's going to contact the substrate in a way that will eliminate the benefit of the tunnel oxide layer.

Turning to Slide 32. Petitioner cannot meet its burden to prove that a person of ordinary skill in the art would have been motivated to combine Jin and Feldmann. But even assuming, for argument, that a person of ordinary skill in the art were motivated to try to make that combination, it would not have resulted in the proposed combination that excludes the tunnel oxide from the isolation portion.

Rather, as shown on Slide 22, the combination would have the ultra-thin tunnel oxide grown -- not deposited but grown -- as is taught by Feldmann and the other contemporaneous art across the entire surface, and at most, the polysilicon, the red polysilicon excluded. But that doesn't meet the claim.

But this would use the known manufacturing techniques. It would prevent the polysilicon and emitter contact and prevent the shorting. And the tunnel oxide helps, as the patent teaches, ensuring that dopants are not diffused into the substrate. It would improve the efficiency and passivation. And it would use Feldmann's rear metallization, not Jin's fingers.

So turning to Slide 23. A person of ordinary skill in the art would understand Jin to teach the benefits -- like we spoke of -- of varying the dope and density at the bottom of the cell. And we have the citation to Jin, paragraph 32, that describes that. And that benefit would be eliminated by Petitioner's proposed combination.

And Feldmann talks about the tunnel layer -- tunnel oxide as being vital. Feldmann says it is required to achieve the excellent passivation interface on page 270 of Exhibit 1012. Feldmann says, notably, the tunnel oxide is crucial, on page 271. And on page 272, Feldmann says that most importantly, the tunnel oxide layer is needed for passivation -- the tunnel

1 oxide layer needed for passivation doesn't hinder the majority charge
2 carriers, transport across its barrier, and thus allows excellent FFs of above
3 82 percent.
4 So Feldmann is teaching that the oxide layer is needed, that it's
5 crucial, that it's vital. And there is no motivation to -- for a person of
6 ordinary skill to think that they're going to exclude -- or want to try to
7 exclude -- that crucial, vital that needed tunnel oxide layer, from any portion
8 of the cell. Also, the -- Feldmann employs the full rear metallization. It
9 doesn't have point contacts. It doesn't have legs or fingers like Jin. It
10 therefore doesn't have openings in the -- it doesn't have a rear passivation
11 layer at all. It doesn't have openings.
12 And then finally, Feldmann specifically says that the application of
13 any insulating dielectric layer would contradict the idea of our TOPCon
14 structure. That's on page 273 of Feldmann. And Petitioners are arguing that
15 the -- in the combination, that there would be an insulating dielectric layer,
16 that layer across -- from Jin across the entire rear surface.
17 So turning to Slide number 24. It was Petitioners burden to prove
18 invalidity, including that a person would be motivated at the time of the
19 invention to combine Jin and Feldmann in the way they assume. And
20 Petitioner has not and cannot meet that burden.
21 Instead of proving motivation, Petitioner is relying on the
22 challenged patents. And this is what we spoke of before, where they're
23 saying the '009 Patent describes removing the tunnel oxide layer, and
24 therefore, it would be obvious. And that is hindsight, that is what is
25 improper, that is what is -- what courts warn of all the time. You cannot use
26 the teaching of the '009 Patent to justify the motivation for a person of

ordinary skill in the art.

So unless there's further questions on this ground, I'll move on to the Chang-Jin Ground next.

JUDGE DENNETT: Let me let you know that you have five minutes.

MR. DE BLANK: Thank you, Your Honor. Okay. So the Chang-Jin -- turning to Slide number 25 and the Chang-Jin Ground. First off, I want to note that the case that Petitioner cited from last Friday, Guardant Health versus University of Washington, is inapposite. It does not actually support and in fact, contradicts Petitioner's arguments.

In that case, there were two options that, quote, "were disclosed in a single embodiment in a single prior art reference." That is not what Chang says, there are not two options that are being disclosed in a single embodiment of the Chang prior art reference. And Petitioners are instead trying to combine different features from different embodiments of Chang. And to do so, they need to provide a motivation. They don't provide that motivation. And therefore, their arguments fail.

Turning to Slide number 26. The Petitioners rely on Chang and add Jin's gap T. Now, Petitioners seem to be almost asserting that Chang alone meets every limitation. That would be an anticipation argument. Petitioners did not make an anticipation argument. There is no anticipation ground. Petitioners are relying on Jin and the teaching of Jin's gap T because Chang does not disclose or illustrate or teach the isolation portion that would meet the claims itself.

The Petitioner fails to meet its burden for four reasons, and these are similar to what we discussed for Jin and Feldmann, so I'll go through

these more quickly. But the Petitioner ignores that the -- Chang teaches that its cell is already designed to eliminate this need for isolation. It requires the specific manufacturing steps, again, like Jin, without any motivation to do so.

It doesn't explain why a person of ordinary skill in the art would be motivated to locate the isolation regions, even if they were going to try to add them where the claims require. And it picks and chooses between Chang's different embodiments without an explanation why.

So turning to Slide 27. Every embodiment in the Chang Patent shows the solar cell without an isolation portion. And Petitioner says, oh, but there's no wavy lines. And this somehow means that this is only a portion of the cross section, not the entire cell. And there is no support for that attorney argument whatsoever.

Chang itself in paragraph 76 specifically teaches that the emitter and the back surface field are not adjacent, that they're separated, that they're on opposite sides of the solar cell, exactly as shown in Figures 1 and 8, without contacting each other. This is not a subpart of the Chang cell and that isolation portions would be shown somewhere else. These are the entire embodiments of the Chang cell that do not have and do not include the claimed isolation portion.

And turning to Slide 28 that shows paragraph --

JUDGE DENNETT: Sorry. Judge Dennett again. So in Figures 1 and 8 in Chang, you're saying if this is the entire cell and it's got two electrodes on the front and two electrodes on the back, is --

MR. DE BLANK: Yes, Your Honor. It would work. This would be an entire functioning cell with two electrodes at the front, two electrodes

at the back.

JUDGE DENNETT: Okay.

MR. DE BLANK: You could scale this up. And if you scale it up, you'd have more -- you could have more electrodes. That's fine. But it's not a portion of the cross section where the cell itself has an isolation portion that's just not being illustrated here.

And that's made clear -- if you look at Slide 28 which shows paragraph 76 of Chang, that talks about how the emitter 20 in the back surface field may be disposed at different sides of the semiconductor substrate. And that because they're on the -- they're not adjacent to each other, the necessity of performing an isolation process, as if they -- kind of when they were formed is eliminated.

So Chang is making clear that this is not just some subpart of a cell with an isolation portion not being shown. Paragraph 76 is saying, this is it. They are not adjacent to each other. And moreover, there's a benefit of them not being adjacent to each other, you can eliminate the need for the isolation process. And at the end of that paragraph, it goes on and makes the point about why that's a benefit. As a result, manufacturing process is simplified and cost is thus reduced.

And Petitioner's argument is that, yes, but a person could do it in a different way, eliminate that benefit and form an isolation portion. And again, respectfully, that's the difference between could and would. The Petitioners fail to explain why a person of ordinary skill in the art would have been motivated to come up with a process that is less simple, harder to manufacture, more expensive, and introduces problems that could then only be solved by the -- adding Jin's gap T into this.

JUDGE OBERMANN: Counsel, this is Judge Obermann. You're focusing on paragraph 76, and that's one instance, even the very first sentence says that. But I'm looking at paragraphs 56 and 62, and it seems to me that Chang there is anticipating an embodiment where the periphery sections are masked.

MR. DE BLANK: In those paragraphs, I believe, Your Honor, it says that the relevant material, the polysilicon or the tunnel, may be excluded inevitably formed or predetermined sections. I believe that's the quote, I don't have it correctly in front of me. There's nothing in Chang that says that these are inevitably formed. In fact, Chang shows that they're not inevitably formed by showing embodiments that don't have them. And there's nothing in Chang that says that they are predetermined or predisposed to be there.

JUDGE OBERMANN: But Chang itself is saying that you picked an area that you want to mask. That's how I read that. I mean, how are you reading that?

MR. DE BLANK: Sure. Sorry, let me -- so the -- what Chang is saying is that that they're formed -- kind of entirely formed over the back surface, and then says, entirely formed can exclude areas that are predesignated or inevitably formed, like the periphery. And it's possible. I mean, that there is a -- if there had been a teaching of a predesignated or inevitably formed region, then the tunnel oxide could be excluded from this. That would be consistent with the --

JUDGE OBERMANN: It's taught right there. Paragraphs 56 and 62, it's taught. It might not be illustrated. It might not be in paragraph 76. But I'm seeing an embodiment in paragraphs 56 and 62 that is taught. How

do you read that out?

MR. DE BLANK: Because Your Honor -- well, first, no expert has taken that position. There is no evidence that this --

JUDGE OBERMANN: Even the expert tell us what does paragraph 56 and 62 say. It says that you could, you know, do it your way in paragraph 76 or you can take certain regions and mask them. And one of the regions it points out is the periphery region.

MR. DE BLANK: Mm-hm. Correct, Your Honor. It is saying that you could do that. But we would argue that the fact that a person --

JUDGE OBERMANN: It's teaching you to do it. You're saying it could be. It's one of the embodiments that's taught in this reference. That's how I'm reading it.

MR. DE BLANK: Respectfully, Your Honor, we would say that that's -- it's not an embodiment. It is a description of the tunnel oxide layer -- sorry, the second tunneling layer 44, or the polysilicon region, and a generic statement of where it's formed. It doesn't say that you would -- how you would do this, why you would do this. And it, in fact, teaches that you should not do this. Because if you form them entirely on opposite sides as it explains, it simplifies manufacturing and reduces cost.

JUDGE OBERMANN: Yeah. I understand what you're saying. But your friend got up here and rather persuasively pointed out that it's in those paragraphs, it doesn't have to be the best way, but it's one of the ways that's disclosed in the reference. And they're not picking and choosing. There's two different ways set forth in paragraphs 56 and 62.

And when I asked your friend the question, they said, yeah, we're turning to Jin to show you that it would have been well-known in the art how

to do this, to mask. And it is really a description of masking in those two paragraphs. I'm just not understanding your position that there's some kind of a reason why the disclosure in those two paragraphs should be sort of read out of the reference.

MR. DE BLANK: Sure. And we're not saying the disclosure should be read out of the reference. Your Honor, what we're saying is the disclosure would be understood in the context of the teachings of Chang and that there is no embodiment where Chang does this.

There is no motivation why a person of ordinary skill in the art would have come up with excluding the material in the manner that they describe and rely on, and that it would not have been obvious to a person of ordinary skill in the art to have done this for any reason, given the teachings in Chang that it will increase the cost and increase the complexity.

JUDGE OBERMANN: I'm having some trouble here because you're saying that we need to find a reason to do what's actually disclosed in paragraph 62 and 56. And I heard your opponent get up and say, we don't need to have a reason to do it because it's right here in the reference.

MR. DE BLANK: Well, Your Honor, so what the reference is saying is kind of as used here in the expression entirely formed means that an element, such as a layer, is formed over an entire surface without an empty area or noncoverage area or is formed in an entire area excluding predesignated or inevitably formed regions such as periphery regions, isolation regions, or the like. So there still needs to be something that would either predesignate or identify an inevitably formed location for that --

JUDGE OBERMANN: It's asking you -- like, they've given you two examples, and one is a periphery region. We were getting --

MR. DE BLANK: So I don't -- I'm sorry?

JUDGE OBERMANN: Sorry. I thought you were freezing there. You're --

MR. DE BLANK: Oh, no, I apologize, Your Honor. I was just looking at the language. I don't believe that those are two examples. I believe that those are the conditions that need to be met in order for that exclusion to apply, that it is entirely formed over the entire back surface, unless there is a predesignated or inevitably formed region.

And it gives examples of what that could be. But there still needs to be some sort of disclosure or motivation for a predesignated or inevitably formed region that would meet the specific exclusions that are required by the claims. And Chang does not have that.

JUDGE DENNETT: Well, you've gone well past your time. Although, I will say that I contributed to that. I'm going to give you a couple of minutes to wrap up. I won't penalize you in your rebuttal, but just a couple more minutes, please.

MR. DE BLANK: Sure. Thank you, Your Honor. So one thing, I guess, I would note is the -- even if we read the -- Chang the way that Your Honors seem to be considering, which is that the tunnel oxide in the back surface field would be necessarily excluded from the edge portions. First, as shown on Slide number 31, that doesn't mean the same as the claim and that their teachings at edge isolation is - -can be inward from the periphery.

And secondly, as shown in paragraph 63 of Chang, the second passivation film, the passivation layer that is also required by the claim, that is formed on the back surface field area. So if you interpret Chang to be describing excluding the back surface field area from the isolation portion,

1 paragraph 63 says, you are also excluding the passivation film 31 from the
2 isolation portion. Because it is only teaching that the passivation film is
3 formed on the back surface field area, not across the entire surface.
4 So even if you were to assume that Chang did disclose excluding
5 the tunnel oxide and the polysilicon from the isolation portion, it still doesn't
6 meet the claims because it doesn't have the required passivation layer.
7 And with that, Your Honor, I'll reserve the remaining time for
8 rebuttal.
9 JUDGE DENNETT: Okay. Thank you. Mr. Tiu, if you would
10 -- if -- you have -- you reserved 10 minutes. You gave us back about four
11 minutes. So, you know, if you can wrap it up in 10, if you need to go over a
12 couple of minutes, I'm not going to throw anything at you.
13 MR. TIU: I appreciate it, Your Honor. I'm going to start by going
14 back to this slide that Petitioner -- that Patent Owner had used was just our
15 Slide 16 and said we didn't explain why there would be a motivation to keep
16 the isolation portion. But we didn't change our theory. This is Patent Owner
17 own slide in the petition. On page 26, we -- in the Jin and Feldmann
18 combination, we said it right there. Indeed, Feldmann -- following
19 Feldmann, Chang disclosed a bifacial solar cell with Feldmann TOPCon
20 structure in Jin's isolation portion, right?
21 Our whole theory at the very beginning is that looking at Jin and
22 Feldmann, we have actual evidence before the patent of Chang disclosing to
23 exclude the tunnel oxide and the polysilicon, which is the claim isolation
24 portion. That has been our theory all throughout. And that's in petition page
25 26 expressly stated in the motivation to combine section.
26 Now, a couple of times there is mentioned that, oh, we never took

1 their expert's deposition in this proceeding. Well, Your Honor, you would
2 recognize that there is a parallel ITC proceeding, where the same prior art,
3 the same patent is being asserted, the same expert, Dr. Banerjee, Dr.
4 Peckerar. So when their expert was already taking -- the deposition of the
5 expert already taking that case, there's no reason why we need to spend the
6 money at the end to retake the deposition.
7 And there is no dispute, you know, there's no motion to exclude or
8 anything like that. That is in the record of what their expert testified to in a
9 deposition for the same issue in which Mr. Blank actually defended the
10 deposition.
11 So with respect to the reasonable expectation and success, I just
12 wanted to reemphasize, look, we've already shown that there is a motivation
13 to combine Jin and Feldmann to have an isolation portion. Chang is the best
14 evidence of that because Chang expressly said so.
15 Then the only question is how do you do that, right? So there was
16 a question by Judge Dennett about, well, how do you actually do that? And
17 I disagree with my colleague that says that, look, you know, you can't do this
18 with the PECVD.
19 And actually, PECVD with the tunnel oxide and the polysilicon is
20 actually performing the same machine. It's just, you know, the next step,
21 depending on the gas that you put in, right? And in fact, we point out in one
22 of our -- the reference that they point to -- this is Slide 44 of our
23 demonstrative. Patent Owner says, well, it's not using TOPCon, it's not
24 using TOPCon commercial and stuff.
25 And it's only an idea they cite to Exhibit 2007. Well, in fact,
26 Exhibit 2007 points to a reference that we submitted, a 1040, and says, you

can in fact use the shadow mask with TOPCon. And we've successfully demonstrated that in the deposition of layers in the TOPCon that's applicable to TOPCon.

And with respect to how you would do it, there was another question going back to the motivation to combine. Patent Owner makes the argument that, well, Jin is talking about the differential doping of the back surface field. But Jin is not limited to that.

We discussed that in a reply in response to that argument on page 15. Jin actually says their invention is not limited to the differential doping of the back surface field. And then Figure 17 and Figure 16, you see embodiments where the back surface field, which is the back part, there is no differential doping of that that you see in Figure 3.

So let me just take a look at my notes to see if there's anything else Your Honor, or if there's any other question that, you know, you would like to ask about that. But I think with that, I probably will give back my time to you because I think the record is pretty clear.

JUDGE DENNETT: Okay. Thank you. Let me get back here. Mr. de Blank, let me -- I'm sorry it's taking me a second here to get my timer back in order. Okay. So I think you reserved 10 minutes, and I'll let you have that. As I said, because you went over because largely me. So go ahead when you're ready.

MR. DE BLANK: Thank you, Your Honor. Okay. So thank you very much for the kind of for the opportunity to respond. I'll address both grounds briefly. First, with respect to the Jin-Feldmann ground, Petitioner, again, still hasn't responded to the why a person of ordinary skill in the art would be motivated to try to remove the tunnel oxide from the isolation

1 portion.
2 As we pointed out in my earlier presentation, it's an entirely
3 circular argument where they first create a problem that doesn't exist and
4 then try to solve it in a way that makes it more complicated. And they
5 provide no motivation for this. The only reason that they say a person of
6 ordinary skill in the art would have tried to exclude the tunnel oxide is
7 because it could lead to these inversions.
8 But they say those inversions are only created by CVD
9 (INDISCERNIBLE - TECHNICAL DIFFICULTY) deposition, not by
10 growing the oxide in the way that Feldmann describes. They don't explain
11 why somebody would switch techniques to create this problem. And they
12 don't explain why -- if they have -- why they'd be motivated to then try to
13 add the isolation portions to remove not just the polysilicon, but also the
14 tunnel oxide.
15 With respect to the Chang and Jin combinations, respectfully, our
16 position is that there is no embodiment in Chang that meets the limitations of
17 the claims. If there were, Petitioners would have been arguing anticipation.
18 They're not arguing anticipation because the -- there is no single
19 embodiment that discloses this. There is at most -- and we can agree or
20 disagree kind of on teachings -- those paragraphs that describe that the
21 tunnel oxide and the polysilicon could be excluded from inevitably formed
22 or predetermined regions.
23 But those are (INDISCERNIBLE - TECHNICAL DIFFICULTY).
24 We're talking now about one where it is going to be excluded from isolation
25 portions and then one where the tunnel oxide is also excluded from the
26 isolation portion. There still needs to be some sort of motivation to

1 combine, even in a single reference obviousness argument, which is not the
2 argument that they're making. It is not a single reference obviousness
3 argument. They're saying there'd be a motivation to combine Jin.
4 Secondly, as I mentioned at the beginning of my presentation, they
5 seem to assume but do not address the argument that a person of ordinary
6 skill in the art would have no -- sorry, would have no reasonable expectation
7 of succeeding in the combination that they seem to anticipate for Chang.
8 And we addressed this with respect to the Jin explanation on the shadow
9 masks. But as we explained in our Patent Owner response, that argument is
10 equally applicable to Chang.
11 They are assuming that a person of ordinary skill in the art would
12 be motivated to use CVD, chemical vapor deposition, to form a tunnel oxide
13 using a shadow mask. And as we explained on Slide 20, with citations to
14 Exhibit 2001, Dr. Peckerar's declaration, the unrebutted evidence, the only
15 evidence is -- from the experts is that the shadow mask could not and would
16 not be used, that nobody has ever successfully manufactured a TOPCon cell,
17 either commercially or even for research purposes, employing a shadow
18 mask to form a tunnel oxide layer.
19 And the reason why is because it would result in significant
20 variations around the mask edges. It would cause variations in the thickness
21 of the separation between the mask and the piece work. This will worsen
22 device uniformity and performance. They need to prove not just that there is
23 a teaching that this could be done but that it would be done, that there's a
24 motivation and also a reasonable expectation of success.
25 And they have not done that because the only evidence, the only
26 argument, the only explanation for how they believe this could be

accomplished is something that the expert testimony shows has never been done and could not be done. A person of ordinary skill in the art would not have a reasonable expectation of succeeding in the -- combining the Chang embodiments in the manner that they describe. So with that, Your Honors, unless there's additional questions for me, thank you for your time.

JUDGE DENNETT: Thank you both, Counsel. Let me ask you to hold on for just a couple of minutes to ask our court reporter if she has any --

(Whereupon, the above-entitled matter went off the record at 1:57 p.m.)

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