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EXHIBITS: None

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

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

Petitioners

vs.

TRINA SOLAR CO., LTD.,

Patent Owner

Case No. IRP2025-00006
U.S. Patent No. 10,230,009

Case No. IRP2025-00007
U.S. Patent No. 9,722,104

VIDEOCONFERENCE DEPOSITION of
SANJAY BANERJEE, Ph.D.

Thursday, November 20, 2025
9:00 a.m. Central Time

----- Megan M. Castro, RPR, CSR -----

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I N D E X

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SANJAY BANERJEE, Ph.D.	
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E X H I B I T S

No exhibits were marked.

P R O C E E D I N G S

- - -

SANJAY BANERJEE, PH.D., first having
been satisfactorily identified by the
production of his driver's license and duly
sworn by the Notary Public, testified under
oath as follows in answer to examination by
ATTORNEY HERMAN:

- - -

Q. Good morning, Dr. Banerjee.

A. Good morning.

Q. So while I recognize that you have been
deposed in the past, I am going to go through a
few very basic ground rules just to make sure
we are on the same page here today.

The first is, it is important that we
try not to talk over each other, so that there
is a clear record. So I will do my best to
wait for you to finish answering before asking
another question, and I also ask that you wait
until I am done with my question before
answering, and also pause for a bit, to give
your counsel time to object.

Is that okay?

1 A. Yes.

2 Q. Next, you are entitled to a question
3 you understand. So if there is anything I ask
4 that is unclear, please let me know.
5 Otherwise, I will assume we are on the same
6 page.

7 Is that fine?

8 A. Yes.

9 Q. I ask that you not look at anything
10 during your deposition besides documents that I
11 give you. I understand you have a clean copy
12 of your supplemental declaration, and it is
13 fine for you to look at that. But if you are
14 looking at it, I ask that you let me know.

15 Is that is okay?

16 A. Yes.

17 Q. Next, I ask that you don't have any
18 side conversations or use technology to chat or
19 communicate with anyone during the deposition.

20 Is that okay?

21 A. Yes.

22 Q. Now, is there anything that would
23 prevent or interfere with your testimony today?

24 A. No.

1 Q. Do you understand that you are here to
2 testify in connection with two different IPR
3 proceedings, one of which is IPR2025-0006 and
4 the other which is IPR2025-0007?

5 A. Yes.

6 Q. So I am going to put two exhibits in
7 the chat. And I understand that you may
8 already have paper copies of these, but I want
9 to give you electronic versions, just to be
10 safe.

11 Both of these exhibits have been
12 designated Exhibit 1037.

13 Let me know when you have a chance to
14 take a look at those.

15 A. Yes, I see them.

16 Q. So I would like to direct your
17 attention first to Exhibit 1037 in the
18 IPR2025-0006 proceeding.

19 A. Okay.

20 Q. Do you recognize that exhibit?

21 (Pause.)

22 A. Yes.

23 Q. Now, that is a declaration that you
24 signed that relates to U.S. patent

1 number 10,230,009. Correct?

2 A. Yes.

3 Q. Is it okay if I refer to that patent
4 today as the '009 or the '009 patent?

5 A. Yes.

6 Q. Is it okay if I refer to this
7 particular declaration as your '009 reply
8 declaration?

9 A. Yes.

10 Q. Now, the second Exhibit 1037 that I
11 provided to you is from IPR2025-0007. Do you
12 recognize that exhibit?

13 A. Yes.

14 Q. That is a declaration that you authored
15 relating to U.S. Patent number 9,722,104.
16 Correct?

17 A. Yes.

18 Q. Is it okay if I refer to that patent as
19 the '104 patent?

20 A. Yes.

21 Q. Now, while I intend to spend much of
22 the time today focusing on you '009 reply
23 declaration, in the event I discuss this
24 particular declaration, the one that relates to

1 the '104 patent, I will refer to that as
2 your '104 patent reply declaration.

3 Is that okay?

4 A. Okay.

5 Q. Now, your declarations in this case,
6 including your '009 reply declaration, discuss
7 the combination of the Chang and Jin prior art
8 references, among other things.

9 Correct?

10 A. Yes.

11 Q. Now, your declarations also separately
12 discuss the combination of the Jin and Feldman
13 prior art references. Right?

14 A. Yes.

15 Q. So I would like to start with the
16 combination of Chang and Jin. If you could get
17 out your '009 reply declaration in either the
18 paper version that you have or the electronic
19 version that I sent is fine.

20 A. Okay.

21 Q. If you could turn to paragraph 8 of
22 that declaration.

23 A. Okay.

24 Q. So paragraph 8 is part of your reply

1 declaration that is discussing the Chang and
2 the Jin combination of prior art references.

3 Correct?

4 A. Yes.

5 Q. In that paragraph 8, there is a
6 sentence that begins, "In Chang's figure 8."

7 A. Yes.

8 Q. It goes on to say, "For instance, the
9 emitter may be formed by thermal diffusion,
10 just like in Jin."

11 Do you see that?

12 A. Yes.

13 Q. You have a picture of that occurring on
14 the following page. Right?

15 A. Yes.

16 Q. Now, could you turn down to
17 paragraph 25 for me?

18 A. Okay.

19 Q. This paragraph is still part of your
20 reply declaration that is discussing the Chang
21 and the Jin references. Right?

22 A. Yes.

23 Q. In this paragraph, you state, "As I
24 have explained in my opening declaration and

1 above, in a thermal diffusion process, the
2 substrate is exposed to a dopant vapor that
3 causes dopants to diffuse into the sides of the
4 substrate."

5 Right?

6 A. Yes.

7 Q. So let's go down to paragraph 28.

8 A. Okay.

9 Q. Now, the two paragraphs that we just
10 looked at related to thermal diffusion -- or
11 discussed thermal diffusion. Correct?

12 A. Yes.

13 Q. In paragraph 28, you are discussing ion
14 implantation, not thermal diffusion. Correct?

15 A. Yes.

16 Q. In paragraph 28, you state, "Because
17 dopants only become embedded in the substrate
18 at locations where the ion implant beam is
19 aimed, forming Chang's emitter layer using ion
20 implantation would only result in dopants
21 forming the emitter region along the front
22 surface of the solar cell."

23 Do you see that?

24 A. Yes.

1 Q. Then you conclude that sentence that I
2 just read from by noting that, "the lateral
3 sides of the substrate would remain undoped."

4 Correct?

5 A. Yes.

6 Q. Now, could you go back up to
7 paragraph 27 for me?

8 A. Okay.

9 Q. And about the middle of paragraph 27,
10 you state that, "As a result, by using ion
11 implantation, the step of separately using a
12 laser or other technique to form edge isolation
13 is no longer necessary."

14 Do you see that statement?

15 A. Yes.

16 Q. So is it fair to say that your opinions
17 regarding the combination of Chang and Jin are
18 premised on the use of thermal diffusion and
19 not ion implantation to form the front-side
20 emitter?

21 ATTORNEY ROBERTS: Object to form.

22 A. Could you repeat the question, please.

23 BY ATTORNEY HERMAN:

24 Q. Is it fair to say that your opinions

1 regarding the combination of Chang and Jin are
2 premised on the use of thermal diffusion and
3 not ion implantation to form the front-side
4 emitter?

5 ATTORNEY ROBERTS: Same objection.

6 A. If one uses ion implantation on the top
7 surface of the solar cell -- I believe the
8 patents call that the "second surface" -- you
9 would not go up to sides. However, if you use
10 thermal diffusion or dopants in a furnace, it
11 will be fused at the top surface, as well as
12 the sides.

13 But there are other ways also you can
14 form the front emitter. For example, you could
15 deposit a doped polysilicon layer, as Chang
16 does, using chemical vapor deposition. And if
17 you do that CVD on the front surface, that
18 would also wrap around on the sides and that
19 would require an isolation region that would
20 form between the back surface field of the
21 emitter.

22 So if you could give me more specifics.

23 Q. So your opinions rely on use of a
24 method that causes the front-side emitter to

1 wrap around the sides of the solar cell.

2 Correct?

3 ATTORNEY ROBERTS: Object to form.

4 A. If the front emitter was not close to
5 the back surface field, which could lead to
6 shorting, then you would not need any
7 isolation. The whole goal of the isolation
8 region is to prevent electrical leakage pathway
9 between the emitter and the back surface field.

10 BY ATTORNEY HERMAN:

11 Q. So your analysis is premised on the use
12 of a method that does, in fact, cause the
13 front-side emitter to wrap around the sides of
14 the solar --

15 A. You cut off. I am not sure why.

16 Q. So your opinion --

17 A. I can't hear you.

18 (Discussion off the record.)

19 BY ATTORNEY HERMAN:

20 Q. So your opinions are premised on
21 implementing Chang and Jin using a method like
22 thermal diffusion that results in the
23 front-side emitter going down the sides of the
24 solar cell substrate.

1 Correct?

2 ATTORNEY ROBERTS: Object to form.

3 A. Yes. My idea behind the proposed
4 combination of Chang and Jin is to provide
5 isolation in the scenario where the emitter is
6 in close proximity with the back surface field
7 so that there could be electrical shorting.

8 BY ATTORNEY HERMAN:

9 Q. Now, if you used ion implantation, I
10 think you said there would not be a need for
11 that isolation that you just referred to.
12 Correct?

13 ATTORNEY ROBERTS: Object to form.

14 A. So Chang discloses multiple embodiments
15 for forming the front-side emitter. So if you
16 use ion implantation only on the top
17 surface -- which is used in the parlance of the
18 patents, I think, the "second surface" -- then
19 you would not need an isolation. But Chang
20 does disclose the need to form isolation
21 regions for the other embodiments.

22 BY ATTORNEY HERMAN:

23 Q. So one other question about this.

24 Can you perform thermal diffusion in a

1 way that would not result in doping in the
2 sides of a solar cell substrate?

3 ATTORNEY ROBERTS: Object to form.
4 Object to scope.

5 A. That scenario is not discussed in my
6 report or in these prior art. But in general,
7 yes, it is possible. You can always block
8 thermal diffusion or dopants, if you had a
9 sufficiently thick diffusion mask. And what I
10 mean by "sufficiently thick" depends on the
11 details of the diffusion temperature, the
12 diffusion time, and the thickness of the mask,
13 such as an oxide mask. But I have not opined
14 on any of those aspects in my report.

15 BY ATTORNEY HERMAN:

16 Q. So you did not discuss the application
17 of a mask to the sides of the substrate during
18 a thermal diffusion step in your declarations.

19 Correct?

20 ATTORNEY ROBERTS: Object to scope.

21 A. I did not analyze any of those aspects
22 in my report.

23 BY ATTORNEY HERMAN:

24 Q. But you did discuss the use of a mask

1 during formation of the back-side field layers.

2 Correct?

3 ATTORNEY ROBERTS: Object to form.

4 A. Yes. I mean, we cited Chang, where, in
5 my opinion, Chang discloses forming an
6 isolation at the back side, the peripheral
7 region. And then we drew upon Jin to add color
8 to the picture, if you will, to add technical
9 details of how that isolation will be formed in
10 Chang.

11 But we analyzed that -- I was asked to
12 analyze that in terms of forming an isolation
13 on the front surface, which is the lower
14 surface on the solar cell, the non-sun-facing
15 side.

16 BY ATTORNEY HERMAN:

17 Q. Turning down to paragraph 38 for me.

18 About a third of the way through that
19 paragraph, there is a sentence that reads, "But
20 that is not the embodiment of Chang I relied on
21 in my opening declaration."

22 Do you see that?

23 A. Yes.

24 Q. What is the embodiment that you are

1 referring to in that sentence?

2 A. Chang discloses multiple ways of
3 forming an isolation region. So when he uses
4 the term, "entirely formed," he is referring to
5 forming a layer without any in-holes or gaps in
6 the middle. But he explicitly states in many
7 paragraphs -- I have read so many things, and
8 it is paragraph 45 and then three or four other
9 paragraphs -- where he states that his use of
10 the term, "entirely formed," excludes a
11 peripheral region. And this could be on the
12 front surface or the back surface or both.

13 So for this purpose, for my analysis, I
14 was looking at the embodiment where Chang may
15 not have formed these peripheral isolation
16 regions on the front surface, and that then
17 requires forming this isolation region on the
18 back surface, which Chang discloses in that
19 particular embodiment.

20 Q. So if I understand your answer there, I
21 think you are saying that your opinions are
22 premised on an implementation of Chang, where a
23 portion of the tunnel oxide and the polysilicon
24 is excluded from the edge of the solar cell

1 only on its lower surface, as shown in Chang's
2 figures, but not on the upper surface, as shown
3 in the figures.

4 Is that true?

5 ATTORNEY ROBERTS: Object to form.

6 A. Once again, Chang has multiple
7 embodiments. And the embodiment that I cited,
8 where we have the disclosure of an isolation
9 region on the back side to prevent contact
10 between the back surface field and the front
11 emitter, is the embodiment where the emitter
12 wraps around on the sides.

13 BY ATTORNEY HERMAN:

14 Q. So your opinions are premised on an
15 embodiment or an implementation of Chang, where
16 the layers are not excluded from the sides or
17 the top surface, but are excluded from the
18 perimeter of the bottom surface.

19 Correct?

20 ATTORNEY ROBERTS: Object to form.

21 A. So the embodiment of Chang that I am
22 depending on, is the disclosure where Chang
23 discloses forming a peripheral isolation region
24 on the back surface, the non-sun-facing

1 surface.

2 BY ATTORNEY HERMAN:

3 Q. So only on the back surface, and not on
4 the top surface. Correct? That is what you
5 are relying on?

6 ATTORNEY ROBERTS: Object to form.

7 A. I certainly, depending on that
8 scenario, I think your expert, in his report,
9 said that, if there is an isolation region
10 formed on the front surface, the sun-facing
11 side, there will be no contact, whatsoever,
12 between the front emitter and the back surface
13 field. And therefore, there would be no need
14 to form an isolation region on the back
15 surface.

16 I don't see any problems in the
17 isolation region. I mean, that is going to
18 give you an additional insurance policy, if you
19 will. But once again, the embodiment that I am
20 relying on in Chang is the disclosure where he
21 has an isolation region in the periphery of the
22 back surface.

23 Q. Now, the other primary combination of
24 references you discuss was Jin and Feldman.

1 Is that right?

2 A. Yes.

3 Q. Can you turn down to paragraph 44 of
4 your '009 patent reply declaration for me.

5 A. Okay. Yes.

6 Q. So this is a portion of your
7 declaration that is discussing that Jin and
8 Feldman combination. Right?

9 A. Yes.

10 Q. Now, in paragraph 44, you reference
11 both forming a thin tunnel oxide using shadow
12 mask techniques and you also reference
13 plasma-enhanced chemical vapor deposition, or
14 PECVD.

15 Do you see that?

16 A. Yes.

17 Q. Later in that same paragraph, you note
18 that Dr. Peckerar focuses on Feldman's wet
19 chemical process and thermally grown oxides.

20 Do you see that?

21 A. Yes.

22 Q. Is it fair to say that your opinions
23 regarding Jin and Feldman where premised on the
24 use of shadow masks and PECVD when forming the

1 tunnel oxide, and not some other method, like
2 thermally growing the oxide?

3 ATTORNEY ROBERTS: Object to form.

4 A. I mentioned PECVD or atomic layer
5 deposition as exemplary ways of forming thermal
6 oxide, and I am not necessarily discounting
7 other ways of forming the tunnel oxide. For
8 example, he could use particle deposition also,
9 which I believe Dr. Peckerar referred to in
10 some location.

11 One would not use thermal oxidation
12 with this mask, because that really requires
13 higher temperatures than PECVD and that would
14 be difficult -- maybe not impossible, but it
15 would not be a practical way to use a metal
16 mask under thermal oxidation.

17 So that is why I refer to PECVD or ALD
18 as exemplary ways of forming the tunnel oxide,
19 but I am not discounting other possible ways of
20 forming the tunnel oxide.

21 Q. But you did discount using the thermal
22 growth method. Correct?

23 ATTORNEY ROBERTS: Object to form.

24 A. In this particular location, I said

1 that, yes, thermal oxide growth of the tunnel
2 oxide may not be the ideal way of growing the
3 tunnel oxide. But I haven't looked at every
4 possible scenario of thermal oxidation.

5 And there may be hypothetical scenarios
6 where you could use a mask, even with thermal
7 oxides, but I have not analyzed that. I did
8 not need to, because there is multiple ways of
9 depositing the tunnel oxide, and PECVD would be
10 an excellent way of doing so, where the mask
11 disclosed in Jin who provided the isolation
12 medium.

13 BY ATTORNEY HERMAN:

14 Q. If you could turn down to paragraph 50
15 for me.

16 A. Okay.

17 Q. In paragraph 50, you note, "It is not
18 lateral conduction through the tunnel oxide
19 that would result in leakage and therefore
20 shorting."

21 Do you see that statement?

22 A. Yes.

23 Q. So that is a reference to the fact that
24 tunnelling essentially occurs across the

1 thickness of the tunnel oxide.

2 Correct?

3 A. Tunnelling is a quantum mechanical
4 phenomena, where the tunnelling rate depends,
5 exponentially, on the tunnel layer thickness.
6 The thinner the oxide, it is exponentially
7 easier for these electrons to tunnel through.

8 So the thickness is typically going to
9 be much smaller, on the order of 1 to
10 2 nanometers, than the lateral dimensions that
11 Dr. Peckerar is citing. So therefore, the
12 tunnelling would be in the vertical direction
13 through the thickness, rather than laterally
14 along the tunnel oxide.

15 Q. So an electron is not going to
16 tunnel 1,000 nanometers. Correct?

17 ATTORNEY ROBERTS: Object to form.

18 A. I mean, it will tunnel. It is not an
19 digital on-off switch. Okay?

20 But the tunnelling rate will be so low
21 that, for all practical purposes, it will not
22 tunnel. But you could quantum mechanically
23 calculate a non-zero tunnelling, probably, even
24 in that case. But it is so small that, from an

1 engineering point of view, it will not tunnel.

2 BY ATTORNEY HERMAN:

3 Q. So going back to paragraph 50, you also
4 say, "Rather, during the formation of the
5 tunnel oxide itself, fixed charges resulting
6 from impurities are trapped in the silicon
7 oxide."

8 Do you see that?

9 A. Yes.

10 Q. And that is the reason why you believe
11 a person having ordinary skill in the art would
12 have removed the tunnel oxide from a solar
13 cell's isolation portion, because there could
14 be fixed charges in the oxide.

15 Correct?

16 ATTORNEY ROBERTS: Object to form.

17 A. Depending on the type of fixed charges
18 and the doping type of the semiconductor base,
19 that could potentially create leakage problems
20 between the back surface field and the front
21 emitter.

22 BY ATTORNEY HERMAN:

23 Q. So we turn back to paragraph 53, I
24 think you discuss the combination that you were

1 just referring to.

2 A. Yes.

3 Q. So in paragraph 53, you note that these
4 fixed charges, if they are negative, can result
5 in p-type inversion of the right type of
6 substrate, thus producing a leakage path.
7 Correct?

8 A. Yes.

9 Q. You also note in that paragraph that,
10 while thermal growth results in positive fixed
11 charges, deposition using, e.g., PECVD results
12 in net negative fixed charges.

13 Right?

14 ATTORNEY ROBERTS: Object to the form.

15 A. Are you referring to paragraph 52?

16 BY ATTORNEY HERMAN:

17 Q. I think you say that in paragraph 53 as
18 well, or maybe I am misreading.

19 So why don't we go to paragraph 52 and
20 I will restate my question for you?

21 So take a look at paragraph 52. In
22 that paragraph, you say, "Depending on the
23 process used to form the tunnel oxide, the
24 trapped fixed charges can be either positive or

1 negative."

2 Right?

3 A. Yes.

4 Q. The next sentence notes that, "Thermal
5 growth results in positive fixed charges."

6 Right?

7 A. Yes.

8 Q. And then you note that, "PECVD results
9 in net negative fixed charges."

10 Right?

11 A. Yes.

12 Q. Now, if you thermally grew a tunnel
13 oxide, it would not result in the type of
14 p-type inversion that you show in your figures
15 in paragraph 53.

16 Correct?

17 ATTORNEY ROBERTS: Object to form.

18 A. If you had a thermally grown oxide with
19 positive charges, and the base, the
20 semiconductor solar cell base was n-type, then
21 it would not lead in a p-type inversion layer.

22 BY ATTORNEY HERMAN:

23 Q. So that p-type inversion layer will
24 only occur when the tunnel oxide is deposited

1 using PECVD or another technique that has the
2 types of negative fixed charges that you were
3 referring to.

4 Correct?

5 ATTORNEY ROBERTS: Object to form.

6 A. The p-type inversion that I cite on
7 page 34, paragraph 53, would happen if the
8 tunnel oxide had negative charges, and PECVD
9 would be an example of that -- PECVD oxides
10 would be an example of that, and the substrate
11 was n-type.

12 BY ATTORNEY HERMAN:

13 Q. So is it fair to say that your opinions
14 rely on an implementation of Jin and Feldman
15 that used PECVD, or another deposition method
16 that results in negative fixed charges and not
17 thermal oxidation when forming the tunnel oxide
18 layer?

19 ATTORNEY ROBERTS: Object to form.

20 A. In my report, I analyze the scenario
21 where you have a PECVD tunnel oxide with
22 negative charges deposited on top of on n-type
23 silicon substrate.

24 I have not analyzed every possible

1 scenario. What you are asking is a very broad
2 question, so you have to give me more
3 specifics.

4 BY ATTORNEY HERMAN:

5 Q. So one of the scenarios that you did
6 not analyze was a tunnel oxide that has
7 positive fixed charges. Correct?

8 ATTORNEY ROBERTS: Object to form.
9 Object to scope.

10 A. For the scenario that I describe in
11 paragraph 53, I did not analyze the combination
12 of a tunnel oxide with a positive fixed charge
13 deposited on top of an n-type substrate.

14 BY ATTORNEY HERMAN:

15 Q. Now, I am going to give you to copy of
16 the Chang reference. Chang has been marked
17 Exhibit 1013.

18 Let me know when you have that one.

19 A. Yes, I have it.

20 Q. Now, if you could turn to paragraph 98
21 of Chang for me.

22 A. Okay.

23 Q. So paragraph 98 is discussing the
24 formation of a solar cell's emitter area 20.

1 Right?

2 A. Yes.

3 Q. "The emitter area may be formed by a
4 variety of doping methods (for example, thermal
5 diffusion, ion implantation, or the like)."

6 Right?

7 A. Yes.

8 Q. So there, Chang references methods
9 besides thermal diffusion. Correct?

10 A. Yes.

11 Q. And one of the referenced methods is
12 ion implantation. Right?

13 A. Yes.

14 Q. In fact, you opine in your declarations
15 that certain of Chang's embodiments, including
16 that discussed earlier, in paragraph 76,
17 actually employ ion implantation and not
18 thermal diffusion. Correct?

19 ATTORNEY ROBERTS: Object to form.

20 A. In paragraph 76, I believe Chang is
21 disclosing embodiments where the emitter is not
22 adjacent to the back surface field, and ion
23 implantation of the front emitter would be an
24 example embodiment where the emitter and the

1 front emitter and the back surface field would
2 not be adjacent to each other.

3 But once again, there are many ways of
4 skinning this cat and you have to give me more
5 specifics to comment definitively.

6 BY ATTORNEY HERMAN:

7 Q. So I am going to put another exhibit in
8 the chat. This one is Exhibit 1009, the Jin
9 prior art reference.

10 Let me know when you have that.

11 A. I have it.

12 Q. If you could turn to paragraph 78 of
13 Jin for me.

14 A. Okay.

15 Q. Paragraph 78 of Jin references a heat
16 diffusion method, a laser doping method, or an
17 ion implantation method for purposes of doping
18 portions of a substrate. Correct?

19 A. Yes.

20 Q. So that also references ion
21 implantation as an acceptable method. Correct?

22 A. Yes, that is one of the exemplary
23 methods, among others.

24 Q. And it does not require the use of heat

1 diffusion. Correct?

2 ATTORNEY ROBERTS: Object to form.

3 A. It does not require heat diffusion.

4 But some of the figures in the specifications
5 tell me that heat diffusion is certainly one of
6 the possibilities. I know you are not supposed
7 to limit the claims of a patent by the
8 specifications, but I suppose that you always
9 read the claims in light of the specifications.

10 And the point is, Jin does disclose
11 heat diffusion as an exemplary method of
12 forming the front emitter.

13 BY ATTORNEY HERMAN:

14 Q. If you could get the Chang reference
15 back out for me. That is Exhibit 1013.

16 A. Okay.

17 Q. If you could turn to paragraph 146.

18 A. Okay.

19 Q. That paragraph is discussing methods to
20 form Chang's first and second tunnelling
21 layers. Right?

22 A. Yes.

23 ATTORNEY ROBERTS: Object to form.

24 BY ATTORNEY HERMAN:

1 Q. The paragraph states that those layers
2 can be formed by a method such as thermal
3 growth or deposition. Correct?

4 ATTORNEY ROBERTS: Object to form.

5 A. Yes. Chang discloses here, "The first
6 and second tunnelling layers 42 and 44 may be
7 formed, for example, by a method such as
8 thermal growth or deposition, for example PECVD
9 or ALD or the like."

10 BY ATTORNEY HERMAN:

11 Q. But Chang does not require that any one
12 of those methods be used; you can use any of
13 them. Correct?

14 ATTORNEY ROBERTS: Object to form.

15 A. Yes, I believe here Chang is disclosing
16 all of these as possibilities. You are not
17 restricted to any one of them.

18 BY ATTORNEY HERMAN:

19 Q. If you could get your '009 patent reply
20 declaration out. That is Exhibit 1037.

21 A. Okay.

22 Q. Turn to paragraphs 12 and 13 for me.

23 A. Okay.

24 Q. These paragraphs are discussing a 1984

1 paper by KwarK and others. Correct?

2 A. Yes.

3 Q. And right before paragraph 14, so at
4 the very end of paragraph 13, there is a
5 sentence that reads, "The thicker
6 chemox-plus-interfacial oxide still did not
7 block the diffusion of dopants into the
8 substrate, though it 'acted as a more robust
9 diffusion barrier.'"

10 Do you see that?

11 A. Yes.

12 Q. Is that saying that an oxide layer
13 blocks some, but not all, dopant diffusion?

14 ATTORNEY ROBERTS: Object to form.

15 A. How effective an oxide is in terms of
16 blocking diffusion is a function of many
17 parameters: The type of dopant, the processing
18 temperature, the processing time, and the
19 thickness of the oxide. So in general, the
20 thicker the oxide, the more effective of a
21 diffusion blocker it will be. The higher the
22 temperature or the longer the diffusion time,
23 the less effective it becomes.

24 These are all things that are seen.

1 BY ATTORNEY HERMAN:

2 Q. Even a thin oxide had some impact on
3 diffusion of dopants?

4 ATTORNEY ROBERTS: Object to form.

5 A. I mean, even a thin oxide would block
6 diffusion to a greater degree than having no
7 oxide at all. But a thin oxide, under
8 realistic processing conditions of a solar
9 cell, for example in this context, still does
10 not block the diffusion.

11 BY ATTORNEY HERMAN:

12 Q. Now if you could turn down to
13 paragraph 51 of your declaration for me.

14 A. Okay.

15 Q. In paragraphs 51 and 52, you cite
16 Exhibits 1042, 1043, and 1044.

17 Do you see that?

18 A. Yes.

19 Q. So I am going to put those three
20 exhibits into the chat, so that you have copies
21 of them.

22 Let's start with Exhibit 1042.

23 A. Okay.

24 Q. That is an article entitled, "Negative

1 Charge in Plasma Oxidized SiO₂ Layers."

2 Right?

3 A. Yes.

4 Q. There is an abstract on page 259 of the
5 article. Correct?

6 A. Yes.

7 Q. And the abstract says that the paper is
8 directed to the silicon dioxide (SiO₂) gate
9 dielectric layers, 4 to 60 nanometers.

10 Right?

11 A. Yes.

12 Q. A solar cell's tunnel oxide layer is
13 not a gate dielectric layer.

14 Correct?

15 ATTORNEY ROBERTS: Object to form.

16 A. Can you repeat that, please.

17 BY ATTORNEY HERMAN:

18 Q. A solar cell's tunnel oxide layer is
19 not a gate dielectric layer.

20 Correct?

21 ATTORNEY ROBERTS: Object to form.

22 A. I mean, you can use the same material,
23 such as silicon dioxide, for both applications,
24 but I am not saying that a solar cell is a

1 transistor.

2 BY ATTORNEY HERMAN:

3 Q. So a gate dielectric layer is referring
4 to a layer of insulation used in the
5 transistor. Correct?

6 ATTORNEY ROBERTS: Object to form.

7 A. I mean, a gate dielectric layer could
8 refer to an application of an oxide in a
9 transistor.

10 BY ATTORNEY HERMAN:

11 Q. How thick is four to 60 nanometers in
12 angstroms?

13 A. You multiply by 10, so 40 to 600
14 angstroms.

15 Q. Now, could you take a look at
16 Exhibit 1043 for me?

17 A. Okay.

18 Q. Now, the second page of this exhibit
19 includes a title. Do you see that?

20 A. Yes.

21 Q. It is sideways.

22 A. Yes.

23 Q. And the title is, "VLSI Fabrication
24 Principles."

1 Do you see that?

2 A. Yes.

3 Q. What does the acronym, "VLSI," refer
4 to?

5 A. Very large scale integration.

6 Q. That is not directed to solar cells.
7 Correct?

8 ATTORNEY ROBERTS: Object to form.

9 A. Very large scale integration typically
10 refers to transistors.

11 But once again, that is missing the
12 point. Here, we are looking at the materials
13 that are used, and it could be the same
14 materials for transistors, as well as for solar
15 cells, depending on the context.

16 BY ATTORNEY HERMAN:

17 Q. Now please take a look at Exhibit 1044.

18 That exhibit is an article entitled,
19 "Charges and Defects in SiO₂ Films Deposited By
20 Plasma-Enhanced Chemical Vapor Deposition At
21 Low Temperatures."

22 Right?

23 A. Yes.

24 Q. There is an abstract on the first page?

1 A. Yes.

2 Q. And the abstract references silicon
3 oxide films for MOS devices. Right?

4 A. Yes.

5 Q. What is an MOS device?

6 A. Metal oxide semiconductor.

7 Q. So the solar cells discussed in your
8 declaration are not metal oxide semiconductor
9 devices.

10 Right?

11 ATTORNEY ROBERTS: Object to form.

12 A. A solar cell is not a transistor.

13 But once again, the point is, you are
14 using similar materials in both the transistor
15 and the solar cell for purposes of this
16 analysis. So the relevant conclusions from the
17 Ip paper and the Boogaard paper or the Ghandi
18 book, depending on the context, would be
19 perfectly applicable to a solar cell also.

20 BY ATTORNEY HERMAN:

21 Q. Now, there is an experimental section
22 on the first page. Do you see that?

23 A. Yes.

24 Q. And about the middle of that section,

1 it references an oxide thickness being 500
2 to 600 angstroms. Right?

3 A. Yes.

4 Q. Now, that is more than an order of
5 magnitude thicker than the tunnel oxides
6 discussed in your declaration. Correct?

7 ATTORNEY ROBERTS: Object to form.

8 A. These oxides are thicker than what one
9 would use for tunnelling, because, if you use
10 these oxides as a gate dielectric of a
11 transistor, you would not want the gate to
12 leak. So that is why you typically make them
13 thicker.

14 On the other hand, when you use the
15 same oxides in a solar cell is a top contact
16 structure, you do want it to leak. Otherwise,
17 you end up with an open circuit.

18 But once again, the point is, we are
19 looking at the materials combinations, which is
20 silicon dioxide, either thermally grown or
21 PECVD deposited or ALD deposited.

22 ATTORNEY HERMAN: I don't have any
23 further questions. So I pass the witness.

24 ATTORNEY ROBERTS: Do you mind if we

1 take a five-minute break, Mr. Herman?

2 ATTORNEY HERMAN: Yes, that is fine.

3 ATTORNEY ROBERTS: Thank you.

4 (Recess taken at 9:52 a.m.)

5 (Recess ended at 10:04 a.m.)

6 ATTORNEY ROBERTS: We don't have any
7 further questions at this time. So unless
8 there is anything else, we are ready for the
9 deposition to conclude.

10 ATTORNEY HERMAN: Great. Well, thank
11 you, Doctor, for your time today.

12 (Whereupon, at 10:04 a.m., the
13 deposition was adjourned.)

14

15

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1 ATTACH TO DEPOSITION OF: SANJAY BANERJEE, Ph.D.

2 CASE: RUNERGY USA INC., RUNERGY ALABAMA INC.,
3 MUNDRA SOLAR PV LTD., ADANI SOLAR USA INC. and
4 CANADIAN SOLAR (USA) INC. vs. TRINA SOLAR CO.,
5 LTD.

6 DATE TAKEN: 11/20/2025

7 ERRATA SHEET

8 PAGE LINE CHANGE REASON

9

10

11

12

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14

15

16 I have read the foregoing transcript of
17 my deposition and except for any corrections or
18 changes noted above, I hereby subscribe to the
19 transcript as an accurate record of the statements
20 made by me.

21 Executed this ____ day of

22 _____, 20__.

23

24

SANJAY BANERJEE, Ph.D.

CERTIFICATE

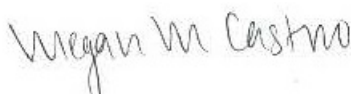
Commonwealth of Massachusetts

Suffolk, ss.

I, Megan M. Castro, Registered
Professional Reporter and Notary Public in and for
the Commonwealth of Massachusetts, do hereby
certify:

That SANJAY BANERJEE, Ph.D., the witness
whose deposition is hereinbefore set forth, was
duly sworn by me and that such deposition is a
true record of the testimony given by the said
witness.

IN WITNESS WHEREOF, I have hereunto set
my hand on November 25, 2025.



Megan M. Castro
Registered Professional Reporter
Certified Shorthand Reporter No. 152614

My Commission expires:
July 22, 2027

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