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

LAM RESEARCH CORP.,	)	Case No.:
	)	IPR2024-00033
Plaintiff,	)	
	)	
v.	)	
	)	
INPRIA CORP.,	)	
	)	
Defendants.	)	
_____	)	

DEPOSITION OF KAREY HOLLAND, PhD
CONDUCTED VIRTUALLY
November 22, 2024
9:01 a.m.

REPORTED BY:
Tammy Moon, CSR No. 13184, RDR, CRR

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INDEX OF EXHIBITS

Marked

NONE.

1 Friday, November 22, 2024, 9:01 a.m.

2 THE REPORTER: This is Tammy Moon, certified
3 stenographic reporter 13184. I am a code compliant
4 reporter, and as such, this transcript will be handled
5 pursuant to the Code of Civil Procedure 2025.550.

6 KAREY HOLLAND, PhD,
7 called as a witness, having been duly sworn,
8 testified as follows:

9 THE WITNESS: I do.

10 EXAMINATION BY MR. WOLFE, COUNSEL FOR PATENT OWNER

11 MR. WOLFE:

12 Q. Dr. Holland, can you please state your full
13 name for the record.

14 A. Yes. Karey Lynn Holland.

15 Q. Okay. Just going over some of the ground rules
16 very briefly because this time we're -- we're virtual
17 rather than in person. And given we're on Zoom, it will
18 be more important for us to be careful not to talk over
19 one another. Okay?

20 A. Yes.

21 Q. Thank you. And then the next thing is we'll
22 make sure to have audio confirmation rather than nodding
23 your head, "huh-uh," "uh-huh," because that doesn't get
24 picked up by the court reporter. Do you understand?

25 A. Yes.

1 Q. And you understand that you are under oath
2 today, right?

3 A. Yes.

4 Q. It's the same oath that you would have given if
5 we were in person. You understand that, right?

6 A. Yes. Absolutely.

7 Q. Is there any reason you cannot testify
8 completely, truthfully, and accurately today?

9 A. No reason at all.

10 Q. Where are you today?

11 A. In Palo Alto.

12 Q. Are you in the Morgan Lewis office?

13 A. I am.

14 Q. Who is in the room with you?

15 A. Dion and Zach.

16 Q. That would be Dion Bregman and Zach Miller,
17 right?

18 A. That is correct.

19 Q. Okay. Is there anyone else in the room?

20 A. No.

21 Q. If we could -- we sent you a box of documents.
22 Could you open up Exhibit 1040.

23 A. We will.

24 Q. Do you recognize this document?

25 A. I do.

1 Q. Is that your signature on page 81?

2 A. Yes.

3 Q. Did you prepare this declaration?

4 A. I worked with the lawyers here at Morgan Lewis
5 to prepare it.

6 Q. But these are your opinions, right?

7 A. That is correct.

8 Q. How long did you spend preparing this
9 declaration?

10 A. I don't know the answer to that, but it was
11 significant hours.

12 Q. Roughly?

13 A. Probably a month.

14 Q. A month. A month working on it full-time?

15 A. No. Part-time.

16 Q. Okay. Roughly how many hours would you say?

17 A. Oh, I'd have to go look up my hours that I
18 wrote down. I really don't remember.

19 Q. Would it be ten hours?

20 A. No, no. Much more than that. So --

21 Q. Would it be a hundred hours?

22 A. Would you like me to look it up? I could look
23 it up. I've got it on my computer.

24 Q. That's okay. I'm just looking for, you know,
25 just rough estimate. Around a hundredish?

1 A. Let's say -- I don't -- yeah. I really don't
2 know. If I even said 30, I wouldn't know. You know,
3 50 -- so sorry. It would be easy for me to look it up.

4 Q. It's okay. No worries. I just wanted to sort
5 of get a ballpark understanding of, you know, how much
6 time you spent on it.

7 (Simultaneous colloquy.)

8 A. It would be speculation. How about that?

9 Q. Okay. That works.

10 A. Okay. It's about 30. I was guessing.

11 Q. Okay. Thank you for that. Did you work with
12 anyone in preparing this declaration other than the
13 Morgan Lewis lawyers?

14 A. No.

15 Q. For today's deposition -- did you spend any
16 time preparing for today's deposition?

17 A. Yes, I did.

18 Q. How much time did you spend?

19 A. Let's say 12 hours. I went back and reread
20 my -- my declaration, things like that so I could find
21 things easier when you ask questions.

22 Q. Okay. And you say "we." You mean you and the
23 Morgan Lewis lawyers, right?

24 A. I didn't mean "we." I read it. But, yes, I --
25 I did spend some time with the lawyers as well.

1 Q. Okay. How much time did you spend with the
2 lawyers?

3 MR. MILLER: And I'll just caution you. And
4 you can answer that question. Just don't reveal the
5 discussions or contents of any discussions with the
6 attorneys.

7 THE WITNESS: I understand.

8 MR. MILLER: You can answer the questions.

9 THE WITNESS: So, yeah, I think we spent seven
10 hours yesterday together.

11 MR. WOLFE:

12 Q. Okay. So just yesterday?

13 A. No. I actually met with Alison and Zach last
14 week for maybe four hours.

15 Q. Okay. So was that a virtual meeting?

16 A. Yes, last week was virtual.

17 Q. So you met virtually for four hours and then in
18 person for about seven.

19 A. Yeah.

20 Q. Is that fair? Did you review any materials
21 while you were preparing?

22 A. Yes.

23 Q. Other than your declaration, what materials did
24 you review, if any?

25 A. It would have been the exhibits that are

1 listed, like the Exhibit 1019 and things like that.

2 Q. So there would be exhibits that are already on
3 the record, right?

4 A. That is correct. I did not review anything
5 that was not already on the record.

6 Q. Okay. Did you talk to anyone other than the
7 Morgan Lewis lawyers while preparing for this
8 deposition?

9 A. Well, I was at home, so I did talk to my
10 husband when I was home.

11 Q. That's fair. Did you --
12 (Simultaneous colloquy.)

13 A. Do you mean about this -- this? No.

14 Q. Understood. So if -- you didn't discuss your
15 upcoming deposition while preparing for your deposition
16 with anyone other than the Morgan Lewis lawyers, right?

17 A. Correct.

18 Q. And if we can turn in Exhibit 1040 to paragraph
19 five, please.

20 A. Okay.

21 Q. So here you state: "My analysis of the
22 materials produced in this investigation is ongoing, and
23 I will continue to review any new materials as they
24 become available." I believe you just testified that
25 you didn't review any new materials that would be

1 outside the record. Is that right?

2 A. Correct. Everything that I reviewed for this
3 was -- Morgan Lewis did -- put them in as -- what are
4 they called? Examples? No.

5 Q. Exhibits, yes.

6 A. Exhibits, yes. Exhibits.

7 Q. Right. There were also some exhibits that were
8 labeled in the 2000 series. Those would be ones that
9 were introduced by Inpria. Do you understand that?

10 A. I did not know that. Okay.

11 Q. So typically in these proceedings, the
12 1000-series exhibits are from the petitioner, who is
13 Lam, and then the 2000 ones would be from us. So --
14 just for your information.

15 A. I didn't know that.

16 Q. If you could, please turn to paragraph ten.

17 A. Okay.

18 Q. This paragraph is titled "Burden of Proof."
19 You understand that it is Lam's burden to prove
20 unpatentability for both the original claims and the
21 proposed amended claims, right?

22 A. Yes.

23 Q. Let's turn to paragraph 13, if we could. Are
24 you there?

25 A. Yes.

1 Q. Okay. Sorry to do this to you, but can you
2 turn back one page. You see page 12 is titled "Written
3 Description," right?

4 A. Yes.

5 Q. Okay. So then back to 13. See the last
6 sentence there -- it says: "Compliance with the written
7 description requirement involves both an assessment of
8 the scope of claims and the adequacy of disclosure to
9 support claims of such scope." Do you see that?

10 A. Yes.

11 Q. In considering whether the claims had written
12 descriptions before you here to the priority
13 application, did you assess the scope of the limitation,
14 reciting an average thickness from 5 nanometers to
15 30 nanometers?

16 A. Ask that again.

17 Q. In considering whether the claims had written
18 description support to the priority application here,
19 did you assess the scope of the claim limitation,
20 reciting an average thickness of 5 nanometers to
21 30 nanometers?

22 A. I believe I did, yes.

23 Q. And what did you understand that claim term to
24 mean, then?

25 A. They -- they stated in the claim 5 to

1 30 nanometers.

2 Q. Right. So was there anything that you needed
3 to interpret about that, or was that clear from its
4 face?

5 A. So if I read the full patent, then it -- 5 to
6 30, to me, is just within a large range of -- of
7 thicknesses that they had as possible thicknesses. So
8 I'm not sure why 5 to 30 would have been chosen. So
9 that's not clear to me.

10 Q. Right. But I'm just asking about the language
11 from Claim 1. States: "An average thickness from 5
12 nanometers to 30 nanometers." Was that unclear to you
13 in the way that you needed to interpret the scope of
14 that?

15 MR. MILLER: Objection. Outside the scope.

16 THE WITNESS: I do know what "5 to
17 30 nanometers" means, if that's the question.

18 MR. WOLFE:

19 Q. And your understanding would be that a POSA
20 would also know what "5 to 30 nanometers" would mean?

21 MR. MILLER: Objection. Outside the scope.

22 THE WITNESS: Yes.

23 MR. WOLFE:

24 Q. And you are opining on the unpatentability,
25 according to you, of Claim 1 of the '564 patent, right?

1 A. That is correct.

2 Q. And the '564 patent includes the limitation in
3 Claim 1 that says: "The average thickness from 5
4 nanometers to 30 nanometers," right?

5 A. Say that again. I'm sorry.

6 Q. Maybe it will help if we open Exhibit 1001. I
7 think that's in the materials. And if you could turn to
8 the last page once you get there.

9 A. Okay. Yes. So you were referring to the '564
10 patent. I just wanted to make sure.

11 Q. Yeah. And then looking at -- I believe it's
12 line 11, but it's sort of in the middle there.

13 A. Yes.

14 Q. It says: "Wherein the coating material has an
15 average thickness from 5 to 30 nanometers," right?

16 A. Yes.

17 Q. And you understood what the term "5 to
18 30 nanometers" meant, right?

19 A. I do know what "5 to 30 nanometers" is as far
20 as the thickness.

21 Q. And you would know what "5 to 30 nanometers"
22 means in the context of this claim, right?

23 A. Well, again, in the context of this claim, I
24 would be reading the full patent and trying to
25 understand why 5 to 30 is specified.

1 Q. Does the full patent --

2 A. Claim. Excuse me.

3 Q. -- change your understanding of what "5 to 30"
4 means?

5 A. It does not change my understanding of what "5
6 to 30 nanometers" means. It does not explain to me why
7 I would say "5 to 30" instead of some other set of
8 thicknesses. There's no explanation.

9 Q. Okay. I'm not necessarily asking about a
10 particular rationale for those words, just that you
11 would have understood -- or a POSA would have understood
12 what those words mean, right?

13 A. Yes. I -- I think I already said that.

14 Q. Okay. Let's turn to paragraph 16 of your
15 declaration, please, which is Exhibit 1040.

16 A. Yes. Got it.

17 Q. And here I believe we're also still talking
18 about written description. How does one determine
19 whether a genus is broad or narrow?

20 A. I could read 16 to you if that would help. It
21 does have some legalese in there.

22 Q. Sure. Let's read the sentence starting with, I
23 believe, "The number." So it says:

24 "The number of representative species
25 required varies depending on the facts of the

1 case, but that where the degree or level of
2 the function recited in the claim is broad or
3 open-ended, disclosure of multiple species
4 representing only a small fraction of the
5 scope of the claimed function is inadequate to
6 meet the description" -- "written description
7 requirement."

8 How does one determine whether a genus is broad
9 or open-ended?

10 A. Well, as an example, I would say is it
11 described in the -- the written-up part of the patent,
12 not just the claims. And, say, do they explain what
13 they're talking about in broad terms or narrow terms?
14 So that's how I read that.

15 Q. Okay. So you would look at the --

16 (Simultaneous colloquy.)

17 A. -- include a huge, you know, group of stuff or
18 small group.

19 Q. Okay. So you would look at the written
20 description of the patent, I think is what you are
21 talking about sort of --

22 A. Right.

23 Q. -- outside of the claims, in addition to the
24 claims to see if the terms that they were using were to
25 a broad group or not. Is that what you are saying?

1 A. Yes.

2 Q. How would one determine whether only a small
3 fraction of the scope of the claimed function was
4 described?

5 A. Yes.

6 Q. I was saying how does one determine that?

7 A. Well, it would be determined by if they name
8 something. Like, I'm trying to think of something. And
9 let's say thickness. And do they use a broad base or a
10 very narrow base of explaining what they mean by
11 "thickness." How's that?

12 Q. Okay. So in terms of what description was
13 provided, you would look at the written description for
14 both, understanding the breadth of a particular genus
15 but also the -- whether something is a small fraction,
16 as you sit here?

17 A. Correct.

18 Q. And if we can look at the next sentence: "I
19 understand" -- "I further understand that more
20 inventions in unpredictable art, adequate written
21 description of a genus which embraces widely variant
22 species cannot be achieved for" -- "by disclosing only
23 one species within the genus."

24 What do you mean by "widely variant species"?

25 A. Let's use the word "chemical elements." So

1 let's say someone said you can use any -- any element,
2 and that would be too broad for anyone if all they did
3 was talk about a specific element within that group. So
4 if they talk about only three elements and then they
5 say, "All elements would work," then that would be too
6 broad.

7 Q. Right. So I think that that goes to a broad
8 and narrow discussion, which is the previous sentence.
9 But this sentence is more about within the genus, when
10 it's widely variant. How do you determine whether
11 something would be a widely variant species?

12 A. I guess I'm not perfectly sure what the
13 difference between that is. So widely variant might be
14 elements that go all over the periodic table versus in a
15 group in the periodic table.

16 Q. Okay. And how would one determine whether a
17 species is -- within genus is widely variant?

18 A. It would be determined by the definition of the
19 genus. So let me use a totally different thing. Let's
20 say I say "birds." You know, there are lots of
21 different birds.

22 But if I say "parrots," that's a subspecies. I
23 happen to have parrots. So -- so, yeah -- so determined
24 by whether or not you are saying -- I'm talking about
25 all birds, which would be everything from, you know,

1 waterfowl, or I'm talking about just parrots, which
2 would be a narrow species. Does that help?

3 Q. So I do think that that helps for the broad and
4 narrow discussion that we were talking about previously.
5 But in terms of widely variant, maybe I'll give another
6 example.

7 A. Yeah. I don't --

8 (Simultaneous colloquy.)

9 A. I guess, to me, all birds is widely variant.
10 You could have anything from waterfowl to eagles.

11 Q. Right. So the variant would be between a
12 parrot and an eagle, and the variation between those
13 might be larger. How does one determine whether a genus
14 that's been described is widely variant or more
15 homogenous?

16 MR. MILLER: Objection. Asked and answered.

17 THE WITNESS: Yeah. I would do it by saying,
18 you know, you have parrots, and then you have all birds.
19 And so if you say, "Hey, I'm using one eagle as an
20 example and one macaw as an example," then that would
21 make it hard for me to understand, well, is this
22 including all parrots and all eagles or not? I would be
23 confused.

24 MR. WOLFE:

25 Q. Okay. If we could move to paragraph 23,

1 please. And sorry. I'm going to do this to you again.
2 Can you flip back to 19 just to see the title of it. It
3 says "Enablement." Do you see that?

4 A. Yes.

5 Q. Okay. Now let's go back to paragraph 23.

6 A. Yes.

7 Q. Here we're discussing enablement. And you say:

8 "I have been informed by counsel that
9 post-priority date references and actions by
10 the inventors may be considered in determining
11 whether compound claims are enabled, as
12 subsequent failures or subsequent undue
13 experimentation needed to make and use the
14 claim compounds is evidence that the patent
15 was not enabling as of the priority date."

16 Do you see that?

17 A. Yes, I do.

18 Q. Here you didn't take into account any
19 subsequent failures or subsequent undue experimentation
20 in your analysis, did you?

21 A. I guess I'm not sure of what you are asking.
22 Can you repeat it.

23 Q. So here you say you have been informed in
24 counsel that you can take into account subsequent
25 failures or subsequent undue experimentation, right?

1 A. Yes.

2 Q. And here did you take into account any
3 subsequent failures or subsequent undue experimentation?

4 A. I did not do any experimentation, but I did use
5 knowledge of POSAs who have worked in this area and
6 understood what they would have to do to understand the
7 material -- have to --

8 Q. Right.

9 A. -- enable it.

10 Q. Right. But in terms of looking at whether
11 there were any failed tests or things of that nature,
12 you didn't point to any of those in your report, did
13 you?

14 A. I do not remember doing that. If you know I
15 did, I'll look it up. But I don't remember referring to
16 anything.

17 Q. Okay. If we could turn to paragraph 27,
18 please. Are you there?

19 A. "Anticipation"?

20 Q. Yes, so this is "Anticipation" section. I
21 think it's maybe under "Obviousness" section.

22 A. "Obviousness." Sorry, sir.

23 Q. Yeah. So if you see -- under "Obviousness,"
24 the last sentence in paragraph 27, it says: "Further, I
25 have been informed that one cannot use the challenged

1 patent near the '564 patent as a guide from which to
2 select prior art elements or otherwise engage in
3 hindsight." Do you see that?

4 A. Yes, I do.

5 Q. What's your understanding of a proper use of
6 the challenged patent near the '564 patent versus an
7 improper hindsight use?

8 A. So as I understand it, I cannot use the '564
9 patent wording as hindsight, but any things that were
10 published before that would be. Is that -- am I -- the
11 correct understanding?

12 Q. I'm just asking for what your understanding was
13 as putting this together.

14 A. I think -- I guess I'm not sure what you are
15 asking. So "hindsight," to me, is saying would I have
16 known this before.

17 Q. Okay. Based on a teaching of the '564 patent?
18 Is that what you are saying? Whether you would have
19 known that before?

20 A. Yes.

21 Q. So it would be proper or improper to rely on
22 teachings from the '564 patent to apply to the prior
23 art?

24 MR. MILLER: Objection. Vague. Ambiguous.

25 THE WITNESS: I really don't understand.

1 MR. WOLFE:

2 Q. So I'm just trying to understand here in this
3 last sentence that -- you say: "Further, I have been
4 informed that one cannot use the challenged patent near
5 the '564 patent as a guide from which to select prior
6 art elements or otherwise engage in hindsight." I'm
7 trying to understand what you mean by "otherwise engage
8 in hindsight."

9 A. I think it refers to was this knowledge before
10 the '564 patent. That's my understanding.

11 Q. When you say "this, "what do you mean? Was
12 "this" knowledge --

13 A. Some knowledge that I found. Something I
14 learned in one of the examples we have.

15 Q. Okay. Some knowledge that you learned in the
16 examples from the '564 patent?

17 A. No, no. I'm talking about based on the '564
18 patent, we have exhibits that are prior art. And so
19 that would be, to me, a hindsight.

20 Q. Sorry. I don't quite understand that.

21 A. I guess I just don't understand what the --
22 what the question is here. To me, "hindsight" means
23 I'm -- I would have known this when the -- when the
24 application was written. That -- so maybe I'm
25 misunderstanding what "hindsight" is.

1 Q. So I think here, as you are describing
2 hindsight, it says that there are certain ways that you
3 can use the challenged patent and there are certain ways
4 that you can't. It seems like you are saying, you know,
5 you cannot use it as a guide to select prior art
6 elements, right?

7 A. Yes.

8 Q. So that would be one -- one thing that you
9 could not do with the '564 patent, right?

10 A. So, yeah, all I can say is what I've got
11 written here. And that -- "as a guide from which to
12 select prior art elements or otherwise engage in
13 hindsight." So I have to say that not being a lawyer, I
14 thought I understand this. But maybe I did not, and I
15 just don't get the whole thing. So I'm sorry.

16 Q. It's okay. No worries. Let's move to the --
17 the next topic at paragraph 35, please. So here we're
18 getting into your analysis, and this is under the header
19 "The '564 patent is not entitled to claim priority to
20 the '867 application." Do you see that?

21 A. Yes.

22 Q. Okay. And you see the first sentence says --
23 sorry. It goes across the page, and it says:

24 "First, Dr. Banerjee cites portions of the
25 '867 application, discussing how to deposit

1 coatings on a substrate, e.g., via spin
2 coating, and how to achieve various coating
3 material thicknesses, e.g., varying the
4 viscosity, precursor solution, spin speed, or
5 other coating parameters."

6 Do you disagree with Dr. Banerjee that a POSA
7 would have known how to make these particular coating
8 thicknesses?

9 A. So I don't disagree that a POSA would know how
10 to vary the viscosity, concentration, spin speeds, et
11 cetera -- actually, concentration, not so much -- but
12 spin speeds and other coating parameters to get a
13 thickness, yes. POSAs do that.

14 Q. So you wouldn't consider achieving a particular
15 thickness to be unpredictable, would you?

16 A. I would think that a person of skill in the art
17 would know how to optimize it. It might take a while,
18 but they would be able to optimize it.

19 Q. So looking at these variables -- varying the
20 viscosity, precursor solution, and spin speed -- aren't
21 these discussing the technological complexity of the
22 thickness limitation?

23 A. Spin speed and viscosity are -- are you saying
24 are those difficult?

25 Q. Yeah. In terms of --

1 (Simultaneous colloquy.)

2 A. I'm sorry to do that.

3 Q. It's okay. I'll repeat. So are the viscosity,
4 precursor solution, and spin speed -- these variables
5 describing how to achieve a particular thickness?

6 A. Yes, they do say that. Yes.

7 Q. And this would --

8 (Simultaneous colloquy.)

9 A. -- part of it, yeah.

10 Q. And this would go to how easy or difficult it
11 would be to achieve different thicknesses, right?

12 A. Yes.

13 Q. The fact that they're limited variables that
14 you would vary?

15 A. Yes, although the variables are quite broad.

16 Q. In terms of viscosity, precursor solution, and
17 spin speed, right? Those are sort of the ones you would
18 change?

19 A. Yes.

20 Q. Let's look to the next sentence that begins:
21 "However." Does -- "However, even if a POSA knows how
22 to achieve a particular coating thickness, the POSA
23 would still not know which thicknesses are appropriate
24 or inventive." Is it your opinion that a particular
25 claim limitation must be inventive in and of itself?

1 A. My -- my point here is that the claim should
2 have some reason for having that -- that claim
3 thickness, and I could not find any reason why a POSA
4 would say this -- this thickness range is the best.

5 Q. Right.

6 A. So a POSA would say, "Well, I don't know what
7 thickness," and do lots of experiments.

8 Q. So my question is -- is more looking at the
9 claim as a whole. Is it your understanding that to be
10 patentable, each of the limitations -- for example, the
11 thickness limitation -- must be inventive on its own?

12 MR. MILLER: Objection. Outside the scope.

13 THE WITNESS: So, yeah, I really don't know how
14 to answer that question. I'm not a lawyer.

15 MR. WOLFE:

16 Q. Well, I'm just, you know, going off of what you
17 have written here.

18 A. Okay.

19 Q. "However, even if a POSA knows how to achieve a
20 particular coating thickness, the POSA would still not
21 know which thicknesses are appropriate or inventive."
22 You say the word "inventive," so I'm asking would you
23 understand that the thicknesses themselves need to be
24 inventive?

25 A. I would say that I would need to understand why

1 I was picking a certain thickness because there are such
2 a range of thicknesses. And why is the patent
3 specifying that range of thickness? Depending on my
4 application, I could use very different thicknesses. So
5 I'm confused as to why they chose those.

6 Q. Right. So you are saying there might be a --
7 need to be a rationale as to why you would choose a
8 particular thickness, but whether that chosen particular
9 thickness as a rationale -- does it need to be an
10 inventive rationale?

11 A. That is a lawyer question.

12 Q. So you can't answer that?

13 A. Well, if you claim a huge range and then you
14 pick just some numbers in the center and say, "That's my
15 invention," I think -- and I'm not an expert -- I'm not
16 a lawyer, but I think you need to support that in the
17 bulk of the document, the patent, explaining why you
18 picked that.

19 At least when I've done patents, I'm -- that I
20 write, I have to explain why am I choosing this. And
21 they don't -- they don't say, "This is an optimal
22 thickness that you should use." They just use ranges.

23 Q. So would you say that they needed to say that
24 particular thickness ranges were optimal to give you a
25 reason to select them?

1 A. I think in there they would have to say, "This
2 is" -- "we invented this, and this is why it's better."

3 Q. Okay. So --

4 (Simultaneous colloquy.)

5 A. -- thickness range is better. Like, 35 is no
6 good, and this other one is better for this reason. And
7 they don't explain anything like that.

8 Q. Right. So your understanding is that in the
9 written description, they have to explain why a
10 particular limitation is better. Is that right?

11 A. I'm not really sure how to answer that.
12 It's -- you know, so as a POSA reading this, I would
13 want to say, "Okay. What makes a certain thickness you
14 are" -- explain why it's targeted. And so that wasn't
15 done in the patent before the claim that just threw out
16 those numbers.

17 Q. Right. But you had -- like we were talking
18 about before, be able to understand -- a POSA would be
19 able to understand what is 5 to 30 nanometers, though,
20 right?

21 A. Oh, yes, we know what 5 to 30 is.

22 Q. And they would know what's outside of 5 to
23 30 nanometers, right?

24 A. Yes.

25 Q. And they would know what's inside 5 to

1 30 nanometers, right?

2 A. Yes. Just wouldn't know why to pick 5 to 30.

3 Q. And what you were saying earlier is that there
4 needed to be some disclosure in the written description
5 of why that was better. Is that right?

6 A. I don't know. That's probably more legal
7 information that -- I don't know what has to be in
8 there. But for me to understand it, I would want that.

9 Q. And you would want to know whether certain
10 ranges were optimal. I think that was the word you
11 said. Is that right?

12 A. I think what I said was "Why did they choose
13 those?"

14 Q. Okay.

15 A. Because it could be optimal -- different
16 thicknesses could be optimal for different applications,
17 so why did they choose those?

18 Q. Let's turn to the end of paragraph 36, please.
19 Should be the one just below it. So you see earlier you
20 are discussing certain thickness ranges that are
21 discussed in the '867 application.

22 And then at the end, you note a sentence from
23 the '867 application where it says: "A POSA will
24 recognize that additional ranges of thicknesses within
25 the explicit ranges above are contemplated and are

1 within the present disclosure." Do you see that?

2 A. I do see that.

3 Q. What do you understand the "present disclosure"
4 to be there?

5 A. So are you talking about the claim being within
6 the range that they talk about?

7 Q. I'm just asking about this sentence from the
8 '867 application -- what it would mean, "present
9 disclosure."

10 A. Well, this is a quote from Banerjee, I believe,
11 is this not? Or is this a --

12 Q. So if you see --

13 (Simultaneous colloquy.)

14 A. It says: "Banerjee also points to the '867
15 application statement that" -- and so that means that he
16 said that a, quote -- a POSA "will recognize the
17 additional ranges of thicknesses within the explicit
18 ranges above are contemplated and are within the present
19 disclosure." So that's his words, not mine.

20 Q. Right. You are saying that Dr. Banerjee points
21 to a quotation from the '867 application. And if you
22 see at the end of that sentence, it says:
23 "Exhibit 1004." You understand that that's the '867
24 application, correct?

25 A. I see. I'm sorry. Pointed to that --

1 misunderstood that. So that is written in the '867.

2 Q. Right. So this sentence is from the '867
3 application.

4 A. Yeah.

5 Q. What does the term "present disclosure" mean?

6 A. I'm assuming the disclosure would be the '867
7 application.

8 Q. Okay. So then the full sentence would be: "A
9 POSA would recognize that additional ranges of
10 thicknesses within the explicit ranges above are
11 contemplated and are within the '867 application,"
12 right?

13 A. That's how I would read that, yes.

14 Q. Turn to paragraph 37, please.

15 A. Okay.

16 Q. This sentence that bridges the two pages says:
17 "The '867 application never even mentions thicknesses of
18 5 nanometers or 30 nanometers." Do you see that?

19 A. Yes.

20 Q. Is it your opinion that the end points must be
21 expressly mentioned of a range in the specification for
22 the claims to have written descriptions for it?

23 A. So they covered a wide range of thicknesses.
24 And in there, 5 and 30 and 80 are all in there. But
25 there's no explanation to me as to why the -- it would

1 ever mention that a thickness of 5 or 30 is important.

2 Q. Right. But you are -- just for the sentence,
3 you are mentioning that it doesn't mention 5 or 30. So
4 is that your understanding, that -- that it is required
5 for it to mention those?

6 A. Yes, yes.

7 Q. So the specification itself would need to
8 mention those particular end points for a range to have
9 written description support, right?

10 A. As I understand it, yes.

11 Q. Let's move to the next sentence, please:
12 "Similarly, a POSA would not be able to identify what
13 other ranges of thicknesses the inventors possessed as
14 their alleged invention." Do you see that?

15 A. Yes.

16 Q. Is it your opinion that the specification needs
17 to identify other ranges that were not claimed in order
18 to have possession of 5 nanometers to 30 nanometers?

19 A. So when I read what I wrote here, "A POSA would
20 not be able to identify that" -- "what other ranges of
21 thicknesses the inventors possessed," that means that
22 they did not specify smaller ranges again. They have
23 just, you know -- just very broad -- you know, 1
24 nanometer to -- to about 50 nanometers.

25 Q. Right. But here you are mentioning about other

1 ranges of thicknesses that the inventors possessed.

2 A. Right. It just means I wouldn't know by just
3 reading the '867 -- I wouldn't know what other ranges
4 they might put in the claims. I just don't know.

5 Q. Other than 5 nanometers to 30 nanometers,
6 right?

7 A. Correct.

8 Q. Because that's what the "other ranges" here
9 means, right?

10 MR. MILLER: Objection. Vague.

11 THE WITNESS: Yeah. I think -- yeah. I'm not
12 sure I understand your question. Sorry.

13 MR. WOLFE:

14 Q. That's okay. What do you mean by "other
15 ranges," then, in this sentence?

16 A. So if they claimed 5 to 30 in the claim, why --
17 there might be other ranges they would claim as well.
18 And I would not, by reading the '867, have an
19 understanding of what other ranges they might specify.

20 Q. So that might go --

21 A. So I just don't know. Didn't teach me.

22 Q. Sorry. I didn't mean to jump in there. I
23 was -- so that would say whether or not other ranges
24 might be supported by the specification also, right?

25 A. Yes.

1 Q. But not necessarily 5 nanometers to
2 30 nanometers, right?

3 A. So based on the way they described the
4 thicknesses, I would not know what other ranges they are
5 going to choose for the invention.

6 Q. Right. So maybe down the road, they could
7 choose different ranges. But that would be a question
8 about those claims that choose different ranges, right?

9 A. Yes. I wouldn't know why.

10 Q. Let's turn to the next paragraph, please: 38.

11 A. Yes.

12 Q. Here you say: "Dr. Banerjee ignores the
13 inventors' statement during the prosecution of the '564
14 patent that the prior art thicknesses" -- "thickness of
15 35 nanometers in the claimed range of 5 to 30 nanometers
16 do not overlap. And they are not close enough that one
17 would expect them to have the same properties." Do you
18 see that?

19 A. Yes.

20 Q. And that's citing Exhibit 1007 at 508. Do you
21 see that?

22 A. Yes.

23 Q. So 1007 is the prosecution history of the -- of
24 the '564 patent, and it was rather long. So we didn't
25 send it and print it for you, but I can pull it up on my

1 screen and see if it's what you remember. Are you able
2 to see what's here?

3 A. I'll put my face really close.

4 Q. Maybe I can zoom in.

5 A. Oh, that helps. Thank you.

6 Q. Okay. So is this what you were discussing in
7 that paragraph? I believe there was a quote about being
8 close enough. Do you see sort of in the middle:
9 "Therefore, the ranges do not overlap. And they are not
10 close enough that one would expect them to have the same
11 properties"? Do you see that?

12 MR. MILLER: Objection to the extent you are
13 using a partial exhibit.

14 Dr. Holland, if you need to see more of this
15 exhibit, please let us know, and we can get that for you
16 a well.

17 (Simultaneous colloquy.)

18 MR. WOLFE:

19 Q. Let me scroll to the bottom first.

20 A. I could -- I could read that to you if you
21 would like because I think that's -- reading that whole
22 paragraph -- or most of the paragraph is important. So
23 the examiner argued that 35 nanometers is in the range
24 of about 30 because "about" is obviously vague there.
25 Okay. And finally, reading more:

1 "While the applicant maintains the
2 argument that about 30 is not obvious over
3 Stowers" -- "to assist Stowers 2008, Claim 1
4 has been amended to remove the 'about.' And,
5 therefore, ranges do not overlap, and they are
6 not close enough that one would expect them to
7 have the same properties."

8 Q. Okay. And you understand that this is a
9 response from the patent owner to the patent office,
10 right?

11 A. Yes.

12 Q. And I think just for clarity here, I don't
13 think that this one is Stowers 2008, but --

14 A. Oh, sorry.

15 Q. -- it's not necessarily relevant to this
16 discussion. I just wanted to point out at the bottom --
17 do you see that it says -- and it's very small. I
18 apologize. It says: "Lam Research Exhibit 1007-page
19 508."

20 A. Okay. No. It's too big for me to see that
21 number, but okay.

22 Q. Too big?

23 A. Sorry. Now I can read it. That's fine.

24 Q. Okay. Can you --

25 (Simultaneous colloquy.)

1 Q. -- page 508, right? Sorry. Do you see in
2 the --

3 A. Oh, we're at the very, very bottom.

4 Q. Yes.

5 A. I see. I'm sorry. I was reading the text
6 above.

7 Q. Right. And I was just trying to make it clear
8 where in the document we were.

9 A. Yes.

10 Q. Okay. And I just wanted to talk about the
11 sentence that begins with "Therefore." It says:
12 "Therefore, the ranges do not overlap, and they are not
13 close enough that one would expect them to have the same
14 properties." Reading that sentence, what do they mean
15 by "they" and "them"?

16 A. So, therefore, the ranges do not overlap. And
17 they, meaning the thicknesses, are not close enough that
18 one would expect them, the thicknesses, to have the same
19 properties.

20 Q. Is this talking about thicknesses or thickness
21 ranges?

22 A. I believe it was 35 nanometers versus about 30.

23 Q. Could you read the second --
24 (Simultaneous colloquy.)

25 A. -- about -- sorry.

1 Q. It's okay. Could you read the second sentence,
2 please, of the paragraph.

3 A. Is that the one -- "rather, Stowers teaches
4 thicknesses of 35 nanometers or greater."

5 Q. Would you understand that to be a range?

6 A. No, because 35 nanometers or greater -- the
7 "greater" could be -- I don't know -- a mile. So I
8 wouldn't really understand the range there -- or
9 greater.

10 Q. Right. So you are saying it could be an
11 unbounded range, perhaps?

12 A. "Greater" is -- does not give me any bounds.

13 Q. It would not be a singular point, though, would
14 it? Because it says: "35 nanometers or greater."

15 A. I don't know how to interpret "or greater."

16 Q. Okay. But in the sentence we just read,
17 "Therefore, the ranges do not overlap" -- do you see
18 that?

19 A. Right. So he says that the ranges do not
20 overlap. About 30 to 35 do not overlap.

21 Q. Right. Do not overlap with the thickness of
22 35 nanometers or greater. Is that right?

23 A. I guess I'm confused. Where are we reading
24 again? Does it -- can I just read the whole thing and
25 make it easier?

1 Q. Yeah.

2 A. "Stowers teaches a thickness of 35 nanometers
3 or greater. The examiner has argued the 35 nanometers
4 is within the range of about 30, and the applicant
5 maintains the argument that about 30 is not obvious over
6 Stowers. Claim 1 has been amended to remove the word
7 'about' in order to advance the prosecution."

8 Q. And then the next sentence, please.

9 A. "Therefore, the ranges do not overlap, and they
10 are not close enough that one would expect them to have
11 the same properties.

12 Q. Okay. So here it says "the ranges," right?

13 A. Right.

14 Q. So that would be more than one range, right?

15 A. I believe "Therefore, the ranges do not
16 overlap" is referring to 5 nanometers to 30 nanometers,
17 without the "about."

18 Q. Right. So it's referring to the claimed 5
19 nanometers to 30 nanometers without "about" and
20 comparing that to the second sentence where it says:
21 "Stowers teaches a thickness of 30 nanometer or
22 greater." Is that how you would understand that?

23 A. That's how I would understand.

24 Q. Okay. And that therefore sentence at the
25 end -- it says: "One would not expect them to have the

1 same properties." What are the properties here?

2 A. Exposure dose is -- be an example of the same
3 properties -- not having the same properties. Thicker
4 might require higher exposure dose.

5 Q. Okay. Would there be any other properties that
6 you would understand -- or a POSA would understand
7 within that statement of "properties"?

8 A. I could guess at something, but all -- have not
9 looked at 35 versus 30 to be sure what the difference
10 would be. Exposure dose is clear. But others, I'm not
11 sure.

12 Q. Exposure dose is clear from what?

13 A. Oh, that it would be different -- or it could
14 be different. I shouldn't say "would." I have not
15 measured the exposure dose, but a thicker film usually
16 requires -- even if just a few more photons.

17 Q. Okay. So the exposure dose is one property
18 that you would understand might not be the same,
19 depending on thickness. Is that what you are saying?

20 A. Yes.

21 Q. Let me stop sharing my screen because I think
22 we're -- this one. And we're back. Can we please turn
23 to paragraph 39.

24 A. I'm there.

25 Q. Do you see that above 39, it has a header "The

1 materials in Stowers 2008 are materially the same as
2 those disclosed in the '564 patent"? Do you see that?

3 A. Yes.

4 Q. What do you mean "materially"?

5 A. I'm talking the coating material.

6 Q. Yes. We're talking about the coating material
7 and whether it is materially the same, right?

8 A. Right.

9 Q. So what do you mean "materially"?

10 A. Chemically.

11 Q. Chemically. So you're saying the materials in
12 Stowers 2008 are chemically the same as those disclosed
13 in the '564 patent?

14 A. I'm just using "chemically" to use a different
15 word than "materially," but "materially" is probably a
16 better thing to say.

17 Q. Is it -- would another understanding of
18 "materially" here be approximately?

19 A. I don't know.

20 Q. But this is your declaration, right?

21 A. Yes. I just did not put "approximately" in
22 here, so I would have to think about whether or not
23 "approximately" fits this description.

24 Q. Let's turn to the -- paragraph 39, the second
25 sentence. It says:

1 "I understand that Dr. Banerjee opines
2 that a POSA would have understood that
3 differences in the ratios and concentrations
4 of the materials used to form the coatings, as
5 well as the differences in the manner in which
6 those materials are combined, can result in
7 coatings with different characteristics."

8 Do you see that?

9 A. I do read that.

10 Q. Do you disagree that those differences can
11 result in coatings with different characteristics?

12 A. So let me read. So the -- so what I believe is
13 that there are minor differences in the precursor
14 solutions and the processing conditions for those
15 different -- for the two things that are in the
16 description, the HafSOx and the ZircSOx.

17 But based on my review of the solutions and
18 methods used in the patent, the '564, and Stowers 2008,
19 the coating materials are the same in all material
20 aspects.

21 Q. Right. So here you said that there would be
22 minor differences. So they're not identical, right?

23 A. So the differences might be when you put the
24 spin coating on, one has more water in it than the
25 other. And so until you -- until the water evaporates,

1 they'd have a minor difference. That would not affect
2 the performance.

3 Q. Right. But there would be a difference --

4 A. Just an example.

5 Q. Understood. There would be a difference
6 between a film with more water in it and one with less
7 water in it, though, right?

8 A. Not in terms of performance. Just in the fact
9 that there's water there. So --

10 Q. You'd be able to measure that, though, right?

11 A. I'm sure there's a method of measuring that.

12 Q. So it wouldn't be identical films?

13 A. As far as the actual performance of the films
14 and how they react to being photolithography materials,
15 they would be the same.

16 Q. Right. So maybe their reaction to exposure to
17 light -- is that what you are saying? -- might be the
18 same, but the films themselves would have a difference
19 of the water?

20 A. So if water's present, I would not expect that
21 to change -- X for water in one versus another to change
22 the reaction -- what the chemical reaction is when you
23 hit it with photons.

24 Q. But it could --

25 (Simultaneous colloquy.)

1 Q. Apologies. But it could change the extent to
2 which the material changes, couldn't it?

3 A. I don't think so.

4 Q. So if you had a photo-resistant material that
5 had 99 percent water versus one that had 1 percent
6 water, it would react the same to radiation exposure?

7 A. For EUV and EV? Yes, I would expect it to be
8 the same. So --

9 Q. The film would have the exact same response,
10 not necessarily the chemicals within the film?

11 A. So the -- the ZircSOx itself or the HafSOx
12 would react the same. It would have the same chemical
13 interaction.

14 Q. The chemistry of the reaction to the light
15 would be the same. Is that what you are saying?

16 A. That is what I'm saying.

17 Q. But not necessarily what happens in the film as
18 a whole?

19 MR. MILLER: Objection. Incomplete
20 hypothetical.

21 THE WITNESS: Yeah. I don't understand that.

22 MR. WOLFE:

23 Q. So I'm just trying to understand this sentence
24 that says:

25 "I understand that Dr. Banerjee opines

1 that a POSA would have understood that
2 differences in the ratios in concentrations
3 and the materials used to form coatings as
4 well as differences in the manner in which
5 those coating materials can be combined can
6 result in coating films with different
7 characteristics."

8 And I'm trying to understand if you disagree
9 with the statement that it can result in coating films
10 with different characteristics.

11 A. If --

12 MR. MILLER: Objection. Compound.

13 THE WITNESS: If we take the same basic
14 chemicals, not necessarily the same concentration, and
15 we mix them in the order that Stowers 2008 explained,
16 changing the concentration of peroxide or other things
17 will not change the final resulting film.

18 MR. WOLFE:

19 Q. Okay. But you see in the middle of that
20 sentence that you are quoting from Dr. Banerjee in
21 paragraph 39 -- it says: "As well as differences in the
22 manner in which those materials are combined."

23 Would you understand "the manner in which the
24 materials are combined" would include the order in which
25 the materials are combined?

1 MR. MILLER: Objection. Vague. Ambiguous.

2 THE WITNESS: What I will say -- if he changed
3 it -- if you take Stowers and you put sulfate in there
4 before you put hydrogen peroxide in, yes, it definitely
5 changes the results.

6 And so that would not be, but that's not what
7 Stowers or the '564 patent explained. So as long as you
8 mix them in the order as explained by Stowers or '564,
9 then you'll get the same thing.

10 MR. WOLFE:

11 Q. Understand that --

12 A. Change the order you mix them, then you won't.

13 Q. I understand that you are comparing now the
14 Stowers with the '564 patent. I'm just asking about
15 this statement from Dr. Banerjee which, I think in the
16 next sentence, you call it "generalized statement." Do
17 you see that?

18 A. Yes.

19 Q. And one of the statements in there is: "The
20 differences in the manner in which those materials are
21 combined can result in coating films with different
22 characteristics." You see that, right?

23 A. He says that.

24 Q. Right. And you just said that if in Stowers
25 2008 they had put the sulfur in first, that would change

1 the coating film, right?

2 A. They would not have made HafSOx if they put
3 sulfur -- excuse me -- hydrogen sulfur.

4 Q. Right.

5 (Simultaneous colloquy.)

6 A. Yeah. So I was just trying to give you an
7 example of -- since Banerjee is saying you can change
8 methods. But the truth is if you do it in the -- the
9 way it's written in the specification and you mix them
10 in the order they're put together, then you'll get the
11 same thing. So you get the same resulting HafSOx or
12 ZircSOx.

13 Q. Maybe I can put a shortcut to this. My
14 understanding is I don't think you disagree with this
15 statement that they could result in different coating
16 films with different characteristics.

17 I think here, like you have been saying, it's
18 about whether or not the differences between Stowers
19 2008 and the '564 would lead to differences in the
20 coating materials based on the teachings of those two
21 things. Is that what you are saying?

22 A. It's hard for me to hear you say what I said
23 and say, yes, I'm sure that's what I said. So what I
24 will say is that I do not agree with Banerjee that
25 just -- just doing what he says here will make a

1 different film. There -- so no. I disagree with him.

2 Q. But I thought you just did agree somewhat
3 because you said the differences in the manner in which
4 those materials are combined -- for example, putting the
5 sulfate in first -- would make a coating film with
6 different characteristics.

7 MR. MILLER: Objection. Asked and answered.

8 THE WITNESS: So that was just an example.
9 If -- since Banerjee does not talk about what manner he
10 would change. But if he went outside of the explanation
11 of how to mix these, yes, it would change.

12 But they exclude it specifically in the
13 specification how to mix it. So if he changed the order
14 of how he mixed it, that might be different. But that's
15 outside of the specification.

16 MR. WOLFE:

17 Q. Okay. So it's -- just clearing it up, it's
18 based on the teachings of the specification in Stowers
19 2008, right?

20 A. No. In the patent specification.

21 Q. The '564 patent, right?

22 A. '564.

23 Q. I think here -- let's move to paragraph 41.

24 MR. MILLER: We have been going for about an
25 hour. Michael, is now a good time to take a break? If

1 you have got a lot there or --

2 MR. WOLFE: Yeah, no. That's fine. That
3 works.

4 (Break taken.)

5 Q. Dr. Holland, can we please turn to paragraph
6 41.

7 A. Yes.

8 Q. Here you state: "Moreover, as I explain below,
9 any differences in the concentration of the precursor
10 solutions and the processing conditions between the
11 coating materials of Stowers 2008 and '564 patent do not
12 materially change the properties of the coating." Do
13 you see that?

14 A. I do.

15 Q. In addition to the concentrations of the
16 precursor solutions and the processing conditions, there
17 were also differences in the thicknesses between the
18 Stowers 2008 and the '564 patent, right?

19 A. Well, if you look at the overall patent and the
20 ranges of materials, they were quite similar. And the
21 total thickness ranges they talked about, I believe -- I
22 can go back and double-check those.

23 Q. I think we can just take a look. Maybe that
24 will help. But I think you have Exhibit 1008 there. It
25 should be a larger one. And just as a reminder, there

1 are two sets of page numbers?

2 A. Yes.

3 Q. I'll be referring to the ones in the bottom
4 right. And if I'm not, I'll make that clear.

5 A. Yeah. The PDF numbers is what you will be
6 referring to.

7 Q. The ones that are "Lam Research
8 Exhibit 1008-page," those will be the numbers I refer
9 to.

10 A. I'm sorry. What page? I didn't hear that.

11 Q. Sorry. I was just saying generally. But page
12 68, please.

13 A. Okay.

14 Q. And you see the first full paragraph starts
15 with "Substrates." Are you there?

16 A. Yes.

17 Q. See the last sentence in that paragraph? It
18 says: "Working solutions were spin coated at 3000 RPM
19 for 30 seconds, resulting in films 30 to 35 nanometers
20 thick." Do you see that?

21 A. Yes.

22 Q. So Stowers 2008 teaches films that are 30 to
23 35 nanometers thick, right?

24 A. I'm sorry, but I have to go back and read the
25 whole thing, if he mentioned any other thickness. But I

1 do see that this experiment, he used 30 to 35.

2 Q. And if you turn to page 64 --

3 A. Okay. 64.

4 Q. You see this is a title page that says
5 "Chapter 3," right?

6 A. Yes.

7 Q. This is "Photolithographic Patterning of
8 Solution-Deposited SOx Materials." Do you see that?

9 A. Yes.

10 Q. So this is a chapter that you rely on in your
11 declaration, right?

12 A. I'd have to go back and verify that there
13 aren't other chapters I respond to.

14 Q. But you do rely on the 30-to-35-nanometer
15 thickness, don't you, for the original claims?

16 A. I'm going to have to read in here to verify
17 what I refer to.

18 Q. I think I can help us out.

19 A. Yeah. Please.

20 Q. If you can open your original declaration,
21 Exhibit 1002.

22 A. Okay.

23 Q. And if you can open it, please, to paragraph
24 105. Should be on page 56.

25 A. Yes. I have that.

1 Q. Okay. You see here the first sentence says:
2 "Noted above, Stowers 2008 states that precursor
3 solutions were spin coated at 3000 RPM for 30 seconds,
4 resulting in films 30 to 35 nanometers thick." Do you
5 see that?

6 A. Yes.

7 Q. And that's citing Exhibit 1008 at 52. Do you
8 see that?

9 A. Yes.

10 Q. So if we turn back to Exhibit 1008, page 68, I
11 believe that's the page you were referring to because
12 the top right says 52. Is that your understanding?

13 A. Yes. That helps.

14 Q. Okay. So here we're discussing working
15 solutions were spin coated at 3000 RPM for 30 seconds,
16 resulting in films 30 to 35 nanometers thick. So
17 Stowers 2008 discloses films 30 to 35 nanometers thick,
18 right?

19 A. Yes, Stowers does.

20 Q. And you are relying on that teaching for your
21 opinion of teaching of unpatentability, right?

22 A. I don't remember.

23 Q. The Exhibit 1002 that we were just looking at
24 with the quote on paragraph 105.

25 A. Okay. So you are talking about my last

1 deposition?

2 Q. Yes. Your last declaration, yes.

3 A. So, yes, in here I had: "In other words,
4 Stowers 2008 does not merely describe a range of
5 possible thicknesses from 30 nanometers to 35, but
6 rather, it expressly discloses films with a thickness
7 from 30 nanometers to 35, including films that were
8 actually 30 nanometers thick."

9 Q. Right. So for this statement, you are relying
10 on the teaching from Stowers 2008 on page 68 that
11 discusses films 30 to 35 nanometers thick, right?

12 A. Yes, yes. Sorry. I just didn't remember those
13 exact numbers.

14 Q. No problem. And then -- so we were talking
15 about potential differences in thickness between Stowers
16 2008 and the '564 patent. So now I'd like to turn to
17 the '564 patent if you have that, Exhibit 1001.

18 A. Have it.

19 Q. And could you please turn to Column 22, line --

20 A. Which page? Column --

21 Q. Page 21, Column 22.

22 A. Gotcha. Okay.

23 Q. Can you see line 37? It says "The coating
24 material" something.

25 A. Yeah, line 37. 35 --

1 Q. It says: "The coating material was deposited
2 at a thickness form 10 to 50 nanometers." Do you see
3 that?

4 A. I do.

5 Q. And you understand "form" to mean "from,"
6 right?

7 A. Yes.

8 Q. And then if we can turn to Column 23, please,
9 line 35.

10 A. Yes.

11 Q. It says: "The resist applied with a thickness
12 of 20 nanometers by spin coating on a silicon wafer."
13 Do you see that?

14 A. Yes.

15 Q. So the '564 patent teaches thicknesses of 20
16 and a thickness of 10 to 15 nanometers, right?

17 A. I'm sorry. Say that again.

18 Q. The '564 patent teaches thicknesses of 20 and a
19 thickness of -- a thickness range of 10 to 50
20 nanometers, right?

21 A. So it has 20 in this experiment -- this
22 example, and then it -- in one of the ranges, it has --
23 I have to go back and look.

24 Q. So the two sections that I was looking at was
25 22 -- I think it's Example 3, and this is titled on line

1 30 "Example 3, 193-Nanometer Lithographic Patterning of
2 a ZR/Zirconium-Based Coating Material." And we just
3 read that one at line 37ish.

4 A. Oh, yeah. Yes. I see now it says: "10 to
5 50 nanometers."

6 Q. Right.

7 A. Okay. Sorry.

8 Q. Okay. So the '564 patent teaches a thickness
9 of 20 and a thickness range of 10 to 50 nanometers,
10 right?

11 A. Yes.

12 Q. Okay. So 20 is different than 30 to
13 35 nanometers, as taught in Stowers 2008, isn't it?

14 A. You are saying that the 10 to 50 is different
15 than what Stowers taught?

16 Q. Sorry. I was starting with the 20, which is
17 Example --

18 A. 20.

19 Q. -- 4, right, which is --

20 A. 20 is thinner than what Stowers has in 2008.

21 Q. Right. And then the Example 3, 10 to 50 --
22 that's a different thickness than 30 to 35 in Stowers
23 2008, isn't it?

24 A. It encompasses the 30 to 35.

25 Q. But they're different, though, right?

1 A. It's a larger range --

2 Q. 10 to 50 --

3 (Simultaneous colloquy.)

4 A. -- than Stowers 2008.

5 Q. 10 to 50 is a larger range in the '564 patent
6 than 30 to 35 in Stowers 2008, right?

7 A. Yes.

8 Q. So there would be a difference in the thickness
9 between the '564 patent and Stowers 2008?

10 MR. MILLER: Objection. Misstates the
11 testimony.

12 THE WITNESS: So in the -- so if you are
13 talking about the 10 to 50, it is very possible that
14 they ran 30 or 35. So I don't know if they ran -- did
15 they really run everything from 1 to 50 in every
16 nanometer or not? I don't know.

17 MR. WOLFE:

18 Q. So do you understand 30 to 35, as taught in
19 Stowers 2008, as being the same as 10 to 50, as taught
20 in the '564 patent?

21 A. I would say it was in the 10 to 50s since
22 it's -- 10-50 is a very broad range, and 30 to 35 is one
23 narrow range within that area.

24 Q. So the narrow range within that area might be
25 different than the broad range of 10 to 50. Is that

1 what you are saying?

2 A. So I'm not saying that it would be different
3 except for -- again, as I've said, if you have different
4 thicknesses, you have different amounts of light you
5 have to use to expose.

6 Q. Right. So at the lower end --
7 (Simultaneous colloquy.)

8 Q. Apologies. I missed that last part.

9 A. I said "or electrons." I have to -- I always
10 remember that it -- they use the light and they used
11 e-beams themselves.

12 Q. Right. Differentiating between UV, EUV, and
13 e-beam. Is that what that was about?

14 A. Are you asking what I was saying, or do you
15 have a question on this? I'm getting confused.

16 Q. I'm just asking what you were saying.

17 A. Yeah. I was just saying that when I talk
18 about, you know, it being exposed to light, I mean any
19 of the light wavelengths were e-beam that they're using,
20 depending on what experiment they're showing.

21 Q. Okay. So exposure of a film that would be
22 10 nanometers thick would be different than one that is
23 35 nanometers thick?

24 A. The amount of light required to expose it would
25 be different. I don't believe that the reaction will be

1 different. And the film properties would be the same --
2 would give you the same results.

3 Q. You said the amount of exposure would be
4 different. Is that what you said?

5 A. Yeah. So if you have something that's 10
6 nanometers, then you probably don't need as large of an
7 exposure dose as if it's 50. 50 nanometers would absorb
8 more light. And, therefore, you can add more photons.
9 So they would make it all the way to the bottom of the
10 photoresist and expose it properly.

11 Q. Okay. So it would need more light or electrons
12 to expose it properly if it was thicker?

13 A. Yes.

14 Q. Let's go back to your declaration, please,
15 Exhibit 1040. And if we could turn to the paragraph 42,
16 please.

17 A. I'm sorry. What paragraph?

18 Q. 42.

19 A. And you are talking about my new disclosure or
20 the old disclosure?

21 Q. 1040, yeah. The new declaration.

22 A. Oh, sorry. This one.

23 Q. Yes.

24 A. Okay. Sorry. Go ahead.

25 Q. Here you are discussing different metal

1 concentrations, I believe, right?

2 A. I -- since I got confused about which group,
3 you need to tell me the page again. Sorry -- or the --
4 or the paragraph number.

5 Q. No problem. It's Exhibit 1040, page 19,
6 paragraph 42. It begins with: "The precursor solution
7 of Stowers 2008 comprises final metal concentration of
8 0.5 moles."

9 A. Okay. I have that now, yes.

10 Q. All right. So here you are discussing
11 different metal concentrations, right?

12 A. Yes.

13 Q. And you are discussing whether those different
14 metal concentrations would impact particular
15 thicknesses, right?

16 A. So as I stated here, the difference in metal
17 concentration between the precursor solutions in Stowers
18 2008 and the '564 patent do not change the resulting
19 film.

20 Q. Okay. But you are talking about this
21 difference in metal concentration and the effects on
22 thickness above that, aren't you?

23 A. So I do say that Banerjee stated that you
24 could -- metal concentration could impact the ability to
25 deposit the resulting coating to a desired thickness.

1 And I -- I disagree with that.

2 Q. Okay. And then you say later: "Moreover, as
3 Dr. Banerjee explained in" -- "during his deposition, in
4 addition to viscosity, i.e., metal concentration, spin
5 coating speed also controls the film thickness." Do you
6 see that?

7 A. That is correct.

8 Q. So it's your opinion that even if metal
9 concentration would affect the thickness, a POSA could
10 control other variables to compensate to get the desired
11 thickness. Is that what you are saying?

12 A. Yeah. I'm saying if the viscosity of the
13 material is different -- so if you have two different
14 concentrations, different viscosities -- you can change
15 the spin speed to get the same film thickness.

16 Q. Okay. But if you kept the spin speed constant,
17 the film thickness would be different?

18 A. I have to experiment to be sure.

19 Q. So a thicker viscosity film, you wouldn't
20 know -- everything else being the same, you wouldn't
21 know whether it would be thicker or thinner, spinning at
22 the same speeds for the same amount of time?

23 A. So in general, for other photoresists I've
24 used -- I've never studied -- never done experiments
25 with these materials. For other photoresists, if it is

1 higher viscosity, yes, it will have a thicker film if
2 you use the exact same spin speed.

3 Q. Okay. And you are saying other materials -- or
4 other photoresists that you have used. What type of
5 other photoresists would those be?

6 A. A deep UV photoresist, I've used.

7 Q. Okay. A deep UV photoresist. What kind of
8 material is that?

9 A. It's inorganic, but it's -- you know, so that's
10 what I -- I look at and say -- I have not run a metal
11 photoresist. So --

12 Q. Okay. So, like, a metal photoresist -- like,
13 an inorganic photoresist, right?

14 A. Correct. I have not done an inorganic
15 photoresist.

16 Q. Would you expect -- let me back up.

17 You said that in your experience with
18 photoresists -- for example, DUV photoresists -- that
19 you would expect that as the viscosity is increasing,
20 everything else staying the same, the thickness would
21 increase. Do I have that right?

22 MR. MILLER: Objection. Incomplete
23 hypothetical.

24 THE WITNESS: Sorry. Just say that again. I
25 just got to make sure I got it right before I --

1 MR. WOLFE:

2 Q. No problem. In your experience working with
3 deep UV or DUV photoresists, you would expect that with
4 thicker viscosity, everything else being the same --
5 lead to a thicker film?

6 MR. MILLER: Objection. Incomplete
7 hypothetical. Beyond the scope.

8 THE WITNESS: A higher viscosity, same spin
9 speed, most likely lead to different film thicknesses.

10 MR. WOLFE:

11 Q. And would that expectation change between an
12 organic versus an inorganic resist?

13 MR. MILLER: Objection. Incomplete
14 hypothetical. Beyond the scope.

15 THE WITNESS: I don't know. I would have to go
16 do some work and find out.

17 MR. WOLFE:

18 Q. Okay. So you are not sure whether this
19 relationship between viscosity and thickness for an
20 organic resist would necessarily apply to an inorganic
21 resist?

22 A. So the problem is you are saying I need to keep
23 the spin speed identical and just change the viscosity.
24 And so I would -- there might be a variation, but I
25 wouldn't know the magnitude of the variation.

1 Q. But you would expect it to be thicker and not
2 thinner, right?

3 A. You know, it just depends so much on the
4 chemicals, so I'm not sure. I really have not done
5 these experiments, so I don't know the answer to this.
6 So --

7 Q. Okay. Let's turn to paragraph 43, please, the
8 next one.

9 A. Okay.

10 Q. If you were -- you are discussing the precursor
11 solutions and particular metal-to-peroxide ratios. Do
12 you see that?

13 A. Yes.

14 Q. So looking first at the comparison for
15 zirconium, Stowers 2008 contains a metal-to-peroxide
16 ratio of 1 to 0.75. You would understand that that
17 applies to hafnium or zirconium, right?

18 A. That would apply to his work that he did, yes.
19 And I -- yes.

20 Q. And then in the next sentence, you are
21 referring to Example 1 of the '564 patent. And for
22 zirconium and hafnium, they're different, right?

23 A. Yes.

24 Q. These are based on, I believe, calculations
25 that you did in your first declaration, right?

1 A. That's correct.

2 Q. And so the range for zirconium is 1 to 0.66 to
3 1 to 0.88. Is that right?

4 A. That's correct.

5 Q. And so those values are different, aren't they?

6 MR. MILLER: I'm sorry. You cut off there for
7 a second. I don't know if there was a question that you
8 asked.

9 MR. WOLFE:

10 Q. Sorry. I said, "Those values are different,
11 aren't they?" And I'll rephrase those values. What I
12 was talking about was Stowers 2008. He just went to
13 0.75. And the '564 patent teaches 1 to 0.66 to 0.88.
14 Those are different, right?

15 A. The Stowers teaches 1 to 0.66 to 0.88, and the
16 Stowers 2008 -- so the patent shows that, and the
17 Stowers 2008 is within that -- that range. 1 to 0.75 is
18 within the range of .66 and .88.

19 Q. So it's your opinion that because the Stowers
20 2008 ratio is within the range taught in the '564
21 patent, it would necessarily have the same properties?

22 A. Yes.

23 Q. The '564 patent doesn't expressly list a 1:0.75
24 ratio, though, does it?

25 A. Expressly, no. It has a range.

1 Q. Next let's look at the hafnium and do a similar
2 comparison. For Stowers 2008, it has the range of 1 to
3 0.75, and then the ratio in the '564 patent is 1 to 6.62
4 to 8.81. Do you see that?

5 A. Yes.

6 Q. Those are very different values, aren't they?

7 A. They are different.

8 Q. About ten times higher of a ratio, right?

9 A. Yes.

10 Q. Let's look at the last statement in this
11 paragraph. It says: "At best, Dr. Banerjee opines that
12 higher peroxide content could improve contrast." Do you
13 see that?

14 A. Yes, I do see that.

15 Q. But here isn't Dr. Banerjee just quoting the
16 '564 patent? If you are unsure, I think maybe it would
17 be best to turn to Exhibit 2009, which you are citing
18 here. And I don't think you have that, so I would need
19 to bring it up on the screen. I think I only sent you
20 the ones that were Lam exhibits.

21 Zach, thank you, by the way, for letting me
22 know when I cut out.

23 And, Dr. Holland, if there's a point where you
24 think that I've frozen or cut out, please let me know.

25 A. Okay. I will. I thought you just literally

1 stopped. So now I know, and I will do that.

2 Q. I appreciate it. Okay. So still with your
3 declaration just for now, it says: "At best,
4 Dr. Banerjee opines that a higher peroxide content could
5 improve contrast." Do you see that?

6 A. Yes.

7 Q. And it cites ID at paragraphs 32 to 33. Do you
8 see that?

9 A. Yes.

10 Q. And "ID" refers to the previous cite, so that's
11 Exhibit 2009, right?

12 A. Yes.

13 Q. Okay. Let's try pulling this up. This is a
14 document that is already in the record, premarked for
15 identification as Exhibit 2009. And I'll start at the
16 beginning so, that way, you can see the front. See that
17 it's marked "Inpria Exhibit 2009" on the bottom?

18 A. I can't see the bottom on this.

19 Q. Jump pages. I apologize.

20 A. Yes, I see 2009. Yes.

21 Q. Okay. And you see the title of this is
22 "Declaration of Sanjay Banerjee, Ph.D."?

23 A. Yes.

24 Q. So this is Dr. Banerjee's declaration, right?

25 A. Yes.

1 Q. And I believe you cited paragraphs 32 to 33.
2 Do you remember?

3 A. Yes.

4 Q. This is paragraph 32. So here he's saying the
5 ratio of peroxide ligands to metal of at least about two
6 and five above -- "the '564 patent further discloses
7 other ratios where the peroxide is much higher in
8 concentration than the metal." So here we're just
9 talking about higher peroxide concentrations, right?

10 A. Yes.

11 Q. If we turn to paragraph 33, Dr. Banerjee
12 states:

13 "The '564 patent further discloses that
14 the greater stability of the precursor
15 solutions results in a higher-quality
16 resulting coating material where the contrast
17 between the irradiated and nonirradiated
18 regions of the coating material is improved."

19 Is this the statement that you are referring to
20 in your paragraph 43?

21 A. Yes.

22 Q. And if you see below that, there's a quotation
23 to the patent. Do you see that?

24 A. Yes.

25 Q. And the patent -- the last sentence says: "The

1 more stable precursor solutions provide an added
2 advantage of greater contrast between the ultimate
3 irradiated coating material and the unirradiated coating
4 material." Do you see that?

5 A. Yes.

6 Q. Is -- the '564 patent teaching that there's an
7 added advantage of greater contrast, isn't it?

8 A. It does say that, yes.

9 Q. Okay.

10 A. Did you --

11 Q. No. I was just trying to find my place and
12 make sure we were done with this one before I stop
13 sharing.

14 A. I just wanted to make sure I wasn't missing
15 something. Thank you.

16 Q. Let's go back to your declaration, paragraph
17 46.

18 A. Okay.

19 Q. Here we're talking about in the first sentence:
20 "Dr. Banerjee also finds that the differences in amount
21 of rest time in the methods of forming precursor
22 solutions, 15 minutes in Stowers 2008 and 5 minutes in
23 the '564 patent, could result in different coating
24 films."

25 So here we are discussing differences in the

1 rest times. Do you understand that?

2 A. Yes, I do.

3 Q. If you look at the next to last sentence,
4 this -- "Stowers explains that the rest times allow for
5 ligand exchange." Do you see that?

6 A. Yes.

7 Q. What is the ligand exchange occurring here?

8 A. So it is the hafnium getting -- during that
9 time, some ligands are coming off the hafnium, and the
10 peroxides are adding.

11 Q. Okay. So this is the peroxide?

12 A. That's my understanding.

13 Q. Right. So that would be, for instance, in the
14 first step where the hafnium oxychloride or zirconium
15 oxychloride is mixed with the hydrogen peroxide, right?

16 A. Yes, because that's what it says. If you
17 take -- "the hafnium oxychloride or zirconium
18 oxychloride is mixed with peroxide and allowed to rest."

19 Q. Hydrogen peroxide, right?

20 A. Hydrogen peroxide. Sorry.

21 Q. And your understanding of the ligand exchange
22 that you are referring to in that next sentence to be,
23 for instance, peroxides going onto the hafnium or
24 zirconium?

25 A. Correct. Connected to them.

1 Q. Is that ligand exchange important?

2 A. Yes.

3 Q. Why?

4 A. Because the ligand -- the peroxide ligands are
5 known to be the photosensitive material that causes the
6 reactivity in the resist.

7 Q. It's important for those ligands to be
8 exchanged onto the hafnium ions, right?

9 A. Correct.

10 Q. Turn to paragraph 48. First sentence, you say:
11 "Dr. Banerjee ignores this evidence and instead assumes
12 that the rest time after the mixing steps limit the
13 formation of larger undesirable particles in the
14 solution."

15 Do you disagree that longer rest times could
16 lead to larger particles in the solution?

17 A. Yes, I disagree with him.

18 Q. Why do you disagree that larger rest times
19 could lead to the formation of larger particles in the
20 solution?

21 A. As I've read: "Rather, it is the order of
22 addition that prevents the formation of larger
23 undesirable particles in the solution, which is
24 identical in Stowers 2008 and the '564 patent.

25 "Accordingly, the difference in rest times

1 between the formation of the precursor
2 solutions in Stowers 2008 and the '564 patent
3 are inconsequential in the composition of the
4 final film."

5 Q. So why does the statement that mixing order
6 prevents larger particles necessarily mean that shorter
7 rest times would not also prevent larger particles?

8 A. Because the chemistry is controlling the
9 situation. So the order means you put something else in
10 instead of the peroxide first, and that changes the
11 chemistry of the ligands and how they interact with the
12 hafnium or zirconium.

13 But if you just do rest times that, you know --
14 there's nothing in here that says it -- you know, it has
15 to be exactly five minutes -- or put a timer on and made
16 sure it wasn't five minutes and one second or 15 minutes
17 and one second.

18 Q. All right. So there might be some dispute as
19 to whether it would be critical to have a particular
20 rest time, but -- and that the order could affect the
21 formation of larger particles. But I'm just curious if
22 you disagree with the concept that a longer rest time
23 could lead to larger undesirable particles in the
24 solution.

25 MR. MILLER: Objection. Asked and answered.

1 THE WITNESS: So I will say that within time
2 of -- rest times that they're talking about, I don't
3 believe there's a difference. If you let it rest for
4 two years, I can't answer that question.

5 MR. WOLFE:

6 Q. Right. Or for two days --

7 A. Right.

8 Q. -- would that change. Let's turn to paragraph
9 49, please, the next one. Here are the difference
10 between Stowers 2008 and the '564 patent. Seems to be,
11 as you sit here -- "includes an initial 100 RPM spin for
12 five seconds." Do you see that?

13 A. Yes.

14 Q. And in the next sentence, you say: "As the
15 '564 patent explains, this spreads the resist across the
16 wafer," right?

17 A. That is correct.

18 Q. Why would a POSA want to spread the resist
19 across the wafer?

20 A. It would probably make a more uniform coating.
21 So it's -- it's honestly something in that time frame
22 where we used to just do one spin, and then we learned
23 later on that doing just a light spin first to evenly
24 put it on and then spin it gives us a better coating.

25 Q. Okay. So in terms of --

1 A. It has to do with the average thickness across
2 the wafer.

3 Q. Got it. Are there any other properties that
4 having that first light spin help?

5 A. I can't think of anything that it would cause.

6 Q. Except for the uniformity that we were just
7 talking about?

8 A. Right. The average thickness across the wafer.

9 Q. Okay. Let's turn to paragraph 50.

10 A. Okay.

11 Q. And if you see, paragraph 50 actually spans the
12 next page too because it has a table.

13 A. Yes.

14 Q. And I just want to look at the preexposure
15 bake, if we could.

16 A. Okay.

17 Q. So here you state that: "Stowers 2008 has a
18 preexposure bake for" -- and I'm going to call that
19 "prebake." Is that okay?

20 A. Yeah.

21 Q. And you state that: "Stowers 2008 has a
22 prebake for 100 degrees C for two minutes," right?

23 A. Yes.

24 Q. And on the right, you state two different
25 examples with "or" between them. Do you see that?

1 A. Yes.

2 Q. So the Stowers 2008 100 degrees C for two
3 minutes would be different than the 50 degrees C in the
4 '564 patent, right?

5 A. As seen in the Stowers 2008, we have here
6 100 degrees C or lower for two minutes. I don't know
7 how much lower he put in his thesis. I don't remember.
8 So 50 degrees C would be lower than a hundred.

9 Q. I think if we could turn to Stowers 2008, it
10 might help.

11 A. Okay. Okay. It may take me a second. I got
12 the pages. Just tell me what page, and I'll see if I
13 can find it, and then we can fix it.

14 Q. Page 70 on the bottom right.

15 A. Did I miss it? Okay. I'm on page 75.

16 Q. And you see in the middle there -- middle
17 paragraph, it says: "Negative tone" -- or no. Sorry --
18 "positive tone patterning could be achieved by
19 subjecting the resist to a prebake of 100 degrees C for
20 two minutes," right?

21 A. Yes. I do see that.

22 Q. So here it's disclosing a prebake of 100
23 degrees C for two minutes, right?

24 A. Yes.

25 Q. And so that would be different than the '564

1 patent's teaching of a 50 degrees C prebake, right?

2 A. But below it says: "Negative tone patterning
3 can be enhanced by applying a mild" -- oh, that's
4 postexposed bake. Sorry.

5 Q. Right. So there's a preexposure -- as I
6 understand it, there's a preexposure bake for positive
7 tone patterning, and a negative tone patterning has a
8 postexposure bake. Is that how you read that paragraph?

9 A. Right. That's how I read that.

10 Q. Okay. And let's go back to your declaration at
11 paragraph 50 again, the table that we were just talking
12 about. 100 degrees C for two minutes versus 50 degrees
13 C -- those would be different, right?

14 A. I don't know where the "or lower" came from. I
15 don't remember. So unfortunately, I don't know if it's
16 in some other section of Stowers. I would have to go
17 read through Stowers to find that. I'm so sorry.

18 Q. It's okay. Just let's stick with 100 degrees
19 C -- ignore "for lower" for now -- and for two minutes.
20 That would be different than 50 degrees C, right?

21 A. If 100 degrees C does not include "or lower,"
22 then that would be different than 50 degrees C.

23 Q. Okay. And that range -- if it was 100 degrees
24 C or lower or if it was just 100 degrees C, it would be
25 different than 40 to 200 degrees C from 0.1 to 5

1 minutes, right?

2 A. The 100 degrees C for two minutes is within the
3 range of 40 to 200 degrees C and from 0.1 to 5 minutes.
4 So that's just -- Stowers did his work in a thesis, and
5 he just put one time and temperature. He did not show
6 the variety that they show in '564.

7 Q. Right. So the -- in the '564 patent, he
8 teaches a broader range, and the Stowers 2008 was a more
9 narrow disclosure, right?

10 A. Yes. And within the '564 patent range.

11 Q. And 100 degrees C for two minutes would not be
12 the same as a bake at 40 degrees C for six seconds,
13 right?

14 A. I don't know. I would have to -- have to go
15 test for that.

16 Q. It might be different?

17 (Simultaneous colloquy.)

18 Q. Sorry. I interrupted you. You said you think
19 they're different?

20 A. I would have to do a test. It sounds like they
21 were different, but I would have to test to see if it
22 makes a difference.

23 Q. Okay. And then 100 degrees C for two minutes
24 could be different from 200 degrees C for five minutes,
25 right?

1 A. Could be. You know, it's -- since what we're
2 doing here is evaporating water, things like that, it
3 probably has a lot to do with which mole ratios they're
4 using, things like that. So --

5 Q. I think we can move to the next section, which
6 is discussing radiation-sensitive ligands. Can we turn
7 to paragraph 54, please. Here you say: "Dr. Banerjee
8 ignores the disclosures of Stowers 2008, which described
9 peroxide as being radiation sensitive." Do you see
10 that?

11 A. Yes.

12 Q. In the next sentence, you say: "For example,
13 in a peroxo-polytungstate resist, the mechanism of
14 photoactivity has been shown to be the decomposition of
15 peroxide groups." Do you see that?

16 A. Yes.

17 Q. Why is the disclosure of a peroxo-polytungstate
18 resist relevant here?

19 A. Because it has peroxide groups in there. And
20 so the photoactivity of the peroxide group is what
21 causes photoreaction.

22 Q. So it would be your opinion that peroxide acts
23 as a radiation-sensitive ligand whether it's attached to
24 polytungstate or hafnium?

25 A. That is correct.

1 Q. Or polytungstate or zirconium, right?

2 A. Correct.

3 Q. If you look at the next sentence: "Moreover,
4 Stowers 2008 explains that the HafSOx and ZircSOx
5 photoresist materials were adapted from materials
6 designed as high-k dielectrics." Do you see that?

7 A. Yes.

8 Q. And then it says: "Stowers 2008 adapted those
9 materials by adding peroxide to create a
10 radiation-sensitive photoresist." Do you see that?

11 A. Yes, I do.

12 Q. And you are saying adapted those materials --
13 you are talking about the high-K dielectrics, right?

14 A. I'm talking about the HafSOx and ZircSOx were
15 adapted to cause -- from being a high-dielectric
16 material to making a photoresist.

17 Q. And how did you understand Stowers 2008 to be
18 adapting the HafSOx and ZircSOx from a high-dielectric
19 material to being a photoresist?

20 A. Well, what they're doing is taking the same
21 material, adding peroxide to it. And that becomes
22 radiation sensitive.

23 Q. Okay. So it would be your understanding that
24 the term "HafSOx" and "ZircSOx" does not necessarily
25 have peroxide in it, then?

1 A. Yeah. I cannot say that. I don't think -- I
2 mean, everything else I have read, I believe -- HafSOx
3 and ZircSOx does have peroxide in it.

4 Q. Right. But I think these two sentences here
5 were saying Stowers 2008 explains that the HafSOx and
6 ZircSOx photoresist materials were adapted from
7 materials designed as high-K dielectrics. And -- and we
8 just discussed Stowers 2008 adapted those materials by
9 adding peroxide, right?

10 A. Let me -- let me read this too. He explains
11 the HafSOx and ZircSOx photoresist materials. So he's
12 claiming the HafSOx and ZircSOx are photoresist
13 materials.

14 They were adapted from materials designed for
15 high-K, which means hafnium and zirconium that did
16 not -- were not photoresist materials. And that's what
17 he did.

18 So originally they were looking at literally
19 just depositing high-k materials liquidly -- with a
20 liquid. And so then they figured out how to add
21 peroxide and make them photoresist, at which point they
22 named them HafSOx and ZircSOx.

23 Q. So your understanding is that before they were
24 photoresists, they weren't called HafSOx and ZircSOx?

25 A. That is correct. I see no reference to calling

1 them HafSOx and ZircSOx before they had the peroxide
2 group added.

3 Q. So can I direct your attention to
4 Exhibit 1008 -- Stowers 2008.

5 A. Okay.

6 Q. And just to be clear -- so in your paragraph
7 54, you are citing ID 143, right? Sort of in the middle
8 there.

9 A. Yes. So that means page 143.

10 Q. Right. And for this sentence, you are saying
11 Stowers 2008 adapted those materials -- those dielectric
12 materials by adding peroxide to create
13 radiation-sensitive photoresist. This is the page you
14 are citing for that, right? And I believe the teaching
15 that you are quoting there is in regards to Chapter 3.
16 Is that right?

17 A. Yes.

18 Q. So here it says: "The patterning of HafSOx and
19 ZircSOx was significantly improved on by changing
20 chemistries to a peroxide-based system." Do you see
21 that?

22 A. Yes.

23 Q. Wouldn't that indicate a POSA that HafSOx does
24 not necessarily have peroxide but is improved upon for a
25 photoresist if peroxide is added?

1 A. What I will say is they used the word "HafSOx"
2 and "ZircSOx" a lot. And that -- until we get -- start
3 adding peroxide, they routinely call HafSOx and
4 ZircSOx -- and so before that -- I'm not sure why he has
5 HafSOx and ZircSOx named before that. So sorry. Just
6 don't really know.

7 Q. Okay. I think I might be moving to the next
8 thing, so it might be a good time for a break.

9 (Break taken.)

10 Q. Dr. Holland, let's next turn to paragraph 61 in
11 your declaration. And this paragraph is fairly long
12 because it stretches across page 26, 27, 28, just so you
13 are aware.

14 A. Okay. Yeah.

15 Q. Let's look at the picture on page 27, please.

16 A. Okay.

17 Q. This is a picture from Ober, right?
18 Exhibit 1027.

19 A. That is correct.

20 Q. And here you are pointing to the label that
21 says: "Photochemical Reactions." Yes?

22 A. Yes.

23 Q. And that's referring to the gold color, right?

24 A. To the organic ligand shell, yes.

25 Q. What color would you call that?

1 A. Bronze.

2 Q. Bronze. Perfect. Do you see in that bronze
3 shell there are certain ligands?

4 A. Yes, I do.

5 Q. What are those ligands?

6 A. They're the little white structures that are
7 on -- they show on the left side of the ZircSOx or
8 hafnium Ox.

9 Q. And you see on the right side, inside of the
10 label, it says: "Carboxylic acid or sulfonic acid
11 ligands." Do you see that?

12 A. Yes, I do see that.

13 Q. Are these ligands carboxylic acid ligands or
14 sulfonic acid ligands?

15 A. I guess it says "or," so I would say it is
16 either. In his thesis, I would have to go -- not
17 thesis. In his report, I would have to go see what he
18 actually put in there, but it does say "or."

19 Q. Right. But in terms of the white things on the
20 left side inside of the bronze shell, do you see those?

21 A. Yeah.

22 Q. There's four of them, it looks like. Is that
23 right?

24 A. Yeah, yeah.

25 Q. What are those?

1 A. You know, I'd have to go look at how he defines
2 them, but it does show oxygens and what might be carbon
3 bonds. But it doesn't say -- I don't know where the
4 sulfonic acid would be in there.

5 Q. Right. Sulfonic acid would require sulfur,
6 right?

7 A. Right. But perhaps he just drew one that had
8 the carboxylic acid. And since he put "or" in there, it
9 could be replaced by a version of sulfonic acid ligands.
10 I really don't know.

11 Q. Is it possible that those ligands are
12 methacrylate?

13 A. I would have to go read the thing to find that
14 out. I don't remember.

15 Q. Let's just turn to the next page, please, page
16 28. This is still all paragraph 61.

17 A. Yes.

18 Q. This one's Figure 2 from Ober. Do you
19 understand that?

20 A. Yes.

21 Q. And then there's a blue box on the right-hand
22 side. Do you see that?

23 A. Yes, a blue box on the right side. Yes.

24 Q. And the right-hand side has an arrow pointing
25 to the right, right?

1 A. Yes.

2 Q. And above it, it says "HV," right?

3 A. Oh, I see. Yes, "HV."

4 Q. Might be H nu. I'm not positive.

5 A. Yeah. It's -- means photons.

6 Q. Okay. So that's the photons and the reaction,
7 right?

8 A. Correct.

9 Q. What's the chemical on the right side?

10 A. I have to put my glasses on. I'm having
11 trouble seeing it.

12 Q. I can try to share my screen and blow it up.
13 It will be a little blurry, though.

14 A. I can't -- I can't read the center. It does
15 look like the center on the right is sulfur. And then
16 there's two oxygens coming off an OH group on one side
17 and CF₃ on the right side.

18 Q. That's what I see. Would that be sulfonic
19 acid?

20 A. Sorry. I don't remember.

21 Q. Maybe we could open Ober, if that might help.
22 If we go to Exhibit 1027 -- if you go to page two.

23 A. You are asking me to read here?

24 Q. Unfortunately, it is small. So it's not
25 necessarily the figure that I think would help us.

1 Perhaps the description on the right -- that might
2 refresh your recollection. You can see it's describing
3 Figure 2 because it says "See Figure 2" on the right of
4 Figure 2.

5 A. Oh, okay. "See Figure 2." I see that now.

6 Q. And then it says: "For example, the sulfonic
7 acid produced by photo acid generators, e.g.,
8 triphenylsulfonium triflate, displaces the methacrylate
9 ligands used in many of our compositions." Do you see
10 that?

11 A. Yes, I do. So that does help. Thank you.

12 Q. So you would understand the chemical on the
13 right side of that arrow be sulfonic acid, right?

14 A. Correct.

15 Q. And the ligands that we are talking about
16 before in the bronze shell that were shown in white,
17 those would be methacrylate ligands, right?

18 A. Yes.

19 Q. And here in Figure 2 -- I'm not sure why, but
20 they've reversed the colors. And now the bronze is the
21 zirconium, and the ligands are in red. Do you see that?

22 A. Yes, I do.

23 Q. But that would be showing the similar thing as
24 shown in Figure 1, right?

25 A. Yes.

1 Q. Let's turn back to your declaration,
2 Exhibit 1040 -- second declaration.

3 A. So if we could go back to the last question
4 first, I'm sort of confused about what you mean by
5 what's in that picture. Would you mind asking me that
6 again so I can just make sure I understand when I didn't
7 answer it.

8 Q. Yeah. No problem. Figure 2 --

9 A. I'm starting to look at this, and I'm like,
10 "Wait a minute. What's that?" So go ahead.

11 Q. Yeah. Figure 2 in the blue box --

12 A. Yeah.

13 Q. -- to the right of the arrow that says "H nu,"
14 I believe -- right?

15 A. Yeah.

16 Q. It has sulfonic acid there, right?

17 A. Correct.

18 Q. And then in the picture below that, the
19 sulfonic acid is attached to the zirconium oxide core,
20 right?

21 A. That's why I'm -- can't tell that that is the
22 one that they're connecting, but I'm guessing that is.

23 Q. It's blue, right? They have --

24 A. Yeah. They're both blue, but -- so --

25 Q. And then the red is -- do you understand to be

1 the original ones -- the methacrylate ones?

2 A. The original.

3 Q. That's all I had for this figure. Let's go
4 back to your declaration, and go to paragraph 64,
5 please.

6 A. I'm on 64.

7 Q. Okay. In the middle, it says: "Dr. Banerjee
8 did not identify even a single example where UV or EUV
9 exposure changed only the physical properties of a
10 photoresist," and you cite. And then you say: "I was
11 also unable to identify such an example." Do you see
12 that?

13 A. Yes, I do.

14 Q. Earlier today we were talking about a
15 photoresist having a lot of water in it. Do you
16 remember that?

17 A. I mentioned it does have water in it, yes.

18 Q. So could exposing a photoresist to UV radiation
19 cause the water to evaporate?

20 A. Heating it -- and if the UV somehow heated
21 that -- I'll be honest. I don't know if water reacts to
22 UV. I have not studied that.

23 Q. All right. But if a photoresist contained a
24 lot of water, it's possible that exposing it to UV
25 radiation would cause the water to evaporate?

1 MR. MILLER: Objection. Calls for speculation.

2 THE WITNESS: Yeah. I -- I would have to go
3 study that. And it depends on, you know, a lot of other
4 factors. As an example, if the photoresist was
5 absorbing all the UV, it might not have enough radiation
6 left to affect water.

7 MR. WOLFE:

8 Q. Okay. Assuming that it had enough radiation to
9 affect the water and it did evaporate, would that
10 evaporation be a physical change or a chemical change?

11 MR. MILLER: Objection. Incomplete
12 hypothetical.

13 THE WITNESS: You know, I'd go look at that in
14 more detail.

15 MR. WOLFE:

16 Q. So evaporation of water is a physical change or
17 a chemical change?

18 A. So hypothetically, evaporating water changes
19 the water physics. But I don't think it would change
20 the chemistry of the film --

21 Q. Okay.

22 A. -- and how it reacts to light because that's
23 all chemical.

24 Q. Look at paragraph 65.

25 A. Okay.

1 Q. In this discussion, you are talking about
2 Exhibit 2006, which Dr. Banerjee cited. And you are
3 saying here that: "This reference does not show an
4 example of a physical change caused by UV or EUV
5 exposure. It discloses a chemical change to the
6 photoresist." Do you see that?

7 A. Yes.

8 Q. And you say in the next sentence that the PMMA
9 is "cleaved into smaller fragments," right?

10 A. Yes.

11 Q. Doesn't the reference say that this cleaving
12 occurs during the postexposure bake?

13 A. I guess we'd have to pull it out and look.

14 Q. I think we can shortcut. If we go down to
15 paragraph 67, in the next to last sentence, it says:

16 "For example, an article by Moon and Kim
17 describes that upon radiation, acids
18 photogenerated -- photogenerated from a PAG
19 catalytically cleaves TBOC groups during
20 postexposure bake at high temperatures."

21 Do you see that?

22 A. Yes.

23 Q. So do you understand that the catalytic
24 cleaving occurs during the postexposure bake at high
25 temperatures?

1 A. So what we have happen is the irradiation forms
2 acids that then, when you heat them, interact with
3 the -- with the photoresist.

4 Q. Right. So you need to heat the photogenerated
5 acids for them to interact with the photoresist, right?

6 A. For these -- for this specific type of resist,
7 yes.

8 Q. And that heating --
9 (Simultaneous colloquy.)

10 Q. And that heating would occur during the
11 postexposure bake, right?

12 A. In this example, yes.

13 Q. Okay. Let's go back to PMMA. What is PMMA?

14 A. Poly -- I don't know. We always call it
15 "PMMA."

16 Q. PMMA is a polymer, though, right?

17 A. Yes.

18 Q. And so a polymer is a chain of monomers, right?

19 A. I'm sorry. What?

20 Q. A polymer is a chain of monomers, right?

21 A. Yes.

22 Q. So why would cleavage of PMMA into fragments be
23 a chemical change?

24 A. Because in order to cleave them, you have to
25 break chemical bonds to get them to come apart.

1 Q. But before they're cleaved, the material's
2 PMMA, right?

3 A. So it's PMMA, and then the acid will -- I
4 believe it's -- let me read this again. Okay. So upon
5 exposure to e-beam, the PMMA is cleaved into smaller
6 fragments.

7 So that means that the -- in this case, either
8 UV or EUV radiation causes chemical reaction change in
9 the PMMA by breaking bonds and breaking -- so you are
10 right. If a bunch of things connected -- they're all
11 chemically connected. And if you radiate them, that
12 breaks those apart, and that's what's going on here.

13 Q. And the PMMA after it's broken apart -- those
14 pieces are still PMMA, right?

15 A. You know, I'd have to go look at what the
16 definition of PMMA versus the cleaved things are. But
17 certainly have, you know, differential solubility for
18 the exposed versus the unexposed areas.

19 Q. Right. And that would have to do with the
20 molecular weight of the PMMA, right?

21 A. I don't know. I'd have to go study that. I
22 don't remember. It's been -- it's been a long time
23 since I've dealt with PMMA.

24 Q. Would cleaving PMMA cause it to be lower in
25 molecular weight? PMMA.

1 A. Cleaving the PMMA makes it into fragments. I
2 just don't know if those smaller fragments are still
3 called PMMA. I'd have to go look at that. I'm sorry.
4 I just don't remember.

5 Q. Let's turn next to paragraph 76.

6 A. I'm there.

7 Q. Here you say: "It remains my opinion that
8 Stowers 2008 and Trikeriotis coatings have high
9 absorption relative to conventional radiation-based
10 resists." Do you see that?

11 A. Yes.

12 Q. What do you understand "high absorption" to
13 mean here?

14 A. That's a -- that's a good thing. So it means
15 it is -- high absorption means it is -- it reacts at
16 less radiation energy, so lower energy -- or I should
17 say, maybe, less photons.

18 Q. So you said "reacts at less photons." Is that
19 right?

20 A. Right.

21 Q. So the Stowers 2008 and Trikeriotis coatings
22 would react at less photons, in your opinion?

23 A. Than conventional resists, yeah.

24 Q. Than conventional radiation-based resists. So
25 that's my next question: What is conventional

1 radiation-based resists?

2 A. I used the -- on the next page, they show a
3 variety of polymers that are photoactive and -- and
4 absorption coefficient. So those are some examples,
5 like PMMA.

6 Q. So PMMA is an example of a conventional
7 radiation-based photoresist as recited in the patent?

8 A. I'd have to say I'd have to go look at the
9 patent to verify they used PMMA in there. I just don't
10 remember.

11 Q. So I'm just asking, like, in terms of -- you
12 see the term "conventional radiation-based resists" in
13 the claim language, and you are pointing to PMMA as an
14 example. So you would understand PMMA to be an example
15 of a conventional radiation-based resist, right?

16 A. Yes.

17 Q. Would the other data points that you pointed to
18 in Figure 3 also be a conventional radiation-based
19 resist?

20 A. Certainly polyhydroxy styrene. I don't know
21 all of these.

22 Q. Okay. And let's look at -- back on 36, still
23 with paragraph 77.

24 A. My -- my 36?

25 Q. Your 36, paragraph 77 still, just because the

1 paragraph spans your pages.

2 MR. MILLER: Page 36, not paragraph.

3 THE WITNESS: Oh, page 36. I'm sorry.

4 MR. MILLER: Paragraph --

5 THE WITNESS: Thank you. I was -- sorry. I
6 thought you were talking about paragraph 36. Okay.

7 MR. WOLFE:

8 Q. Yeah, yeah. Okay. Here it says: "Indeed, the
9 trend is generally linear, with the EUV absorption
10 coefficient becoming larger as density increases." For
11 this generally linear trend, is that a trend for organic
12 resists or inorganic resists?

13 A. So it does look at this point that these are --
14 you know, I don't know what all of them are. They only
15 have little things there. So it says polymers can --
16 you know, containing silicon atoms. So that would not
17 be necessarily a purely organic resist if it contains
18 silicon atoms, as an example.

19 Q. Okay. I'm just asking you about the general
20 trend that you are mentioning -- the linear trend. Does
21 that apply to both organic resists and inorganic
22 resists?

23 A. I believe so. If it includes the silicon atom
24 versions, yes.

25 Q. So the materials shown in Figure 3, other than

1 the ones containing silicon atoms -- are any of the
2 other ones organic resists?

3 A. It does not specifically say if anything else
4 has that. But since they have so many dots there, you
5 know -- say polymers containing fluorine atoms, that
6 doesn't mean it couldn't contain something else as well.
7 I don't know. I really don't know. Sorry.

8 Q. Let's look at the -- the pink box there. So in
9 the sentence just above that on the previous page, it
10 says: "Dr. Banerjee takes issue with the outliers shown
11 on the graph of Exhibit 1025." You understand the
12 outliers you are referring to there as being those
13 within the pink box, right?

14 A. Correct. At the bottom of the pink box.

15 Q. Why are those outliers?

16 A. Probably has to do with what other atoms they
17 have in there. So --

18 Q. Did you do any analysis or, like, statistics to
19 determine whether something was an outlier?

20 A. No, I did not. But I'm looking at the general
21 trend as an example of the diamond-shaped ones that are
22 silicon atoms. So they have some noncarbon --
23 nonpolymer carbon in it, and that seems to be following
24 a similar trajectory.

25 Q. Right. But PMMA, the example that you are

1 pointing to, is on the trend line, more or less, right?

2 A. Yes, it is.

3 Q. And then polyhydroxy styrene, which you
4 mentioned earlier -- you would understand that to be
5 higher density and lower EUV absorption, right?

6 A. Than the PMMA?

7 Q. Yes.

8 A. The polyhydroxy styrene seems to have a
9 lower -- when I look at this, it looks like it's got a
10 lower density than PMMA. Slightly lower.

11 Q. So you think that the .4 polyhydroxy styrene is
12 to the left of where that PMMA is?

13 A. Well, it's certainly what my eyes are seeing.
14 I'm sorry if it's not -- because it does look like it's
15 to the left of the pink box in my picture.

16 Q. Part of it goes to the left of the pink box,
17 right? Not the center of it?

18 A. If you say so.

19 Q. But the --

20 (Simultaneous colloquy.)

21 A. Go ahead.

22 Q. The -- the circular dot -- that's a white dot
23 to the right of that one. That dot would be higher
24 density and lower EUV absorption, right?

25 MR. MILLER: Objection. Vague. Ambiguous.

1 THE WITNESS: On this graph, it does show that.

2 MR. WOLFE:

3 Q. In paragraph 77, below the graph, you mention
4 other resists, like HSQ. What is HSQ?

5 A. Sorry. My brain is just not remembering what
6 HSQ is. I even know what it is, and my brain is just
7 having some --

8 Q. Is it -- maybe I can help. Maybe is it
9 hydrogen silsesquioxane?

10 A. Yeah. Right. Hydrogen -- yeah.

11 Q. Is that a conventional radiation-based resist?

12 A. That is, yes.

13 Q. Looking further down on paragraph 77 on the
14 next page, do you see the annotated figure there?

15 A. Yes, I do.

16 Q. You added points that are labeled "ZircSOx" and
17 "HafSOx," right?

18 A. That is correct.

19 Q. Did you calculate the ZircSOx linear absorption
20 coefficient, which is the y-axis?

21 A. I believe we used -- I don't remember how I got
22 those numbers, so I'm sorry. No, I don't remember.

23 Q. If you look below the graph, it says: "Adapted
24 Figure 3, with red extensions to x-axis, y-axis, and
25 trend line and red dots showing location of 4 grams per

1 centimeter cubed and 5 grams per centimeter cubed on the
2 trend line." Does that help?

3 A. Yeah. So we did get the density of the
4 material. I just don't know -- I don't remember how we
5 got -- what the absorbance -- where we got those.

6 Q. Is it --

7 A. How we calculated that.

8 Q. You think you calculated the absorbance of
9 ZircSOx and HafSOx?

10 A. Yeah. I just don't remember for sure. I'm
11 sorry. I don't remember.

12 Q. So it's not your opinion that you placed them
13 on the trend line that was extended based on the
14 densities there?

15 MR. MILLER: Objection. Misstates the
16 testimony.

17 THE WITNESS: So based on the density -- and we
18 placed these on the line, yes. We did that.

19 MR. WOLFE:

20 Q. So you didn't actually calculate the EV
21 absorption. Instead, you placed them on the trend line,
22 where it intersected the density. Is that right?

23 A. That's correct.

24 Q. Why did you put them on the trend line?

25 A. Because it is a natural trend line that's in

1 the literature, so we use that. And even as
2 Dr. Banerjee said, you know, once you get to higher
3 density, it will be off that chart.

4 Q. Once you get to higher density and off that
5 chart, for example, were you showing -- for ZircSO_x and
6 HafSO_x here, how do you know the trend is linear in the
7 upward direction at those higher densities?

8 A. We just drew it that way. Partly also because,
9 you know, Dr. Banerjee pointed to a location off the
10 chart in that general direction in XY also. So we were
11 agreeing with him on that.

12 Q. But you don't know whether the trend is linear
13 at those much higher densities, do you?

14 A. I haven't calculated them. I haven't done -- I
15 have not done experiments on these to get that answer,
16 so I would have to do experiments to understand them.

17 Q. Let's look at paragraph 78, please. So here
18 you are talking about -- I think it says a "fourfold
19 increase."

20 (Reporter clarification.)

21 A. Sorry. Go ahead and start over.

22 Q. Yeah. So here you are saying a fourfold
23 increase in the density -- and you are talking about a
24 comparison with PHS, right?

25 A. Yeah. Polyhydroxy styrene.

1 Q. And polyhydroxy styrene is another conventional
2 radiation-based resist, right?

3 A. Yes.

4 Q. So you are saying hafnium has a fourfold
5 increase in density, right?

6 A. Approximately, yes.

7 Q. And in the next sentence, it says a "fourfold
8 increase in EUV absorption," right?

9 A. Yes, based on -- yes -- on the publication.

10 Q. But this trend doesn't necessarily hold for
11 ZircSOx, does it?

12 A. I don't know. I would have to go and get --
13 get data to analyze that and verify that for ZircSOx.

14 Q. Let's look back at paragraph 77 at the bottom
15 of page 37. Here we're talking about -- "Stowers
16 explained that a reasonable density of 4 grams per
17 centimeters cubed for ZircSOx" -- dot, dot, dot -- "can
18 be assumed." Do you see that?

19 A. I would say yes.

20 Q. The ZircSOx would be an assumed density of 4
21 grams per centimeter cubed, right?

22 A. Yes.

23 Q. And then if we go back to 78 -- paragraph 78,
24 you cite polyhydroxy styrene, which has a density of
25 1.19, right?

1 A. Yes.

2 Q. So four is about three times that, right?

3 A. Close, I think.

4 Q. And then if you can turn down two pages -- it's
5 in paragraph 79 -- there's a couple of figures there?

6 A. Okay.

7 Q. Do you see zirconium on the periodic table?

8 A. Oh, I'm sorry. Page --

9 Q. Page 40.

10 A. 40. Oh, okay. Okay. Now I've got it. Go
11 ahead.

12 Q. Do you see zirconium on the periodic table?

13 A. I do.

14 Q. Do you see carbon on the periodic table?

15 A. I do.

16 Q. Those colors are the same, right?

17 A. You know, in here, I can't tell if the colors
18 are the same.

19 Q. Can you tell if the colors are different?

20 A. And, of course, they're talking about
21 radioactive versus toxic, aren't they? No, I really
22 can't tell what the color difference is in something
23 that's grayish like this. I'm sorry.

24 Q. If you look at the bottom right side --

25 A. Okay.

1 Q. -- there seems to be a scale. And it also
2 mentions EUV. Do you see that?

3 A. Oh, yes. Okay.

4 Q. So can you tell -- do you see zirconium on the
5 periodic scale?

6 A. Yes.

7 Q. And do you see hafnium on the periodic scale?

8 A. Yes.

9 Q. Can you tell if those two are different colors?

10 A. I believe they are, yes.

11 Q. And can you see hafnium on the periodic scale
12 and carbon on the periodic scale?

13 A. Yes, I do.

14 Q. Are those two different colors?

15 A. Yes.

16 Q. And is zirconium and carbon close to the same
17 color, at least?

18 A. You know, that's where I can't tell. I can't
19 tell if the carbon is in the zero to 2 and the zirconium
20 is in the 6 to 8, if that's what those numbers are.
21 Unfortunately, they didn't change the colors
22 consistently. So I really can't tell the difference
23 between zero-2 and 6-8 on this. I'm sorry.

24 Q. Okay. Let's look at the figure above.
25 Actually, before we get there, what's the atomic number

1 of zirconium as it's shown on the periodic table?

2 A. I can't read it.

3 Q. Is it 40?

4 A. 40, I'm guessing. Yeah.

5 Q. If you look at the figure above --

6 A. Yeah.

7 Q. -- do you see 40?

8 A. I do.

9 Q. Is that higher or lower than the carbon?

10 A. It looks to be similar to carbon.

11 Q. Is that higher or lower than hafnium?

12 A. Definitely lower than hafnium.

13 Q. Okay. So the trend of being three times more
14 dense does not necessarily translate into being three
15 times more EUV absorption for zirconium, right?

16 A. So the thing here is you are looking at carbon,
17 not polymers. And the density of the polymer is
18 significantly different than the density of solid
19 carbon.

20 Q. Then I'm confused --

21 A. So I don't know how they're -- relate the
22 carbon here to the polymer, now that I think of it.
23 It's -- like, the polymers will be even lower in
24 density.

25 Q. And in paragraph 79, what's the point of the

1 comparison to carbon and hafnium there?

2 A. So hafnium has definitely got higher absorption
3 than carbon. So --

4 Q. So in the previous sentence -- or sorry. The
5 previous paragraph, 79 -- I guess that's the same
6 paragraph. It says:

7 "This makes sense because, as Dr. Stowers
8 and others have recognized, metals have a
9 higher EUV absorption than carbon. And,
10 therefore, metal oxide photoresists will
11 necessarily have higher UV absorption than
12 carbon-based photoresists." Do you see that?

13 A. Yes, I do.

14 Q. So here, aren't you relating the UV absorption
15 of hafnium and carbon because that's relating the EUV
16 absorption of inorganic resists to polymers?

17 MR. MILLER: Objection. Compound.

18 THE WITNESS: So I'd have to go and study this
19 more, but certainly in -- in -- Stowers and others did
20 say that there's higher EUV absorption for metal
21 photoresists than for carbon. So -- and that's where we
22 get these graphs.

23 MR. WOLFE:

24 Q. Right. And the claim limitation here is high
25 absorption relative to conventional radiation --

1 radiation-based resists, right?

2 A. Right, right.

3 Q. So in order for this statement about carbon to
4 be relevant, it has to be a comparison between the
5 inorganic resists and the conventional radiation-based
6 resists, right?

7 MR. MILLER: Objection. Vague. Ambiguous.

8 THE WITNESS: So as I said before, my problem
9 is although Stowers and Trikeriotis talk about carbon,
10 the photoresists, as you saw in Figure 3 -- they vary a
11 lot depending on the polymers.

12 So while carbon is lower than hafnium,
13 obviously there are other parts to the photoresist --
14 the conventional photoresists that have to do with their
15 absorption. It's not just the carbon.

16 MR. WOLFE:

17 Q. I understand. So in paragraph 79, in those two
18 figures, those are comparing elements, right?

19 A. That's correct.

20 Q. And it could have other things in the
21 photoresists that affect the EUV absorption, right?

22 A. It could be.

23 Q. Let's turn now to paragraph 85.

24 A. I'm there.

25 Q. And the heading above two says: "The

1 Trikeriotis coatings can be effectively patterned at a
2 dose no more than 100 millijoules per centimeter
3 squared." Do you see that?

4 A. Yes.

5 Q. What do you understand "effectively patterned"
6 to be?

7 A. After it is exposed and developed, then you
8 have a pattern that's printed and effectively can be
9 determined by the use of the application. So I don't
10 know the exact definition.

11 Q. So here below, you point to a figure from
12 Trikeriotis Figure 5A, right?

13 A. That's correct.

14 Q. You say that's a positive tone contrast curve,
15 right?

16 A. Yes.

17 Q. What is a contrast curve?

18 A. When they run experiments, they take a layer of
19 photoresist. They do different amounts of exposure, and
20 they found out at what point they get to -- and then
21 they develop them.

22 And they look at how much of the photoresist is
23 left on the wafer after the development, and that helps
24 them understand what dose is required to get through
25 80 percent of the film versus 100 percent of the film.

1 Q. In those contrast curves, is a pattern being
2 formed?

3 A. You know, I don't know. I don't remember.
4 They could just do -- they could just be doing flat
5 experimentation with the coupons, as an example, and
6 just exposing the whole coupon and looking at the amount
7 removed after development. I'd have to go read this to
8 see if they used -- because it says they used an exposed
9 film. I didn't see whether it says it's patterned.

10 Q. So your understanding is a contrast curve can
11 also be with a pattern with a mask?

12 A. I don't know. I'd have to go -- I'd have to go
13 back and see how they did it. So --

14 Q. Let's turn to paragraph 90.

15 A. Okay. I'm there.

16 Q. Here we're discussing a reference called
17 "Keszler." And in this paragraph, you mention Example
18 4. Do you see that?

19 A. Yes.

20 Q. And it says: "Discloses a method for producing
21 smooth, dense, and pinhole-free ultra-thin nanolaminate
22 films as thin as about 2 nanometers." Do you see that?

23 A. Yes.

24 Q. What are nanolaminate films?

25 A. That's a good question. I don't -- I'm not

1 sure what he means by the word "nanolaminate." I'd have
2 to go check that and see. I'm sorry.

3 Q. Aren't nanolaminate films made up of several
4 nanometer-layer layers?

5 A. It might be. I'd have to go back and read what
6 he's doing.

7 Q. Do you think it will help if we can open that
8 exhibit? I believe it's 1038. Yeah, 1038. And it's on
9 page 40.

10 A. I'm on 40.

11 Q. And you see it says "Example 4" on page 40 of
12 the bottom right? Sorry.

13 (Simultaneous colloquy.)

14 A. Yeah. Okay. I see now. Yes.

15 Q. It says "Example 4." And this is the example
16 that you were relying on before, right?

17 A. Can you point me to which -- where on this page
18 I'm supposed to look.

19 Q. The first sentence: "This example describes a
20 general method for producing smooth, dense, and
21 pinhole-free ultra-thin nanolaminate films as thin as
22 about 2 nanometers." Do you see that?

23 A. You know what? I grabbed the wrong 40. Hold
24 on. I was looking at the -- no. Sorry. I was looking
25 at the patent's number instead of the PDF. Okay. I'm

1 on the right page now, sir. Sorry.

2 Q. No worries. So you see that first sentence,
3 right?

4 A. Yes. "This example describes the general
5 method" -- yes.

6 Q. And that's what you are quoting in paragraph
7 90, right?

8 A. Yes.

9 Q. Okay. And you see it discusses spin coating
10 around line 17: "Films were deposited using a spin
11 coater with a spin rate of 3000 RPM for 30 seconds,"
12 right?

13 A. Yes.

14 Q. "Followed by hotplate polymerization at 125 C
15 for one to two minutes." Do you see that?

16 A. Yes.

17 Q. Then it says: "Spin coating and polymerization
18 steps were repeated until the desired thickness was
19 reached." Do you see that?

20 A. Yes, I do.

21 Q. So would that inform your opinion of what
22 nanolaminate films are?

23 A. Yes.

24 Q. What would they be?

25 A. Well, since he does state in here films as thin

1 as 2 nanometers -- nanolaminates can be as thin as 2
2 nanometers, I'm -- I don't know. I'm not really sure if
3 that's one coating or two coatings for 2 nanometers.

4 Q. Right. But you would understand the sentence
5 that says "Spin coating and polymerization steps were
6 repeated until the desired thickness was reached" to
7 indicate that there would be multiple layers, right?

8 A. Well, unless you met the first thickness of 2
9 nanometers with one spin coating, in which case then you
10 wouldn't do multiple coatings. So they just keep adding
11 if they haven't met the right thickness.

12 Q. Above that, in line 14 -- 13 to 14, it says:
13 "The difference in metal ion concentrations allowed for
14 thickness-per-coat variation from 3 nanometers to
15 25 nanometers." Do you see that?

16 A. Yes.

17 Q. So that would be a per-coat variation, right?

18 A. Yes.

19 Q. So there would be multiple coats, right?

20 A. Well, "per coat" could also mean one coat.

21 Q. Would one coat get you 2 nanometers?

22 A. Would one coat what?

23 Q. Would one coat -- you were pointing to the
24 sentence at the very beginning: "Thin as about 2
25 nanometers." And then now we're looking at a sentence

1 that says: "Per-coat thickness of 3 nanometers to 25
2 nanometers." Would one coat get you a 2-nanometer
3 thickness?

4 A. Well, since they say the precursor solution
5 contains metal ion concentrations that are quite
6 variable, it does sound like they would have different
7 viscosities. So it is possible that they could have
8 deposited 2 nanometers. It doesn't say they didn't.

9 Q. Right. So the difference in the metal ion
10 concentrations affects the viscosities, which affects
11 the thickness, right?

12 A. I believe so.

13 Q. And here in the sentence above that one, it
14 says: "The precursor solutions contained a metal ion
15 concentration of about 0.5 moles to 0.4 moles with
16 70 percent hydrogen peroxide and 50 percent sulfate
17 relative to metal." Do you see that?

18 A. Yeah. It says the metal ion concentration of
19 about 0.05 moles to 0.4 moles.

20 Q. Thank you for the correction. Yeah.
21 0.05 moles to 0.4 moles.

22 A. Yeah.

23 Q. And then the next sentence says: "The
24 difference in metal ion concentrations" -- that's
25 discussing that range, right?

1 A. Yes.

2 Q. And then that difference -- that range allowed
3 for thickness-per-coat variation from 3 nanometers to
4 25 nanometers, right?

5 A. Did you ask me a question that I missed?

6 MR. MILLER: I don't think we heard it,
7 Michael.

8 THE WITNESS: Oh, yeah. I didn't hear one. I
9 was waiting. I thought maybe you were reading. Sorry.

10 MR. WOLFE:

11 Q. So I'll read it back. And then that
12 difference -- that range allowed for thickness-per-coat
13 variation from 3 nanometers to 25 nanometers, right?

14 A. That is correct. And so if someone wanted to
15 have just a 3-nanometer film, using those difference
16 would allow to have one film spin on -- it would have
17 made 3 nanometers without multiple coatings.

18 Q. And one spin-on of 3 nanometers would not get
19 you a thickness of 2 nanometers, would it?

20 A. No. You would have to do something thinner to
21 get it down to 2 nanometers. So I'm surprised they
22 don't say that they could do -- because it says "per
23 coating" -- the variation.

24 So I wonder how they do 2 nanometers. Since
25 they say "per coating," they can only get 3 to 25.

1 Interesting. They should have said -- because,
2 otherwise, how did they get 2 in the first sentence?

3 Q. And if you could take a moment to look at
4 Example 4. It starts on page 40, and it goes to page
5 42. This example is, you know, about three pages.
6 Doesn't disclose anything about UV, EUV, or e-beam
7 exposure, does it? I understand it's a few pages, so
8 take your time.

9 A. Yeah, no. It goes this way. Just swap the
10 pages.

11 Q. Tell you what. If it helps, we're coming close
12 to lunch. We can take a break now and pick this up when
13 we get back.

14 A. I'm okay with that.

15 (Lunch break taken.)

16 Q. All right. Dr. Holland, welcome back. I think
17 before we broke, we were discussing Example 4 of
18 Keszler, which is Exhibit 1038 on pages 40 to 42. Are
19 you -- do you see those?

20 A. Yes.

21 Q. I ask you: "This example doesn't disclose
22 anything about UV, EUV, or e-beam disclosure, does it?"

23 A. I did not read through it -- sorry -- all
24 Example 4 while we were off. So --

25 Q. Yeah. Take a look now.

1 A. Yeah. So Example 4 -- I did not find anyplace
2 in Example 4 where they actually do exposure to
3 radiation to get photoresist results.

4 Q. Right. Example 4 is discussing various ways of
5 measuring surface roughness, right?

6 A. Yes.

7 Q. Okay. Let's go back to your declaration,
8 paragraph 90.

9 A. 9-0.

10 Q. 9-0, yeah.

11 A. Okay. I'm there.

12 Q. The last sentence on page 43 says: "Similarly,
13 Keszler's Example 7 discloses a method where a precursor
14 solution containing peroxide (is 'spin-cast, liquid
15 misted, or inkjet printed onto an appropriate
16 substrate')." Do you see that?

17 A. I do see that.

18 Q. Let's go back to Keszler, Exhibit 1038. Turn
19 to page 44.

20 A. Okay.

21 Q. And sorry to go back and forth. But in your
22 paragraph 90, at the end, it says: "Id, at 42:8-10." I
23 understand that to be a typo, and that means 44, right?
24 Because the bottom right page number is 44.

25 A. I'm guessing. Right.

1 Q. Because we're discussing Example 7, right? And
2 that's on page 44 of the exhibit, right?

3 A. Yeah. So it starts on 42.

4 Q. 42 of the reference?

5 A. Right. You are right. So 7 starts on page 44
6 of the PDF numbers. Yes, sir.

7 Q. So if you look at this Example 7, you can tell
8 me what you think. But I -- it looks like it's one
9 paragraph long. The second paragraph underneath that
10 appears to be summarizing. Is that fair?

11 A. I'm going to read it. Sorry.

12 Q. Take your time.

13 A. Okay. So I do see there's a paragraph below
14 Example 7. Is that the one you are talking about?

15 Q. Yeah. And my understanding is that is
16 describing all of the examples, talking about the many
17 possible embodiments. Is that how you read it?

18 A. That's how I read it.

19 Q. Okay. So Example 7 would be just one
20 paragraph, right?

21 A. Yes. That's what it looks like.

22 Q. And if you look at the first sentence, this
23 talks about patterning a single layer in organic film.
24 Do you see that?

25 A. Patterning a single layer in organic film, yes.

1 Q. So this is a photolithography example, right?

2 A. Correct. With a single layer of the film.

3 Q. And Example 7 doesn't list -- it doesn't
4 mention nanolaminates, does it?

5 A. I do not see it saying "nanolaminates," no.

6 Q. And Example 7 does not list the precursor
7 materials for the films that are used in that example,
8 does it?

9 A. It does not explicitly say here. However,
10 being -- Example 7, they talked about all those
11 inorganic things before that, so --

12 Q. Okay. But the --

13 (Simultaneous colloquy.)

14 Q. Sorry.

15 A. I'm sorry.

16 Q. The precursors themselves are not listed in
17 this Example 7, right?

18 A. So do you mean precursors -- you mean the
19 components that were put together to make the solution?

20 Q. Yes.

21 A. Or are you talking about the solution itself?

22 Q. The different components that were put together
23 to make the solution.

24 A. Example 7, they -- they say that the single
25 inorganic film consisting -- containing peroxide and

1 related coordinated species.

2 Q. Okay. But the chemical names of the
3 precursors, like hafnium oxychloride or things like
4 that, are not listed here?

5 A. Not here.

6 Q. And this example doesn't have any explicit
7 reference to Example 4, does it?

8 A. Well, you know, when I read this thing, I read
9 the whole thing as a unit, not Example 7 as a unique
10 thing on its own. So I, in reading it, read it as 7 is
11 further on to the earlier examples they used.

12 Q. Okay. But Example 7 in -- the text in that
13 paragraph never refers to Example 4, does it?

14 A. Not -- it does not expressly refer to it.

15 Q. And it doesn't expressly refer to any other
16 examples, does it?

17 A. It does not list other examples. However, it
18 talks about a single inorganic film containing peroxide
19 or related coordinating species, which, in my, mind
20 would be the things they already talked about earlier in
21 the patent. So they wouldn't -- they wouldn't feel a
22 need to reference it, perhaps.

23 Q. If we can look further down in that paragraph,
24 maybe line 19, it talks about the film thicknesses.
25 What are the thicknesses in that example?

1 A. The films were about 30 to 60 nanometers thick.

2 Q. Okay. Could we turn back to your declaration
3 and turn onto paragraph 96.

4 A. Okay. I'm on 96.

5 Q. And if you look at the first paragraph -- or
6 the first sentence, he says: "As shown above, the
7 precursor solutions comprise peroxide in addition to the
8 hafnium or zirconium ion." Do you see that?

9 A. Yes, I do.

10 Q. And there you are citing ID, which I understand
11 to be Keszler 38, 6 to 63. Can you turn to Keszler page
12 38. And, again, I think this one might be a typo, and
13 you can let me know if that's correct or not. I think
14 it's referring to the document page 38.

15 A. Oh, not again.

16 Q. But you can let me know if that's right.

17 A. Do you know where -- let's see. So it would be
18 6 to 63. That would be the lower line on the top.

19 Q. There's no lines up to 63, are there?

20 A. No.

21 Q. Patent columns typically go to 63 lines, so it
22 might mean -- end, perhaps, but I'm not positive what
23 exactly that cite means. So that's why I wanted to
24 check in with you.

25 Here we're talking about the precursor

1 solutions comprised peroxide in addition to the hafnium
2 and zirconium ion. So we're looking for something with
3 peroxide in it.

4 And in the next sentence, it says: "Keszler
5 discloses that peroxide, i.e., H₂O₂, is a
6 radiation-sensitive ligand. So I'm looking for
7 peroxide --

8 A. That too.

9 Q. -- and hafnium and zirconium.

10 A. Zach, if you find it, let me know.

11 MR. MILLER: Unfortunately, I cannot testify
12 for you. So --

13 THE WITNESS: No. I know. Just --

14 MR. WOLFE:

15 Q. So let me sort of lead this along by --

16 A. I'm looking. I can't find it.

17 Q. If you look at 38 of the pages on the bottom
18 right --

19 A. Okay.

20 Q. -- that lists a bunch of chemicals, but
21 there's -- there's, like, different ones that I don't
22 recognize: LA and CE and other ones. And this is in
23 Example 1, which we haven't talked about before.

24 A. Oh, Example 1. Sorry. I was looking at 2.

25 Sorry. Okay. Example 1.

1 Q. And if you are looking sort of at line 6, which
2 is -- you cited 38, 6. So looking there, we haven't
3 really talked about these chemicals or this example
4 previously.

5 Then if we compare that to page 40 of the PDF,
6 the bottom right -- if you look at six, it appears to be
7 right after the previous example. And it says to 63, so
8 maybe that could mean to the end, talking about --

9 A. Okay. Hold on. I went too far. So say it
10 again about 40.

11 Q. If we look at page 40 -- and then this is
12 Example 4, which we did talk about before.

13 A. Yes.

14 Q. And it seems to start around line six.

15 A. That's correct. It starts around line six.

16 Q. So is this what you were meaning to cite in
17 that sentence there?

18 A. I'm not finding -- it says -- because this is
19 supposed to be a quote: "A small coordinating species,
20 such as peroxide." So --

21 Q. So I think that's the next quote. I think this
22 one is -- doesn't really have a quote attached to it
23 exactly.

24 A. Oh, I'm sorry. I have been looking at the
25 wrong one. Okay. So which one are you looking at? I

1 thought we were looking at 96.

2 Q. We are looking at 96.

3 A. Okay.

4 Q. But there's a -- the first cite in there.

5 A. "Keszler discloses 'peroxide' is a
6 radiation-sensitive ligand." Is that what you want me
7 to look for?

8 Q. I'm just trying to understand what the cite is
9 just before that one. And I was using that sentence as
10 sort of context, but I'm just trying to understand.

11 A. Okay. I guess I don't understand what I should
12 be looking for. I'm a little confused. Sorry for that.

13 Q. Okay. Let's start over. At paragraph 96, it
14 says: "As shown above, the precursor solutions comprise
15 peroxide in addition to the hafnium or zirconium ion,
16 ID 38, 6 to 63."

17 A. Okay.

18 Q. You are citing 38, 6 to 63, in support of that
19 sentence.

20 A. Okay. It does -- PDF page 40, it does have:

21 "Precursor solutions with hafnium
22 oxychloride or zirconium oxychloride plus
23 peroxide and sulfuric acid were prepared as
24 described in the U.S. patent publication
25 number."

1 Q. All right. So does it seem fair that for that
2 one, you were meaning to cite page 40, which happens to
3 be page 38 of the document?

4 A. It does appear that, yes.

5 Q. Okay. Let's turn to the next cite, then. This
6 is 28, 9 through 12. And this one has a quote, so
7 hopefully it should be easier. Are you on page 28 of
8 the document?

9 A. I'm trying. I'm getting there. 28, 9 to 12.
10 Okay. I'm finding this on the PDF page 28.

11 Q. Right. So that one --

12 A. That one is PDF number.

13 Q. Okay. So looking at that paragraph --
14 (Simultaneous colloquy.)

15 A. Go ahead.

16 Q. Looking at that paragraph, starting about line
17 three, do you see it says:

18 "During the deposition and processing of
19 the films described herein, it's possible to
20 control the film hydration level, which
21 provides a method for controlling the
22 interdiffusion of stacked films and the
23 resulting physical and chemical properties"?

24 Do you see that?

25 A. I do see that.

1 Q. So that paragraph is talking about
2 interdiffusion of stacked films, right?

3 A. Correct.

4 Q. And then later down, where it starts "This
5 methodology" sort of in the middle of the paragraph, it
6 says: "This methodology involves depositing and
7 reacting two distinct films, and it is designed as a
8 bilayer diffusion." Do you see that?

9 A. "Designated as a bilayer diffusion."

10 Q. Thank you for that. "Designated as a bilayer
11 diffusion." So this is discussing two distinct films in
12 bilayer diffusion, right?

13 A. Right.

14 Q. Then after that, it says: "In addition, small
15 coordinating species, such as peroxide, O₂²⁻, can be
16 incorporated into aqueous-based inorganic liquid
17 suspensions and films, provide an additional new
18 lithographic patterning method." Do you see that?

19 A. Yes, I do.

20 Q. So that's a continuation in that same paragraph
21 of the previous examples, right?

22 A. Yes.

23 Q. Okay. Let's turn back to your declaration,
24 paragraph 122. I'm getting there. Sorry.

25 A. No. It's okay.

1 Q. Okay. So here we're discussing effectively
2 patterned with UV radiation -- UV radiation at a dose no
3 more than 100 millijoules per centimeter squared, right?

4 A. Correct.

5 Q. And here you are pointing to Keszler, which is
6 Exhibit 1038, at page 33, lines 13 to 18, right?

7 A. That's what it says, yeah.

8 Q. And you are pointing there because you have a
9 quote before that that says: "At dose levels as low as
10 2 microcoulombs per centimeter squared," right?

11 A. So where does it have the 2 microcoulombs?

12 Q. Just before that -- that citation in paragraph
13 122, at the end of the sentence.

14 A. Oh, okay. I see what you have got.

15 Q. So here you were relying on the teaching that
16 could be patterned as -- at dose levels as low as 2
17 microcoulombs per centimeter squared. Do you see that?
18 Right?

19 A. I do see that.

20 Q. So you were relying on this dosing of 2
21 microcoulombs per centimeter squared as satisfying this
22 teaching, right?

23 A. Yes.

24 Q. So let's go to Keszler --

25 A. That's a quote of him.

1 Q. Yes. But you are relying on that quote for
2 this claim limitation, right?

3 Sorry. I missed it. Was that "yes"?

4 A. Yeah. Just -- that's one thing I'm relating to
5 it.

6 Q. Okay. Well, let's look at that -- that thing
7 first.

8 A. Okay.

9 Q. Page 33.

10 A. Yeah. 13.

11 Q. And this one does appear to be the PDF number.
12 So if you look at around line 17 --

13 A. Okay.

14 Q. -- it says: "As shown in Figure 16,
15 figures" -- "or features have been written via electron
16 beam exposure at dose levels as low as 2 microcoulombs
17 per centimeter squared," right?

18 A. Yes.

19 Q. And that's the quote that you are making in
20 your paragraph, right?

21 A. Right.

22 Q. Can we turn to Figure 16, please.

23 A. Which Figure 16?

24 Q. It's in Keszler, page 60.

25 A. Figure 16, you said?

1 Q. Yes?

2 A. Okay. Figure --

3 Q. Okay. On Figure 16, do you see where it's
4 written: "2 microcoulombs per centimeter squared"?

5 A. Yes.

6 Q. Do you see an arrow coming from 2 microcoulombs
7 per centimeter squared?

8 A. I do.

9 Q. What's it pointing to?

10 A. I don't know. I haven't studied that.

11 Q. Do you see any pattern in this space where the
12 arrow is pointing?

13 A. I guess it depends on how long the arrow is.
14 If it's pointing up further, I'd have to go read their
15 description of Figure 16 to understand that.

16 Q. Do you see above it says: "400 microcoulombs
17 per centimeter squared"?

18 A. Yeah.

19 Q. Do you see that that's pointing into a box?

20 A. Yes.

21 Q. It appears that the 2 microcoulombs per
22 centimeter squared is pointing at a black space. Is
23 that fair?

24 A. At least as far as the resolution of this
25 printed copy, yes. I don't know what it's pointing to,

1 honestly, because it's -- unfortunately, the resolution
2 with this isn't the greatest. Copies.

3 Q. If it was pointing to just sort of the black
4 space there, would you consider that effective
5 patterning?

6 MR. MILLER: Objection. Outside the scope.
7 And incomplete hypothetical.

8 THE WITNESS: In fact, in here, it says:
9 "Figure 16 shows that features can be written with an
10 electron beam exposure dose at as low as 2 microcoulombs
11 per square centimeter."

12 So maybe the picture just doesn't show what's
13 being printed. Maybe it's just -- just like I couldn't
14 read some of the ligand values and things easily,
15 because it says that Figure 16 shows that.

16 MR. WOLFE:

17 Q. When you look at Figure 16, you can't see
18 anything under there, right?

19 A. The picture, Figure 16 -- resolution itself
20 was -- the printed version does not show it. I don't
21 know if the original thing might have had something in
22 there. I just don't know. We'd have to go find the
23 original.

24 Q. Let's turn to paragraph 145.

25 A. You are talking about mine now?

1 Q. Yes. Your second declaration. Thank you.

2 A. Okay. I'm on page -- excuse me -- on paragraph
3 145.

4 Q. Okay. Here you say: "A POSA would understand
5 that the technology that is the subject of Claim 13 and
6 the remaining proposed substantive claims is highly
7 unpredictable." Here you are saying the technology is
8 highly unpredictable, right?

9 A. What I'm saying is that Claim 13 is -- includes
10 functional requirements. So functional requirements of
11 metal ligands and ions are radiation sensitive, and
12 that -- that's what it includes there.

13 Q. Okay. So you are saying the functional
14 requirements are highly unpredictable? That's what you
15 are saying?

16 A. No. What I'm saying -- unpredictable is what
17 are radiation-sensitive ligands? All they talk about in
18 the patent is peroxide, so what are other
19 radiation-sensitive ligands? I have no idea what I
20 would include, so that's the problem with the claims.

21 Q. So I'm just trying to clarify the first
22 sentence in terms of the unpredictability of Claim 13.
23 So you are not talking about, for example, the thickness
24 limitation, right? That wouldn't be highly
25 unpredictable, would it?

1 MR. MILLER: Just to clarify, Doctor, he's
2 looking at paragraph 145.

3 THE WITNESS: Oh, I'm reading 144. I'm sorry.
4 Thank you. I'm reading the wrong one.

5 MR. WOLFE: Thank you.

6 THE WITNESS: Okay.

7 MR. WOLFE:

8 Q. So I can rephrase the question. Basically, my
9 question is -- this discussion here where you say the
10 technology is highly unpredictable, that's discussing
11 things like radiation-sensitive ligand, not thickness,
12 right?

13 A. So, yes, specifically the functional
14 limitations of Claim 13 relate to chemistry and chemical
15 properties of certain compounds. Chemical reactions and
16 properties can be highly variable and difficult to
17 predict.

18 For example, combining certain elements or
19 functional groups into a molecule can affect the
20 properties of the molecule in unpredictable ways. So
21 that's what I'm saying. That is not -- this paragraph
22 is not about thickness.

23 Q. So thickness would be predictable, wouldn't it?

24 A. I guess I don't know what you mean by that.

25 Q. In terms of you could vary the viscosity, the

1 spin speed, and the spin time to achieve particular
2 thicknesses -- a POSA could, right?

3 A. A POSA would know to change things to get
4 thicknesses. They wouldn't know in the claim what
5 thicknesses -- you know, why would you pick one
6 thickness versus another.

7 Q. Right. But I'm just saying if they changed
8 from 3,000 to 6,000, they wouldn't expect it to be
9 completely unpredictable what the thickness would be
10 from that change, right?

11 MR. MILLER: Objection. Vague. Ambiguous.

12 THE WITNESS: Yeah. It depends on other
13 factors. So, yeah, I really -- sorry. I'm not helpful
14 here.

15 MR. WOLFE:

16 Q. So you are saying that in determining whether
17 you could achieve a particular thickness, it would be
18 unpredictable based on changing variables?

19 A. No. I'm saying you could change the variables,
20 but I wouldn't know which ones to be targeting based on
21 the substance of the patent.

22 Q. You wouldn't know which thicknesses to be
23 targeting based on the substance of the patent, right?
24 That's what you are saying?

25 A. That's correct.

1 Q. Not necessarily which way you would tweak the
2 variables to achieve particular thicknesses, right?

3 A. A POSA would understand that there are certain
4 things you can do that will change the final thickness
5 of the film. That is true. We do know that.

6 Q. And you read a sentence: "For example,
7 combining certain elements or functional groups into a
8 molecule can affect the properties of that molecule in
9 unpredictable ways." Do you see that?

10 A. Yes.

11 Q. So would combining different amounts of
12 additives or compounds in a material also affect the
13 properties in the material?

14 A. Not necessarily.

15 Q. I'd direct your attention first to the next to
16 last sentence: "Similarly, the inclusion of different
17 additives or compounds in a material can affect the
18 properties of the material in unpredictable ways."

19 A. That's correct. So that would be different
20 additives or compounds, not different concentrations.
21 So maybe I misunderstood your question. I don't know.
22 Sorry.

23 Q. I think that's my next question. So it's about
24 whether different additives or compounds are in there as
25 a binary, yes or no, not how much is in there. Is that

1 what you are saying?

2 MR. MILLER: Objection.

3 Hold on a second.

4 Objection. Incomplete hypothetical.

5 You can --

6 THE WITNESS: I'm confused. Please repeat the
7 question. That way, I can hopefully help you.

8 MR. WOLFE:

9 Q. Let's go to the sentence one more time:

10 "Similarly, the inclusion of different additives or
11 compounds in a material can affect the properties of the
12 material in unpredictable ways." Do you see that?

13 A. Yes.

14 Q. And that's your opinion, right?

15 A. Yes.

16 Q. And is it your opinion that different amounts
17 of additives or compounds in a material can affect the
18 properties in a material in unpredictable ways?

19 MR. MILLER: Objection. Outside the scope.

20 THE WITNESS: No. I did not state that here.
21 I said different compounds, not different
22 concentrations.

23 MR. WOLFE:

24 Q. Would it be your understanding that different
25 concentrations could also affect the properties and the

1 material in unpredictable ways?

2 A. I really don't know. I really don't know. It
3 depends on what materials you are talking about.

4 Q. Let's turn to paragraph 146, just below this.

5 A. Okay.

6 Q. Here you say: "A POSA would understand that as
7 used in the '564 patent, a ligand is an atom or molecule
8 with a functional group that binds the central atom,
9 typically a metal, in a coordination complex." Do you
10 see that?

11 A. Yes.

12 Q. Where did you get that definition?

13 A. I'm sorry?

14 Q. Where did you get that definition of a ligand
15 from?

16 A. My chemistry background.

17 Q. And why is the central atom typically a metal?

18 A. Because that's -- those are the ones most
19 likely where -- we call them "ligands" when they're --
20 or "ligands" when they're attached to the metal.

21 Q. Okay. So when they're attached to the metal,
22 they're called a ligand is what you said. So they need
23 to be attached to the metal. Did I say that right?

24 A. They're somehow chemically interacting to the
25 metal.

1 Q. Interacting in a way that they stay with the
2 metal?

3 A. Depends on what you are doing to it.
4 Obviously, if you hit it with radiation, the ligand
5 will -- may pop off or whatever. But typically a ligand
6 is something that is chemically coordinated with a
7 metal. How's that for -- coordinated.

8 Q. It's good. I think I'll need help with what
9 the word "coordinated" means.

10 A. Well, if you look at some of the pictures we
11 have, it shows how the ligands are on the outside.
12 Trying to think of some of the things.

13 Q. Like in Ober with the methacrylate?

14 A. Yes. Or if you go to page 33 of my thing, this
15 shows the ligands in HafSO_x . In this case, they are --
16 these peroxide are actually chemically bound in this
17 case. Yeah.

18 Q. How about the sulfate there?

19 A. The sulfate is actually coordinating the
20 peroxides, I believe.

21 Q. So you wouldn't consider the sulfate there to
22 be a ligand?

23 A. That's a good question. I'd have to go and
24 study whether or not that's considered a ligand. It
25 might be because it is connecting the peroxides, which

1 are connecting the metals. So I would have to go back
2 and lead up on that. I haven't done that in a long
3 time. Sorry.

4 Q. Related question: Can ligands attach to
5 nonmetals?

6 A. I would have to go, again, read up on the
7 definition. I -- in my mind, I had this definition of a
8 ligand in a metal. But now that you ask that question,
9 I'd have to go back and study it to give you a precise
10 answer other than just my opinion, which might be wrong
11 if I did that.

12 Q. I understand. If we look at, I think, page 33
13 of your declaration, the hafnium is represented in blue
14 there, right?

15 A. Yes.

16 Q. Because it's a tetra, and there's four of them,
17 right?

18 A. Yeah. They're hafnium. Yeah. Four hafniums.

19 Q. And the peroxides are -- spokes out from that,
20 and it appears to be yellow and red, right?

21 A. Red dots with yellow connectors. If you look
22 at the peroxide word above it, you'll see the red -- two
23 red dots and a yellow line between them. That's how
24 they did this, yeah.

25 Q. So my question is if that blue dot instead was

1 a nonmetal, would you still call that peroxide a ligand?

2 A. I don't know. I'd have to go back and study
3 to -- to verify what that is. I wouldn't want to say
4 something that's wrong.

5 (Break taken.)

6 Q. Dr. Holland, did you talk to or receive any
7 information from anyone about the substance of your
8 testimony during the breaks?

9 A. No, no. Those two guys went off on their own.
10 I went to the restroom.

11 Q. We have no further questions. Thank you,
12 Dr. Holland, for your time.

13 THE WITNESS: Okay. Thank you very much.

14 MR. MILLER: And no redirect at this time.
15 Thank you.

16 (The matter concluded, 1:27 p.m.)

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DECLARATION UNDER PENALTY OF PERJURY

I, KAREY HOLLAND, PhD, do hereby certify under penalty of perjury that I have read the foregoing transcript of my deposition taken on November 22, 2024; that I have made such corrections as appear noted on the Deposition Errata Page, attached hereto, signed by me; that my testimony as contained herein, as corrected, is true and accurate.

Dated this day of 2024.

KAREY HOLLAND, PhD

1 STATE OF CALIFORNIA)
2)
3 COUNTY OF SACRAMENTO)

4 I, TAMMY MOON, CSR No. 13184, Certified
5 Shorthand Reporter, do hereby certify:

6 That prior to being examined, the witness in
7 the foregoing proceedings was by me duly sworn to
8 testify to the truth, the whole truth, and nothing but
9 the truth;

10 That said proceedings were taken by me in
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13 That I am neither counsel for, nor related to,
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25