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

_____	)	
LAM RESEARCH CORP.,	)	CASE NO.:
	)	IPR2024-00033
PETITIONER,	)	
	)	PATENT NO.
v.	)	9,823,564
INPRIA CORP.,	)	
	)	
PATENT OWNER.	)	
_____	)	

DEPOSITION OF KAREY HOLLAND, PH.D.
VOLUME I
PALO ALTO, CALIFORNIA
THURSDAY, JULY 18, 2024

REPORTED BY: NATALIE PARVIZI-AZAD, CSR, RPR, RSR
CSR NO. 14125
JOB NO.: 545893

1 UNITED STATES PATENT AND TRADEMARK OFFICE

2 BEFORE THE PATENT TRIAL AND APPEAL BOARD

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4 _____)
LAM RESEARCH CORP.,) CASE NO.:
5) IPR2024-00033
PETITIONER,)
6) PATENT NO.
v.) 9,823,564
7)
INPRIA CORP.,)
8)
PATENT OWNER.)
9 _____)

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14 DEPOSITION OF KAREY HOLLAND, PH.D. VOLUME I
15 TAKEN ON BEHALF OF THE PATENT OWNER
16 IN PALO ALTO, CALIFORNIA, BEGINNING AT
17 9:12 A.M. AND ENDING AT 6:38 P.M., ON
18 THURSDAY, JULY 18, 2024, BEFORE
19 NATALIE PARVIZI-AZAD, CERTIFIED SHORTHAND
20 REPORTER NUMBER 14125.
21
22
23
24
25

A P P E A R A N C E S

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I N D E X

WITNESS	PAGE
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EXAMINATION BY MR. BREGMAN	229

E X H I B I T S

EXHIBIT NO.	DESCRIPTION	PAGE
	NONE MARKED	

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PALO ALTO, CALIFORNIA

THURSDAY, JULY 18, 2024, 9:12 A.M.

THE CERTIFIED STENOGRAPHER: Please raise your
right hand to be sworn.

KAREY HOLLAND, PH.D.

having declared under penalty of perjury to tell the
truth, was examined and testified as follows:

EXAMINATION

BY MR. WOLFE:

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

A. Yes. Karey Lynn Holland.

Q. Dr. Holland, have you ever been deposed
before?

A. Yes, I have.

Q. About how many times?

A. Four or five.

Q. Okay. And when was the last time you were
deposed?

A. Probably 2005.

Q. Okay. So I'll go over just some of the ground
rules.

1 A. Okay.

2 Q. As you can see, we have a court reporter here
3 today, and we're making a record, so if you could just
4 let me finish my questions before you answer, and I'll
5 let you finish your answers before I ask the next
6 question. Is that fair?

7 A. Yes.

8 Q. And if you don't understand a question, please
9 ask me, you know, to clarify or to follow up, and I'll
10 do that. Is that fair?

11 A. Yes, please.

12 Q. And when you're answering a question, please
13 use "yes" or "no." Don't "uh-huh" or "uh-uh" because
14 that's bad for the record.

15 A. Correct.

16 Q. You understand that you're under oath today;
17 right?

18 A. Yes.

19 Q. Is there any reason that you cannot testify
20 completely, truthfully, and accurately?

21 A. Not at all.

22 Q. Who first contacted you about this case?

23 A. I think -- I think it was Guylaine.

24 Q. And who is Guylaine?

25 A. I don't remember her last name. She's no

1 longer with the firm.

2 Q. Okay. So a lawyer at Morgan, Lewis?

3 A. Yes.

4 Q. Okay. And when were you retained for the
5 case?

6 A. I'm going to say about a year ago.

7 Q. So, summer of 2023?

8 A. Yes.

9 Q. When did you begin working on the case after
10 you were retained?

11 A. I'd have to look at stuff, but I believe it
12 was -- I think it was September, because we did, like,
13 three months of work.

14 Q. Okay. So you did three months of work between
15 when you were retained in summer 2023 and September, or
16 you did three months of work after September?

17 A. After September.

18 Q. What's your rate for this case?

19 A. I'm getting \$600 an hour, but I'm -- was put
20 in by a group that recommended me, so I don't know what
21 the rate is that Lam is paying.

22 Q. Got it. So there is a rate that you're
23 receiving, which is 600 and -- \$600 an hour?

24 A. Yeah.

25 Q. Okay. I'm handing to the witness what has

1 been premarked for identification as Exhibit 1002. You
2 probably have a copy of it, but here it is, anyway.

3 Do you recognize this document?

4 A. Yes, sir.

5 Q. And if you can turn to the end, page 88, is
6 that your signature?

7 A. Yes, sir.

8 Q. Did you prepare this declaration?

9 A. I worked on it with Guylaine. She and I
10 prepared it together.

11 Q. Okay. But all of the opinions herein
12 represent your opinions; right?

13 A. Yes, yes.

14 Q. Are you aware that Lam has filed a petition
15 for inter partes review of the -- of the 9,823,564
16 patent?

17 A. No, I don't -- I guess I don't know what that
18 means.

19 Q. So there's a --

20 A. Sorry.

21 Q. -- proceeding at the patent office --

22 A. Okay.

23 Q. -- against the 9,823,564 patent?

24 A. Oh, '564 yes.

25 Q. Which is the patent I understand to be at

1 issue here; right?

2 A. Right. Yeah, yeah.

3 Q. And you were retained, in part, to assist on
4 this IPR; right?

5 A. Yes.

6 Q. Okay. And when did you become aware that they
7 filed the petition? Was that when you were retained?

8 A. Oh, boy. I'm going to have to try and
9 remember. Yes, I think I heard about it when I was
10 retained, and then I found out later that they had
11 actually made it a public statement out there.

12 Q. So my understanding is IPR applications are
13 public when they're filed, so I'm not quite sure what
14 you're saying.

15 A. Oh, I'm just saying I didn't know about it
16 'till -- I didn't know about this until I was retained.

17 Q. Got it. Did you know about the '564 patent
18 before you were retained?

19 A. No.

20 Q. Are you aware that there is related district
21 court litigation going on with the '564 patent? And,
22 sorry, before I go there, just for clarity, I'm going to
23 refer to this patent by the last three numbers, the '564
24 patent. Is that fair?

25 A. Yes.

1 Q. Okay. Are you aware that there is district
2 court litigation related to the '564 patent?

3 A. Yeah, I believe that's what we're working on.
4 Is that what you mean by district court?

5 Q. So right now, this proceeding is for IPR,
6 which is an inter partes review --

7 A. Oh, okay.

8 Q. -- with the patent office, and it's a
9 challenge by Lam to the '564 patent's validity, and
10 we're representing patent owners, and they're
11 representing petitioners.

12 A. Yes.

13 Q. Parallel to this proceeding, there is a
14 district court litigation in the District of Delaware.
15 Are you aware of that?

16 A. No.

17 Q. Okay. So then, I think it's safe to assume
18 that you aren't involved at all with the district court
19 sides of things; right?

20 A. I don't know about it, so, no, I don't know.

21 Q. Okay. And you haven't received any documents
22 that are stamped with, like, a district court number?

23 A. Not that I know of.

24 (Reporter clarification.)

25 ///

1 BY MR. WOLFE:

2 Q. Are you familiar with the patent owner here,
3 Inpria?

4 A. Yes.

5 Q. How are you familiar with them?

6 A. One of their CEOs used to be one of my CEOs
7 when I was CTO, so I learned about it back then, and
8 then I heard about when JSR acquired them.

9 Q. Okay.

10 A. And I am familiar with JSR because I have been
11 involved in photoresist for years.

12 Q. Okay. You mentioned a CEO when you were a
13 CTO. Who was that person?

14 A. Jim Lacasse.

15 Q. And what company was that at?

16 A. I was at CMP pad company called NexPlanar.

17 Q. CMP being chemical mechanical --

18 A. Mechanical planarization, yeah, and that
19 was --

20 (Reporter clarification.)

21 A. Chemical mechanical planarization, and that
22 was 2007 to 2000 -- no, 2006, 2008, so it was a long
23 time ago.

24 Q. Okay.

25 A. And I haven't talked to him since.

1 Q. But at that time, that was just -- you were
2 aware of that person?

3 A. Right. I did not know anything about Inpria
4 at that time. It was -- I don't know how many years
5 later he joined Inpria, but that's how I heard about it.

6 Q. Okay. But before you were retained for this
7 litigation -- or this matter, you were aware of Inpria;
8 right?

9 A. Yes.

10 Q. Did you spend any time preparing for today's
11 deposition?

12 A. Yes.

13 Q. How much?

14 A. Ten hours.

15 Q. And what did you do to prepare?

16 A. Well, mostly, since it had been months since I
17 did the initial work, I went back and read my work. I
18 read the patents again, things like that, so a lot of
19 reading.

20 Q. Okay. So did you talk to anybody while you
21 were preparing for the deposition?

22 A. Yes, my team.

23 MR. BREGMAN: Yeah, I just want to caution the
24 witness not to disclose any privileged information.

25 THE WITNESS: Right.

1 MR. WOLFE: Right.

2 Q. And you say your team -- the two individuals
3 here today?

4 A. Yes.

5 Q. Okay. I'm not going ask you about the
6 substance of your conversation, but, you know, the whos
7 and whats are fair, or whos and when.

8 You mentioned that a lot of your preparation
9 was reading.

10 A. Yes.

11 Q. What materials were you reviewing?

12 A. So I reviewed my declaration. I read through
13 the '564 patent from one end to the other. I read some
14 of but not all of the 208 -- Stowers 208 dissertation,
15 209 dissertation.

16 Q. Just to be clear, you mean the 2008, 2009;
17 right?

18 A. Yeah. What did I say?

19 Q. 208, but --

20 A. Oh, 2008, 2009, yeah. So that was the
21 majority of what I went through.

22 Q. Okay. If you turn in your declaration to --
23 it's a Roman numeral 7, VII?

24 A. Do you know what page that is?

25 Q. It's very towards the beginning.

1 A. Oh, okay.

2 Q. Just the exhibit list.

3 A. Okay.

4 Q. And if you can take a look at that quickly --

5 A. This is the exhibit list?

6 Q. Yes. If you take a look at that quickly, this
7 page, the next page, and the following page, the three
8 pages --

9 A. Yes.

10 Q. -- list the exhibits in this proceeding.

11 Did you review all of those when preparing for
12 this deposition?

13 A. I reviewed all of them when creating the
14 deposition [sic] here, but I did not read them all in
15 the last 24 hours.

16 Q. So you read them all when creating the
17 declaration --

18 A. That is correct.

19 Q. -- but not --

20 (Simultaneous speaking.)

21 Q. And just as a reminder, we got to take turns
22 in talking.

23 A. Sorry.

24 Q. So you mentioned your declaration, the patent,
25 Stowers 2008, and Stowers 2009. Was there anything else

1 for this deposition that you read in preparation?

2 A. I also looked over the '888, but not -- I did
3 not read it from end to end. I just looked at parts of
4 it. And I went over, again, parts of the Trikeriotis --
5 how do you pronounce that? The 1024.

6 Q. I been trying to pronounce it Trikeriotis.

7 A. That sounds good.

8 Q. That's just my version.

9 Okay. Did you review any materials that are
10 not cited here in this exhibit list for preparation for
11 today's deposition?

12 A. No.

13 Q. Okay. Let's turn to paragraph 6 of your
14 declaration. You mentioned here that you obtained your
15 Ph.D. in bioanalytical chemistry from Pennsylvania State
16 University, your MS in bioanalytical chemistry from
17 Purdue University, and a BA in chemistry from Albion
18 College. Did your course work in these studies cover
19 photolithography?

20 A. Did not.

21 Q. Okay. But you are presented here as an expert
22 in the subject matter of the '564 patent; right?

23 A. That is correct.

24 Q. So where did you get your training and
25 understanding about photolithography?

1 A. So when I graduated from Penn State, IBM came
2 to me and said, "You will be able to learn this quickly
3 because you have a Ph.D.," and I went in and became a
4 photolithography engineer.

5 Q. Okay.

6 A. So that was in 1981.

7 Q. So that was more on-the-job training with
8 photolithography at IBM?

9 A. Well, on the job, we were also -- I was in
10 R&D, so we were also doing development.

11 Q. I think maybe it will be helpful if we turn to
12 your bio -- or your CV. And if you look at paragraph 2
13 of your declaration, you state that your CV is attached
14 as Exhibit 1017; right?

15 A. I'm sorry. So you're asking about 2?

16 Q. Yes, ma'am.

17 A. Okay. So what was your question? Sorry.

18 Q. You state at the bottom that your CV is
19 attached as Exhibit 1017; right?

20 A. Okay.

21 Q. And can you flip back one page previous, the
22 other direction. You see on here Exhibit 1017, it says,
23 "reserved." Do you know why that is?

24 A. No.

25 Q. Okay. Did you review an exhibit that was

1 Exhibit 1017?

2 A. I don't know what reserved means, so I don't
3 know the answer to that. I do know what my CV looks
4 like and I did review my CV.

5 Q. Right. And then if you look on the next page,
6 it says, "Exhibit 1029." It says, "CV of Karey
7 Holland"?

8 A. Yeah.

9 Q. Okay. So I'm handing the witness what has
10 been premarked for identification as Exhibit 1029.

11 A. Thank you.

12 Q. Do you recognize this?

13 A. Yes.

14 Q. Is this your CV?

15 A. Yes.

16 Q. Is this the CV that you prepared for this
17 proceeding?

18 A. Yes.

19 Q. And is this accurate, to the best of your
20 knowledge?

21 A. Yes.

22 Q. So going over this, can you remind the company
23 that was -- where you were the CTO where an Inpria CEO
24 was then CEO?

25 A. NexPlanar at the top of page 2.

1 Q. Thanks. So that was 2007 to 2009?

2 A. There you go, yeah.

3 Q. And we were just talking about your experience
4 with photolithography, and that was with IBM, I think;
5 right?

6 A. It began with IBM.

7 Q. Began with IBM, and that's at the very
8 beginning at 1981 to '93; right?

9 A. That is correct.

10 Q. Did you do things at IBM other than
11 photolithography?

12 A. Yes.

13 Q. Like what?

14 A. Integration yield, etching, metal etching.

15 Q. Okay. After you left IBM in 1993, you seemed
16 to have had a number of different jobs, so I'm going to
17 ask a broader question.

18 A. Okay.

19 Q. Which of these involved photolithography?

20 MR. BREGMAN: Objection. Form.

21 A. So throughout my life, because I ran the first
22 248 litho program in world, so my last assignment from
23 IBM was Sematech, and so I spent the last two years of
24 my IBM career at Sematech running the first 248 litho
25 program there, and because of that, I have people who I

1 am still in contact with from that organization who are
2 still involved with photolithography, so I have -- while
3 I'm not necessarily doing photolithography constantly,
4 I'm constantly keeping up with them on what is the
5 status.

6 And then in 2000 -- excuse me, 1999, my
7 husband and I started TECHCET, and we started writing
8 critical materials reports for the semiconductor
9 industry, particularly for fab companies like Intel,
10 Micron, et cetera, and I wrote -- was writing
11 photolithography reports for that, and so to do that --
12 it's based on materials, not on everything, and so to do
13 that, I was constantly communicating with people I knew
14 in lithography.

15 Q. Okay.

16 A. I also continued to attend the SPIE Advanced
17 Lithography conferences like I did this past year.

18 Q. Did you say SPIE?

19 A. Yeah, it's called -- can't remember what it
20 means. It's capital S, capital P, capital I, capital E.

21 Q. Got it. Okay. If we can turn back to your
22 declaration and look at the exhibit list again,
23 previously, I was asking if you had reviewed certain
24 materials in preparation for the deposition, and now I'm
25 going to be asking: Did you review any other materials

1 when preparing this declaration? So other than these
2 materials listed here, did you prepare -- did you review
3 any other publications or documents in preparation for
4 making this declaration?

5 MR. BREGMAN: Objection.

6 Q. He can make some objections. Unless he
7 specifically instructs you not to answer, you can
8 answer.

9 A. Because I'm in lithography, I read numerous
10 things, some of which had no relevance.

11 Q. Okay. Do you have a record of what you
12 reviewed?

13 A. Just this record here.

14 Q. So there would be exhibits -- or there would
15 be items outside of this exhibit list of things that you
16 reviewed?

17 A. There were other lithography things I reviewed
18 that are not related particularly to this patent or to
19 this type of photoresist.

20 Q. Okay. And I want to just be specific for,
21 like, in preparation for submitting this declaration,
22 you're reviewing these other documents; right?

23 A. So as an example, I might review online, is
24 TMAH -- making sure it's an organic solvent. The word
25 "organic" is in there, and the answer is, yes.

1 Q. Okay. So like Google?

2 A. Google. Yeah, I Googled that.

3 Q. Okay. Would there be anything other than
4 online searches that you did? For example, like journal
5 articles that were printed out that you had?

6 A. No.

7 Q. Did you do any experimental testing related to
8 this matter?

9 A. No.

10 Q. Are you aware if Lam did any experimental
11 testing?

12 A. Unaware.

13 Q. Let's turn in your declaration to paragraph 9.
14 So here you say that you're applying various legal
15 principles and giving opinions based on those; is that
16 right?

17 MR. BREGMAN: Objection. Mischaracterizes
18 testimony.

19 A. So I am not a legal person, so I am doing the
20 best to answer, obviously, honestly and correctly.

21 Q. Right.

22 A. Do my best.

23 Q. And your understanding of those legal
24 principles that were used in forming your opinions are
25 reflected in the paragraphs that follow; right?

1 A. I believe so. Again, not being a legal
2 person, I can't say definitely yes.

3 Q. And if we turn to paragraph 12 for
4 anticipation. And in the last sentence, you say, "I
5 also understand an anticipatory reference does not need
6 to explicitly describe each element because anticipation
7 can occur when a claim limitation is necessarily
8 present, inherent, or otherwise implicit in the relevant
9 reference."

10 What do you understand "necessarily present,
11 inherent, or otherwise implicit" to mean?

12 A. That's a tough question. I guess I would need
13 to have a reference into the actual technical thing to
14 discuss since I'm not legal person.

15 Q. Right. I'm just asking generally about the
16 understanding that you have of certain legal concepts
17 that you're applying in your declaration, and this says
18 that a reference does not need to explicitly describe
19 each element; right?

20 A. Correct.

21 Q. But, instead, it can be "necessarily present,
22 inherent, or otherwise implicit"; right?

23 A. That is what it says, yes.

24 Q. So I'm trying to understand the dividing line
25 between, you know, when something would be or when

1 something wouldn't be necessarily present, inherent, or
2 otherwise implicit.

3 MR. BREGMAN: Objection.

4 A. The only way I can answer that is if we talk
5 about technical stuff and I could explain, as an
6 example, what a person of ordinary skill knows about a
7 technology, then that could be -- that's known.

8 Q. Okay. So you can't tell me exactly what those
9 terms mean unless we're talking about specific
10 references?

11 A. Correct. Sorry.

12 Q. Turning to 13 for obviousness. If you look on
13 page 5 at the top, third line from the bottom, one of
14 the considerations for obviousness is the differences
15 between the claimed invention and the prior art. What
16 are some of the difference between the claimed invention
17 in the '564 patent here and the prior art that you
18 applied that you considered here?

19 MR. BREGMAN: Objection.

20 A. When I look at the prior art, if there is
21 chemical relationship that's correct, then I consider
22 that a prior art and use that or something similar,
23 so...

24 Q. Right. I think this is going less to whether
25 or not something would or would not be prior art and

1 more to, when you're considering obviousness, you have
2 to make certain factual inquiries. And there's four
3 factual inquiries listed in your paragraph 13, scope and
4 content of the prior art, essentially what the prior art
5 teaches, the differences between the claimed invention
6 and prior art, so what's different from the '564 patent
7 from the prior art you're applying; level of ordinary
8 skill in the art; and then secondary consideration.

9 So I'm asking about the second one,
10 differences between the claimed invention and the prior
11 art. As you were reviewing the references we mentioned
12 earlier, Stowers 2008, Stowers 2009, there's also the
13 Trikeriotis, what were some of the differences between
14 the '564 patent and the prior art when applying
15 obviousness?

16 MR. BREGMAN: Objection.

17 A. I'd have to go read what I put in my
18 declaration to talk about those in specifics.

19 Q. Right. But high level, can you think of any
20 of the differences between the prior art and these
21 patents?

22 MR. BREGMAN: Objection.

23 A. The only thing I can think of is -- I can't
24 think of anything right off the top. I'd have to go
25 through the declaration and --

1 Q. Okay. We'll be covering the prior art later,
2 so we'll come back to this.

3 In paragraph 14, at the end, you state that
4 you can not "engage in hindsight." What do you mean by
5 hindsight?

6 A. Correct. Meaning --

7 MR. BREGMAN: Objection.

8 A. Sorry. Hindsight would mean what I know today
9 and it's obvious because I've read it today and learned
10 from it and therefore assume that it happened in the
11 past, that I would know it in the past. I think that's
12 what hindsight means and that's the definition of
13 hindsight.

14 Q. I do believe that's a sort of a layman's
15 definition of hindsight. But I think if we just read
16 the full sentence together --

17 A. Sorry, I'm a layman.

18 Q. It's okay. "Further, I have been informed
19 that one cannot use the challenged patent -- here the
20 '564 patent -- as guide from which to select prior art
21 elements or otherwise engage in hindsight."

22 So here in this context, it seems like the way
23 you're applying hindsight is using the '564 challenged
24 patent in your unpatentability analysis?

25 MR. BREGMAN: Objection. Mischaracterizes

1 testimony.

2 A. Well, I read the other documents from him that
3 are historic, so that's not hindsight. That is was what
4 was present before the patent.

5 Q. So would you understand using the teachings
6 from '564 patent in analyzing, for example, obviousness
7 to be improper as hindsight?

8 MR. BREGMAN: Objection. Form.

9 A. I don't understand the question. I'm sorry.

10 Q. So the '564 --

11 A. Wish I was a legal person.

12 Q. It's okay. So the '564 patent includes a
13 number of different examples and other things. I
14 realize you don't have the '564 patent; do you?

15 A. No.

16 Q. Handing to the witness what has been premarked
17 for identification as Exhibit 1001.

18 A. Thank you.

19 Q. So, for instance, if we're looking at
20 column 21 -- and you see that there's an "Example 1"
21 there?

22 A. Yes.

23 Q. So would using the teachings of example 1 in
24 an unpatentability analysis to say that the claims of
25 the '564 patent, would that be hindsight?

1 MR. BREGMAN: Objection.

2 A. I guess I don't understand what you're saying.
3 Are you saying if I analyze the numbers they have in
4 here, that I can't use it as an example of what their
5 claims are?

6 Q. I'm saying --

7 A. I don't understand.

8 Q. It's fine. We'll just move on.

9 You can turn to paragraph 18 in your
10 declaration, please. Here you state that I have been
11 informed by counsel my analysis is to be conducted from
12 the perspective of one of ordinary skill in art at the
13 time of the invention.

14 What do you mean by "at the time of the
15 invention"?

16 A. I'm assuming that is when the people did all
17 the work that produced this invention. So I don't know
18 the exact dates of that, but it sounds like they were
19 working on it during 2006, '07, '08 to get his Ph.D.
20 dissertation, and that's when I started it.

21 Q. So for analyzing who a person of skill in art
22 is here, you were considering the 2008 and 2009 time
23 frame?

24 MR. BREGMAN: Objection. Form.

25 A. Well, if you're asking me where I start

1 looking, that is correct. But there are others after
2 that, obviously. And some before. So as an example, if
3 there was someone that did the exact same work five
4 years earlier, then that would be considered -- you
5 know, I would look at that as well.

6 Q. Right. Because a person of ordinary skill in
7 the art would have access to something that was five
8 years earlier?

9 A. Right. If it was paper or something, yes.

10 Q. Right. But what I'm trying to establish --

11 A. Published.

12 Q. Is what the earlier is measured from?

13 MR. BREGMAN: Objection. Form.

14 A. I guess I don't understand. I'm sorry.

15 Q. It's okay. So just -- just looking at the
16 last sentence, then. You also stated that you
17 "understand that a person of ordinary skill in the
18 art... is a person of ordinary creativity."

19 What does "ordinary creativity" mean?

20 A. That's a good question. It means someone who
21 has -- who is not a genius, probably.

22 Q. But here, they would be a Ph.D.; right?

23 A. Master's would be okay. Someone who has a
24 bachelor's and has done enough research to be equivalent
25 to a Ph.D. research, would also been that level person.

1 Q. Okay. So in the context of the technology of
2 the '564 patent, and the considerations that you've
3 listed in paragraph 19, you would think that someone
4 with a master's degree or a bachelor's with experience
5 could be a person of skill in the art here?

6 A. Absolutely, yes, depending on the level of
7 experience they've had in -- in the technology.

8 Q. Okay. And looking at those factors on
9 paragraph 19, "the education level of the inventor, the
10 types of problems encountered in the art, prior art
11 solutions to the problems, rapidity with which
12 inventions are made, and sophistication of technology
13 and education level of active workers in the field."

14 You considered these factors when considering
15 who a person of skill in the art was; right?

16 MR. BREGMAN: Objection. Compound.

17 A. Educational level, I do consider, yes. Type
18 of problems encountered while they're doing work, yes.
19 That's important. Prior to art solutions to the
20 problems, yes. Rapidity of which inventions are made,
21 yes, somewhat. Some people are fast, some are not. And
22 sophistication of the technology, education level, and
23 fact of the active work they've done in the field, yes.

24 Q. So I think for number 4, rapidity with which
25 innovations are made, I think this refers to the field

1 in which you're looking, for example, the technology of
2 the '564 patent.

3 A. Oh.

4 Q. I was curious, what is the rapidity with which
5 inventions are made in this photolithography field?

6 A. I have not studied that. I don't know. I'd
7 have to go look and check how often patents are made.

8 Q. Right. I don't think it has to be limited to
9 patents. But you had mentioned that in 1999 you and
10 your husband founded a company called TECHCET?

11 A. Yes.

12 Q. And that was involved making publications --
13 or sort of summarizing the relevant, you know,
14 happenings in photolithography. You can tell me if
15 that's right or wrong?

16 A. Yeah, it's not the happenings. What it is is
17 we analyze what are all the materials being used to
18 make -- to do photolithography in semiconductor
19 industry, who are the suppliers, what are the different
20 materials, and it's all based on public information.

21 Q. And then which ones are the most common, which
22 ones are used for different wavelengths of light?

23 A. So it doesn't look at inventions. I didn't do
24 that.

25 Q. But it can also be innovations. So you

1 mentioned particular wavelengths of light. I
2 understand, you know, there's different wavelengths that
3 have, sort of, evolved over the years. That's a
4 different innovation in the art.

5 So would you say that the photolithography
6 space is a rapidly changing space or not?

7 MR. BREGMAN: Objection.

8 A. So the wavelength change is very slow. So as
9 an example, they started EUV over a decade ago and it's
10 just becoming useful in the last couple years. So it
11 depends on what we're talking about. And then there are
12 some chemical things that people do, like material that
13 you -- a coating that you put on, you spin on to a wafer
14 to improve the stochastics of the printed image.

15 Q. So how often are you coming across, in your
16 work for TECHCET, new coatings that are, you know,
17 effecting these different things?

18 MR. BREGMAN: Objection.

19 A. I would say, where I find them is when I go to
20 the SPIE conference, advanced lithography conference,
21 they do some really excellent presentations there.

22 Q. Looking at paragraph 20, here it says that
23 your opinion is that a POSA would have been an
24 individual with at least a graduate degree such as
25 master's or Ph.D. in a relevant discipline such as

1 chemistry, material science, chemical engineering,
2 physics, or an equivalent field. But that doesn't
3 include a bachelor's?

4 A. Correct. That is because if someone had a
5 bachelor's and they did all the type of research that
6 would have gotten them a Ph.D., I consider that person
7 to have the qualities of a Ph.D.

8 Q. Okay. But you didn't explain that here in
9 this paragraph.

10 A. Okay. Well, I'm sorry.

11 You're right. I put in here a least a
12 graduate degree. That's what was in my mind with
13 the quality of the person.

14 Q. Let's turn to the '564 patent. So this is the
15 patent that's at issue in these proceeding; right?

16 A. Yes.

17 Q. And if you turn to the last page, you'll see
18 there are 12 claims here; right?

19 A. Uh-huh.

20 Q. And you had opinions as to all 12 of those
21 claims; right?

22 A. That is correct.

23 Q. So here if we can turn first to column 5?

24 A. I'm sorry, to where?

25 Q. Column 5, and then the paragraph, to start, on

1 line 61.

2 A. Okay.

3 Q. This states here, "In particular, the higher
4 peroxide-based ligand concentrations provide a
5 surprisingly large improvement in the precursor
6 stability"; right?

7 A. Am I finding the right spot?

8 Q. It starts at line 65.

9 A. Oh, 65. I thought you said 61. Yes, sorry.
10 "In particular," yes.

11 Q. And so that's providing a reason why a person
12 of skill in the art would have wanted to include higher
13 peroxide-based ligand concentrations; right?

14 MR. BREGMAN: Objection.

15 A. Yeah, for improved stability.

16 Q. Do you have any reason to disagree with that?

17 MR. BREGMAN: Objection.

18 A. No.

19 Q. If you look to the next column, column 6,
20 starting at line 29 it say, "Even more surprisingly,
21 significantly increasing the radiation sensitive ligand
22 concentration in the precursor solution results in a
23 coating material that has greater contrast following
24 radiation exposure."

25 Do you see that?

1 A. Yes.

2 Q. Do you agree that that would have taught a
3 person of skill in the art to include an increased
4 radiation sensitive ligation concentration for greater
5 contrast?

6 MR. BREGMAN: Objection. Form.

7 A. At first, one might say radiation sensitive
8 ligand increase would improve that. But at some point,
9 more ligand is not going to improve it anymore. So it
10 has some kind of limitation. However, since it's
11 peroxide-based ligand, it could decompose over time. So
12 having more in there would make it more stable for
13 people that don't want to just mix it and use it
14 immediately, they want to use it and ship it to a
15 customer.

16 Q. Right. But this -- this sentence here doesn't
17 say anything about peroxide, specifically; does it?

18 A. Well, ligand -- in all of this, the ligand is
19 peroxide-based.

20 Q. Right. But this sentence doesn't say that.
21 It says "radiation sensitive ligand"; right?

22 A. Correct.

23 Q. And so --

24 A. So at some point, you can put more ligand in
25 and it just will not be more radiation sensitive. So it

1 will have a limit. So it will -- more of it improves
2 and then, at some point, it doesn't improve anymore.

3 Q. So are you saying that you disagree with this
4 sentence, then, "increasing the radiation sensitive
5 ligand concentration in the precursor solutions results
6 in a coating material that has greater contrast"?

7 MR. BREGMAN: Objection. Form.

8 A. Within limits, it is true.

9 Q. Turning to column 7, line 24, this is the
10 paragraph discussing deposition techniques. At
11 line 27 -- or 26 to 27, it mentions "the precursor
12 compound can be deposited onto a substrate, for example,
13 using conventional coating approaches."

14 What are conventional coating that you would
15 have understand -- a POSA would have understood at the
16 time?

17 MR. BREGMAN: I think you misread it. Do you
18 want to read it again? You said "the precursor
19 compound."

20 Q. Oh, yes. "The precursor composition can be
21 deposited onto a substrate, for example, using
22 conventional coating approaches."

23 A. So a POSA involved in semiconductor
24 photoresist technology, the coating means that we do a
25 liquid deposition onto a substrate and then a common way

1 of doing that is then spinning the wafer to make it
2 uniform or as close to uniform as we can get across the
3 wafer.

4 Q. What do you mean as close to uniform as you
5 can get?

6 A. Whenever you spin a wafer, with the coating
7 liquid on top, as you can imagine, it will change
8 thickness from the center of the wafer to the edge,
9 because you're pushing liquid to the edge. So there can
10 be a variation in thickness across -- there will be a
11 variation of thickness across the wafer.

12 Q. So the center of wafer will have -- would it
13 be the thickest or thinnest?

14 A. It could be either, depending on the viscosity
15 of the liquid.

16 Q. What other variables might affect how the
17 thickness changes?

18 MR. BREGMAN: Objection.

19 A. How warm it is in the room. Because you start
20 evaporating the solvent while it's spinning, so
21 temperature can change it. Yeah, a lot of factors.

22 Q. So you mentioned viscosity and temperature.
23 Is there anything else about the composition that might
24 change it?

25 A. I would have to research that. I don't know.

1 Q. Okay. And if you look down at lines 33 to 36.

2 A. Which column again?

3 Q. Column 7, lines 33 to 36. At the beginning,
4 it mentions spin coating, which I believe is what you're
5 talking about; right?

6 A. Yes.

7 Q. And then it says, "other coating approaches
8 can be used, such as spray coating, knife edge coating,
9 and other appropriate techniques," including printing
10 techniques.

11 So you would understand that those techniques
12 would also be covered by the '564 patent; right?

13 MR. BREGMAN: Objection.

14 A. I have to say I don't know, because I --
15 besides spray coating, I don't know what a knife edge
16 coating is. So, yeah, I don't know if it's covered by
17 the patent.

18 Q. Are you aware of what printing techniques are
19 that are described here?

20 A. I know what inkjet printing is. I don't know
21 what screen printing is.

22 Q. What are some other coating approaches that a
23 POSA would have been aware of at the time?

24 MR. BREGMAN: Objection. Form.

25 A. A POSA, at least, you know, back in this time,

1 would have just -- I mean, every person who does
2 photoresist in the semiconductor industry dispenses a
3 liquid on the wafer and spins it. There's equipment,
4 like from TEL and everyone that are -- the constant in
5 the industry, to do this.

6 Q. Okay. But that is spin coating; right?

7 A. That is correct.

8 Q. And that's different than spray coating?

9 A. Yes. That's what I'm saying. I don't know
10 much about spray coating or knife edge -- I've heard of
11 spray coating, but I have only hearing of people using
12 spin coating for photoresist at this time frame.

13 Q. Okay. And if we can turn to the same column,
14 line 48, this paragraph is talking about exposure to
15 radiation. If you look at line 51, it says, "The
16 radiation pattern can be introduced through the passage
17 or reflection of radiation through a physical mask and
18 suitable optics can be used to deliver the patterned
19 radiation to the coating material."

20 Do you understand that to be optical
21 photolithography?

22 MR. BREGMAN: Objection.

23 A. That is photolithography exposure tools that
24 we know of.

25 Q. Okay. But what types of radiation would you

1 be using based on this description or what types of
2 radiation would a POSA be using on this description?

3 MR. BREGMAN: Objection.

4 A. So as an example, deep UV or the
5 193 nanometers uses a mask. You have exposure up here,
6 the mask is here, and you put the light through.

7 Q. And when you say "deep UV," what nanometers
8 are those?

9 A. 248 to -- and 193 is sometimes considered deep
10 UV.

11 Q. Okay. And then in the next sentence it says,
12 "Additionally or alternatively, a beam of radiation can
13 be scanned across the coating material to form a pattern
14 in the coating material as a latent image" --

15 (Reporter clarification.)

16 Q. "Additionally or alternatively, a beam of
17 radiation can be scanned across the coating material to
18 form a pattern in the coating material as a latent image
19 based on exposure to the radiation."

20 Do you understand this to be electron beam
21 lithography?

22 A. Yes, that is e-beam.

23 Q. So the first sentence seems to be talking
24 about lithography using UV or some other type, like
25 optical --

1 A. Yeah. Deep UV or EUV, yeah. Something that
2 uses a mask, is the first one. So the first one is
3 something where you use a mask and you have light coming
4 in and it focuses on the wafer and the e-beam actually
5 literally writes on the wafer.

6 Q. So the difference would be sort of you're
7 patterning all at once with the first method and, with
8 the second, you would be drawing more with a line?

9 MR. BREGMAN: Objection.

10 A. You're actually not patterning all at once.
11 Because the image is only the size of a chip or smaller.
12 So you're doing multiple chip images. But, yes, you're
13 doing that chip at once, and then -- yeah, so the
14 e-beam, you're drawing on it. That's a good way of
15 putting it.

16 Q. And which would be faster?

17 MR. BREGMAN: Objection.

18 A. It depends on the exposure dose required.

19 Q. If you're trying to pattern similar patterns
20 in the same type of resistant material, which would be
21 quicker?

22 MR. BREGMAN: Objection. Incomplete
23 hypothetical.

24 A. It would depend on the photoresist material
25 and what it's sensitive to. So if I used an exposure

1 light source that didn't react to and it reacted to
2 e-beam, then e-beam would be faster.

3 Q. And if we can look further down the paragraph,
4 starting at line 62, "While not wanting to be limited by
5 theory, it is believed that upon absorption of the
6 radiation, the peroxide functional groups are
7 fragmented."

8 Do you understand this to be what the '564
9 patent is referring to when it says radiation sensitive
10 ligand?

11 MR. BREGMAN: Objection.

12 A. That is -- my understanding is that when the
13 peroxide functional groups are hit by radiation, they
14 decompose, and that allows the material to be changed
15 photolithographically. So it changes the substance, the
16 chemical substance of it.

17 Q. Okay. So it's from the breakdown of the
18 peroxide groups that changes the chemical?

19 A. Well, it's -- it's much more complex than
20 that, because when you break down the peroxide, it
21 causes other chemical reactions to happen inside the
22 resist. So it's not just the break down of peroxide.
23 That's the beginning of what starts the reaction to
24 form -- to form metal oxides or whatever down there.

25 Q. Okay. So it's not necessarily the radiation

1 exposure to the peroxide that is causing the chemical
2 change but maybe a downstream effect?

3 A. Well --

4 MR. BREGMAN: Objection. Mischaracterizes
5 testimony.

6 A. It is the peroxide breaking down that starts
7 the reaction to create the changes.

8 Q. Sorry. Getting back to my question: Is this
9 what you would understand the '564 patent to be meaning
10 the peroxide ligand is radiation sensitive?

11 MR. BREGMAN: Objection. Form.

12 A. Did I put it in my declaration on that? I
13 mean...

14 Q. I'm just asking about the '564 patent right
15 now.

16 MR. BREGMAN: Same objection.

17 A. So, yes, I believe the peroxide groups are
18 fragmented.

19 Q. Right. And is it your understanding the '564
20 patent describes the peroxide groups as being radiation
21 sensitive ligands?

22 A. That is correct. That is how it describes
23 them.

24 Q. And is this the reason that it describes them
25 in that way, that when they're exposed to radiation --

1 upon absorption of the radiation, the peroxide
2 functional groups are fragmented?

3 MR. BREGMAN: Objection. Form.

4 A. I guess I don't understand the difference
5 between those two sentences.

6 Q. Sorry. You're saying you don't understand the
7 difference between --

8 A. The -- you said two different sentences, and I
9 didn't -- you asked me if they were different, and I
10 didn't understand, so if you can repeat, maybe --

11 Q. Oh. I'm just trying to ask is -- we spoke
12 earlier that you understood the '564 patent to be
13 describing the peroxide ligand as a radiation sensitive
14 ligand; right?

15 A. Yes.

16 Q. And then this sentence is explaining that the
17 peroxide functional group is fragmented upon absorption
18 of radiation; right?

19 A. That is what it says, yes.

20 Q. So that's an explanation for why the peroxide
21 group would be a radiation sensitive ligand; right?

22 MR. BREGMAN: Objection.

23 A. That is what it says, yes.

24 Q. Turning next to column 9, do you see just in
25 line 54, discusses precursor solutions, and then at the

1 bottom of the page, line 67, it says, "The control" --
2 66 -- "The control of the precursor solution is based on
3 high concentrations of radiation sensitive ligands to
4 the metal cations, specifically peroxide based ligands?

5 So this is describing another reason why high
6 concentrations of radiation sensitive ligands is
7 desirable; right?

8 MR. BREGMAN: Objection.

9 A. That is what it says.

10 Q. Do you have any reason to believe that it
11 doesn't provide for control over the precursor solution
12 like it says here?

13 MR. BREGMAN: Objection.

14 A. They don't specify what is high concentration,
15 so then I can't say a direct answer on that.

16 Q. You can't say a specific number of a
17 concentration, but a high concentration, do you have any
18 reason to believe a high concentration would not be
19 beneficial to the control of the precursor solution?

20 MR. BREGMAN: Objection. Form.

21 A. So I will say a high concentration is a very
22 relativistic word, and so if it -- if it was extremely
23 high, which might be called high for their explanation,
24 then it might not have the same effect.

25 Q. How would you understand the word "high" to

1 mean in this context?

2 A. I really don't know. I don't know how to
3 understand high concentration here. Is it 100X? Is it
4 2X? I don't know.

5 Q. If you continue reading down on column 10,
6 line 2, it says, "In particular, if mole ratio of
7 peroxide groups to the metal cations is at least 2, more
8 stable solutions can be formed."

9 Would you understand that to be referring back
10 to the high concentrations it was referring to before?

11 MR. BREGMAN: Objection. Form.

12 A. I would not. 2 may not be high. High might
13 be 10.

14 Q. But you see that this sentence is immediately
15 following the one previously; right?

16 A. Correct. So this sounds like it is saying
17 that 2 is good enough.

18 Q. So a POSA reading this specification would
19 have understood the inventor describing this to
20 understand 2 to be, in their words, a high
21 concentration?

22 MR. BREGMAN: Objection.

23 A. That is how I would interpret this.

24 Q. Okay.

25 A. That is what it reads. That's how it reads.

1 Q. And if at any point, you need a break, just,
2 please, let me know.

3 A. Okay.

4 Q. Let's go to the next paragraph. So you see on
5 line 14, it says, "As additional hydrolysis takes place,
6 the solutions" --

7 A. Am I in the right spot?

8 Q. Sorry. Column 10, line 14?

9 A. Oh, 14. Sorry. I went too far.

10 Q. "As additional hydrolysis takes place, the
11 solutions can be become unstable with respect to
12 precipitation of the metal oxide or with respect to
13 gelation."

14 What is your understanding of the terms
15 "precipitation" and "gelation"?

16 A. I am not sure. At this point, I'd have to go
17 back and do some more work on that. I could make a
18 guess, but I'd rather not make a guess.

19 Q. If you need more time to read this paragraph
20 up to that sentence, feel free.

21 A. Yeah, I would have to go do research to
22 understand what they mean by that sentence.

23 Q. Okay. Moving on to column 12. And you see at
24 line 2, it says, "The peroxide-based ligands stabilize
25 composition with respect to condensation."

1 So is this another reason why having a high
2 concentration of peroxide-based ligands would be good
3 for the precursor solution?

4 MR. BREGMAN: Objection. Form.

5 A. That is what it states.

6 Q. And as we discussed before, you don't have any
7 reason to disbelieve that they're helpful in stabilizing
8 the precursor solution?

9 MR. BREGMAN: Objection.

10 A. Again, I guess it would have to do with how
11 much peroxide-based ligands they have in there, so
12 assuming that they -- not assuming, but in stating this,
13 they should be talking about the correct amount of
14 peroxide-based ligands.

15 Q. And let's go down to line 40. And these
16 paragraphs talk generally about how the solutions are
17 mixed. If you look at line 57 -- 56, it says,
18 "Generally, the separate solutions can be well mixed.
19 In some embodiments, the metal cation solution is then
20 mixed with the peroxide-based ligand solution such that
21 the peroxide-based ligand solution [sic] can conjugate
22 with the metal cations."

23 So you understand this to mean the metal
24 cation solution is mixed with the peroxide-based ligand
25 solution first; right?

1 A. That is correct. That's how it reads.

2 Q. And then, two lines down, it says, "In some
3 embodiments, the stabilized metal cation solution is
4 allowed to stabilize for at least five minutes and in
5 further embodiments at least about 15 minutes prior to
6 further processing."

7 Why are they providing that time?

8 A. They did not explain how they're -- why
9 they're doing that.

10 Q. Why would a POSA -- what would a POSA
11 understand the reason to be for waiting 5 to 15 minutes?

12 A. That would be an awfully long time for
13 crosslinking or for -- for interaction to occur, so that
14 seems a very long time to take for a reaction. So I
15 don't know that a POSA would understand that we'd have
16 to go through and do some research to understand why
17 they have to do up to 15 minutes to get the chemistry
18 stabilized.

19 Q. But would there be any reasons to have a
20 shorter period of time or a longer period of time?

21 A. No idea.

22 Q. Okay. Next, it says, "The polymeric anion
23 solution can be added to the stabilized metal cation
24 solution to form the stabilized precursor solution."

25 So you understand this is adding the polymeric

1 anion solution to the solution we were just talking
2 about; right?

3 A. Yes.

4 Q. So looking at column 13, starting at line 29,
5 it's discussing a coating material. It states that "A
6 coating material is formed through the deposition of
7 precursor solution onto a selected substrate."

8 What do you understand the substrate to be?

9 A. Substrate's most likely a silicon wafer. It
10 could be a silicon wafer with other materials on top, or
11 it could be a silicon carbide wafer, or it could even be
12 something like a platform used for making packaging of
13 semiconductors.

14 Q. And what do you understand the coating
15 material to be here?

16 A. Coating material typically is a liquid
17 material.

18 Q. But as we discussed before, there were other
19 methods of deposition that were described by the '564
20 patent; right?

21 A. Yeah, but a POSA for photoresist, the coating
22 is you put a liquid on the wafer and spin it. That is
23 the -- the most -- that is the way of doing photoresist.
24 I don't know of anyone else doing it otherwise.

25 Q. At the bottom of that paragraph, it's line 53.

1 It says, "In general, it is desirable for the substrate
2 to have a flat surface, especially for high resolution
3 applications."

4 Why is that?

5 A. Because the -- my guess -- not guess. If I
6 was doing this in my own lab, I would put a thinner
7 coating down and then want the exposure dose to be as
8 short as possible because if -- you have a thin coating,
9 and so if it's flat, you don't have as much variation
10 and photoresist thickness.

11 If it's not flat, if you have semiconductor
12 device things underneath, which go up and down quite a
13 bit, then the photoresist thickness will change across
14 that wafer, and that would change the exposure doses.

15 Q. Okay. So this is another thing we were
16 talking about earlier in spin coating that could affect
17 the variation and thickness of the photoresist material?

18 MR. BREGMAN: Objection. Form.

19 A. When we talk about photoresist thickness, the
20 common way of doing that is to do it on a flat wafer to
21 get the thickness, and then when they produce the
22 semiconductor chips, it's not necessarily on a flat
23 wafer, and we understand that, and we -- that areas are
24 thinner and thicker in there.

25 Q. And that's because, in part, the substrate is

1 not entirely flat?

2 A. That is correct.

3 Q. Looking down on the next paragraph, line 56,
4 this mentions, "Traditional organic resists are soluble
5 in nonpolar solvents and are deposited onto hydrophobic
6 surfaces."

7 What are traditional organic resists?

8 MR. BREGMAN: Objection.

9 A. Oh, gosh. There's many, depending on the
10 wavelength. I have to pull up one of my reports to give
11 you all the listing of them, but there are -- ones that
12 I have, organic chemicals, and then they have acid
13 groups in them, photoacid generators, and when it gets
14 exposed with light, the photoacid generator produces
15 acid, which then essentially makes that area dissolve
16 when you -- when you put a developer on it.

17 Q. Are you referring to chemistry amplified
18 resists --

19 A. Yes. Yeah.

20 Q. -- or CARs?

21 A. Yeah. They also call them photoactive
22 compounds.

23 Q. And you would consider those to also be
24 traditional organic resists?

25 A. Yes.

1 Q. So looking to the next column, column 14,
2 starting at line 8, there is a paragraph about suitable
3 coating processes again, similar to what we talked about
4 before, but I want to talk about line 17. It says, "The
5 coating material can be applied in multiple coating
6 steps to provide greater control over the coating
7 process. For example, multiple spin coatings can be
8 performed to yield an ultimate coating thickness
9 desired."

10 So is this describing doing sequential spin
11 coatings to create a total thickness?

12 MR. BREGMAN: Objection. Form.

13 A. So they do state here multiple spin coatings
14 to get an ultimate thickness that's desired. I can't
15 think of any process in semiconductor right now where we
16 put multiple coatings down, so it's unusual.

17 Q. It's unusual, but they're saying that you
18 could do that; right?

19 A. They're saying they could do that, yes.

20 Q. So, for example, they're saying they could do
21 the 10-nanometer coating followed by another
22 10-nanometer coating to get a 20-nanometer --

23 A. I don't --

24 MR. BREGMAN: Objection. Incomplete
25 hypothetical.

1 A. I don't know the answer to that. Seriously.

2 Q. And looking at the next paragraph, lines 24 to
3 42, this is discussing different RPMs.

4 A. Uh-huh.

5 Q. Line 26 states, (as read) "In some
6 embodiments, a wafer can be spun at rates from 500 RPM
7 to 10,000 RPM."

8 Are those common speeds for a spin coating?

9 MR. BREGMAN: Objection. Form.

10 A. Yeah, I think the 500 is not as common as
11 higher RPMs.

12 Q. Is there any particular RPM rate that's
13 typically used?

14 MR. BREGMAN: Objection. Form.

15 A. It totally depends on the thickness of the
16 photoresist that people want, what the viscosity of the
17 photoresist is, so, no, I don't have a number for RPMs.

18 Q. And I think if you look at line 30, it says,
19 "The spinning speed can be adjusted to obtain a desired
20 coating thickness."

21 Is that what you're talking about?

22 A. Yeah, that's what I'm referring to.

23 Q. And turning to the next paragraph -- oh, yeah,
24 so starting at 43, "The thickness of the coating
25 generally can be a function of the precursor solution

1 concentration, viscosity and the spin speed."

2 So is that what we were talking about just
3 now?

4 A. That's exactly -- yes.

5 Q. Are there any other variables that a POSA
6 would have considered important in determining the
7 thickness of the coating?

8 MR. BREGMAN: Objection. Form.

9 A. At this time, I don't think so. There are
10 things that people do now that change this, but I
11 don't -- that's in just the last couple of years, so...

12 Q. But at that time?

13 A. Not at that time. Not that I know of, at that
14 time.

15 Q. And here, the '564 patent is describing
16 various thickness ranges; right?

17 A. Yes.

18 Q. So if you look at line 50, it says, "average
19 thickness of no more than about 1 micron"; right?

20 A. Uh-huh.

21 Q. So you would understand 1 micron to be 1,000
22 nanometers; right?

23 A. Uh-huh.

24 Q. And so, that would be less than 1,000
25 nanometers; right?

1 A. Yes.

2 Q. And then, (as read) "in further embodiments no
3 more than 250 nanometers"; right?

4 MR. BREGMAN: Objection.

5 A. "No more than about," yes.

6 Q. So it's less than about 250 nanometers?

7 A. Well, "no more than about," so I don't know
8 that it means it's less than.

9 Q. But 250 -- about 250 nanometers or less?

10 A. Yes.

11 Q. Okay. Then it also describes the ranges from
12 1 to 50; right?

13 MR. BREGMAN: Objection.

14 A. Yeah, it does.

15 Q. Sorry. About 1 nanometers to about 50
16 nanometers; right?

17 A. Yes, it does.

18 Q. And then 1 to 40?

19 MR. BREGMAN: Objection.

20 Q. Sorry. About 1 nanometer to about 40
21 nanometers; right?

22 A. Yes.

23 Q. And then finally about 1 nanometer to about 25
24 nanometers; right?

25 A. That's correct.

1 Q. And a POSA would have understood that these
2 ranges, like we were just talking about, include their
3 end points; right?

4 A. Include their what?

5 Q. So like we were just talking about with no
6 more than about 250 nanometers, that might include the
7 end point of 250 nanometers; right?

8 MR. BREGMAN: Objection.

9 A. Yes. No more than 250, yes.

10 Q. So this is describing various ranges and
11 particular end points; is that right?

12 MR. BREGMAN: Objection.

13 A. As I understand it, yes.

14 Q. The next sentence reads, "A person of ordinary
15 skill in the art will recognize that additional ranges
16 of thicknesses within the explicit ranges above are
17 contemplated and are within the present disclosure."

18 What do you understand that to mean?

19 A. It just means that a person skilled in the art
20 might choose any range to fit the thickness they want.

21 Q. Okay. So a person of skill in the art would
22 have been able to choose any range in those thickness --

23 MR. BREGMAN: Objection. Mischaracterizes
24 testimony.

25 Q. So a person of skill in the art would have

1 been able the choose any range in those thickness
2 ranges?

3 MR. BREGMAN: Objection. Mischaracterizes
4 testimony.

5 A. So what I would say is a person skilled in the
6 art would say I want a film thickness of X, and then
7 they would decide if it's within that range, they could
8 deposit that by changing the spin speeds.

9 Q. Okay. And this is teaching a person of skill
10 in art that they could make that range -- make that
11 deposit by ranging the spin speeds?

12 MR. BREGMAN: Objection.

13 A. Yeah. They could do whatever they want, and
14 it does not specify what range is recommended. It just
15 says -- yeah, these -- all these -- all these ranges are
16 available.

17 Q. It does specify certain ranges, though;
18 doesn't it?

19 A. Yeah, yeah, but they overlap, but yeah.

20 Q. I think let's turn next to column 15.

21 THE WITNESS: I hate to do this. Can I take a
22 break?

23 MR. WOLFE: Yeah, yeah, absolutely.

24 THE WITNESS: I need to stretch my knees. I'm
25 getting stiff.

1 MR. WOLFE: Let's go off the record. Thank
2 you.

3 (Recess.)

4 BY MR. WOLFE:

5 Q. We were just talking about the '564 patent,
6 and we were in the section starting on column 13 that
7 describes coating material. Towards the end of that
8 section in column 15, line 16 says, "While heating is
9 not needed for successful application of the process, it
10 can be desirable to heat the coated substrate to speed
11 the processing and/or to increase the reproducibility of
12 the process."

13 Do you understand this to be a preexposure
14 bake?

15 A. That's --

16 MR. BREGMAN: Objection.

17 A. That's what they're doing. They're exposing
18 it to heat before -- they're baking it before they
19 expose it, yes.

20 Q. And the next section is "Patterned Exposure
21 and Patterned Coating Material," and then in column 16,
22 towards the end, lines -- starting at line 60. "It has
23 been surprisingly found that the contrast can be
24 improved with post-irradiation heat treatment, although
25 satisfactory results can be achieved in some embodiments

1 without post-irradiation heat treatment."

2 So this would be a postexposure bake; right?

3 MR. BREGMAN: Objection.

4 A. That is what they're describing, yes.

5 Q. And in both of those it says that it's not
6 needed for the process; right?

7 MR. BREGMAN: Objection.

8 A. Certainly the postexpose bake, it says it
9 isn't needed. Let's see. Go back up here.

10 Yeah, while heating is not needed for
11 successful application of the process, so they say it's
12 optional.

13 Q. Okay. Oh, I forgot ask. While we were on
14 break, did you talk to anybody about the substance of
15 your testimony?

16 A. No. I'm a pilot, so we were talking about the
17 fact that there are airplane cars now.

18 Q. Good topic. And drone cars.

19 A. I love it.

20 Q. Okay.

21 A. That too. Drones. Although I like to be the
22 pilot myself.

23 Q. Okay. Next, I'd like to just briefly go over
24 some -- one of the examples in the specification, if you
25 can look at column 21. In the paragraph starting at

1 line 18, it's describing the components for the
2 precursor solutions; right?

3 A. Correct.

4 Q. And then starting around line 43, it says, (as
5 read) "The method to prepare either precursor solution
6 was the same except that a Zr based precursor solution
7 was prepared with Part A1 and an Hf based precursor
8 solution was prepared with Part A2"; right?

9 A. It says the method was the same, yes.

10 Q. And then, down at line 51, it says the
11 components were "combined by pouring Part A1 or Part A2
12 component solution into Part B component solution,
13 waiting 5 minutes, then pouring Part C into the combined
14 Part A1 or Part A2 and Part B and waiting another 5
15 minutes"; right?

16 A. That's what it says, yes.

17 Q. So those two five-minute time periods are on
18 the shorter end of the ranges that we talked about
19 earlier; right?

20 MR. BREGMAN: Objection.

21 A. They said five minutes to, what, 25?
22 Something like that?

23 Q. I believe it was 15.

24 A. To 15. Okay.

25 Q. So these would be on the shorter end of that

1 range; right?

2 MR. BREGMAN: Objection.

3 A. Well, I guess it's 10 minutes total. So it's
4 not 15; correct.

5 Q. But I believe previously you said it could be
6 5 to 15 for either of the bakes?

7 A. Okay.

8 Q. Or either of the rests, I apologize.

9 (Reporter clarification.)

10 Q. Rests.

11 A. Rest, not bake.

12 Q. And then in the next paragraph, it describes
13 exactly the volumes used to combine the precursor
14 solution; right?

15 A. That is correct.

16 Q. So a person of skill in the art would have
17 been able to understand and repeat this process; right?

18 MR. BREGMAN: Objection.

19 A. I would think a person skilled in the art
20 could follow this exact explanation.

21 Q. Okay. I'm going to turn next to Stowers 2008.
22 And I'm handing the witness what has been premarked for
23 identification as Exhibit 1008, which is Stowers 2008.

24 Do you recognize this document?

25 A. I do.

1 Q. What is it?

2 A. It's the Ph.D. dissertation of Jason Stowers.

3 Q. If had you summarize generally what the thesis
4 is about, what would you say?

5 MR. BREGMAN: Objection.

6 A. To generalize it?

7 Q. Uh-huh. Yes.

8 A. He goes over history of previously known
9 technologies and then talks about his -- what he
10 developed in the thesis, the work he did in the thesis.

11 Q. Okay. And one point, as we're referring to
12 this document, you see on the bottom how there's a stamp
13 that says Lam Research Exhibit 1008, and page something?

14 A. Yes.

15 Q. I'm going to be referring to those page
16 numbers instead of the page numbers that are at the top
17 right corner of some of the pages.

18 A. Okay.

19 Q. If you turn to page 64, this is the chapter
20 that specifically discusses the metal oxide sulfate
21 materials that you rely on; right?

22 MR. BREGMAN: Objection.

23 A. Oh, sulfates, yes.

24 Q. And looking at pages 67 to 68, this is
25 discussing the precursor chemicals for the application

1 of the photoresists; right?

2 A. Sorry, I need to reread it to make sure.

3 Q. Yeah.

4 A. So you were including page 68 in your
5 question?

6 Q. Yes.

7 A. Right. It does list aqueous precursor
8 solutions.

9 Q. And here the main ingredients seem to be
10 zirconium oxychloride, hafnium oxychloride, sulfuric
11 acid, hydrogen peroxide; is that right?

12 MR. BREGMAN: Objection. Compound.

13 A. All of those are listed, yes.

14 Q. Are any other compounds listed?

15 A. They explain where they got the different
16 materials, but I don't see any other compounds listed.

17 Q. Okay. And here they list the molarity of
18 those specific compounds; right?

19 A. They do.

20 Q. But they don't list the specific amounts of
21 those compounds that are included; do they?

22 MR. BREGMAN: Objection.

23 A. Correct. Right, in that sentence. In that
24 sentence, they do not list the number of moles that
25 they're adding together for each of these things.

1 Q. And they don't list the number of milliliters
2 that they're adding either; do they?

3 A. Not here.

4 MR. BREGMAN: Objection.

5 Q. And that's different than the '564 patent,
6 which we were just looking at. They included the
7 milliliters; right?

8 MR. BREGMAN: Objection.

9 A. In the patent they do list milliliters.

10 Q. But here they don't?

11 MR. BREGMAN: Objection.

12 A. Correct, they do not list milliliters here.

13 Q. Okay. At the bottom, sort of in the middle of
14 that first paragraph, there's a sentence that reads,
15 "The solution was allowed to rest for 15 minutes to
16 enable ligand exchange approach equilibrium."

17 So you understand this to be the rest, right,
18 first rest?

19 A. That's what they're saying, yeah, rest for 15
20 minutes.

21 Q. And here it's 15 minutes; right?

22 A. Yes.

23 Q. But in patent, it was 5 minutes in that
24 example we looked at; right?

25 MR. BREGMAN: Objection.

1 A. It was 5 minutes in the patent for each,
2 although it did list in the patent it could be 5 to 15.

3 Q. Right in the background it listed a range of 5
4 to 15; right?

5 A. Right.

6 Q. But in the specific example it used 5 minutes
7 as a rest for each of them; right?

8 A. Yes.

9 MR. BREGMAN: Objection.

10 A. Yes.

11 Q. And then here, it's using 15 minutes for each
12 rest; right?

13 MR. BREGMAN: Objection.

14 A. That is what it says.

15 Q. And at the bottom of that paragraph, it lists
16 that the final metal concentration is 0.5 moles; right?

17 A. That is what it states, yes.

18 Q. That's also different than the example from
19 the -- from the patent; isn't it?

20 A. I'd have to go look.

21 Q. Okay. I think if you look at column 21,
22 line 59 and line 64, line 59 says that the final
23 zirconium concentration of 0.16 moles; right?

24 A. Yes.

25 Q. And then 63 and 64 says a final hafnium

1 concentration of 0.15 moles?

2 (Reporter clarification.)

3 Q. Hafnium, H-A-F-N-I-U-M.

4 A. It does state that, yes.

5 Q. And then going back to Stowers 2008 on
6 page 52, here they used a final metal concentration of
7 0.5 moles; right?

8 A. State that again so I hear you, sorry.

9 Q. Page 52 it stays in Stowers 2008 that they
10 used a final metal concentration of 0.5 moles; right?

11 A. That is what it states.

12 Q. That is different than the example in the
13 patent?

14 MR. BREGMAN: Objection.

15 Q. Is that different than the example stated in
16 the patent?

17 A. Oh, I'm sorry. I said this is 0.5 and this
18 is -- yes, this is lower in the patent.

19 Q. Okay. At the bottom of the next paragraph it
20 says, "Working solutions were spin coated at 3,000 RPM
21 for 30 seconds resulting in films 350 to 35 nanometers
22 thick."

23 Is 3,000 RPMs a typical speed for a spin
24 coater?

25 A. It's familiar to me as one I have used, 3,000.

1 Q. Sorry, I should rephrase. Would that have
2 been a typical speed used for a spin coater at the
3 relevant time?

4 MR. BREGMAN: Objection.

5 A. It's in the range of typical spin speeds, yes.

6 Q. And they spin for 30 seconds, is that a
7 typical duration?

8 A. I'll be honest, I don't remember.

9 Q. But it doesn't stand out to you as unusual,
10 does it?

11 A. It does not stand out as unusual.

12 Q. The spin speed here appears to be the same as
13 the spin speed in the '564 patent example at the lower
14 range given in the '564 patent. For example, the '564
15 patent mentions 30 to 60 seconds.

16 Do you know why that is?

17 And I can point you to it, so let's go there
18 first. In the '564 patent, column 22, line 19, do you
19 see that it says spun at 3,000 RPM for 30 to 60 seconds
20 to cast the resist film?

21 A. Yes.

22 Q. So that gives a range of times to spin; right?

23 A. Correct.

24 Q. Whereas Stowers 2008 gives a specific time of
25 30 seconds; right?

1 A. Do understand that when you see the Stowers,
2 he is applying this to silicon coupons. So these might
3 be a different size, so you would spin it for a
4 different time depending on the size of the wafer. So
5 that could...

6 Q. So the wafer size could also determine how
7 long you might spin it?

8 A. That is correct.

9 Q. What variables would that change, by spinning
10 for different amounts of time?

11 MR. BREGMAN: Objection.

12 A. I don't know. I would have to go back and
13 check into that. It's been a while since I've done
14 that, so I don't remember.

15 Q. But you were mentioning silicon coupons?

16 A. Yeah.

17 Q. What would be the alternative to that?

18 A. Well, silicon coupon is usually pretty small
19 versus a 300-millimeter wafer, which is 12 inches.

20 Q. Would you have understood the '564 patent to
21 be using a wafer or a coupon?

22 A. I would have to go back and read and see if
23 they specify that, but I thought they said wafer. But
24 I'd have to go back and verify that.

25 Q. If you look a column 22, line 7, it says "Five

1 inch silicon wafers were used for substrates."

2 A. Yeah. There they are, yeah, five inch.

3 Q. Silicon wafers?

4 A. Yeah.

5 Q. Is so Stowers 2008 is using coupons, whereas
6 the '564 patent is using wafers; right?

7 A. That is correct. So it's just a different
8 size of what he's doing the work on. Different type,
9 different size.

10 Q. And then it mentions "resulting in films 30 to
11 35 nanometers thick."

12 What's your understanding of what he meant
13 there?

14 A. When we put photoresist onto a coupon or a
15 wafer, we always have to measure it to find out what it
16 really is. And so we take multiple measurements on a
17 wafer or on the coupon, and then it's the average of
18 that measurement that we come to. And since he says 30
19 to 35, he's -- if we're doing a Ph.D. thesis, he's
20 certainly done more than one coupon; so he's done
21 multiple coupons. And so they must range from 30 to 35
22 in the average thickness.

23 Q. Okay. But he's not saying average thickness
24 here, is he?

25 A. No. But that's -- every POSA would know you

1 can't just take one dot and say "this is the thickness."

2 Q. Right. But you were also mentioning that on a
3 particular coupon you might take multiple measurements;
4 right?

5 A. On coupon or a wafer you will take multiple
6 measurements. That is correct.

7 Q. And so --

8 A. And so they would be an average.

9 Q. So one way to read this would also be that the
10 films also varied from 30 to 35; right?

11 MR. BREGMAN: Objection. Form.

12 A. On a silicon coupon it would be very unusual
13 to have a film vary that much on each -- on a single
14 coupon. From coupon to coupon, yes. But I -- would be
15 hard to believe that he had that much variation within
16 one coupon.

17 Q. But it is possible; right?

18 MR. BREGMAN: Objection. Form.

19 A. I don't believe so.

20 Q. You believe it's impossible?

21 MR. BREGMAN: Just give me a second to object
22 before you answer.

23 A. Sorry. So --

24 Q. Assuming for a hypothetical that he was
25 referring to a single film 30 to 35 nanometers thick and

1 referring to, like you were saying before, the multiple
2 measurements, would an average of those be above 30?

3 MR. BREGMAN: Objection. Incomplete
4 hypothetical.

5 A. Yeah, I -- I -- for one, I cannot imagine that
6 you put a coupon and have something where the coupon
7 variation across the one coupon is 30 to 35 nanometers.
8 It's too large a range.

9 Q. Right. But I'm just asking you to assume that
10 part, that the multiple measurement that you took from
11 the single coupon were 30 to 35. Say, for example, I'll
12 compete the hypothetical, 30, 31, 32, 33, 34, 35; those
13 are the measurements that you took. That would be an
14 average thickness greater than 30; wouldn't it?

15 MR. BREGMAN: Objection. Incomplete
16 hypothetical.

17 A. I was going to say, I -- if you're asking me
18 just to do pure math, that would be the case. I don't
19 see that as -- as something that a POSA would even think
20 of if they see 30 to 35.

21 Q. But they would also know that spin coating
22 doesn't provide perfectly uniform thickness; right?

23 A. That is correct.

24 Q. So they would need measure multiple points on
25 it to determine --

1 A. That is correct.

2 Q. And here it doesn't say average. It just says
3 30 to 35 nanometers thick, the words it says?

4 A. Does not say average, although it should
5 because that is how these things are done.

6 Q. And this was in 2008; right?

7 A. Yes. Well, that's when it was printed up.
8 Who knows how long ago he did that.

9 Q. You're saying the experiment or the paper?

10 A. The documentation is written in 2008.

11 Q. And then after where we were just looking at
12 for spin coating for films 30 to 35 nanometers thick,
13 the next paragraph starts with "Patterning by UV light";
14 right?

15 A. Okay.

16 Q. So here there's no mention of a preexposure
17 bake; is there?

18 MR. BREGMAN: Objection.

19 A. It is not listed here in this area of the
20 patent -- excuse me, of the research.

21 Q. And then if you go back to the '564 patent,
22 column 22, lines 20 to 21, it says, "The wafer was
23 subjected to a preexposure bake at 40 to 200 degrees C
24 for 0.1 to 5 minutes"; right?

25 A. It does state that.

1 Q. So the example in the patent used a
2 preexposure bake; right?

3 A. This example. But it did have in another part
4 that it's an option to do a pre -- a postexposure and a
5 preexpose bake.

6 Q. Right. In the, sort of, earlier parts
7 describing the technology, it described it as an
8 optional one. But in the example that they gave, they
9 did perform a preexposure bake; right?

10 A. They did.

11 Q. But in the 2008 Stowers, he did not?

12 A. He did not write down that he did. So I don't
13 know -- I wasn't in his room, so I don't know if he did
14 or didn't.

15 Q. But a POSA reading this would not have
16 understood to do a preexposure bake; right?

17 MR. BREGMAN: Objection.

18 A. Honestly, post -- preexposure bakes are
19 extremely common, so it would be in my -- thought it was
20 surprising that they didn't bake it beforehand or -- and
21 did he say how long he had let it sit?

22 Q. What "it," sorry?

23 A. So no, he doesn't say he does that.

24 Q. Right so a POSA wouldn't have known how, at
25 least, to do the preexposure bake if he had done one and

1 not reported it?

2 MR. BREGMAN: Objection.

3 A. As I said, it's common to do preexposed bakes.
4 And so a POSA might have read this and said he forget to
5 put it the thesis. And so I don't know whether someone
6 would use it or not use it.

7 Q. So based on this 2008 disclosure alone, you
8 wouldn't have known whether or not he used a preexposure
9 bake?

10 A. Does not say he does, but it does not say he
11 doesn't.

12 Q. Fair enough. You mentioned that the document
13 was printed up in 2008. Do you know when Stowers 2008
14 was actually published?

15 A. No, I don't.

16 MR. BREGMAN: Objection.

17 Q. It says, "After patterning, the films were
18 annealed at 300 degrees C for 5 minutes to fully cure
19 them." That was from 68 to 69.

20 A. Sorry. I was looking at the page top. Okay.
21 68. So what was your question, sorry, I was on the
22 wrong page.

23 Q. It's okay. It says, "After patterning the
24 films" -- "After patterning, the films were annealed at
25 300 degrees C to fully cure them"; right?

1 A. It does say that, yes.

2 Q. And you would understand that to be a
3 postexposure bake; right?

4 A. Yes.

5 Q. And that's also different than the '564
6 patent; isn't it?

7 MR. BREGMAN: Objection.

8 Q. I can direct you to column 22, line 43.

9 A. Thank you.

10 Q. And I read it out.

11 A. Yeah, it says "Postexposure bake at 40 to
12 200 degrees C for 1 to 5 minutes."

13 Q. So the example in the '564 patent use a
14 postexposure bake; right?

15 A. Yes.

16 Q. But it was at different ranges than specified
17 in the Stowers 2008; right?

18 MR. BREGMAN: Objection.

19 A. At different temperature.

20 Q. Temperature, yes. Because the patent says 40
21 to 200; right?

22 A. That is their example, 40 to 200.

23 Q. And Stowers 2008 says 300 C; right?

24 It says -- Stowers 2008 says 300 degrees;
25 right?

1 A. Were annealed at 300 degrees C for 5 minutes,
2 yes.

3 (Reporter clarification.)

4 Q. A-N-N-E-A-L-E-D.

5 So looking at page 70, and if you look at the
6 middle paragraph, it says that, "It was found that
7 ZircSOx could be patterned by UV light in either
8 positive or negative tone." And then it goes on to
9 describe positive tone patterning and then negative tone
10 patterning; right?

11 A. Uh-huh.

12 Q. And then the next paragraph seems to describe
13 different processing -- "Under different processing
14 conditions the photoactive element of the resist is
15 either increasing or decreasing the solubility of the
16 exposed region relative the unexposed region"; right?

17 MR. BREGMAN: Objection.

18 A. That is what it states.

19 Q. And that's referring back to positive
20 patterning and negative patterning; right?

21 MR. BREGMAN: Objection.

22 A. That's what it should mean, yes.

23 Q. Okay. And if you look at the top of
24 page 55 -- oh, sorry, 71.

25 "Understanding this exposure mechanism is

1 critical to understanding how to optimize resist
2 performance." So this is stating that understanding the
3 resist's exposure mechanism is important to know how it
4 performs; right?

5 A. That is what it states.

6 Q. Then in the next sentence it says, "Films on
7 the order of 30 nanometers thick do not have sufficient
8 volume per unit area to generate a signal large enough
9 to be measured under most analyses"; right?

10 A. To be measured from an analysis, that is what
11 it says, yes.

12 Q. So this -- this is generally getting to
13 understanding the exposure mechanism from the sentence
14 before; right?

15 MR. BREGMAN: Objection.

16 A. I can't say that, because if it's being
17 measured under "most analyses," that doesn't mean that
18 it isn't exposed. It just means they can't analyze it.

19 Q. Right. So the way I understand these two
20 sentences to be working together is as understanding the
21 mechanism is critical, but there are issues with
22 understanding the mechanism because films on the order
23 of 30 nanometers thick do not have sufficient volume per
24 unit area to generate a signal large enough for most
25 analyses?

1 A. Well, if you read the next sentence as well --
2 so what it says is that for -- that the typical surface
3 analysis is too energetic to measure the reactive
4 species without destroying them. So it sounds like it's
5 the measurement technology that they were using, is
6 causing the issue.

7 Q. Right. So they're not able to use correct
8 measurement technology to understand the exposure
9 mechanism; right?

10 MR. BREGMAN: Objection.

11 A. They're using the wrong metrology to try and
12 do this, because it's too aggressive.

13 Q. But this generally is describing problems with
14 understanding the exposure mechanism; isn't it?

15 MR. BREGMAN: Objection.

16 A. I do not know that this changes -- say that
17 sentence again.

18 Q. This is just generally describing problems
19 with understanding the exposure mechanism; right?

20 MR. BREGMAN: Objection.

21 A. No, I don't think it says anything about not
22 understanding the exposure mechanism. It has to do with
23 not being able to measure stuff afterwards, after
24 it's -- after the exposure. So they can't do the
25 metrology.

1 Q. But if we're looking at the top of 55 again,
2 it says, "Understanding this exposure mechanism is
3 critical to understanding how to optimize resist
4 performance." So they're trying to understand the
5 exposure mechanism; wouldn't that be fair?

6 MR. BREGMAN: Objection.

7 A. So understanding the exposure mechanism is
8 critical to understanding how to optimize the resist,
9 yes, that is true.

10 Q. Great. Because here in this paragraph, we're
11 talking about positive and negative patterning; right?

12 MR. BREGMAN: Objection.

13 A. That's true.

14 Q. And then in the next sentence, it says --
15 sorry, in the sentence on page 55 about four lines down,
16 "Films on the order of 30 nanometers thick do not have
17 sufficient volume per unit area to generate a signal
18 large enough to be measured under most analyses."

19 So this seems to relate to the previous
20 sentence talking about understanding the exposure
21 mechanism?

22 MR. BREGMAN: Objection.

23 A. I -- I can't agree with that. Just because
24 they get measurement using this analysis doesn't mean
25 that they can understand the exposure mechanism. There

1 are other ways to analyze it.

2 Q. Right. But here, this is just generally
3 talking about films in general; isn't it?

4 MR. BREGMAN: Objection.

5 A. No. It's talking about, specifically, their
6 materials.

7 Q. Did -- why do you believe that?

8 A. Because they're talking about their material
9 beforehand, so this is specific to the ZircSOx sign
10 because that's what they're talking about, so they're
11 understanding that exposure mechanism for the ZircSOx.

12 Q. But here, it's saying -- it doesn't say
13 ZircSOx stones. It just says films; doesn't it?

14 MR. BREGMAN: Objection. Asked and answered.

15 A. No. As I read it, it starts with talking
16 about ZircSOx and then just continues on. It does not
17 say a more general resist, so...

18 Q. Okay. So you mentioned other analyses that
19 could be used to understand the exposure mechanism.
20 Does Stowers 2008 describe any of those other ways?

21 MR. BREGMAN: Objection.

22 A. They do go on and talk about if they use this
23 different method, the reaction products of the exposure
24 mechanism, if released in a vacuum, can be captured and
25 analyzed, so they think they could analyze them that

1 way.

2 Q. So what is your understanding of the term
3 "films on the order of 30 nanometers thick" to mean?

4 MR. BREGMAN: Objection. Form.

5 A. As I read this, 30 nanometers would refer back
6 to the 30 to 35 because they've mentioned that before,
7 but don't know exactly what they mean, so I don't know.

8 Q. I'm not necessarily asking about the specific
9 number. I'm saying the "on the order of" piece of that,
10 how do you read that -- or how would a POSA read that?

11 A. That's a good question. They really do not
12 explain what they mean in the order of, and so I really
13 don't know.

14 Q. So would one understanding of that be within a
15 power of 10, 30 to 300?

16 MR. BREGMAN: Objection.

17 A. If they described it, it would explain it, but
18 they did not describe it, so I do not know.

19 Q. What's your opinion about how a POSA would
20 have understood this portion?

21 MR. BREGMAN: Objection. Form.

22 A. I would say it's approximately 30 nanometers,
23 but I would not know the variation around that.

24 Q. Okay. Does Stowers 2008 explain the effect of
25 EUV exposure on the films that it was testing?

1 MR. BREGMAN: Objection.

2 A. I don't remember. You have a spot for me to
3 check? Oh, here on 56. "Films were also subject to EUV
4 interference exposures." However, they "did not
5 generate significant results because of processing
6 errors."

7 Q. So does Stowers 2008 explain the effect of EUV
8 exposures on the films it was testing?

9 MR. BREGMAN: Objection. Form.

10 A. It does say, "Contrast data were collected
11 from this single sample set."

12 Q. So it was able to give contrast data, but does
13 it explain the effect on the film of the EUV exposure?

14 MR. BREGMAN: Objection. Form.

15 A. They do not explain that here.

16 Q. And then, you were mentioning the contrast
17 data in Figure 3-7, I believe. If you look at page 56
18 towards bottom, it says, example -- oh no. I got the
19 wrong -- there, at the top of that paragraph. "Contrast
20 data were collected from a [sic] single sample set.
21 These data have plotted in Figure 3-6."

22 Is that what you're referring to?

23 A. Yes, that's what I was referring to.

24 Q. And from this sentence, do you understand that
25 only a single data set was collected for EUV exposure in

1 Stowers 2008?

2 A. It states a single sample set.

3 Q. Do you see any examples of other data from the
4 EUV exposure?

5 A. This is the only experiments they did with
6 sending them to Switzerland. It does state, "Even with
7 these errors, a contrast of 0.3 and a sensitive of is
8 194 millijoules per square centimeter were
9 demonstrated."

10 Q. Okay. And that's referring to the data for
11 Figure 3-6, right, the single sample set?

12 MR. BREGMAN: Objection. Form.

13 Q. It's on page 79.

14 A. Yeah, those are the same numbers.

15 Q. Okay. Isn't there an issue with this contrast
16 curve? I'll be less vague.

17 The normalized thickness goes up to 0.5.
18 Doesn't the normalized thickness on a contrast curve go
19 up to 1?

20 MR. BREGMAN: Objection.

21 A. So that has to do with their difficulty with
22 the -- with the way it was processed.

23 Q. Right. So this could show that the contrast
24 data itself is not entirely reliable; right?

25 MR. BREGMAN: Objection.

1 A. I would say the contrast information here is
2 not as good as it could have been had it been processed
3 correctly.

4 Q. Right. So there are errors in processing
5 making the data not as good as it could have been;
6 right?

7 MR. BREGMAN: Objection. Mischaracterizes
8 testimony.

9 (Reporter clarification.)

10 A. I said that -- I think that's what I stated.

11 Q. But going back to the contrast curve, are they
12 normally up to 1?

13 MR. BREGMAN: Objection. Form.

14 Q. On the normalized --

15 A. I'd have to go look at some. Honestly, I
16 haven't done it in a while. I'm guessing, yes, 1, but
17 I'd have to go look. The normalized thickness he did
18 for 3-2 only goes up to about .6, and that's for UV,
19 so...

20 Q. Also for UV, I think you're looking at
21 Figure 3.2; right?

22 A. Yes.

23 Q. On page 75; right?

24 A. That also does not go up to 1.

25 Q. Also, for this contrast curve, isn't the

1 X-axis unusual?

2 MR. BREGMAN: Objection. Form.

3 A. I guess I don't understand.

4 Q. Typically, wouldn't the X-axis be a dose that
5 is performed rather than exposure time?

6 MR. BREGMAN: Objection.

7 A. Those -- exposure time is if you know the
8 amount of intensity of light, then exposure time is what
9 you use to get a larger exposure.

10 Q. Right. But here, they don't know what the
11 intensity of the light is, so they're using exposure
12 time on the X-axis; right?

13 MR. BREGMAN: Objection.

14 A. I don't know. Do they not on UV, because it's
15 not EUV? It's UV.

16 Q. Look at page 70 at the top.

17 A. That's what I'm reading. So they used a lamp
18 that they did not know the exposure -- excuse me, the
19 amount of output power density of the lamp, so that's
20 why they used minutes.

21 Q. Right. So --

22 A. They didn't characterize the lamp, which is
23 pretty...

24 (Reporter clarification.)

25 A. They did not -- they had a -- they did not

1 know the power output of the lamp.

2 Q. And that's why --

3 A. So that's why they had to use minutes, but we
4 know that the amount of exposure is related to an output
5 times the amount of minutes, so that's the exposure
6 dose.

7 Q. Right. Power by time?

8 A. Yeah.

9 Q. So the curve in Figure 3-6, the data isn't as
10 good as it could have been because of errors in
11 processing; right?

12 A. That's what they said.

13 MR. BREGMAN: Objection.

14 A. They say.

15 Q. And the for Figure 3-2, the data isn't as good
16 as it could have been because they didn't characterize
17 the power of the lamp?

18 MR. BREGMAN: Objection.

19 A. I would say in 3-2, it might be as good as it
20 could do. They just did not know the dose when they
21 wrote down, so they but down time, but if someone went
22 back and analyzed the lamp, they could convert exposure
23 time to dose.

24 (Reporter clarification.)

25 MR. WOLFE: Hyphen -- 3, hyphen, 2.

1 BY MR. WOLFE:

2 Q. Would the -- would a person of ordinary skill
3 in the art have accredited the results in Figure 3-2
4 without knowing the dose of the lamp?

5 MR. BREGMAN: Objection.

6 A. Would they have accredited? I don't know what
7 that means.

8 Q. Would they have believed the results that
9 Stowers 2008 is presenting?

10 MR. BREGMAN: Objection. Incomplete
11 hypothetical.

12 A. I guess I don't understand the question. So
13 are you saying that seeing that an exposure dose time
14 goes up, that does mean it has more exposure to the
15 light, so that should mean that it's changing.

16 Q. Would a person of skill in the art have been
17 able to, in reading Stowers 2008, reproduce these
18 results without knowing the dose of the lamp?

19 MR. BREGMAN: Objection. Incomplete
20 hypothetical.

21 A. They could if they borrowed the same lamp.

22 Q. But if they don't know the lamp?

23 MR. BREGMAN: Objection. Incomplete
24 hypothetical.

25 A. Then I don't know.

1 Q. What would you need to know to complete the
2 Stowers 2008 3-2?

3 MR. BREGMAN: Objection. Form.

4 A. So you would need to know the amount of output
5 of the lamp, which I'm surprised they didn't know. At
6 the same point, if someone was trying to reproduce this,
7 they could find the type of lamp used and then try
8 different times on it.

9 Q. So one interesting thing, we've been looking
10 figures 3-2 --

11 A. 3-6.

12 Q. -- and 3-6, and 3-6 is mentioning EUV, right
13 and 3-2 is mentioning UV; is that right?

14 A. Yeah.

15 Q. 3-6 is mentioning EUV for HafSOx, H-A-F-S-O-X;
16 right?

17 A. That is correct. That is what they have here.

18 Q. And 3-2 is measuring UV exposure for ZircSOx,
19 Z-I-R-C-S-O-X.

20 A. Yeah.

21 Q. So there's no data for EUV for ZircSOx in
22 Stowers 2008?

23 MR. BREGMAN: Objection.

24 A. I have not found any there. I would have to
25 read through to be sure.

1 Q. So we can look at page 68 and go through.
2 This part is not super long?

3 A. 68 in the bottom thing or at the top?

4 Q. At the bottom, so where it starts "Patterning
5 by UV light" at the bottom paragraph.

6 A. Oh, there it even is what the lamp is.

7 Q. Sorry. I meant actually page 70 at the top.
8 This is where the UV exposure starts.

9 So this discusses the lamp issue we were
10 talking about before, and then in the middle, it says,
11 "It was found that ZircSOx could be patterned by UV
12 light in either positive or negative tone"; right?

13 A. And it's page 70 at the top?

14 Q. In the middle. The middle paragraph.

15 A. May not be on the same page as you.

16 Q. In the middle it says "It was found," maybe?

17 A. I'm on the wrong page then. So it's 70 at the
18 bottom?

19 Q. Yes.

20 A. I thought you said at the top.

21 Q. I will always try to refer to the bottom?

22 A. Yeah, I know. It's easy to flip back and
23 forth.

24 Okay. "It was found that ZircSOx could be
25 pattern by UV light."

1 Q. So this is showing the UV patterning of
2 ZircSOx; right?

3 A. That's what it states.

4 Q. And then the next paragraph that goes on to
5 the next page is that long one that we talked about
6 previously, but it doesn't talk about either one
7 particularly; right?

8 MR. BREGMAN: Objection.

9 A. It does not state which one it's talking about
10 there.

11 Q. Okay. Then the next paragraph on page 72 at
12 the bottom, then it's mentioning films were also subject
13 to EUV interference exposures; right?

14 A. So it does talk about EUV in this paragraph,
15 yes.

16 Q. Before it was talking about UV, and then it
17 talked about ZircSOx, now it's talking about EUV. And
18 then if you look down to the next paragraph it talks
19 about HafSOx, "Under these processing conditions, HafSOx
20 exhibited a contrast of 0.3 and a sensitivity of 194
21 millijoules per centimeter squared"; right?

22 A. That is what it says, yes.

23 Q. So from this, it appears that the UV data is
24 for ZircSOx; right?

25 A. So in his thesis, he did US on ZircSOx and EUV

1 on hafnium.

2 Q. Right.

3 A. At least that's what he's put in the document.

4 Q. Okay. Okay. I'm going to go to the next
5 document. Handing the witness what has been premarked
6 for identification as Exhibit 1010.

7 Do you recognize this document?

8 A. Yes, I do.

9 Q. What is this document?

10 A. This is Stowers' and Keszler's paper from
11 2009.

12 Q. And the cover says "Microelectronic
13 Engineering," and then "MNE '08." What do you
14 understand that to mean?

15 A. It means it was the microelectronic
16 conference, nanoengineering, and it happened in Athens,
17 Greece, September 2008.

18 Q. So you understand this to be a conference
19 paper?

20 A. That is correct.

21 Q. If you had to summarize what this document was
22 generally about, what would you say?

23 MR. BREGMAN: Objection.

24 A. I don't remember. I'd have to read it. I
25 could read the abstract to you. That would probably

1 summarize it.

2 Q. Yeah, that might help. I think if you can
3 read the abstract to yourself and then I can ask again.

4 A. So it says that they were using -- they're
5 developing new e-beam resists.

6 Q. So you would understand this one to be
7 electron beam lithography after; right?

8 A. That is the experiments they're showing here,
9 yes.

10 Q. And electron beam is the one we were talking
11 about earlier that is sort of a direct write; is that
12 right?

13 A. That is correct.

14 Q. If you look at page 19 under "experimental,"
15 there it lists aqueous precursor solutions.

16 Do you see that?

17 A. Yes.

18 Q. And then it lists zirconium oxychloride,
19 hafnium oxychloride, sulfuric acid, hydrogen peroxide,
20 and water; right?

21 A. Yes.

22 Q. And those are the same precursor compounds
23 from the '564 patent; right?

24 MR. BREGMAN: Objection.

25 A. I'd have to double check on the Alfa Aesar

1 part of it, if it's the same but...

2 Q. So other than the source, those are the same
3 precursor solutions; right?

4 MR. BREGMAN: Objection.

5 A. Yes.

6 Q. But here, it doesn't list even the molarity of
7 those solutions; does it?

8 MR. BREGMAN: Objection.

9 A. They do not show it here. Could have been in
10 the presentation, but it's not shown in the paper.

11 Q. To be clear, the -- I think the sulfuric acid
12 has a molarity, but the other components don't; right?

13 MR. BREGMAN: Objection.

14 A. The others are percentages.

15 Q. And it doesn't list the precise volumes that
16 were used in the mixture; does it?

17 MR. BREGMAN: Objection.

18 A. They don't list it here.

19 Q. And at the bottom, it lists certain metal to
20 peroxide ratio, metal to sulfate ratio, and final metal
21 concentration; right?

22 A. Remaining reagents to produce metal to
23 peroxide ratios with 1 to 0.5, metal to metal to sulfate
24 ratio of 1 to 0.5 to 0.7, and final metal concentration
25 is half a mole.

1 Q. All right. And that 0.5 molar concentration
2 is the same as Stowers 2008; right?

3 MR. BREGMAN: Objection.

4 A. I'd have to go back and check, but I think so.

5 Q. So if you look at Stowers 2008 at page 68 in
6 the middle, he gave a final metal concentration of 0.5
7 molar. Page 68 at the bottom, at the end of the first
8 full paragraph.

9 A. Oh, yes. A final metal concentration of half
10 a mole.

11 Q. And then looking back at Stowers 2009, at the
12 bottom of that paragraph it says final metal
13 concentration of 0.5 molar; right?

14 A. Yes.

15 Q. And that's the same as Stowers 2008; right?

16 MR. BREGMAN: Objection.

17 A. They read the same, yes.

18 Q. But that's different than the example that was
19 in the '564 patent; right?

20 MR. BREGMAN: Objection.

21 A. Than the example. It is different than the
22 example.

23 Q. Okay. After listing those concentrations, it
24 states that, "Silicon substrates were prepared by [sic]
25 spin coating for [sic] sonication in Decon Labs," other

1 stuff. So here it's not listing how those precursor
2 solutions were combined, was it?

3 MR. BREGMAN: Objection.

4 A. It does not explain it here. They might have
5 in the presentation, but they didn't in the summary.

6 Q. In the paper.

7 A. In the paper.

8 Q. Turning to the next page, page 20. At the top
9 it says, "Solutions were spin coated at 3,000 RPM for
10 30 seconds to produce a thickness of 35 nanometers."

11 Do you see that?

12 A. Yes.

13 Q. Aren't those the same spin coating conditions
14 that were used in Stowers 2008?

15 MR. BREGMAN: Objection.

16 A. Yes.

17 Q. Didn't Stowers 2008 say thickness from 30 to
18 35?

19 A. That is correct. It did.

20 Q. Why does this one say 35?

21 MR. BREGMAN: Objection. Calls for
22 speculation.

23 A. I don't know why they would not add the full
24 range.

25 Q. But here they say 35; right?

1 A. They do say 35.

2 Q. And it's using the same RPMs; right?

3 A. Yeah.

4 Q. And the same spin time; right?

5 A. Yes. So maybe -- if you want to speculation,
6 maybe they just didn't bother putting 30 to 35 in, just
7 didn't type it in.

8 Q. Would a person of skill in the art understood
9 30 to 35 to be the same as 35?

10 MR. BREGMAN: Objection.

11 A. If you look at this and the 2008, yes, I would
12 expect that to be the same.

13 Q. Okay. So in the 2009-2008 time frame, a
14 person of skill in the art looking at this would have
15 expected 30 to 35 to be the same as 35?

16 MR. BREGMAN: Objection.

17 A. Let me put it differently. This paper is
18 written by a person who's doing a Ph.D. thesis. The
19 Ph.D. thesis has more detail than the written paper. So
20 I would not be surprised if they just made it shorter
21 and put 35 nanometers.

22 Q. Okay. And then if we look at the end of that
23 paragraph it says, "A final hard bake" -- one second.
24 It says, "A final hard bake" --

25 Did Stowers 2009 refer to his 2008 thesis?

1 A. I don't know. No, he does not reference his
2 thesis.

3 Q. So a person of skill in the art, reading the
4 thickness that we're talking about above, a thickness of
5 35 nanometers, would not have necessarily known to look
6 at the thesis to know it was 30 to 35; would they?

7 MR. BREGMAN: Objection.

8 A. So I don't know if you know about
9 publications, but publications are often written a year
10 to six months to a year before they're ever presented,
11 so...

12 Q. Right. But in terms of this referring to --
13 Stowers 2009 referring to Stowers 2008, the thesis, it
14 doesn't refer to that; right?

15 A. It doesn't refer to it. However, if I, as a
16 person skilled in the art, read this and said, "Hmm, he
17 got his Ph.D." and if it's available online, I would
18 pull it up and read it.

19 Q. Okay. Next at the end of the paragraph, it
20 says, "A final hard bake was performed at 325 degrees C
21 for 5 minutes."

22 Do you see that?

23 A. Yes.

24 Q. Do you understand that to be the postexposure
25 bake?

1 MR. BREGMAN: Objection.

2 A. Actually -- sorry. Actually it is the
3 postdevelopment bake in this case.

4 Q. Okay. So a post --

5 A. It was not a postexposure. It's
6 postdevelopment.

7 Q. So here, Stowers 2009 doesn't refer to a
8 postexposure bake; does it?

9 MR. BREGMAN: Objection.

10 A. He does not list it here.

11 Q. And he doesn't refer to a preexposure bake;
12 does he?

13 MR. BREGMAN: Objection.

14 A. It's not written in here.

15 Q. It's only postdevelopment bake that's
16 included; right?

17 A. That's all they list.

18 Q. And that bake was at 325 degrees C; right?

19 A. Yes. "A final hard bake was performed at 325
20 degrees C for 5 minutes."

21 Q. But Stowers 2008 used a postexposure bake at
22 300 degrees C; right?

23 MR. BREGMAN: Objection.

24 A. I'd have to go back, if you have the page, and
25 just look at it. Sorry. I don't want to assume I

1 remember.

2 Q. If you look at page 69, at the top?

3 A. Oh, there it is. 300 degrees for 5 minutes
4 after -- no, this is -- yeah after patterning.

5 Q. What does "after patterning" mean to a POSA?

6 A. Actually, in this case it says the images were
7 developed by emersion. Blanket exposures were performed
8 across samples. After patterning the films, they were
9 annealed.

10 So since he talks about developing beforehand,
11 it could be postdevelop or postexposure. He doesn't say
12 it's a postexposure bake.

13 Q. So it's unclear whether the bake in Stowers
14 2008 happened before or after development. Is that what
15 you're saying?

16 MR. BREGMAN: Objection.

17 A. Yeah, it says "after patterning," but
18 patterning could be postexposure or postdevelopment, so
19 they do not describe that very well at all.

20 Q. But in any case, the temperature is different;
21 right?

22 A. Yes.

23 Q. In Stowers 2008, it's 300?

24 A. It's 325 versus 300; correct.

25 Q. And that's different from the example in

1 patent too; isn't it? And I can point you to column 22,
2 line 43 --

3 A. Postexposure bake, 40 to 200.

4 Q. So the postexposure bake in Stowers 2009 at
5 325 degrees C is different than what is described in the
6 '564 patent example; right?

7 A. It is different.

8 Q. Okay. So if I'm looking on page 21 of Stowers
9 2009, and if you look on the right-hand column here, it
10 appears to be doing a comparison to more conventional
11 polymer electron beam resists; right?

12 A. 2009. What page?

13 Q. Page 21, on the right column, the first full
14 paragraph.

15 A. Okay. So what is the question? Sorry.

16 Q. So this is doing comparison between
17 conventional polymer electron beam resists; right?

18 MR. BREGMAN: Objection.

19 A. "In comparison to more conventional polymer
20 e-beam resists."

21 Q. Right. And in the next sentence it says, "The
22 sensitivity can be traced to their high electron
23 densities." So do you understand high electron density
24 to impact sensitivity for such resists?

25 MR. BREGMAN: Objection.

1 A. Yes.

2 MR. WOLFE: I'm about to go to another
3 document, so I don't know if now a good time for a break
4 or we can keep going. However you're feeling
5 comfortable.

6 MR. BREGMAN: Let's see if lunch is outside.

7 (Recess.)

8 BY MR. WOLFE:

9 Q. I'm handing the witness what has been
10 premarked for identification as Exhibit 1024.

11 Do you recognize this document?

12 A. Not right off.

13 Q. If you turn to page 15, perhaps the first
14 author might give you a tip.

15 A. (Indiscernible) mixing things up here --

16 (Reporter clarification.)

17 A. Oh, sorry, I was talking to myself. I'm
18 mixing up pages and trying not to do that. Sorry. I'm
19 talking to myself.

20 Oh, okay. Yes, I do recognize the name.

21 Q. And what is this document?

22 A. It's development of an inorganic photoresist.

23 Q. And in general, what is this document talking
24 about?

25 MR. BREGMAN: Objection.

1 A. Let's see, "For the 22 nanometer node, the
2 critical aspect ratio will be less than two to one,
3 meaning 40 to 45 nanometer will be commonplace, meaning
4 that's the image being printed." How's that?

5 Q. We can start with that sentence. That's fine.
6 He mentions for the 20 nanometer node, the critical
7 aspect ratio will be less two to one, meaning 40 to 45
8 nanometers thick resists will be commonplace. Do you
9 agree with that?

10 MR. BREGMAN: Objection.

11 A. I don't remember. I'd have to go back. 22
12 nanometers was a long time ago.

13 Q. Do you know when that was?

14 A. Let me think. So right now they are in the 3
15 nanometer node. So I'd have to go look at my -- I have
16 a road map and I'd have to go look at that and see what
17 the timing was for 22, but, no, I don't remember.

18 Q. And my understanding is that the certain
19 nanometer notes are delineating points in time of the
20 development of, like, UV -- or photoresist technology,
21 not necessarily UV?

22 MR. BREGMAN: Objection.

23 A. The nanometer nodes are the names that the
24 semiconductor device companies use. It used to be based
25 on the minimum printed images. It's not anymore. They

1 just have names. So they now have the 10 nanometer, the
2 7, the 5, the 3, the 2. Now we're going to 20 angstroms
3 instead of 2 nanometers, but it's all marketing names,
4 honestly.

5 Q. But it's always going down in size; right?

6 A. Yes, yeah.

7 Q. And so, the 22 nanometer node would have been
8 previous to now?

9 A. Definitely. Definitely.

10 Q. Do you know approximately the time the 22
11 nanometer node was?

12 MR. BREGMAN: Objection.

13 A. As I said, I can look it up, but I don't
14 remember.

15 Q. Roughly 2000s?

16 MR. BREGMAN: Objection.

17 A. I really don't remember. I'm trying. My
18 brain is trying to see my road map in my head. It's
19 just -- it's been quite a while ago.

20 Q. But --

21 A. So --

22 Q. -- for the 22 nanometer node time frame,
23 whenever that was, were 40-45 nanometer thick resists
24 common place?

25 MR. BREGMAN: Objection.

1 A. I don't remember. I don't remember.

2 MR. BREGMAN: Slow down.

3 Q. Then if you look sort of in the middle of that
4 first abstract paragraph he mentions, "Hafnium oxide
5 nanoparticles are used as core to build the inorganic
6 nanocomposite into an imageable photoresist."

7 So here he seems to be describing hafnium
8 oxide nanoparticles; right?

9 A. That is what they say, yes.

10 Q. What is the difference between hafnium oxide
11 nanoparticles and the hafnium oxide sulfates described
12 in the Stowers references?

13 A. I would have to go look at a report to
14 understand what -- what the exact stuff is, because they
15 do make an inorganic composite photoresist from those
16 nanoparticles, so I'd have to go look at that. I don't
17 remember if they do that.

18 Q. The next sentence mentions, "During sol-gel
19 processing of nanoparticles, a variety of organic
20 ligands can be used to control the surface chemistry of
21 the final product."

22 What is sol-gel processing?

23 A. I don't remember.

24 Q. Is it possible that it's the way that
25 nanoparticles are being produced, given the context?

1 MR. BREGMAN: Objection.

2 A. No, actually, not the way nanoparticles are
3 produced. It's processing those nanoparticles. That's
4 what it says, that "sol-gel processing of the
5 nanoparticles" so they're doing the nanoparticles with
6 these organic ligands. So they're processing them
7 together.

8 Q. And if you can turn to page 16, mentions
9 nanoparticle synthesis in section 1.2.

10 MR. BREGMAN: We're not finding the page in
11 here.

12 MR. WOLFE: At the bottom in the middle.

13 MR. BREGMAN: Oh, I see.

14 A. I'm sorry, so what was your question?

15 Q. Just -- I haven't asked yet. Just that it's
16 discussing nanoparticle synthesis towards bottom.

17 A. Oh, okay.

18 Q. And it discusses controlled hydrolysis of
19 hafnium isopropoxide and then mentions the formation of
20 a white precipitate. So you would understand that these
21 nanoparticles are synthesized by precipitating from
22 hafnium isopropoxide?

23 MR. BREGMAN: Objection.

24 A. That is what I read. I am not an expert in
25 how to make nanoparticles, so I would just read that and

1 have to believe that's how they make them.

2 Q. Okay. And then after that, it mentions the
3 precipitate was centrifuged and then washed twice with
4 acetone. Would that be the processing of the
5 nanoparticle also?

6 A. I don't know. I'd have to research it. It's
7 what they said they're doing, so that's -- one would say
8 that's what they're doing.

9 Q. And then it mentions the final product is a
10 white powder, so would it be a POSITA's understanding,
11 reading this about nanoparticles, that the nanoparticles
12 were produced as a white powder?

13 MR. BREGMAN: Objection.

14 A. I suppose I would just read this and believe
15 what they say. So the final product was a white powder.

16 Q. Okay. And if we can turn to the next page,
17 page 17, under section 1.3 it says "nanoparticle powders
18 and suspensions," and then at the bottom paragraph it
19 mentions that, that bottom paragraph, the nanoparticles
20 can for stable suspensions in either water or organic
21 solvents like PGMEA."

22 Do you see that?

23 A. Yeah. I found it now, yes.

24 Q. And PGMEA -- sorry to do this to you -- can
25 you switch back to page 16. If you look under 1.1

1 "materials," it provides an acronym for PGMEA.

2 A. Yeah.

3 Q. Do you know what PGMEA is?

4 A. Yes, I do.

5 Q. What is it?

6 A. It's a solvent, an organic solvent.

7 Q. Okay. And then so back on page 17, it
8 mentions suspensions in either water or organic solvents
9 like PGMEA. What's a suspension?

10 A. A suspension is typically something where you
11 have a liquid and another material where the material
12 does not dissolve totally.

13 Q. So would that be the same or different than a
14 solution?

15 MR. BREGMAN: Objection.

16 A. Hate to say this, I'd have to go look up
17 online what a solution is defined as. But it certainly
18 would not be that it is dissolved in the liquid.

19 Q. So your understanding of suspension is that
20 it's a solid particle suspended in liquid; is that
21 accurate?

22 MR. BREGMAN: Objection. Mischaracterizes
23 testimony.

24 A. So I don't know if it's solid or if it's -- it
25 could be soft and jelly, so all I know is it's

1 suspended.

2 Q. But not liquid itself; right?

3 MR. BREGMAN: Objection.

4 A. That -- don't know. Not dissolved in the
5 liquid, is a suspension.

6 Q. But typically if it was two liquids mixed
7 together, you might call that a solution; right?

8 MR. BREGMAN: Objection. Incomplete
9 hypothetical.

10 A. Only if they dissolve into each other. If I
11 put oil into water, those are two liquids.

12 Q. Wouldn't that be an emulsion?

13 A. I don't know. Maybe. Look up online the
14 definitions. Sounds right.

15 Q. Okay. For these nanoparticles, do you know --
16 would a POSA be able to tell from this article whether
17 they were suspended in water or in organic solvent like
18 PGMEA for its tests?

19 MR. BREGMAN: Objection.

20 A. I could only tell by what they write in the
21 paper as to which way they used it.

22 Q. Right. So if you look at the next page,
23 page 19, they disclose a couple test results, some of
24 which being contrast curves. Is there anything in this
25 article that lets you know whether this was suspended in

1 water or an organic solvent like PGMEA?

2 MR. BREGMAN: Objection.

3 A. The only thing can I read is under 1.4 where
4 it says "uniform thin films can be spin coated on
5 silicon wafers using either aqueous or PGMEA dispersions
6 of the nanoparticles."

7 Q. So this section is talking about how to make
8 the nanoparticle thin films; right?

9 MR. BREGMAN: Objection.

10 A. I don't know.

11 Q. The section 1.4's title is what?

12 A. "Nanoparticles thin films."

13 Q. Okay. And it's mentioning "uniform thin films
14 can be spin coated on silicon wafers using either
15 aqueous or PGMEA dispersion of the nanoparticles";
16 right?

17 A. Right. But it does not say how they're making
18 those on this, you know, so I don't know what else is in
19 there.

20 Q. Sorry, you mean the nanoparticles?

21 A. So they talk about nanoparticles and the
22 solvent, but they don't talk about if there's something
23 else in there with them at this point, so I'm -- I don't
24 know.

25 Q. If we start at page 17, section 1.3, it seems

1 to describe the nanoparticle powders and suspensions.
2 We discussed the powders previously.

3 A. The reason I don't know is that if you look at
4 Figure 3 it says, "HfO₂+ ligand" or -- and two ligands.
5 So there's got to be ligand added, and I have not seen
6 where they talk about how they mix the ligand in. So I
7 have not seen that.

8 Q. I think that might be above in section 1.2,
9 pages 16 to 17 talking about nanoparticle synthesis,
10 looking at section B it says, "The surface ligands can
11 be replaced by other carboxylic acids via direct ligand
12 exchange."

13 Do you see that?

14 A. No, I haven't seen it yet. Where is that at?

15 Q. Top of page 17.

16 A. Okay. I see that. So it says the surface
17 ligands, so it has them on there. I did not know that.

18 Q. So going back to section 1.4, the nanoparticle
19 thin films, it says in the first sentence either aqueous
20 or PGMEA dispersions; right?

21 A. That is what it says.

22 Q. So it could be either of those?

23 A. Oh, I thought I answered it. Sorry.

24 Q. So it can be either of those; right?

25 A. Yes, that's what they state.

1 Q. Then the next section discusses optical
2 lithography on page 19; right? And that shows some
3 tests of the Hf nanoparticle films that, "were patterned
4 using DUV light."

5 Do you see that?

6 MR. BREGMAN: Objection.

7 A. It does say that.

8 Q. But here, it doesn't say whether this film was
9 made from a suspension in an aqueous solution or PGMEA;
10 does it?

11 A. It does not specify in that paragraph.

12 Q. And the paragraph before said it could be
13 either; right?

14 A. Correct -- two paragraphs before.

15 Q. So we don't know which one was being used for
16 this test; right?

17 A. Does not appear that they highlight which one
18 is used.

19 Q. Going back to the 1.4 nanoparticle thin films
20 on page 18. Here he mentions spin coating and says,
21 "Typically a dispersion containing 5 to 20 percent by
22 weight nanoparticles was spin coated for 60 seconds at
23 1,000 to 3,000 RPM."

24 So he only lists one spin time. Do you know
25 why that is?

1 MR. BREGMAN: Objection.

2 A. No, I don't know. Just what he did for
3 experiments.

4 Q. He lists a range of percentage of
5 nanoparticles; right?

6 A. Yes.

7 Q. And he lists a range for spin speeds; right?

8 A. Correct.

9 Q. But he only lists one spin duration; right?

10 A. Right.

11 Q. Okay. And as with the aqueous or PGMEA
12 distinction, is there anything in the optical
13 lithography section below that tells you what the spin
14 speed he used was or the percentage of nanoparticles?

15 MR. BREGMAN: Objection.

16 A. Yes, he does not write down the specific -- at
17 least I have not found it -- specific spin speed.

18 Q. Okay. And if you look at Figure 3, he is
19 testing on page 18, he's testing various spin speeds
20 versus film thickness; right?

21 A. That is what that shows, yes.

22 Q. And the minimum film thickness on this test is
23 around 60 nanometers; right?

24 A. Yes.

25 Q. Okay. So if you read the sentence at the

1 bottom of the paragraph, the first paragraph in 1.4, it
2 says, "In general, film thicknesses ranging from 30 to
3 200 nanometers can easily be achieved"; right?

4 A. That is what it says.

5 Q. But he didn't test those, actually, right,
6 because in Figure 3 they go down to 60?

7 MR. BREGMAN: Objection.

8 A. I do not know if he tested it. He did not put
9 it into Figure 3.

10 Q. Okay. And going back to the optical
11 lithography section on page 19 looking at those contrast
12 curves, he doesn't -- Trikeriotis doesn't explain what
13 thickness of film was used for this test, did he?

14 MR. BREGMAN: Objection.

15 A. Yeah, I did not find here where he specified
16 the thickness.

17 Q. Okay. And it seems like the only thickness
18 that's disclosed in this testing is on page 21. Do you
19 see that at the bottom paragraph, "The film that was
20 used was only 30 nanometers thick to minimize the
21 absorptions and reflection of light"?

22 A. Which one are you looking at?

23 Q. The bottom of page 21. It's the next to last
24 sentence.

25 A. Oh, there it is. "The film that was used was

1 only 30 nanometers thick to minimize the absorption and
2 reflection of light."

3 Q. Right. So for this test, they used a film
4 that was 30 nanometers thick; right?

5 A. That is what they say.

6 Q. And this test is specific at 193 nanometers;
7 right?

8 MR. BREGMAN: Objection.

9 Q. If you look --

10 A. It says they used 193 nanometer light, yes.

11 Q. And if you go back to the previous page,
12 page 20, it says, "Similar films were also exposed at
13 193 nanometer light"; right?

14 A. Similar films were exposed at 193 light, yes.

15 Q. So this seems to be discussing a second test
16 that was conducted with 193-nanometer light; right?

17 MR. BREGMAN: Objection.

18 A. Or similar films, but could be more than two
19 that they were testing.

20 Q. Sure, but a different set of tests than
21 previously. If you look above on pages 19 and 20 with
22 the contrast curve and the positive and negative
23 imaging -- do you see those?

24 A. Yeah.

25 Q. That was done with either 254 nanometer

1 light -- if you look at the paragraph above the positive
2 and negative imaging, you see it says "The contrast
3 curves for the positive- and negative-tone imaging,
4 Figure 5, were conducted by measuring the thickness of
5 the film after exposure at various doses of 250
6 nanometer light."

7 A. I'm sorry, where did you see the 250?

8 Q. 254, it's on the second --

9 A. Oh, I thought you said 250.

10 Q. Yeah, so, no, 254. Sorry.

11 A. Okay. So yes, they use 254 and then developed
12 it and TMAH.

13 (Reporter clarification.)

14 A. T-M-A-H, all capitals.

15 Q. And what is TMAH?

16 A. TMAH for 30 seconds, that gives it positive
17 tone. Or IPA, isopropyl alcohol, for two minutes to
18 make it negative tone.

19 Q. And what's TMAH?

20 A. Trimethylammonium hydroxide.

21 Q. And is that a common solvent?

22 A. Yes. It's the most common developer in
23 photoresist today.

24 Q. So, looking at these two examples, it seems
25 like there's a test regarding the 250-nanometer light

1 that we were just discussing for the positive and
2 negative; right?

3 A. Uh-huh.

4 Q. And then there's a test for the 193-nanometer
5 light below; right?

6 A. That's what it says, yes, similar tests were
7 exposed at 193 -- films were exposed at 193.

8 Q. What would a person of ordinary skill have
9 understood the term "similar films" to mean?

10 MR. BREGMAN: Objection.

11 A. I'd have to understand what he meant by
12 similar films.

13 Q. So they could be slightly different?

14 A. Right. Means it's not identical, is what
15 "similar" would mean to me.

16 Q. Okay. And then if you could take a look at
17 Figure 8, this is the one that's with the film that was
18 30 nanometers thick. Can you describe Figure 8 for me?

19 MR. BREGMAN: Objection.

20 A. Figure 8, the SEM images of 60 nanometer
21 patterns printed on the nanoparticle resist using 193
22 light.

23 Q. Yeah, I'm -- generally this, compared to some
24 of the previous pictures in this article, this one
25 seemed a little bit more gray and fuzzy; doesn't it?

1 MR. BREGMAN: Objection.

2 A. I have to say I would have to actually see the
3 original image that he had. Because as I look at here,
4 I see a lot of ups and downs and an then they disappear,
5 so I really can't tell.

6 Q. Where are you seeing ups and downs?

7 A. In the black image here --

8 Q. Got it.

9 A. -- of Figure 8, where they're showing the --
10 that shows the -- I'm assuming -- I'd have to go check
11 that. But it looks like that's up and down of these
12 topography images where they have the little black lines
13 above them.

14 Q. Okay.

15 A. And if you think it looks a little different,
16 they were put on a bottom antireflective coating which
17 might be making it look like that.

18 Q. In this article, is there any description as
19 to the mechanism of action that happens in the resist
20 film when they're being exposed with either 254
21 nanometer light or 193?

22 MR. BREGMAN: Objection. Form. Objection.
23 Compound.

24 A. I will look through and see.

25 Yeah, the only thing I read is the absorption

1 coefficient on the films depends on the ligand and the
2 synthesis method.

3 Q. So the absorption coefficient of the film is a
4 property of the film; right?

5 A. That is correct.

6 Q. So that's not necessarily saying what is
7 happening to the film when it's being exposed; is it?

8 MR. BREGMAN: Objection.

9 A. I haven't read that yet.

10 I did not find where they said what was the
11 mechanism of exposure on this.

12 Q. Okay. So it just shows different results of
13 patterning; right?

14 MR. BREGMAN: Objection.

15 A. It shows patterning, but does not explain what
16 causes the resist to be photosensitive or what the
17 chemistry is. It does not explain the chemistry of what
18 happens with exposure.

19 Q. Looking at the bottom of page 21. Here again,
20 this is the 193 nanometer light experiment. And it
21 says, "The film that was used was only 30 nanometers
22 thick to minimize the absorbance and reflection of
23 light." The next sentence says, "Currently,
24 optimization of the photoresist formulation is underway
25 to pattern 60 nanometer features on thicker films."

1 Why would he want to pattern on thicker films?

2 MR. BREGMAN: Objection. Calls for
3 speculation.

4 A. Different process applications.

5 Q. What do you mean?

6 A. He obviously has some need for a thicker
7 resist for his process. I don't know what it is, but
8 that is -- if he wants 60 nanometers, he must need it
9 thicker for whatever he's using it for. And I don't
10 know what he's using it for, because he doesn't say.

11 Q. What would be reasons that a person of skill
12 in the art would want to use a thicker film?

13 MR. BREGMAN: Objection.

14 A. Depends on the application. So as an example,
15 you could use hafnium oxide as actually leaving a layer
16 on the wafer because it's a high dielectric constant
17 material and maybe that's -- you want it to be thicker
18 and you're not going to use it for patterning anything
19 but you're own placing that material on there.

20 Q. Okay. If other than placing the material on
21 and leaving it as part of the structure, would there be
22 any other reason that you would want a resist film to be
23 thicker?

24 MR. BREGMAN: Objection. Calls for
25 speculation.

1 A. Yeah, I really don't know.

2 Q. All right.

3 A. I would think hafnium oxide at 30 nanometers
4 is pretty good, but he obviously has a reason he wants
5 60. And again it was, you know, older technology, so...

6 Q. And remind me the time frame of this one, I
7 think it was 2010; is that right?

8 MR. BREGMAN: Objection.

9 Q. If you look at page 1.

10 A. It was presented in February 2010.

11 Q. Okay.

12 A. Is that, February? Don't assume. It was
13 presented in 2010.

14 Q. Okay. I'd like to turn to your declaration if
15 I could.

16 A. Okay.

17 Q. Okay. We can turn to paragraph 25.

18 A. Okay. Go ahead.

19 Q. So in this section, you're describing the '564
20 patent and what you've titled the overview of described
21 technology, right, on page 8?

22 A. Yes.

23 Q. Okay. And then, on the sentence on the bottom
24 it says, "In some embodiments, the inorganic precursor
25 solution can have a relatively low concentration of

1 metal ions such that the rheology of the coating
2 composition, EG the viscosity, allows the formation of a
3 thin coating on a substrate."

4 What is -- what would a person of skill in the
5 art have understood low concentration of metal ions to
6 have to do with the rheology?

7 A. So if you have larger concentrations of a
8 thicker substance that gets dissolved, it makes higher
9 viscosity.

10 Q. So the higher viscosity can affect the
11 thickness of the coating on the substrate?

12 A. That is true.

13 Q. And that higher viscosity can be driven by
14 different concentrations of metal ions; is that right?

15 MR. BREGMAN: Objection.

16 A. Different concentrations of additives to the
17 solution.

18 Q. And one of the additives can be metal ions;
19 right?

20 A. One of the additives is specified as metal
21 ions.

22 Q. And a higher concentrations of metal ions
23 could change the viscosity of the solution; right?

24 A. It could.

25 Q. Is there a circumstance when it wouldn't

1 change the viscosity of a solution?

2 A. I don't know. I'd have to go study that and I
3 didn't really look into that.

4 Q. Turn to paragraph 29 if you could. And if you
5 look at the last sentence it says, "In other words, the
6 energy from radiation absorption results in
7 agglomeration of the metal ions to change the character
8 of the irradiated material."

9 Do you understand that to be a chemical
10 change?

11 MR. BREGMAN: Objection.

12 A. Yes, a chemical change.

13 Q. Next, if you could turn to paragraph 38 on the
14 next-to-the-last line. You mentioned an "HR ion" did
15 you mean Hf?

16 A. Where are we?

17 Q. Next-to-the-last line on paragraph 38?

18 A. Paragraph 38 -- Hf, yes. I don't know how
19 that typo happened. Sorry.

20 Q. And then on the next couple pages are your
21 calculations for precursor -- the -- certain peroxide to
22 metal ratios or vice versa.

23 A. Uh-huh.

24 Q. If you look at your calculations for the
25 hafnium precursor solution on page 19 -- actually

1 page 18 first, on the left-hand side at the bottom box,
2 says, "Part A," and then it comes to an amount of 4.5
3 millimole.

4 Do you see that?

5 A. Yes.

6 Q. And then, if you go to page 19, under ratio of
7 Hf to peroxide, the amount of metal that's used there is
8 4.8 millimoles.

9 A. Oh, someone typed it wrong.

10 Q. Who would have typed it wrong?

11 A. I don't know.

12 Q. But it wasn't you?

13 A. I did not type this up per se. I didn't do
14 all the words and typing. I did all the stuff on my --
15 on a separate piece of paper then it was put in here.
16 So I did all this calculation, but I didn't specifically
17 type this here.

18 Q. Do you know if that number is correct, the
19 1.6 -- the 0.16?

20 A. Well, if -- I'd have to go back and look and
21 do the calculation. Can I take my phone and do --

22 Q. Feel free.

23 A. Yes, the 1.6 6 is correct. It's just the
24 4.8 -- the 4.8 is a copy error.

25 (Reporter clarification.)

1 A. So the 4.8 up should not have been 4.08, it
2 should be 4.5. Oh, no, that is -- that did come out
3 that. Let me try it again.

4 Yeah, sorry, it's 1.5 not 1.6.

5 Q. 0.15; right?

6 A. Yeah.

7 Q. And that's because it says 4.8 instead of 4.5;
8 right?

9 A. Yeah. So this should be 4.5 and this should
10 be 1-5.

11 Q. Okay. And the same for the one below; right?

12 A. Sorry, yeah, I don't know how that happened.

13 Q. Next, I'd like to turn to the '564 claims?

14 A. The claim on the actual patent, is that what
15 you're talking about?

16 Q. Uh-huh, yeah, on the last page.

17 A. Okay.

18 Q. And I wanted to get your understanding of
19 certain terms and your application of them, so looking
20 at claim 1, it says, "a structure comprising a substrate
21 and a coating material on the surface of the substrate."
22 What did you understand the structure comprising a
23 substrate would be?

24 MR. BREGMAN: Objection.

25 A. So you're asking a -- what is the structure

1 comprising a substrate and a coating?

2 Q. Uh-huh.

3 A. So a substrate, typically for semiconductors
4 is a silicon wafer, but it could be some other material
5 like the coupons we heard about earlier. And a coating
6 material would be a liquid material that is placed on
7 the substrate.

8 Q. But, like we discussed a while ago, the '564
9 patent describes methods of deposition of the material
10 other than spin coating; right?

11 MR. BREGMAN: Objection.

12 A. Spin coating is the most common way of doing
13 that. Yes, you could spray coat, but I don't know
14 anyone that spray coats photoresist on wafers.

15 Q. Right. But if a POSA spray coated a
16 photoresist onto a substrate, that would fall within
17 this claim; right?

18 MR. BREGMAN: Objection.

19 A. It falls within the explanation they have
20 internal to this patent.

21 Q. Okay. So in light of the specific --

22 A. Still a sprayed-on liquid then.

23 Q. Okay.

24 A. Sorry, go ahead.

25 Q. And next it says "wherein the coating

1 materials comprises metal ions with radiation sensitive
2 ligands." What do you understand the term "metal ions"
3 to mean?

4 A. I can only --

5 MR. BREGMAN: Objection.

6 A. Listed it here, it's relationship to the
7 patent itself. And they list what they consider metal
8 ions in the patent.

9 So that would be starting at the bottom of 10,
10 halfway down, 10-45, "various metal ions." So those are
11 the ones, I would look at those. And it continues onto
12 the next page.

13 Q. And those are metal suboxide cations; right?

14 A. The first set is and then it continues on to
15 just list metal ions. It says "solution can comprise
16 additional metal cations, such as," and it lists a large
17 number of metal cations that do not have oxygens.

18 Q. Okay. What would you understand -- what would
19 a person of skill in the art have understood "radiation
20 sensitive ligands" to mean?

21 A. Again, I would refer to the patent. In this
22 case, I believe they said it was hydrogen peroxide, but
23 I'd have to double check. It's the peroxide -- once the
24 photoresist is mixed together, it's the peroxide part,
25 or the O-O-O part.

1 Q. So your understanding is the radiation
2 sensitive ligand is after the precursor solutions have
3 been mixed?

4 A. Yes.

5 MR. BREGMAN: Objection.

6 A. Yes. Before it's mixed, it's just peroxide,
7 and then it forms a ligand on the metal.

8 Q. Okay. And what does it mean to be radiation
9 sensitive?

10 A. Means it has some reaction when light hits it.

11 Q. What does "some reaction" mean?

12 A. Well, as we talked before, if it was a
13 photoactive compound, when it gets hit with light, it
14 produces acids. And if it's a different thing, it might
15 cause decomposition of -- of a material.

16 Q. Okay. So it's causing some --

17 A. Chemical reaction.

18 Q. So it causes --

19 A. It depends on what the ligand is and what the
20 photoresist is.

21 Q. So it causes some chemical reaction in the
22 ligand?

23 A. That's correct. That's my understanding.

24 Q. The claim also recites an average thickness
25 from 5 nanometers to 30 nanometers. What do you

1 understand an average thickness to mean?

2 MR. BREGMAN: Objection. Asked and answered.

3 A. So you want me to explain what average means?

4 Q. Just in this context for the thickness?

5 A. So an average means that if you look at the
6 entire substrate, you measure the thickness, and the
7 average thickness of that -- of the material on that --
8 the coating, that would be those numbers.

9 Q. So is it your understanding that you could
10 have a coating material with a thickness that ranges
11 between 25 and 35, and that could have an average
12 thickness of 30?

13 MR. BREGMAN: Objection. Form.

14 A. So are you asking, if we had one substrate and
15 we spun on the coating, that that coating thickness
16 could vary from 25 to 35 on a single substrate? Very --
17 I've never heard of that happening.

18 Q. So for -- fine. For -- let's go to 29 to 31.

19 MR. BREGMAN: Objection. Incomplete
20 hypothetical.

21 A. Yeah, I would have to go look it up and see
22 what people have for variation. I don't really remember
23 what a common variation is.

24 Q. I'm not asking you to necessarily know what
25 common thickness variations might be. It's more in the

1 pure math sense, an average thickness of a coating
2 material could include an actual thickness that's
3 greater than that average; right?

4 MR. BREGMAN: Objection. Form.

5 Q. At certain points?

6 MR. BREGMAN: Objection. Form.

7 A. So if you're just doing the math, if the
8 average is 25, yes, that means that there would be some
9 points above and some points below 25 to be an average
10 of 25.

11 Q. Okay. The claim then says, "Exposure of the
12 coating material to UV, EUV, and/or electron beam
13 radiation alters the chemical properties of the coating
14 material."

15 What does "alters the chemical properties of
16 coating material" mean to you?

17 A. Means that that radiation impacts some element
18 of that photoresist to change the chemical properties.
19 So, again, it would be like if it was a more classical
20 photoactive compound, the light hits it and it changes
21 the chemistry of a photoacid-generating compound.

22 Q. And moving on to claim 7. This states that
23 "the coating material has high absorption of EUV
24 radiation relative to conventional radiation-based
25 resists."

1 What do you understand "conventional
2 radiation-based resists" to be?

3 A. That's hard to say just off the top of my
4 head, but in the paper -- I believe in -- I'd have to go
5 back and look. But they referred to what they thought
6 was conventional versus...

7 I don't remember where that is. This is so
8 long.

9 Q. If you look at column 13, line 56, is this
10 what you're talking about?

11 A. Yes. Traditional organic resists. So that
12 would be my interpretation, that they consider --

13 Q. Claim 7.

14 A. -- conventional radiation-based resists.

15 Q. Okay.

16 A. Traditional, conventional -- to me that would
17 be the same thing.

18 Q. Okay. And then in claim 12 it says "wherein
19 the coating material can be effectively patterned with
20 UV radiation or EUV radiation at a dose no more than 100
21 millijoules per centimeter squared."

22 What does "effectively patterned" mean to you?

23 MR. BREGMAN: Objection.

24 A. "Effectively patterned" should mean produces a
25 pattern that is effective to their needs.

1 Q. So it depends on what the ultimate use of the
2 chip is?

3 MR. BREGMAN: Objection.

4 A. I really don't know. I'd have to found out
5 what they meant by "effectively."

6 Q. Right. But the claim is defining the -- the
7 scope of the invention, and so the typical way to
8 understand it --

9 A. Did I have that in my -- this at all? Did I
10 have it in my --

11 Q. In your declaration?

12 A. Yeah.

13 Q. I think we'll get to claim 12 in a moment in
14 your declaration.

15 A. That might make it easier for me to remember.

16 Q. Okay. Then let's just go to your declaration.
17 Go to paragraph 98.

18 And this claim limitation is from independent
19 claim 1 regarding "wherein the coating material
20 comprises metal ions with radiation sensitive ligands";
21 right?

22 A. Yes.

23 Q. And here you're listing some of the precursor
24 solution including zirconium oxychloride and hafnium
25 oxychloride; right?

1 MR. BREGMAN: Objection.

2 A. Yes. The precursor solutions in Stowers is
3 zirconium oxychloride and hafnium oxychloride with
4 peroxide.

5 Q. And then in the middle of the paragraph, 99,
6 you say a POSA would understand that the working
7 solutions of Stowers 2008 contain metal ions since in
8 solution zirconium oxychloride hafnium oxychloride exist
9 as O_2^+ and HfO_2^+ , IE metal suboxide ions; right?

10 A. Yes.

11 Q. And just as a reminder the claim recites
12 "wherein the coating material comprising metal ions."
13 So it's the coating material comprising metal ions;
14 right?

15 A. Yes, it does say that.

16 Q. And then paragraph 99, you mentioned those
17 metal suboxide ions in the precursor solutions. And
18 then in the next sentence you say, "Since those
19 precursor solutions in Stowers 2008 are spin coated onto
20 wafers to make films, the resulting films will
21 necessarily also contain those same metal ions."

22 Why would they necessarily also contain those
23 same metal ions?

24 A. Because if it's in the solution that you spin
25 on, then it's in the solution that's on the spined-on

1 material. I don't think the metal ions would come out
2 when you put it in -- put it on.

3 Q. Okay. If we can turn to paragraph 53, going
4 back. Here you're identifying two portions of the '564
5 patent as disclosing a ratio of ligands to metal
6 suboxide to metal ions as being at least 2. But aren't
7 each of these portions of the specification in regards
8 to the precursor solution?

9 We can start with the 2, 31 to 33, if that
10 works.

11 A. I'm sorry?

12 Q. We can start the '564 patent at column 2, 31
13 to 33.

14 A. I'm too far away.

15 Q. That was the first one cited.

16 A. Yeah, okay. Thanks.

17 Q. And then there it says, "In some embodiments,
18 the molar concentration ratio of ligand to metal
19 suboxide cations is at least about 2"; right?

20 A. Right.

21 Q. But in sentence before, this is talking about
22 the precursor solution; isn't it?

23 A. Precursor solution comprising a mixture of
24 water, et cetera, and a molar concentration between
25 ligands to metal suboxide cations at least about 2.

1 Q. Right. So my point here is this seems to be
2 discussing the precursor solutions rather than
3 necessarily the coating materials; right?

4 MR. BREGMAN: Objection.

5 A. The precursor materials is what you spin on
6 the wafer.

7 Q. Okay. So the precursor --

8 A. So that's the same as the coating material.

9 Q. Right. So here they're saying the precursor
10 solution will have a concentration of ligands to metal
11 at least about 2 -- is at least about 2; right? And
12 you're say that if that's true, the coating material
13 would also have a ratio of ligands to metal suboxide
14 cations that's at least about 2?

15 MR. BREGMAN: Objection. Mischaracterizes
16 testimony.

17 A. All I can tell you is that that is the
18 concentration that they specify in the thing, that it's
19 at least -- at least 2, in the coating material.

20 Q. But here in this portion, they're talking
21 about the -- the precursor solution, though; right?

22 MR. BREGMAN: Objection. Asked and answered.

23 A. I guess I don't understand the difference.
24 The coating material is -- the precursor solution is the
25 coating material.

1 Q. So the amount that would be in the precursor
2 solution would be the amount in the coating material?

3 MR. BREGMAN: Objection.

4 A. Unless they specify somewhere else that they
5 change that. I did not find that changing.

6 Q. Okay. In paragraph 54 you state that a
7 radiosensitive ligand to metal ration of at least about
8 2 appears to be an error. Why is that?

9 A. Because this is backwards from what -- so as
10 we put in here, they said that the metal to
11 radiosensitive ligand, at least 2. And the claim is
12 radiosensitive ligand to metal ion of at least 2. So
13 it's reversed.

14 Q. And in paragraph 55 you say changing it the
15 other way around would drastically change the scope of
16 the claim; right?

17 A. Yeah, changing claim from saying the metal to
18 ligand is at least 2, to the ligand to metal is at least
19 2, is drastically different.

20 Q. Why is that drastically different?

21 A. If it wasn't important, why would they put it
22 in there, in the claim?

23 Q. What would a POSA have thought?

24 A. I'm sorry. So obviously, you need to have a
25 certain amount of radiosensitive ligand to the metal

1 ion. And so they obviously think it's important. And
2 so they -- in all of the discussion earlier, they had
3 that there was 2X the amount of ligands to metal. And
4 now they're saying it's 2X -- 2X the metal to ligand.
5 So it's -- it's inconsistent.

6 Q. Okay. But it also says "drastically change
7 the scope of the claim." So I'm just trying to
8 understand, what would change about it. Would there be
9 a change in the structure of the coating material?

10 A. Yes.

11 Q. What would the change be?

12 A. So the difference between in one case you have
13 a certain concentration of metal and a certain
14 concentration of the ligand, and if you change that and
15 make one twice the other one, then you change the ratios
16 in the coatings. So the coatings are two different
17 types of coatings.

18 Q. Two different types of coatings --

19 A. To two different concentrations types of
20 coatings. Same materials, different concentration
21 ratios.

22 Q. So at different concentration ratios, would it
23 be your understanding that the photoresist reacts
24 differently?

25 A. I can only base that on what's in their

1 patent, and that recommend -- and that they say in here
2 the ligands to metal sub-cations should be at least 2 --
3 is about 2. And they say it again somewhere else too.

4 Q. But you don't know what the change would have
5 been if it had been the other way around on the film?

6 A. I do not have data on that. I just know
7 it's -- it's inconsistent.

8 Q. And then --

9 A. I'd have to, you know, run the photoresist
10 myself to see the difference.

11 Q. Moving on to paragraph 56, you state that this
12 is not an obvious error because a publication by
13 inventor Keszler shows that there's a saturation that
14 occurs; is that right?

15 MR. BREGMAN: Objection. Mischaracterizes
16 testimony.

17 A. So, you know, claim 8 does not recite an
18 error, as a subsequent publication from Keszler shows
19 that even with excess peroxide in the precursor
20 solution, the hafnium to O2 ratio saturates 2 to 1 in
21 the solution.

22 Q. Right. So this is saying that the precursor
23 solution has excess peroxide; doesn't it?

24 MR. BREGMAN: Objection.

25 A. Which one has excess peroxide? The one that's

1 in the claim? Or the one that's in the -- what to you
2 call this part?

3 Q. The specification?

4 A. Yeah, specification.

5 Q. I'm talking about just in Exhibit 1016. He's
6 saying even with excess peroxide in the precursor
7 solution; right?

8 A. Uh-huh.

9 Q. So that would indicate that there's excess
10 peroxide in the precursor solution; right?

11 MR. BREGMAN: Objection.

12 A. And if the ratio saturates near 2 to 1, so if
13 there's more peroxide then it's saturated.

14 Q. Right. So the hafnium ions are saturated by
15 peroxide; right?

16 MR. BREGMAN: Objection.

17 A. That's my -- that's how I would read this,
18 yes. Even the peroxide -- the precursor solution
19 hafnium oxide ratio saturates near 2 to 1. So the ratio
20 saturates 2 to 1.

21 Q. Right. So the ratio for that part saturates
22 at 2 to 1, but there's still excess peroxide in the
23 precursor solution; right?

24 A. Well, if it saturates at 2 to 1, then that
25 means it matches. And so, anything, any more peroxide

1 above 1, then, is beyond needed.

2 Q. Right.

3 A. That's my understanding.

4 Q. It's beyond needed, but where would the
5 peroxide go if it's added in and it's in excess
6 peroxide, like it says here?

7 A. Just hangs around.

8 Q. So it would hang around in the precursor
9 solution?

10 A. In the solution, correct. Or over time,
11 peroxide can decompose over time.

12 Q. But here, we're also saying that the
13 composition of the precursor solution is what the
14 composition of the coating material is; right?

15 MR. BREGMAN: Objection. Mischaracterizes
16 testimony.

17 A. I guess I'm -- say it again.

18 Q. Before when we're talking about the metal ions
19 and why those would necessarily be in the coating
20 material, we were saying that the composition the
21 precursor solutions became the composition of the
22 coating material; right?

23 A. Sorry, I just missed that. Go ahead, try one
24 more time. I'll close my eyes and listen.

25 Q. Before, we were saying the composition of the

1 precursor solution as a mix, is the composition of the
2 coating material, because it's just spun on?

3 A. Yes.

4 Q. So here with the excess peroxide that would
5 just be hanging around, that would also be spun on?

6 A. That is correct. So it would be part of the
7 solution unless it evaporates during the spin-on
8 process.

9 Q. Okay. And just be clear for this paragraph,
10 this is discussing hafnium only, right, and not
11 zirconium?

12 A. The -- the Keszler only discusses hafnium.

13 Q. And you didn't see any literature that
14 discussed a saturation with zirconium; did you?

15 A. I don't remember any.

16 Q. If we can turn forward to paragraph 85. And
17 to just give some context as to where we are, this is
18 under Section 9, ground 1, claims 1 to 12 are
19 anticipated by the 888 publication. That's on page 41.

20 A. Got it.

21 Q. Okay. And then in this section --
22 paragraph 85, sorry. It says, As noted above, the
23 specification does not disclose a metal ion to
24 radiosensitive ligand ration of about 2?

25 A. Of at least two.

1 Q. Of at least two. Thank you.

2 But wouldn't that be fatal to an anticipation
3 ground?

4 MR. BREGMAN: Objection.

5 A. I don't understand what you --

6 Q. So the claim requires the structure of claim 1
7 having metal ion to radiosensitive ligand ratio of a
8 least 2, so that's what the claim requires; right? And
9 here, it says, "As noted above, the specification does
10 not disclose a metal ion to radiosensitive ligand ratio
11 of a least 2"; right?

12 A. So the specification, the metal to ligand
13 ratio of at least 2, not the metal to ligand ratio. So
14 again, in the claims, it has metal ion ratio is 2, but
15 the specification states the metal -- the ligand to
16 metal is at least 2.

17 Q. Right. So --

18 A. Which is the opposite.

19 Q. So for this ground, like I was saying before,
20 it's anticipation by the '888 publication, and the '888
21 publication is the publication of the priority
22 application to which the '564 claims benefit; right?

23 A. Uh-huh.

24 Q. And that specification, in all material
25 respects, is the same as the specification -- or the

1 '888 publication, in all material respects, are the same
2 as the specification of the '564 patent; right?

3 A. I'd have to go back and look at this thing.
4 I'm sorry, but I don't remember. The 2 to 1, 1 to 2s
5 are driving me crazy. Do you remember where he has it
6 in his thesis?

7 MR. BREGMAN: I think you're looking at not
8 the wrong document.

9 A. Oh, that's right --

10 MR. BREGMAN: The '888 publication, which I
11 don't think you've got.

12 A. Oh, '888. Okay. I'm sorry. I was thinking
13 it was the 2008. Okay. The '888 publication. I'm
14 sorry. That's the other patent. I was thinking 2008.
15 Bad brain. Do you have the '888 so I can --

16 Q. I do, but I --

17 A. Is it identical to the '564 in writing.

18 Q. The '564 specification is the same as the '888
19 publication except for one thing mentioned in --

20 A. Okay.

21 Q. -- something is not of the substance, but
22 here, my point is that the claim requires the structure
23 of claim 1 having a metal ion to radiosensitive ligand
24 ratio of at least 2; right? And then, the next sentence
25 says, "As noted above, the specification does not

1 disclose metal ion to radiosensitive ligand ration of at
2 least 2."

3 So here, it's saying the specification does
4 not disclose the limitation of the claim; right?

5 A. Okay. So claim 8 has the claim the claim
6 saying the metal is twice as much as the ligand, and the
7 specification for '888 says the metal is -- oh, it
8 doesn't disclose the metal ion to radiosensitive ligand
9 being 2, rather, it says that the molar concentration of
10 the ligands is at least 2 and that would be two ligands
11 to one metal suboxide cation, so...

12 Q. So this would not disclose the claim
13 limitation?

14 A. So this does not disclose -- this is not
15 consistent with claim 8. It's the opposite of claim 8.

16 Q. And can we turn to paragraph 100, please? And
17 just so you can be aware, if you look back at page 51,
18 it says this is ground 2, which is anticipation by
19 Stowers 2008, the thesis?

20 MR. BREGMAN: Would this be a good time to
21 take a break?

22 MR. WOLFE: Yeah.

23 (Recess.)

24 BY MR. WOLFE:

25 Q. So if you look at page 51 of your declaration,

1 this is regarding the anticipation by Stowers ground,
2 ground 2.

3 A. Okay.

4 Q. And I'd like you to take a look at paragraph
5 100. Here, in the first sentence, you state that a POSA
6 would understand that the peroxide group in the working
7 solutions of Stowers 2008 is a radiation sensitive
8 ligand. What's that based on?

9 A. Well, it's based on explanations in things
10 like Stowers and others where they call it radiation
11 sensitive ligand.

12 Q. Calls peroxide a radiation sensitive ligand in
13 Stowers 2008?

14 A. I'd have to go back and look. I'm pretty
15 sure.

16 Q. So I think --

17 A. Somebody did because I remember reading that.

18 Q. I think it might be in the '564 --

19 A. Might be in the '564 --

20 Q. -- specification.

21 A. Okay.

22 Q. But here, we need to be looking at the prior
23 art, and here we're focused on Stowers 2008, which is
24 the thesis. And I think in the rest of the paragraph,
25 you provide some explanations.

1 MR. BREGMAN: Sorry. Which paragraph are we
2 on again?

3 MR. WOLFE: 100 on page 52.

4 MR. BREGMAN: Okay. Got it. That's
5 paragraph 100.

6 THE WITNESS: Yeah. So...

7 Q. So here, you're pointing to certain points of
8 Stowers 2008 as supporting the first sentence that a
9 POSA would also understand that the peroxide group in
10 the working solutions of Stowers 2008 is a radiation
11 sensitive ligand. Is that right for this paragraph?

12 A. Correct, because this is the Stowers ZircSOx
13 and HafSOx, and it is the -- it is the peroxide group in
14 there that is splitting.

15 Q. And --

16 A. So it's part of this ZircSOx or HafSOx, but
17 it's the peroxide ligand part of that.

18 Q. But the part discussing why it's radiation
19 sensitive, I think below you are tying that to the
20 extinction coefficients of the materials; right?

21 A. Stowers 2008 notes that it is expected that
22 the extinction coefficients will be different with the
23 presence of peroxide in the as-deposited material.

24 Q. So first, you're saying both ZircSOx and
25 HafSOx are UV sensitive, right, at the beginning of that

1 paragraph?

2 A. Yes. In fact, Stowers uses UV to expose them,
3 so...

4 Q. And then, mentions that the extinction
5 coefficients of these materials have previously been
6 determined. You understand that to be the ZircSOx and
7 HafSOx materials; right? And if you want to look at
8 Stowers 2008, it's on page 69.

9 A. Okay.

10 Q. And there's numbers on the bottom of the page.

11 A. Yeah, I'm just trying to make sure I'm in the
12 right thing here.

13 Q. It should be Exhibit 1008?

14 A. Oh, that helps. 1008. Yes, it is. So
15 what -- I'm sorry, what page did you say?

16 Q. Page 69 on the bottom.

17 A. Right on page 69.

18 Q. And we're on that bottom paragraph. So in the
19 third sentence, it says, "The extinction coefficients of
20 these materials have previously been determined."

21 You understand these materials to be ZircSOx
22 and HafSOx; right?

23 A. That is correct.

24 Q. Okay. And it is expected that these -- that
25 "extinction coefficients will be different with the

1 presence of peroxide in the as-deposited material";
2 right?

3 A. That's what it says, yes.

4 Q. And in your -- back in your declaration,
5 paragraph 100, you say, "An extinction coefficient is a
6 property that determines how strongly a material absorbs
7 radiation at a particular wavelength; right?

8 A. Yes.

9 Q. So why does the addiction of peroxide to
10 HafSOx and ZircSOx changing the extinction coefficient
11 of the total material mean that the peroxide is
12 radiation sensitive?

13 A. Well, Stowers teaches that the peroxide group
14 is radiation sensitive because it indicates the
15 extinction coefficient is expected to change with the
16 addition of peroxide.

17 Q. Right. So the extinction coefficients of
18 ZircSOx and HafSOx are known; right? And then you add
19 peroxide, and then Stowers says it expects those
20 extinction coefficient would change; right?

21 MR. BREGMAN: Objection. Mischaracterizes
22 testimony.

23 A. Stowers indicates the extinction coefficient
24 is expected to change with the addition of peroxide.

25 Q. Right. Why does the extinction coefficient

1 changing mean that peroxide is a radio sensitive -- a
2 radiation sensitive material?

3 A. It's not the peroxide per se. It's the
4 ligand, the peroxide ligand on the HafSO_x and ZircSO_x ;
5 right? It's the ligand that's radiation sensitive.
6 Why -- so if you add peroxide, the extinction
7 coefficient is expected to change.

8 Q. So I guess my question is why is it
9 necessarily the case that if you expect the extinction
10 coefficient to change with the addition of peroxide, why
11 that means, necessarily, peroxide is radiation sensitive
12 as a ligand?

13 MR. BREGMAN: Objection.

14 A. I don't know. I just have what I've got
15 written here, so explaining it -- especially since he
16 says it's different -- expect it to be different --
17 doesn't say in which direction it's different.

18 Q. And the extinction coefficient is just the
19 property that determines how strongly a material absorbs
20 radiation at a particular wavelength; right?

21 A. As I understand, that is the definition.

22 Q. So adding material to another material, if it
23 has a different extinction coefficient, the mixture at
24 the end will change in its extinction coefficient; isn't
25 that true?

1 MR. BREGMAN: Objection. Mischaracterizes the
2 testimony.

3 A. So, yeah, I mean, Stowers does say the coating
4 material comprises metal ions with radiation sensitive
5 ligands. The peroxide is the ligand, so -- I guess I
6 don't know what the question is again. Sorry.

7 Q. I'm just trying connect why the changing of
8 the -- the extinction coefficient means that the added
9 thing, here, the peroxide, is radiation sensitive, and I
10 can maybe help with an example. So you have the ZircSOx
11 and HafSOx material and you add water.

12 A. Uh-huh.

13 Q. Water absorbs radiation at a particular
14 wavelength differently than ZircSOx and HafSOx; right?

15 A. Okay.

16 Q. And then that would mean the material
17 comprising ZircSOx and HafSOx has a different extinction
18 coefficient; right?

19 A. Probably would.

20 Q. So here, it doesn't necessarily mean that
21 because the extinction coefficient changes when you add
22 peroxide, that the peroxide is radiation sensitive;
23 right?

24 MR. BREGMAN: Objection.

25 A. Well, Stowers, the person who's authored the

1 patent, he said -- he teaches that the peroxide group is
2 radiation sensitive, and he indicates that from the
3 extinction coefficient when he adds peroxide, so I'm
4 going with what he put in his thesis.

5 Q. Right. But I think at the beginning of
6 paragraph 100, you're saying that Stowers 2008 -- sorry.
7 A POSA would have understood -- "A POSA would also
8 understand that the peroxide group in the working
9 solutions of Stowers 2008 is a radiation sensitive
10 ligand."

11 I was asking whether Stowers 2008 previously
12 disclosed that peroxide was a radiation sensitive
13 ligand?

14 A. Yeah, Stowers did show that.

15 Q. And here, we're saying he showed that by
16 showing the extinction coefficient of the mixture of
17 ZircSOx and HafSOx changed when adding peroxide; right?

18 MR. BREGMAN: Objection. Mischaracterizes
19 testimony.

20 A. All I'm doing is using what Stowers put in his
21 thesis, which indicates the extinction coefficient
22 changes with the addition of peroxide, and then he
23 discloses that coating materials comprising metal ions
24 with radiation sensitive ligands -- and the ligand are
25 peroxide, so...

1 Q. But like in my example, you agreed with me
2 that the addition of water to ZircSOx and HafSOx did not
3 mean that the water was radiation sensitive even if it
4 would change how strongly a material absorbs radiation
5 at a particular wavelength?

6 MR. BREGMAN: Objection. Form.

7 A. So it says here, you know, that it changes.
8 He doesn't say whether it goes -- increases or
9 decreases. So -- and you're right. You're right. If I
10 add water, I don't know what it would do with the
11 extinction coefficient at that wavelength. I have not
12 looked at what is the absorption coefficient of water at
13 that wavelength. I have not looked at that.

14 Q. Right. But it would need to be identical to
15 ZircSOx and HafSOx for the extinction coefficient to not
16 change; right?

17 MR. BREGMAN: Objection.

18 A. So again, I'm using Stowers' teaching here
19 that he says that -- that that extinction coefficient
20 changes, and therefore, with the addition of
21 peroxide -- therefore, it is the metal ligands is
22 what -- so I'm going after what he was teaching us in
23 his thesis.

24 Q. Right. So he's teaching us that the addition
25 of peroxide to ZircSOx and HafSOx will change what the

1 extinction coefficient is; right?

2 A. Uh-huh.

3 MR. BREGMAN: Objection. Form. Lack of
4 foundation.

5 Q. And all Stowers is teaches is that it changes
6 the extinction coefficient; right? He doesn't use the
7 word "radiation sensitive," does he?

8 MR. BREGMAN: Objection.

9 A. So, "It is expected that these extinction
10 coefficients will be different with the presence of
11 peroxide in the as-deposited material, but the
12 separation of the two materials is expected to remain."

13 Q. So in your declaration, you're saying that the
14 mere fact that the extinction coefficient changes means
15 that the added material is radiation sensitive. What is
16 your basis for saying that?

17 A. My basis is that Stowers 2008 discloses a
18 coating material comprising metal ions with radiation
19 sensitive ligand, and the ligand on there is peroxide
20 based.

21 Q. Where -- I think you're reading -- you're
22 saying Stowers 2008 discloses a coating material
23 comprising radiation sensitive ligand --

24 A. Ligand.

25 Q. Where is that?

1 A. I don't know. It doesn't refer to in here as
2 to where it came from. It doesn't have the number.
3 Let's look at 69, it says.

4 Q. So I think if we're looking at paragraph 100,
5 maybe that first sentence is where you're getting that
6 from. Okay. So I think maybe you're looking at the
7 very last sentence in paragraph 100; right? Sorry if
8 that was confusing.

9 A. Yes, yes.

10 Q. Okay. And that literally is a quote of the
11 claim language; right?

12 A. I don't remember. I --

13 Q. If we look at page 52 above the header,
14 page 52 of your declaration.

15 A. Yeah. Oh, 52.

16 Q. You see at the header, it says, wherein the
17 coating material -- "wherein the coating metal comprises
18 metal ions with radiation sensitive ligands; right?

19 A. Okay. Found that.

20 Q. And that's the claim language for claim 1;
21 right? So then at the end of paragraph 100, when we're
22 saying, "Therefore, Stowers 2008 discloses a coating
23 material comprising metal ions with radiation sensitive
24 ligands," that's a conclusion that Stowers discloses the
25 claim limitation; right?

1 A. Yeah, I thought he had something in here about
2 the peroxide.

3 Q. So maybe I can put this another way.

4 A. Okay.

5 Q. You would agree that if the language that's
6 quoted at the last sentence of paragraph 100 is not
7 actually contained in Stowers, you wouldn't have a basis
8 to assert that Stowers 2008 discloses a coating material
9 comprising metal ions with radiation sensitive ligands?

10 MR. BREGMAN: Objection. Mischaracterizes
11 testimony.

12 A. Let me read above. Well, what I will say is
13 that there's plenty of information out there about
14 peroxide being sensitive to light and decomposing, so
15 that is a known thing, that peroxide decomposes under
16 light.

17 Q. But you didn't cite any of that in this part
18 of your declaration; did you?

19 A. I thought he put that in there, but I guess
20 not.

21 Q. And --

22 A. So I guess that's my opinion.

23 Q. And you also said peroxide there; right? Did
24 you mean the peroxide in terms of a ligand was known to
25 break down in response to UV or hydrogen peroxide?

1 A. Any type of peroxide, typically, can be
2 decomposed with expense. I went -- I did do some
3 looking at that before I wrote this, and there is -- you
4 know, peroxide is not the most stable chemical. It
5 decomposes -- if you put hydrogen peroxide out on a
6 table, it'll start decomposing, so...

7 Q. But you don't cite any of those sources --

8 A. No, I don't. No.

9 Q. I think this might help us all. If you go to
10 paragraph 104, here says, "Accordingly, although Stowers
11 does not explicitly state that the resulting coating
12 material comprises metal ions with radiation sensitive
13 ligands, this limitation is present in Stowers 2008
14 because the films of Stowers 2008 contain the same
15 components as the '564 patent films"; right?

16 A. -- that state that. Okay.

17 Q. So it's your opinion that because the films
18 are identical between the '564 patent and Stowers 2008,
19 that that's why it contains metal ion with radio
20 sensitive ligands -- radiation --

21 MR. BREGMAN: Objection.

22 Q. But you would agree the first part of that
23 sentence, it says, "Stowers does not explicitly state
24 that the resulting coating material comprises metal ions
25 with radiation sensitive ligands"; right?

1 A. Looks like he did not do the work so he could
2 explicitly state that at the time of his writing of his
3 thesis.

4 Q. And then, if we can turn to paragraph 106.
5 This is in regards to the thickness limitations. Here,
6 you're saying that the thickness from 5 to 30
7 nanometers -- and then, it would have to be shown to be
8 critical. What do you mean by critical?

9 A. Well, in the -- in the patent, they show a lot
10 of different claim ranges, but -- not claim ranges,
11 different ranges, but they never claim a specific name
12 claim range is critically important, and so, there's
13 nothing in there explaining why one would pick 5 to 30
14 nanometers.

15 Q. Okay. So a person picking 5 to 30 nanometers
16 wouldn't think that that's some separate invention,
17 then?

18 MR. BREGMAN: Objection.

19 A. If they had data to show that 5 to 30 was
20 critically important or information to show that that
21 was -- we have all these different ranges, but 5 to 30
22 is critically important for this reason, yes, but that
23 wasn't shown anywhere.

24 Q. All right. So it's your opinion that 5 to 30
25 nanometers is not critical?

1 A. I don't know because I don't know why they put
2 5 to 30 in claim. I wasn't involved in the claim.

3 Q. So you don't know whether or not it is
4 critical to the operability of the claim?

5 A. I don't --

6 MR. BREGMAN: Objection. Mischaracterizes
7 testimony.

8 Q. Based on the specification and what you were
9 talking about earlier with the different ranges of
10 thicknesses, what is your opinion of what a person would
11 have thought -- a person of skill in the art would have
12 thought about the critically of 5 to 30 as a range?

13 A. Okay. As a POSA, I would say that the
14 thickness is going to be decided by many factors. You
15 could make -- make it -- want to make thicker than 30
16 because you want it thicker, but then you might have
17 parts of the -- exposed. Things start falling over, so
18 then you would want it thinner. I mean, there's all
19 sorts of reason you might want it thinner or thicker.
20 You might want it thinner because the exposed time is
21 shorter, and therefore, it costs you less to make the
22 wafer because the exposure time is less.

23 So there's a variety of reasons one would pick
24 that. I just -- there was nothing in here explaining
25 why 5 to 30, so I just could not find a way to say why 5

1 to 30.

2 Q. So in paragraph 107, you're referring to
3 Example 3 of the '564 patent and its disclosure of films
4 that were 10 to 15 nanometers thick; right?

5 A. Uh-huh.

6 Q. But this is comparing a claim range from the
7 specification to what was taught in Stowers 2008; isn't
8 it?

9 MR. BREGMAN: Objection. Form.

10 A. Do you know what Example 3 means?

11 Q. Yeah, so in the --

12 A. It's in the patent itself; right?

13 Q. That's right. It's at column 22.

14 A. Pardon?

15 Q. It's at column 22, lines --

16 A. Yeah. I'm trying to find my copy, what I did
17 with it. Found it.

18 Okay. I'm sorry. Where was it?

19 Q. Column 22, and it's at lines 37 to 38.

20 A. Okay. So I'm sorry. Now that I see this,
21 you'll have to re-ask the question.

22 Q. So this section is about anticipation by
23 Stowers 2008?

24 A. Okay.

25 Q. I'm just trying to understand why a comparison

1 to one of the examples in the '564 patent specification
2 is relevant to what's taught in Stowers 2008.

3 MR. BREGMAN: Objection. Form.

4 A. Okay. Now I have to go to...

5 Trying to find where I have a thing for spin
6 coating for Stowers. I'm looking at 00852, but I don't
7 know if I'm on the right 52 or the wrong 52.

8 Q. Yeah. I think that it's possible that that
9 wasn't at top one because spin coating for Stowers
10 2008 --

11 A. Oh, here it is, yeah. "The working solutions
12 were spin coated at 3,000 RPMs for 30 seconds resulting
13 in 30 to 35 nanometer thick films," so am I in the right
14 thing or have I gotten switched? So I was looking at
15 105, or do you want me in a different one?

16 Q. I think we can just move on.

17 A. Okay.

18 Q. Looking at paragraph 108, you note that
19 Stowers 2008 discloses patterning by UV light was
20 achieved by exposing films through chrome on silicon
21 mask and that ZircSOx could be patterned by UV light in
22 either positive or negative tone. Then below that
23 quote, you say, "In other words, Stowers 2008 discloses
24 that exposure of a ZircSOx film to UV radiation altered
25 the chemical properties of the film such that exposed

1 regions have a different dissolution rate than the
2 unexposed regions of the film."

3 Why does the patterning by UV light
4 necessarily mean that the chemical properties of the
5 film were altered?

6 A. The fact that the chemistry of the photoresist
7 that's on the substrate, so the coating on the
8 substrate, that some portions of it are -- come off in
9 the developer and some do not, that means that the
10 radiation affected chemically those areas, one way or
11 the other, so they either, during the exposure, made the
12 thing so it would not come off in the developer, or
13 during exposure, it would come off in the developer. So
14 it's exposure to the radiation that changes chemically
15 the thing so it either dissolves in TMAH or not, or it
16 dissolves in organic solvent or not.

17 Q. But isn't it possible that the exposure to
18 radiation would change the physical properties of the
19 resist, so that way, it would change solubility?

20 A. I don't know what physical -- what you mean by
21 "physical"? To me, it's chemistry because the light
22 affects -- that's what all photoresists have or --

23 Q. You're saying that all photoresists --

24 A. I shouldn't say all photoresists. The
25 photoresists I know all are affected by light by a

1 chemical change, just like I've talked about the
2 photoacid generators.

3 Q. So any typical photoresist that has patterning
4 by UV light, it would be your opinion that those would
5 alter the chemical properties of those films?

6 A. That is correct.

7 Q. Turning next to paragraph 109.

8 A. Okay.

9 Q. Here, you're pointing to where Stowers was
10 attempting to pattern HfSiO_x films with EUV, and then
11 looking at the figure that's on the next page, page 59.

12 A. Sorry. Okay.

13 Q. Here you state that "as Stowers says, a
14 contrast of 0.3." Is a contrast of 0.3 good?

15 A. It was not as good as Stowers would have liked
16 it in 2008 in his patent.

17 Q. For typical -- for, like, a traditional
18 photoresist like we talked about previously, traditional
19 organic photoresist, would a contrast of 0.3 be good?

20 MR. BREGMAN: Objection.

21 A. You know, I'd have to go back and read. I
22 don't remember what a typical contrast would be, so,
23 sorry, it's just not in my brain right now, but I could
24 go back and go look it up and give you a thing that
25 explains what good contrast was versus not. In Stowers

1 2008, he did say he was disappointed that it was --
2 whatever happened when they sent it to Switzerland, so
3 obviously, he wanted better contrast than .3, but that
4 was a misprocessing there.

5 Q. And then, in the next paragraph,
6 paragraph 110, regarding this EUV on the HafSOx.

7 A. Okay.

8 Q. On page 60 at the top, you referred to
9 Figure 3-7 from Stowers 2008; right?

10 A. Okay.

11 Q. And can you look at Figure 3-7? It's on
12 page 80, 8-0. Wouldn't this be an example of poor
13 contrast?

14 A. We went through this. So as Stowers said, the
15 processing of the EUV was not done properly, and so,
16 he -- the fact that they had lower contrast than they
17 expected, they believe is all due to misprocessing of
18 the wafers.

19 Q. Right. But this is the only data that he
20 reports for the HafSOx EUV; right?

21 A. Yes, because that's all he did. So he was
22 disappointed, but he did not say it was because HafSOx
23 did not have good ability to absorb. It was more the
24 misprocessing, temperatures, waiting times, things like
25 that.

1 Q. Right. But there were errors in processing
2 that made the data not as good as it could have been;
3 right?

4 A. That is what he stated.

5 Q. And then, that caused the contrast to be lower
6 than he would have wanted; right?

7 A. That is what he stated.

8 Q. Can we turn paragraph 160? So here you say
9 that the HafSOx films of Stowers 2008 also have the same
10 hafnium ion to peroxide ratio as the HafSOx films
11 exemplified in the '564 patent; right?

12 A. Uh-huh.

13 Q. Again, this is a theory that's based only the
14 hafnium, right, not zirconium?

15 A. That is correct.

16 Q. And this is based on a saturation theory;
17 right?

18 MR. BREGMAN: Objection.

19 A. I'm not sure I understand what you mean by
20 saturation.

21 Q. So in the rest of the paragraph -- so let me
22 put it this way. Stowers 2008 lists a ratio of 1 to
23 0.75, right, for metal to radiosensitive ligand?

24 A. 0.75 peroxide per hafnium. And this -- its
25 ratio saturates at half a peroxide to one hafnium.

1 Q. Right. So this is what we were talking about
2 before --

3 A. Okay.

4 Q. -- for the saturation; right? But Stowers
5 2008 doesn't say it saturates; does it?

6 MR. BREGMAN: Objection.

7 A. So I have to read claim 8. It says as -- "As
8 explained below with respect to claim 8, the ratio of
9 hafnium ion to peroxide saturates," so I have in 119,
10 "Stowers 2008 discloses precursor solutions having
11 zirconium/hafnium ion to peroxide ratios of 1 to 0.75,"
12 which means there's 0.75 peroxide ligands per zirconium
13 or hafnium ion, so this peroxide content is greater than
14 the -- no more than half radiation sensitive ligand per
15 metal cited in the claim 8."

16 Q. Okay.

17 A. And then it goes on to talk about the Keszler
18 lab where Stowers did his work, saying "even with less
19 excess peroxide, the ratio saturates near 2 to 1."

20 Q. In the solution; right?

21 A. Right. In the solution. Right. In the
22 solution.

23 Q. And that was what we were talking about
24 previously where the hafnium in this theory only bonds
25 to 2 to 1 to the peroxides; right?

1 A. Correct.

2 Q. But we were saying the beginning of that
3 sentence still says, "even with excess peroxide in the
4 precursor solution"; right?

5 A. Which page is that?

6 Q. The same page.

7 A. Same page.

8 Q. Yeah, just earlier in the quote. "Even with
9 excess peroxide in the precursor solution, the ratio
10 saturates" --

11 A. Yeah, okay. In Keszler's. Yeah. "Even with
12 excess peroxide it saturates near 2 to 1 in the
13 solution."

14 Q. Right. And then I was discussing this with
15 you previously, and I believe you stated that the excess
16 peroxide, even if it bonds, would hang around?

17 A. Or even if it doesn't bond.

18 Q. Even if it doesn't bond, it would be hanging
19 around; right?

20 (Reporter clarification.)

21 A. I'm sorry. I said yeah. Sorry. I probably
22 just mumbled.

23 Q. And so, there still would be peroxide that was
24 unbound in the solution; right?

25 A. According to Keszler, if it was 1 to 0.75,

1 there would be excess peroxide in the solution, so it
2 would be peroxide that wasn't part of the ligand.

3 Q. And then, if you looked in the second half,
4 that sentence says, "and it persists in the film." What
5 do you understand "it" to mean?

6 A. I would read this to be the peroxide persists
7 in the film.

8 Q. Okay. So the excess peroxide persists in the
9 film. Okay. Is that right? The excess peroxide
10 persists in the film?

11 A. Yes. So in the patent, they made a point that
12 was if you want to ship this photoresist and have it
13 last for a while, having excess peroxide is an
14 advantage.

15 Q. Right. For stability purposes; right?

16 A. Correct. And that would be if the ligand fell
17 off, you'd have more peroxide to put new ligands on.

18 Q. And if we turn to paragraph 123, this is for
19 claim 12.

20 A. Okay.

21 Q. So for this claim, you're not relying on any
22 dosage disclosures from Stowers 2008; are you?

23 MR. BREGMAN: Objection.

24 Q. For context, here, the claim requires that
25 "the coating material can be effectively patterned with

1 UV radiation or EUV radiation at a dose no more than 100
2 millijoules per centimeter squared"; right?

3 A. That is what it says, yes.

4 Q. And you're not relying on a particular dose
5 disclosed in Stowers 2008 that's below 100 millijoules
6 per centimeter squared; are you?

7 A. I'm just looking at this to see if I put that
8 in here. So I have to go back and look at the Stowers
9 to see what he says about exposure dose because I don't
10 remember.

11 Q. I think if you look at Figure 3-7 on page 80,
12 it's one page where exposure is mentioned.

13 A. Yeah, that was for the EUV where they messed
14 up the processing, but for -- what about the UV?

15 Q. If you look at Figure 3-2 on page 75.

16 A. What did I do? Oh, I messed up here. This is
17 66. I'm going the wrong way here. I'm sorry. Which
18 page?

19 Q. 75 on the bottom numbers, and I think maybe
20 that's your declaration, and that's Stowers, so you've
21 in the wrong document.

22 A. Right. This is the wrong one. Sorry.
23 Getting them messed up. Okay.

24 Q. So you see 3-2?

25 A. What did I do? Put that over there? I can

1 put it over here. So this is page 78. You said page
2 60 --

3 Q. 75 on the bottom numbers?

4 A. 75. Sorry. Okay. That's what I was looking
5 for.

6 Q. Yeah. So you recall --

7 A. Oh, you're right, so --

8 Q. -- when we were discussing this one?

9 A. Yeah. They did not put in the actual dose
10 here.

11 (Reporter clarification.)

12 A. Oh, I'm sorry. They did not actually put in
13 the dose because they said they did not know the
14 intensity of the beam of the exposure light, so they
15 just have time.

16 Q. So then back at your declaration at
17 paragraph 123. So here, you're not relying on any
18 disclosure in Stowers 2008 as meeting this limitation,
19 right, for the dose?

20 A. He does not disclose the dose he used for the
21 zirc for UV, and the EUV was much higher because the
22 processing was messed up.

23 Q. Right. And instead, here, you're relying on
24 the teachings of the '564 patent; is that right?

25 A. I believe so.

1 Q. And the reason that you say that that is
2 acceptable is because like the -- I'm in paragraph 124.
3 "Like the ZircSOx and HafSOx films of the '564 patent,
4 the ZircSOx and HafSOx films of Stowers 2008 necessarily
5 can be effectively patterned with UV radiation or EUV
6 radiation at a dose of no more than 100 millijoules per
7 centimeter squared because they are the same films
8 composed of the same components"; right?

9 A. Correct. So --

10 Q. So the basis for this isn't based on a
11 teaching in Stowers 2008, but instead, that the films
12 are identical; right?

13 A. Right. The films are identical. Thus, if it
14 works in '564, it is likely the millijoules they were
15 using for his work since he didn't know what they were.

16 Q. Okay. I'd like to turn next to Stowers 2008
17 obviousness section, which starts on page 66. It's
18 ground 3, and then if we can turn to paragraph 130. On
19 page 69, it's till paragraph 130.

20 A. Okay.

21 Q. You're including a picture from Exhibit 1013
22 supporting as your theory of obviousness, but
23 Exhibit 1013 is after the priority date; isn't it?

24 A. This example is from after the priority date,
25 I think. I don't know. I'd have to go look at the date

1 on this Inpria. It's a presentation. It says at the
2 top, "2010 International Symposium."

3 Q. I'm handing the witness what has been
4 premarked for identification as Exhibit 1013.

5 A. Yeah. So it's 2010.

6 Q. Okay. So this is October 20th, 2010; right?

7 A. Right.

8 Q. And then, if you look at the '564 patent, the
9 earliest priority date, which is on the second page of
10 the patent, it says June 1st, 2010?

11 A. Okay.

12 Q. So why does this support your argument of
13 obviousness if it came after the priority date?

14 A. Maybe -- so repeat your question, please.
15 Sorry.

16 Q. So this paper is dated after the priority of
17 the patent, so it wouldn't have been available to a
18 person of skill in the art; right?

19 MR. BREGMAN: Objection.

20 A. It would not be available at the -- this --
21 that doesn't mean that they didn't have the information,
22 but yes.

23 Q. Technically, it means they didn't have the
24 information, right, because as a June 2010 person,
25 right, from the '564 patent?

1 A. So one question I would have is when they did
2 they submit the paper for the extreme UV lithography,
3 not when was it presented, but when was it submitted?
4 Do you know? Because they often make you submit it six
5 months before you present. SPIE, in particular, does
6 that.

7 Q. Would you equate submission date to the date
8 that it's available to the public?

9 A. I guess not to the public, but to a heck of a
10 lot of people who are reviewing it, so it's -- if
11 someone found it interesting, they could share it,
12 but...

13 Q. Did you include any information showing that
14 this document was publicly available before --

15 A. No, I just -- I'm just saying that -- yeah.

16 Q. Okay.

17 A. So if you're saying the date that it -- that
18 they presented it, then yes, it is after the priority
19 date.

20 Q. But in general, the reason that you're relying
21 on this seems to be related to pattern collapse; right?

22 A. Correct.

23 Q. What is pattern collapse?

24 A. It's a well-known thing that happens in
25 photoresist, so if the photo -- photoresist structures

1 are -- have a certain aspect ratio when you develop
2 them, a lot of times, there's electrostatic charge, if
3 you will, that pulls them together and they fall over,
4 and so making them shorter is one way to get around it.
5 Changing other parameters can also change that.

6 Q. Okay. So this --

7 A. So it is something that's been known --
8 pattern collapse is not new.

9 Q. But this is, you said, related to the aspect
10 ratio, so my understanding of that is if it is too tall
11 and skinny, it might fall over. Is that a way to say
12 that?

13 A. Tall -- tall, skinny, and too close together.
14 So if they were tall and skinny and falling apart, they
15 wouldn't have enough charge to suck them together. So
16 it has to do with the height and the distance.

17 Q. So it has to do with feature dimensions of
18 what you're patterning; right?

19 MR. BREGMAN: Objection.

20 A. The -- the height, the width, and the spacing.

21 Q. So if you're patterning one etch in -- in a
22 straight line without making any sort of a beam, pattern
23 collapse might not be so relevant to you; would it?

24 MR. BREGMAN: Objection.

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

1 Q. If you were just patterning, you know, one
2 trough rather than multiple lines, pattern collapse
3 probably wouldn't be an issue; would it?

4 MR. BREGMAN: Objection. Incomplete
5 hypothetical.

6 A. So I just was looking at this, and the one
7 that's collapsing here is the chemically amplified
8 resist, so it's a different resist than the metal oxide
9 that's thinner. So that's an organic, chemically
10 amplified resist at the top.

11 Q. Okay. But the --

12 A. So that's been known for a while, the pattern
13 collapse, that's -- knowing that theirs would not do
14 that would be new, but the one above is something that
15 we could find other -- I could go find other evidence to
16 show that pattern collapse is a problem for a while.

17 Q. Right. But pattern collapse is only a concern
18 for certain features like we were talking earlier about?

19 A. For certain pattern dimensions.

20 Q. Certain pattern dimensions?

21 A. Dimensions and spacing.

22 Q. Right. And that might be an issue that would
23 want you -- would have motivated a person of skill in
24 the art to make the resist thinner; right?

25 A. Or change the spacing. So some people will

1 make the spacing wider and then put two sets in so that
2 eventually they have two exposures, essentially.

3 Q. Okay. So there's other ways to mitigate --

4 A. There's other ways to mitigate that.

5 Q. And there's other features -- or other
6 characteristics to consider when planning a resist
7 thickness; right?

8 MR. BREGMAN: Objection. Form.

9 A. Can you state that again?

10 Q. I'll give an example. So depending on what
11 developer you're using and the resistance, chemical
12 resistance to that developer, it might be helpful to
13 have a thicker resist so that way, you can etch deeper;
14 is that right?

15 MR. BREGMAN: Objection. Form. Incomplete
16 hypothetical.

17 A. You could -- you could -- so the pattern
18 collapse is dependent on many things, includes the type
19 of photoresist -- organics and the photoresist
20 chemically amplified organic resist as well as the
21 developer, so it's just many other things that get
22 involved in it, so...

23 Q. But there are other reasons that a person of
24 skill in the art might not want a resist film to be as
25 thin as possible; right?

1 MR. BREGMAN: Objection. Form.

2 A. People choose resist thicknesses for many
3 reasons, so it could do with an ion implant or something
4 like that, so yeah. I mean, obviously, for different
5 process steps, they use different -- they might use
6 different photoresist thicknesses.

7 Q. Turning to paragraph 131, here you state,
8 "Given the ease with which film thicknesses can be
9 varied, e.g., by adjusting spin rates and times," and
10 then I'll skip the citation, "finding an optimum
11 thickness range to mitigate pattern collapse would have
12 required nothing more than routine experimentation."

13 So here, you're saying that is easy for a
14 person of skill in the art to vary film thicknesses?

15 A. It is, yes, as I understand it with at least
16 the resists I'm used to working with.

17 Q. So how is that not inconsistent with your
18 argument that the inventor did not possess a thickness
19 range of 5 to 30?

20 A. It -- so my point is that you can choose what
21 thickness you think is important, but as far as I can
22 see in the claim, there is nothing in here that explains
23 why one would claim the 5 to 25 or whatever it is, 5 to
24 30.

25 Q. 5 to 30, I think, for this claim.

1 A. Okay. So I just don't see anything that says
2 this is the optimum and why. So, yes, people can pick,
3 and it's for different applications, what thicknesses
4 they want.

5 Q. So your understanding is that a POSA could
6 have done that? They could have made films 5 to 30
7 thick; right?

8 A. They could have made them 5 to 10, 5 to 25.
9 There's a whole range of different things people could
10 do.

11 Q. Right. But you're point is that the
12 specification needed to tell a POSA --

13 A. Why.

14 Q. -- why?

15 A. Yeah. Why would it be 5 to 30? What's
16 special about 5 to 30? Especially since earlier they
17 claimed all sorts of different thicknesses you can use,
18 which is what we're used to.

19 Q. Did the specification say why thicknesses
20 below 250 microns -- or 250 nanometers was special, as
21 in column 14 --

22 A. I don't remember.

23 Yeah. It says that you can do no more than
24 about 1 microns. Others, no more than about 250. In
25 additional embodiments, 1 nanometer to 50, et cetera.

1 And it says a person skilled in the art will recognize
2 the additional ranges of thicknesses within the explicit
3 range that are contemplated. So that just says, hey,
4 this is my application, and this is the thickness I
5 think I want, so I don't see anything that says why it
6 would pick particularly that range.

7 Q. But it doesn't also say why you would pick
8 particularly 1 -- about 1 nanometers to about 50
9 nanometers; does it?

10 A. No, it doesn't, but it does specify that. I
11 mean, it does say that in here, and it does say 1 to 40.

12 Q. So your opinion is that explicitly specifying
13 them is enough?

14 MR. BREGMAN: Objection. Mischaracterizes
15 testimony.

16 A. Yeah. I don't really understand that.

17 Q. So you would say that the inventor had
18 possession of about 1 nanometers to about 50 nanometers;
19 right?

20 A. That's a good question. It says, "In
21 additional embodiments." Does that mean that he
22 actually made some photoresist that was 1 nanometer
23 thick? I don't know what that means. I don't know the
24 legalese, or does he just, as an embodiment, say you
25 could do that. 1 nanometer is pretty thin.

1 THE CERTIFIED STENOGRAPHER: Want to go off
2 the record? Let's go off the record for a moment.

3 (Recess.)

4 BY MR. WOLFE:

5 Q. Next, if we could turn to paragraph 135. And
6 this is the section regarding claim 7 that has to do
7 with "the coating material has high absorption of UV
8 radiation relative to conventional radiation-based
9 assists."

10 A. Okay.

11 Q. And this is in the obviousness section of
12 Stowers 2008, ground 3.

13 So in paragraph 135, you argue that this
14 ability to absorb UV radiation is an inherent property
15 of a material itself. This opinion is based on the
16 films being the same between Stowers 2008 and the '564
17 patent; right?

18 A. That is correct.

19 Q. And then in 136, you're saying, "to the extent
20 it's not inherent, this limitation would have been
21 obvious to a POSA"; right?

22 A. That is what I put in here, yes.

23 Q. And below, it seems like the reasons that
24 you're giving for that have to do with particular
25 densities?

1 A. That is correct.

2 Q. And here, you're saying that Stowers
3 2008 points out and -- assuming a density of 4 grams per
4 centimeter square of ZircSOx and 5 grams per centimeter
5 squared of HafSOx; right?

6 A. Yes.

7 Q. And your logic goes because those are higher
8 than the densities of HSQ and PMMA, that HafSOx and
9 ZircSOx resists would have high absorption of UV
10 radiation relative to conventional radiation-based
11 resists; right?

12 A. That is correct.

13 Q. Why is it the case that a higher density
14 necessarily means higher absorption?

15 A. I believe that is explained -- I have to go
16 back and remember them. Pretty sure that's explained,
17 that I read it in one of these things --

18 Q. I think if --

19 A. -- explained it.

20 Q. On the next page, perhaps?

21 A. I'm sorry. I didn't hear you because I made
22 too much noise.

23 Q. On the next page, perhaps, is something that
24 you're describing?

25 A. Oh.

1 Q. Is this what you were looking for?

2 A. I will look at it and see. Yes. So this must
3 be what I was using.

4 Q. Handing to the witness what has been premarked
5 for identification as Exhibit 1025.

6 Do you recognize this document?

7 A. I think so. It's been a few months.

8 Q. Did you review this document in preparation
9 for the deposition?

10 A. I can look and see if it's in my list, then I
11 did, yes.

12 Q. For the deposition, not necessarily for
13 preparing --

14 A. Oh, for deposition. No, I have not looked at
15 this since I did the other work.

16 Q. Okay --

17 A. Oh, I do remember this with that list of
18 calculated polymers.

19 Q. And then, if you turn to page 4, I believe
20 that's the same as the figure that you included --

21 A. That's correct.

22 Q. -- in paragraph 136; right?

23 A. Yeah, yeah.

24 Q. Okay. And here, it shows a calculated linear
25 absorption coefficient versus calculated density; right?

1 A. Yes.

2 Q. And generally, the trend is linear, pointing
3 in the upwards and rightwards direction; right?

4 A. Yeah.

5 Q. So why does this show that greater density
6 necessarily equates to a higher UV absorption?

7 A. Because it has a higher linear absorption
8 coefficient.

9 Q. But that's not necessarily true comparing any
10 two individual points; is it?

11 MR. BREGMAN: Objection. Form.

12 A. So for extreme UV, so this was done for EUV,
13 it says 13 nanometer exposure, so one of the most
14 important parameters in the design of the photoresist
15 for this type of lithography is absorption coefficient
16 of the polymer because if the polymer is not transparent
17 enough, the resist pattern will deteriorate.

18 Q. Great. But just looking at Figure 3, if you
19 will, for a moment, in your paragraph 136, you put a red
20 box around PMMA.

21 Do you see that?

22 A. Uh-huh.

23 Q. And then do you see poly-hydroxystyrene?

24 A. Yeah.

25 Q. That one is below PMMA in calculated linear

1 absorption coefficient; isn't it?

2 A. Yes, it is.

3 Q. And it's slightly to the right in terms of the
4 density; isn't it?

5 A. I can't tell if it's to the right or below.
6 Let me look it up in here. He lists all of these.

7 Okay. So it says the trend is generally
8 linear, so -- and here it is. It says, "For fluorinated
9 polymers, the calculated coefficient is larger than
10 expected from the trend line. This is because the
11 atomic absorption of fluorine at 13 nanometers is larger
12 than that for the other atoms."

13 So there are certain elements that might be in
14 these things that would cause them to have different
15 responses.

16 Q. Okay. So it's not necessarily the density
17 alone that governs the EUV absorption; right?

18 MR. BREGMAN: Objection. Form.

19 A. It is one of the most common -- if you look at
20 that, the majority of them fall on the line, and only if
21 they have certain elements in them that have different
22 absorption of the EUV is it affected.

23 Q. Right. So sometimes if they have different
24 absorption of the EUV, they can be above the trend line;
25 right?

1 A. Yes, or below.

2 Q. Or below, which means that in this chart,
3 comparing two points, one cannot say, necessarily, that
4 if it has a higher density, it will have a higher linear
5 absorption coefficient; does it?

6 MR. BREGMAN: Objection.

7 A. In general, the trend is if it has a higher
8 density, it will have a higher absorption. That is what
9 this teaches us.

10 Q. Right. But if we're looking back at the
11 poly-hydroxystyrene, if you look at the dot to the right
12 of that, the white dot to the right of that, that is to
13 the right of the PMMA dot; isn't it?

14 A. So they're both lower than the PMMA.

15 Q. Right. But with an equal to or higher than
16 density?

17 A. Well, my only conclusion is unless there's a
18 particular atom involved in the polymer that is changing
19 significantly the absorption, it should match this line,
20 which is -- which is how it moves.

21 Q. Right. But some of the dots aren't matching
22 that line, though; right?

23 A. Correct.

24 Q. So if you look at -- I'm losing pages. If you
25 look at page 3 of Exhibit 1025, in that first paragraph,

1 it talks about the trend explained by the equation 1.

2 A. Am I on page 3? I am.

3 Q. It's on the right side sort of in the middle
4 of that first paragraph after the --

5 MR. BREGMAN: I'm a little lost. Which
6 page --

7 MR. WOLFE: Page 3 of Exhibit 1025.

8 THE WITNESS: Point at me which one. Oh, it
9 is down here on the bottom right. I was looking -- I
10 was looking up here.

11 MR. BREGMAN: Are you looking -- oh, a plot --
12 where it says "a plot."

13 MR. WOLFE: Yes.

14 A. A plot of the calculated linear absorption
15 coefficient.

16 Q. Right. And then that's the plot that we were
17 looking at; right?

18 A. Uh-huh.

19 Q. And then it's referring to "this trend is
20 explained by the equation 1," right, sort of in the
21 middle? Do you see that?

22 A. Yeah.

23 Q. Then can you turn back to equation 1 on
24 page 2? So here, it says U1 is the linear absorption
25 coefficient; right?

1 A. Uh-huh.

2 Q. And that's calculated as a function of ρ ,
3 which is the mass density of absorption; right? And
4 that's the trend that we were talking about before.
5 Generally, as density goes up, it would seem to indicate
6 a higher linear absorption coefficient, but not always;
7 right?

8 MR. BREGMAN: Objection.

9 A. So if it's not going to match this trend, then
10 we should have a reason why it doesn't.

11 Q. Yeah. And then if you look at the equation
12 one still later, there's also A is part of the
13 calculation of the linear absorption coefficient, and
14 that's the atomic weight?

15 A. Uh-huh.

16 Q. So that also plays a role in addition to the
17 density; right?

18 A. Yes, it does.

19 Q. And then if we can turn to Exhibit 1013,
20 that's that slide show that we were on previously. It's
21 the one with the --

22 A. The Inpria thing.

23 Q. Yeah, if you can turn to slide 12. So you see
24 this is discussing EUV photo absorption; right?

25 A. Yes.

1 Q. Have you seen a graph like this before that's
2 showing EUV absorption versus atomic number?

3 A. No, I did not look at this. Very interesting.

4 Q. So what generally this shows is that atomic
5 number can increase, but not necessarily the EUV
6 absorption; right?

7 A. I'd have to go in and write down what all the
8 elements are for the numbers. I don't off the top of my
9 head have those so I could understand, if this one
10 absorbs 13 nanometers at a higher rate -- so I'd have to
11 really understand this, go back and evaluate this.

12 Q. But generally you can see that the trend here
13 is not linear; right?

14 MR. BREGMAN: Objection.

15 A. In groups it is, so...

16 Q. But it's not the case that necessarily as you
17 increase atomic number, EUV absorption will increase,
18 based on this; right?

19 MR. BREGMAN: Objection.

20 A. This shows ups and downs.

21 Q. Okay. And then if we could turn to
22 paragraph 138. This is in the same section about EUV
23 absorption and obviousness of Stowers 2008? Here you're
24 relying on Exhibit 1022; right?

25 A. Correct.

1 Q. I'm handing the witness what has been marked
2 for identification as Exhibit 1022.

3 Do you recognize this document?

4 A. Yes, I do.

5 Q. Okay. What is this document?

6 A. This is a presentation, again, to the SPIE
7 conference from 2011.

8 Q. So this is another conference paper?

9 A. Yes.

10 Q. And it's dates on the front 2011; right?

11 A. Correct.

12 Q. Which would be after the priority date of '564
13 patent?

14 A. '564, correct.

15 Q. So this would not have been available to a
16 POSA at the time of 2010?

17 MR. BREGMAN: Objection.

18 (Reporter clarification.)

19 A. Oh, I said '564.

20 Q. It would not have been available at the time
21 of the filing of the '564 patent priority date; right?

22 A. To the people outside of the presenters, this
23 wouldn't be available.

24 MR. BREGMAN: Please, wait for me to object,
25 please.

1 A. Oh, I'm sorry. I thought you did.

2 MR. BREGMAN: Objection.

3 THE WITNESS: Now I don't remember the
4 question because I got so distracted.

5 (Record read.)

6 BY MR. WOLFE:

7 Q. And you're relying on this one for showing
8 that the coating material has high absorption of EUV
9 radiation relative to conventional base resists, right,
10 the claim limitation?

11 A. Yeah, paper describes metal oxide patentable
12 hard masks for EUV.

13 Q. But this document, unlike some of the other
14 Stowers documents we're looking at, doesn't describe how
15 it's making its resists; does it?

16 MR. BREGMAN: Objection. Relevance.

17 A. I guess someone who knows what Inpria was
18 doing would be able to contact them, but they do not
19 list what they're doing.

20 Q. Right. So a disclosure in here that this
21 resist has high EUV absorption would not necessarily
22 translate to Stowers 2008 unless the films were the
23 same; right?

24 MR. BREGMAN: Objection. Form.

25 A. Sorry. It's been a while. Well,

1 interestingly, the diagram representing simplified
2 exposure mechanism is very -- very similar to that.
3 It's got the ligands with -- with peroxide in them.
4 Peroxide ligands.

5 So if I look at Figure 1, I would say, "Oh,
6 hafnium and peroxide ligands." So it doesn't talk about
7 the concentrations of each but it does show a picture
8 showing the peroxide ligands.

9 Q. Okay. But like you're saying, it doesn't show
10 the concentrations of the precursor solution?

11 A. I have not found that yet. It doesn't say
12 what chemicals they mixed together to make this, which
13 doesn't surprise me.

14 Q. Okay. It doesn't say what chemicals they used
15 to mix it; right?

16 A. So, no, they do not close the concentrations.

17 Q. They do not disclose the chemicals either, do
18 they?

19 MR. BREGMAN: Objection.

20 A. Well, they disclose that they're using hafnium
21 and peroxide ligands by showing that picture.

22 Q. Right. But they don't say, like in Stowers
23 2008, for example, "hafnium oxychloride"; right?

24 A. They do not say that.

25 Q. So you don't know necessarily what the

1 precursor solutions were used for this paper; right?

2 A. Well, if one saw Stowers' name and Keszler's
3 name on this and they saw the hafnium and the peroxide
4 and they had access to his 2208, think it would be
5 pretty obvious what the mix was.

6 Q. Okay. So there might be someone that might
7 make an assumption that they would be the same --

8 A. Yes.

9 Q. -- but there's nothing in this document --

10 A. They don't -- they don't state that it is.

11 Q. And to be clear, this only recites hafnium;
12 right? It doesn't have zirconium?

13 A. Correct.

14 Q. And by this, I mean Exhibit 1022; right?

15 A. Correct.

16 I did not see anything but hafnium in here.

17 Q. Okay. Turn to paragraph 145. This, again, is
18 about the dose limitation for claim 12. If you look at
19 page 76 --

20 A. I hate to take you back in a second, but
21 Inpria does say it's -- it's metal SOx resist --

22 Q. Okay.

23 A. -- which would infer that it has the sulfate
24 as well.

25 Q. Okay. So you can infer that it's metal and

1 sulfate and hafnium --

2 A. Peroxide, yeah.

3 Q. -- but not the precursor solutions?

4 A. (No audible response.)

5 Q. Right?

6 A. Okay.

7 Q. Yes?

8 A. Correct.

9 Q. Okay. Thanks.

10 Then, back at paragraph 145, and this is about
11 the UV -- or UV or EUV radiation dose of no more than
12 100 microjoules per centimeter squared.

13 And here, it looks like you're pointing at
14 Stowers 2008 at page 89; is that right?

15 And that is in Chapter 4 of Stowers 2008;
16 isn't it?

17 A. I'm guessing it's page 105 on our version of
18 the numbers.

19 MR. BREGMAN: Which one? Sorry.

20 MR. WOLFE: It's page 89 on the Stowers 2008
21 on the bottom right.

22 A. Oh, on the bottom. Okay.

23 Q. Yeah. 73 on the top right.

24 A. Oh, sorry. 83.

25 Q. 89. Sorry.

1 A. Oh.

2 Q. It should say "depending on the developer
3 used" as the first few words.

4 A. I'm getting the pages messed up. Hold on.
5 You said it was 89?

6 Q. Yes.

7 A. Okay.

8 Q. And I believe you're quoting from the last
9 paragraph, the first couple sentences.

10 Does that look right?

11 A. Yes.

12 Q. And here, Stowers is discussing ZircSOx,
13 right, not HafSOx?

14 A. Yes, he has ZircSOx here.

15 Q. And he's mentioning that, as you're quoting,
16 "observed that 16 nanometer-wide isolated features can
17 be patterned at a dose of 112 microcoulombs per
18 centimeter squared"; right?

19 A. That is what he put in there, yes.

20 Q. And that dose would equate to an electron
21 beam; right?

22 A. Yes. That's e-beam.

23 Q. And if you look at Chapter 4 of Stowers 2008,
24 isn't that all about electron beam?

25 MR. BREGMAN: Objection. Form.

1 A. So I can't tell where the chapter is.

2 Q. Yeah. Chapter begins at page 81.

3 A. Okay. You said which page again? Sorry.

4 Q. No worries.

5 81.

6 A. Okay. That's Chapter -- so what's the page
7 you want to look at after the start of Chapter 4?

8 Q. 89.

9 A. Okay. Got that here. So, yeah -- so...

10 I can't find page -- 85, 87, 89.

11 You said -- what was it again? I'm so sorry.

12 Q. 81, I believe, is the first page of Chapter 4.

13 A. Yeah. And then, the one you wanted to look
14 at was --

15 Q. 89.

16 A. 89.

17 Q. Is the one that's quote in your paragraph --

18 A. So it does in here -- it does say this is
19 novel inorganic resists --

20 (Reporter clarification.)

21 A. Novel inorganic resists for nanometer scale
22 patterning.

23 Q. Okay.

24 A. So it doesn't say specifically it's just EUV.

25 Q. Sorry. Electron beam is what I was asking.

1 Not EUV.

2 A. E-beam. It's not e-beam specific.

3 Q. Okay.

4 A. It says "nanometer scale patterning." So does
5 not say e-beam specific for this.

6 Q. But then, if you look at the next page,
7 page 82, you'll see, sort of, in the middle of the
8 paragraph, it says, "An electron beam exposures at
9 30keV, dosage 0 was as low as" -- and then it goes on.

10 So that's talking about electron beam; right?

11 A. It's the middle of page, you say?

12 Q. Uh-huh.

13 A. Yeah. It says, "Their versatility is
14 demonstrated by exposure sensitivity to essentially any
15 energy source: Photo, EUV, X-Ray, and electron beam.
16 In electron beam exposures, 30keV a dose to gel as low
17 as 4 microcoulombs per square centimeter, and a contrast
18 of three have been observed."

19 Q. Okay. And if you turn to page 83, the
20 introduction.

21 A. All right. I'm sorry.

22 Okay.

23 Q. And generally, this talks about "using a
24 high-energy electron beam" --

25 A. Yes.

1 Q. -- and then it mentions that "many other types
2 of lithography are dependant on the flexibility and
3 resolution of electron beam lithography to produce the
4 masks and templates necessary for the implementation";
5 right?

6 A. Yeah. Particularly for the masks.

7 Q. So in general, it seems like this chapter is
8 about e-beam; right?

9 A. Except for the fact that at the beginning, it
10 does say you know, "photo, EUV, X-Ray, and e-beam."

11 Q. It says those are dependant on flexibility and
12 resolution of electron beam lithography; doesn't it?

13 Oh, you're saying in the previous page?

14 A. Yeah. "Their versatility is demonstrated by
15 exposure sensitivity to any energy source."

16 Q. Okay.

17 A. So that's in the abstract, so it should be
18 included in the paper -- in this part.

19 Q. Okay.

20 A. In this section.

21 Q. Okay.

22 THE CERTIFIED STENOGRAPHER: Counsel, whenever
23 you get to a good point, if we could take a one-minute
24 restroom break.

25 MR. WOLFE: Yeah, yeah. I think we're, kind

1 of, in a weird place now, so it's fine. Yeah.

2 THE CERTIFIED STENOGRAPHER: Are you sure?

3 MR. WOLFE: Now is -- is fine. Now is good.

4 (Recess.)

5 THE WITNESS: So when you were asking me is --
6 did this one paper, and I was like, I thought I had it
7 in here, and it does say in here, "By combining the
8 metal oxide precursors described in both" --

9 MR. BREGMAN: Sorry. Which page are we
10 talking about?

11 THE WITNESS: Oh. It's the Exhibit 1022.
12 Exhibit 1022.

13 So I -- I was thinking that did have that in
14 here and I did go up here, the metal oxide resist
15 platform.

16 MR. BREGMAN: What page? Sorry. I'm lost
17 still. What page are you on?

18 THE WITNESS: 3.

19 MR. WOLFE: Okay.

20 MR. BREGMAN: Where?

21 THE WITNESS: So it says "By combining" -- so
22 it's Inpria's films for compare of sol-gel deposition,
23 metal oxides," et cetera. And then, it says, "combining
24 metal oxide precursors directly patternable." And it
25 goes on here somewhere. I just saw this. I just read

1 it.

2 Oh, here it is: "EUV photons lead to the
3 generation of secondary electrons, which subsequently
4 break the peroxide bonds." So they do have that
5 information in here. And I thought I read that it had
6 the combination of... I must be getting too tired. I
7 know I read it.

8 But anyway, so I just wanted to add that, that
9 they do talk about that here, what's in the --

10 Q. Okay. So in Exhibit 1022 --

11 A. Yeah.

12 Q. -- it talks about that?

13 A. Yes.

14 Q. Okay. Okay. So let's turn back to
15 paragraph 145, if we could, of your declaration.

16 A. Okay. Just give me one moment. I'm sure I
17 read that here. I was going through and cleaning up my
18 stuff. Sorry.

19 Okay, sir.

20 Q. Okay. So looking at paragraph 145, there was
21 a quote you had from Stowers 2008 regarding ZircSO_x and
22 electron beam lithography; right?

23 A. Uh-huh.

24 Q. And here, you quote him as saying, "Observed
25 that 16 nanometer-wide isolated features can be

1 patterned at a dose of 112 microcoulombs per centimeter
2 squared"; right?

3 A. Correct.

4 Q. And like we established, that's an e-beam dose
5 unit; right?

6 A. That's correct.

7 Q. And if you look on the previous page, this
8 claim limitation is listed in 100 microjoules per
9 centimeter squared; right?

10 A. On the previous page here?

11 Q. On the header.

12 A. And then, it says here that 249 microcoulombs
13 per squared centimeter for their MSOx has been well
14 characterized to correspond to EUV dose of 25
15 microjoules per square centimeter.

16 Q. Right.

17 A. So he's doing a comparison there.

18 Q. So I'm just talking about the first sentence.

19 A. Okay.

20 Q. It's discussing Stowers 2008.

21 And the portion that you're relying on is
22 regarding an e-beam dose; right?

23 A. That is an e-beam dose.

24 Q. And the claim limitations recites a UV or EUV
25 dose in microjoules per centimeter squared; right?

1 A. Yes.

2 Q. And like you were saying just now, how you are
3 trying to bridge that gap is through a subsequent
4 publication by Stowers; right?

5 A. Uh-huh.

6 Q. And that's Exhibit 1022; right?

7 A. What does that say?

8 Q. It's in the middle of that paragraph.

9 A. It does say 1022, yes. Okay.

10 Q. And then, that's the document we were just
11 looking at; right?

12 A. Correct.

13 Q. Okay. And the statement from Stowers 2008
14 regarding that e-beam dose from that first sentence was
15 regarding ZircSOx films; right?

16 A. Yes.

17 Q. And then, if you look at Exhibit 1022 at 7, at
18 the bottom, this is the part that you're quoting in your
19 paragraph 145; right?

20 A. That is correct.

21 Q. And to be clear, it says, "This dose has been
22 separately well characterize to correspond to an EUV
23 dose of 25 microjoules per centimeter squared; right?

24 A. That is what it says, yes.

25 Q. And this article is discussing HafSOx; isn't

1 it?

2 MR. BREGMAN: Objection.

3 Q. For instance, I think we were referring to
4 Figure 1 previously on page 4 which shows the exposure
5 mechanism; right?

6 A. Interestingly, except for that figure, they do
7 not specify that the Inpria resist has hafnium.

8 Q. But in the figure, they do; right?

9 A. It says, "Diagram representing a simplified
10 exposure mechanism for Inpria resist."

11 Q. I think, if you can turn to page 9, do you see
12 under "Impurity Contamination"?

13 A. Yeah.

14 Q. It says, "Since the resist is wholly inorganic
15 with hafnium as a meter constituent" --

16 A. Oh, it does say "hafnium."

17 Q. So this article is referring to the hafnium
18 films; right?

19 MR. BREGMAN: Objection. Form.

20 A. Well, for the contamination, they're looking
21 at the hafnium.

22 Q. Right. And then, the mechanism exposure
23 mechanism in Figure 1 is hafnium too; right?

24 A. Correct.

25 Q. And there's no indication of zirconium in

1 here, is there?

2 MR. BREGMAN: Objection. Form.

3 A. So are you implying that there would be a
4 different comparison in EU -- EUV to e-beam dose
5 depending on the material?

6 Q. I'm just asking if this article directed to
7 hafnium instead of zirconium.

8 MR. BREGMAN: Objection. Form.

9 A. It's directed at the Inpria resist, and they
10 show a picture hafnium. How's that?

11 (Reporter clarification.)

12 A. It's called Inpria resist, and they show
13 hafnium.

14 I'm making that clarification because I have
15 been at conferences where they show something and it's
16 not exactly the right element because they want to hide
17 what they're doing.

18 So it does say hafnium up here, so...

19 Q. And then, at page 9, it says "hafnium"?

20 A. Page 9, it says "hafnium."

21 Q. And then, at page 10, it says "hafnium";
22 right? So if you look at page 10 at the top, sort of,
23 in the middle of that paragraph.

24 A. Can you tell me exactly where it says
25 "hafnium"? Because I'm missing it. On the last page?

1 12? Or are you on page 10?

2 Q. It's on page 10?

3 A. Oh, 10, not 12.

4 Q. And it's three lines from the bottom near the
5 middle. Near the middle of the page -- near the top of
6 the page.

7 A. Oh, I was looking at the bottom paragraph.

8 Q. Sorry. I misspoke. It's here.

9 A. Oh, up there. Oh, there's the word "hafnium."
10 Okay.

11 "This may be a result of spectral" --

12 THE CERTIFIED STENOGRAPHER: Just to -- so
13 either you got to read loud for me and clearly so I can
14 hear you --

15 THE WITNESS: Oh, sorry.

16 THE CERTIFIED STENOGRAPHER: -- or you got to
17 read t yourself because I can't discern when you mean to
18 be on the record or not.

19 A. Okay. So I found it. It says, "This may be a
20 result of spectral overlap caused by the relatively high
21 concentration of hafnium."

22 Q. So it's another reference to hafnium?

23 A. Of hafnium, yes.

24 Q. And then, I think maybe the best one is on
25 page 3. If we look at the last full paragraph on page 3

1 above where it says Table 1, and then it says, "For the
2 current generation of Inpria EUV resist, we have
3 selected hafnium" --

4 A. Oh, it does, yeah.

5 Q. So this article is about hafnium?

6 A. Okay.

7 Q. Right?

8 MR. BREGMAN: Objection. Form.

9 Q. Would you agree that this article is about
10 hafnium?

11 A. This article is referring to hafnium as the
12 photoresist metal.

13 Q. Okay. And then, looking back at your
14 declaration at paragraph 145, as a reminder, this was
15 looking at the e-beam dose for zirconium, ZircSOx;
16 right?

17 A. Yeah, Stowers 2008 ZircSOx e-beam.

18 Q. So is there -- what would the basis be for
19 equating this correlation for an e-beam dose to an EV
20 dose for HafSOx to ZircSOx?

21 MR. BREGMAN: Objection. Form.

22 A. So the two elements are very close on the
23 periodic table. They have very similar characteristics;
24 thus, the reason they're both being used.

25 So I think a person of ordinary skill could

1 look at this and say it will be in the general range.
2 May not be exactly 25 microjoules, but it would be in
3 the range for hafnium.

4 Q. Have you heard of a conversion between e-beam
5 dose and EUV dose before?

6 A. I don't remember. I'd have to a look.

7 Q. But it's not something that you remember
8 hearing about; right?

9 A. Yeah, but my memory for those months ago is
10 quite a ways, so doesn't mean I didn't hear it because I
11 don't remember.

12 Q. And before, you said the -- the -- it might be
13 in the same general range.

14 What did you mean by "same general range"?

15 MR. BREGMAN: Objection. Form.

16 A. They are near each other in the periodic
17 table, so, therefore, they probably have similar -- as
18 an example, they're both use for high-k dielectric
19 materials, so they have very similar properties.

20 Q. So they have similar properties, but that
21 doesn't necessarily mean that this correlation would
22 directly translate to a different element; does it?

23 MR. BREGMAN: Objection. Form.

24 A. And I did not say it would directly, but it
25 would be close enough that one would think that if EUV,

1 say, 25 microjoules, it would probably that if you're
2 doing hafnium, it would be certainly a hundred or less.

3 Q. Sitting here today, can you tell me how close
4 the correlation would be?

5 A. No, I can't. I'd have to --

6 MR. BREGMAN: Objection. Form.

7 A. -- have to go look.

8 Q. What would the basis for figuring out the
9 correlation be?

10 MR. BREGMAN: Objection. Form.

11 A. I'd go check what's in the literature and see
12 if there's anything different in the literature.

13 Q. But you don't recall, sitting here today, that
14 you had previously seen an equation comparing the EUV
15 dose to e-beam dose?

16 MR. BREGMAN: Objection. Form.

17 A. My problem is, I don't recall but I also, sort
18 of, recall. So I believe I did have something but I
19 don't remember where it was or what I found. So I'd
20 have to go dig it out for you, and I'm willing to go do
21 that.

22 Q. In this quote from Stowers 2008, he says,
23 "ZircSOx films were exposed to determine the highest
24 resolution obtainable with our 30keV electron beam
25 lithography system and observed that 16 nanometer-wide

1 isolated features can be patterned at a dose of 112
2 microcoulombs per centimeter square."

3 What are "isolated features" there?

4 A. Well, where are you reading it? I'm sorry.
5 In my disclosure? In my --

6 Q. Further down --

7 A. Okay.

8 Q. -- paragraph 145?

9 A. E-beam done. Oh, actually, it's at the very
10 top.

11 So, yeah, he quoted -- I'm quoting here: "16
12 nanometer-wide isolated features can be patterned." And
13 so, 16 nanometer-wide means that that -- well, they --
14 he doesn't really explain this, but, typically, it would
15 be a pitch of 32 nanometers.

16 Q. A pitch of 32 nanometers because the features
17 are 16 nanometers wide?

18 A. Yeah. That's typical. That's a standard for
19 photoresist. But I do not know that he meant -- since
20 he's using e-beam, they could be further isolated than
21 what we use in normal photoresist, so...

22 Q. So that's my question, is, what do you mean,
23 "isolated"?

24 A. It's what he means by "isolated."

25 Q. What does he mean by "isolated"?

1 A. I don't know. I'd go back and check.

2 Q. When did a POSA understand he meant
3 by "isolated"?

4 A. I was just explaining. For a POSA for -- if
5 you're talking about printing an image on a wafer. If
6 someone said it was 16 nanometer-wide features, then it
7 would be typically be separated by another 16 nanometers
8 from the next feature.

9 But when he did the e-beam, I'd have to go
10 look at his paper, and I could go do that and see.

11 Q. Yeah. I mean, that's fine. If we look at --

12 A. Okay.

13 Q. It's at page 89.

14 A. Page 89.

15 Q. In the Stowers 2008, on the bottom right.

16 A. I actually have it worked out now, so we can
17 get there.

18 An example of isolated features is shown in
19 Figure 4.3.

20 Q. Can I make a suggestion.

21 A. Yeah.

22 Q. I think that 4.3 is a typo and he meant 4.5.

23 A. Thank you. I'm like, 4.3 doesn't show that.
24 Thank you.

25 Q. You see how it says, "16-nanometer

1 isolated" --

2 A. Oh, yeah. Look at that. So that's quite a
3 space between them. So much larger. So an isolated
4 line is just a single line they printed. Yeah. So I
5 have no idea the space between lines.

6 Q. Okay. And this is --

7 A. So just an isolated feature.

8 Q. And this is one that's at a dose of 112
9 microcoulombs per centimeter; correct?

10 A. That is correct.

11 Q. So this is what a person of skill in the art
12 would have understand to be an isolated feature?

13 A. According to what he has, that's an isolated
14 feature, very isolated feature.

15 Q. And would a person of ordinary skill in the
16 art have expected the dosage for an isolated feature to
17 be more or less than a dense feature?

18 A. I don't know. I'd have to find out what the
19 resist -- I believe -- I don't know off the top of my
20 head.

21 Q. So if we could turn to paragraph 148. This is
22 in ground 4 regarding obviousness over Stowers 2008 and
23 Stowers 2009 for claim 8?

24 A. Okay.

25 Q. In paragraph 148, you're referring to --

1 A. I'm sorry. Let me make sure I understand
2 where claim 8 is.

3 Q. It's the metal to --

4 (Simultaneous speaking.)

5 THE WITNESS: -- metal --

6 (Simultaneous speaking.)

7 BY MR. WOLFE:

8 Q. -- ligand ratio.

9 A. -- to ligand ratio. Okay.

10 THE CERTIFIED STENOGRAPHER: Let's make sure
11 we're talking one at a time or else I can't write it
12 down.

13 A. Okay. So number 8 is the metal to ligand
14 ratio question.

15 Q. Right. And here, it seems you point to
16 Stowers 2009 in the middle of paragraph 148, metal to
17 peroxide ratios of one to 0.5; right? Exhibit 1010 at
18 19.

19 A. Yeah.

20 Q. And the next sentence says that "A POSA would
21 have been motivated to combine Stowers 2008 and 2009
22 because the two prior references are by the named
23 inventors and relate to the same subject matter as the
24 '564 patent; right?

25 A. Yes.

1 Q. But that's not giving a particular reason why
2 a person of skill in the art might want to adjust the
3 metal to peroxide ratios, is it?

4 MR. BREGMAN: Objection. Form.

5 A. Sorry. I think I'm just getting so tired.

6 So 2009, they say that they're using -- the
7 metal to peroxide is one to a half or two metals to one
8 peroxide.

9 Q. Right. And then, if you look above, 2008
10 Stowers says it uses ZircSO_x and HafSO_x film having a
11 metal to peroxide ratio of one to 0.75.

12 A. Right.

13 Q. So the claim here requires a ratio of two
14 metal peroxide to one -- two metal to one peroxide for
15 claim 8; right?

16 A. Metal to -- to peroxide is two to one, yes.

17 Q. And Stowers 2008 doesn't disclose that because
18 it has one to 0.75; right?

19 A. That is correct.

20 Q. And so, we're pointing to Stowers 2009's ratio
21 of one to 0.5, which does meet that; right?

22 A. Sorry. I'm just reading this, and it says
23 that a POSA would have been motivated to combine Stowers
24 2008 and '09 because the two prior art references by the
25 same inventors and relate to the same subject matter as

1 the patent '564. The metal and -- the metal SOx films
2 for EUV, UV, and EV.

3 Q. Right. So here -- you can tell me if I'm
4 wrong -- the -- the argument is that a person of skill
5 in the art would have substituted the metal to peroxide
6 ratio from Stowers 2009 into Stowers 2008?

7 A. That is how I'm reading this.

8 Q. But here, I --

9 A. Or just say it is a range.

10 Q. But here, I'm not seeing any reason why a
11 person of ordinary skill in the art would have wanted
12 less peroxide to metal, which is the direction that
13 that's going?

14 A. I'm sorry. You're not seeing...

15 Q. So the reason that you're substituting Stowers
16 2009 ratio for Stowers 2008, it says in the next
17 sentence, is because the two prior art references are by
18 the same -- by the named inventors and relate to the
19 same subject matter. But that doesn't explain why you
20 would want to use less peroxide.

21 A. Well, if in 2009, he presented something that
22 was slightly different, one that would be perhaps an
23 improvement he's made by making it different.

24 Q. What is that based on, that it's perhaps an
25 improvement?

1 A. Why would he change it? Why would he change
2 it from 2008 to 2009 if it wasn't -- didn't give him an
3 advantage?

4 Q. But that's just assuming that there was an
5 advantage.

6 MR. BREGMAN: Objection. Form.

7 A. I'm -- I don't why he would change it unless
8 it was an improvement.

9 Q. So you're assuming it was an improvement, and
10 that's why someone would have substituted this?

11 MR. BREGMAN: Objection. Form.

12 A. Oh, I -- I'm not assuming. I'm saying that if
13 he changed it -- if I change something, I might -- it's
14 usually because I'm making an improvement in it; I think
15 it's better. Otherwise, leave it the same.

16 Q. Right. Someone would leave -- a person of
17 skill in the art would leave it the same unless they saw
18 a reason that it would improve the substance; right?

19 A. That is correct.

20 Q. Looking on to the rest of that paragraph,
21 you're pointing to statement from the prosecution of the
22 '610 patent; right? At the bottom of page 78.

23 A. Yeah.

24 Q. Here, it say, "Stowers 2008 Chapter 2 overlaps
25 with -- significant with Stowers 2009"; right?

1 A. That is -- yeah, that is what I wrote.

2 Q. What does Stowers 2008 have to do with the --
3 the -- the obviousness argues that you're making here?

4 A. Guess as I'm reading this, so Stowers makes an
5 improvement and updates his presentation in 2009 over
6 his 2008, and so thus he finds -- that's what he puts in
7 the patent.

8 Am I misunderstanding the question? Sorry.

9 Q. Yeah. So I -- I'm moving past the -- sort of,
10 the 2009 into 2008 ratio rationale and moving to, sort
11 of, the last sentence here. It's discussing the --
12 "During the prosecution of the '610 patent, Inpria
13 stated that Stowers 2008 Chapter 2 significantly
14 overlaps with Stowers 2009." And this is in a section
15 discussing obviousness over Stowers 2008 and 2009. But,
16 previously, we haven't discussed anything about Chapter
17 2. So that's why I'm asking, what does Chapter 2 of
18 Stowers 2008 have to do with your obviously opinion?

19 A. Let me see where Chapter 2 is.

20 Q. It begins on page 53.

21 A. So I have to say I don't remember what the
22 overlap is because this is especially relevant to claim
23 8. I'm looking at it.

24 Q. You would agree that so far in this
25 deposition, we haven't talked about Chapter 2, have we?

1 A. No, we have not yet talked about Chapter 2.
2 It's a rather short chapter.

3 Q. And it's discussing a bilayer in Chapter 2;
4 isn't it? If you look at Figure --

5 A. Yes, a bilayer system for patterning.

6 Q. And the technologies we have been talking
7 about so far are not bilayer patterning; right?

8 A. Right.

9 So I will -- do not remember why we put this
10 in here.

11 Q. Okay.

12 A. I'm sorry.

13 Q. Okay.

14 A. I'd have to go back and dig through and
15 understand.

16 Q. I think we can turn to paragraph 152. It's a
17 different section regarding Trikeriotis.

18 A. Okay.

19 Q. In your paragraph 152.

20 A. Okay.

21 Q. And here, the limitation at issue is where the
22 coating materials composes metal ions with
23 radiation-sensitive ligands.

24 Here, you are opining that Trikeriotis
25 discloses coating materials comprising metal ions with

1 radiation-sensitive ligands; right?

2 A. So he discloses an inorganic resist made of
3 hafnium oxide nanoparticles that can be used for deep UV
4 or EUV or e-beam lithography.

5 Q. Okay. But the claim requires metal ions;
6 right?

7 A. Yes, made of hafnium oxide.

8 Q. Okay. So --

9 A. That's the metal.

10 Q. -- the metal ions you're referring to in
11 Trikeriotis are the hafnium oxide?

12 A. That is correct.

13 Q. And then, what are the radiation-sensitive
14 ligands in Trikeriotis?

15 A. I don't remember what he used. Sorry. I
16 haven't found yet what he uses that is photosensitive.

17 Okay. It says here, "nanoparticle films with
18 DPAP" -- I'm not going read the whole word out -- as a
19 photo-inhibitor [sic] act both as a positive and
20 negative tone photoresists."

21 Q. Okay. So you -- it's your opinion that the
22 DPAP is the --

23 A. Well, I'm still reading through it. Let me
24 look some more.

25 It's a photo -- oh, sorry. It's a

1 photoinitiator. I misread that. Photoinitiator.

2 Q. And you're looking at the top of page 20?

3 A. Yes.

4 So I don't think I have seen where else he
5 states what is -- yes, he doesn't explain otherwise that
6 I can find at this point.

7 Q. But in paragraph 152, there's no mention of
8 DPAP; right?

9 A. It's the organ -- well, it's one of the
10 organic ligands can be used to control surface
11 chemistry.

12 Q. Which one of the organic ligands?

13 A. It says here, "During the cell gel processing
14 of nanoparticles, a variety of organic ligands," and I
15 think that D-whatever-it-was is an example of one of the
16 organic.

17 Q. So it's your opinion that DPAP is an organic
18 ligand?

19 MR. BREGMAN: Objection. Mischaracterizes
20 testimony.

21 A. He doesn't say it's a ligand, so I don't know.
22 I'd have to read through it again to verify that it's
23 actually a ligand.

24 Oh, but he does have here -- here is a quote.
25 It says, page 15, "The absorption coefficient of the

1 film depends on the ligand," so...

2 Q. If you look at page 18 of Trikeriotis, I think
3 that quote continues. It's at the bottom of the page on
4 page 18.

5 It says. "The absorption coefficient of the
6 films depends on the ligand and the synthesis method
7 that was used"; right?

8 A. I'm trying to find where it is.

9 Q. It's page 18 --

10 A. I'm there.

11 Q. -- about three lines up, four lines up?

12 A. From the bottom?

13 Q. Yes.

14 A. "The absorbants in the refractive index are
15 important for their application as photoresists."

16 Q. In the middle of that paragraph.

17 A. "To measure the absorbant coefficient..."

18 THE CERTIFIED STENOGRAPHER: Clarify for me.
19 Are you reading out loud or to yourself?

20 THE WITNESS: Oh, just to myself.

21 A. Okay. Here's -- this is the -- "The
22 absorption coefficient of the films depends on the
23 ligand and the synthesis method that was used."

24 Q. Right. So why does this necessarily mean that
25 the ligand is radiation-sensitive?

1 A. So the one I would read is back to page 20:
2 "Nanoparticle films with this DPAP as a photoinitiator
3 at both its positive and negative tone resists."

4 So DPAP is the photoinitiator. So that's part
5 of the solution or part of the -- it doesn't say that
6 it's a ligand. I'd have to go through and see if it
7 says it's a ligand in here.

8 Q. It doesn't say it's a ligand.

9 A. I don't know that. I just haven't found it.

10 Q. So this is what you would say you're mapping
11 from Trikeriotis to the radiation-sensitive ligands?

12 MR. BREGMAN: Objection. Mischaracterizes
13 testimony.

14 A. So his photoresist has a material in it that's
15 photoactive.

16 Q. So photoactive material being what?

17 A. That was the DPAP.

18 Q. Okay. So that photoactive material being DPAP
19 would be the radiation-sensitive ligands per the claims?

20 MR. BREGMAN: Objection. Mischaracterizes
21 testimony.

22 A. That's the best I can do on here because he
23 doesn't state it differently.

24 Q. Okay. We can move to paragraph -- before we
25 move on, I think my last question was, is the DPAP the

1 radiation-sensitive ligand, in your opinion?

2 MR. BREGMAN: Objection. Asked and answered.
3 Mischaracterizes testimony.

4 A. So he has absorption coefficient films depend
5 on the ligand, and we found that it has a
6 radiation-sensitive material, DP-whatever-it-was --
7 DPAP, so I put those together.

8 Q. Okay. So the DPAP correlates to
9 radiation-sensitive ligand?

10 MR. BREGMAN: Objection. Asked and answered.
11 You now basically are harassing the witness, so I'm
12 either going to shut this down -- it's, like, the fifth
13 time you've asked it. She's tried to answer it many
14 times. She's given you an answer, and that's enough.

15 MR. WOLFE: I disagree with that, but I'll
16 move on anyway.

17 Q. If you can just answer the question one last
18 time.

19 MR. BREGMAN: Same objections. Asked and
20 answered. Mischaracterizes testimony.

21 A. I'm willing to go back and read this whole
22 thing and come back with a better answer than I had to
23 see if -- it's just that it's going take me a while to
24 read through the details on this paper.

25 Q. In paragraph 158, you state that, "A POSA

1 would be able to estimate the EUV absorption of the any
2 resistant material based on the density alone -- based
3 on its density alone"; right?

4 A. That's what I stated, yes.

5 Q. What is that based on?

6 A. It's based on earlier discussion about the
7 density affecting the overall photoresist sensitivity
8 absorption.

9 Q. Right. But here, you're saying you'd be able
10 to estimate EUV absorption of any resistant material
11 based on its density alone. And before, I think we were
12 saying that it depends on other factors; doesn't it?

13 MR. BREGMAN: Objection. Mischaracterizes
14 testimony.

15 A. So this relates back to what we talked about
16 earlier where hafnium is not slightly density; it's
17 significantly higher density than PMMA, as an example,
18 and so, therefore, we would expect it to have higher EV
19 absorption.

20 Would it be a straight line? I don't know,
21 but it would certainly be expected to be if it's almost
22 nine times the density. A POSA would expect it to have
23 higher absorption.

24 Q. And you're saying hafnium oxide is
25 approximately 9.68 grams per centimeter; do you agree?

1 A. Yes.

2 (Reporter clarification.)

3 A. He said hafnium oxide is approximately that.

4 Q. So, previously, you had looked at an assumed
5 density in Stowers of around 5, I believe; right?

6 MR. BREGMAN: Objection.

7 A. I'd have to see what Trikeriotis put down for
8 his.

9 Q. So it would depend on what Trikeriotis said
10 was his density?

11 A. I don't know. I'm going to have to see if
12 it's in there. And I have to look at what I put down
13 for the density. Or not me. I guess it's the
14 (indiscernible).

15 Did he put density in here? That's the --
16 well, of course, it -- the density of the coating
17 material is dependant on the entire hafnium, or what do
18 you call them, the HafSOx. So it would be including the
19 sulfur and everything else, so that's why you'd have a
20 different density for what he's doing versus potentially
21 what Trikeriotis is doing, which is hafnium oxide
22 nanoparticles.

23 Q. Okay. So that might explain the difference
24 between the densities --

25 A. Densities --

1 Q. -- of those materials?

2 A. But I'd have to go back and verify that the
3 guy put in the density because I don't remember.

4 Q. But in this paragraph, you don't cite anything
5 in Trikeriotis for density, do you?

6 A. No, but it's in the grouping of the -- that
7 referring to this, so...

8 Q. I'm sorry. I don't understand. What's the
9 grouping?

10 A. It's -- it's in ground 5, which refers to
11 the -- I can't pronounce his name -- 2010.

12 Q. Trikeriotis 2010?

13 A. Yeah. So since it refers to that, this should
14 be responding to his -- it says his films are based on
15 hafnium oxide particles, density of, and so on. I can
16 go look and see if there's a density he puts in here.

17 Q. But at least for this paragraph, for
18 paragraph 158, there's not a citation to Trikeriotis,
19 which is Exhibit 1024, saying the density is this much;
20 right?

21 A. I should have looked at 1026.

22 THE WITNESS: Do we have 1026?

23 MR. BREGMAN: Don't have 1026.

24 THE WITNESS: I don't have 1026? Okay. I
25 don't remember what 1026 is.

1 MR. BREGMAN: He's about to give it to you.

2 THE WITNESS: Okay.

3 BY MR. WOLFE:

4 Q. I'm handing the witness what has been
5 premarked for identification as Exhibit 1026.

6 (Reporter clarification.)

7 MR. WOLFE: 26.

8 BY MR. WOLFE:

9 Q. Do you recognize this document?

10 A. Yes, I think so.

11 There it is, yeah. The bulk density hafnium
12 oxide is stoichiometric and has the bulk density of
13 9.68 grams per cubic centimeter.

14 Q. So that's the bulk density; right?

15 A. Yeah.

16 Q. And then, if you look on page 4, towards the
17 middle, it says, "For thicker films, densities close to
18 the expected bulk density of 9.68 grams per centimeter
19 cubed have been measured"; right?

20 A. Score. I was looking at the references to see
21 who -- what they were referencing. So I'm sorry. Ask
22 again what you -- state again what you said? I'm trying
23 to find it.

24 Q. In the middle of the page, sort of, under
25 where those formulas are, it says, (as read) "For

1 thicker films, densities close to the expected bulk
2 density of 9.68 grams per centimeter cubed have been
3 measured"; right?

4 A. Okay. Point me to where that is on here.

5 Q. Wrong page. Page 4.

6 A. Oh, page 4. That's why I wasn't finding it.
7 I thought you said it was further down on that page.

8 MR. BREGMAN: Is it okay if I circle it for
9 her?

10 MR. WOLFE: Yeah.

11 THE WITNESS: Thank you. He's getting tired
12 too.

13 A. Okay. (As read) "for thicker films, densities
14 close to the expected bulk density of 9.68 grams per
15 cubic centimeter have been measured."

16 Q. All right. So this is a teaching about the
17 bulk density; right?

18 A. That's why it's different from a solution that
19 has other components than hafnium.

20 Q. So the film might have different density than
21 the bulk density?

22 A. The film would have a different density
23 because it has other component in it.

24 Q. So a film might have different absorption than
25 the material itself in bulk form?

1 MR. BREGMAN: Objection.

2 A. I don't know the answer to that.

3 Q. But here, you're linking density to EUV
4 absorption; aren't you?

5 A. Yes, in a broad sense. Yeah. So it says
6 "higher."

7 Q. And then, if you go back to Exhibit 1025,
8 page 4, which is that figure. It might be easier for
9 you to turn to paragraph 136 of your declaration if you
10 can't find that one.

11 A. That is 26.

12 1025, you said?

13 Q. Yeah. If you could just turn to paragraph 136
14 of your declaration. It's the same figure there.

15 A. Okay. Oh, right. That one.

16 Q. Right. And from this figure, one could not
17 connect two points and say that, because the density is
18 higher, it necessarily has a higher absorption, could
19 you?

20 MR. BREGMAN: Objection.

21 A. The general trend is the higher the density,
22 the higher the absorption, and that does change
23 depending on other atoms, as I mentioned earlier. There
24 are specific atoms that are very absorptive.

25 Q. Okay. And if we can turn to paragraph 161.

1 Here, you're referring to figures 5 and 6 of
2 Trikeriotis 2010. And that's Exhibit 1024, and that's
3 pages -- page 19.

4 A. Yeah.

5 Q. Here, you say in paragraph 161, "Figure 5A
6 shows a sensitivity of less than 25 millijoules per
7 centimeter squared for positive tone resist."

8 Where does Figure 5 say that?

9 A. Well, if you look at this area in here, the
10 normalized thickness changes with the dose at about 25.
11 It's where a huge change occurs.

12 Q. And why does that correlate to D 0.8?

13 A. D 0.8 is -- where did I get that?

14 Q. If you look on the next page.

15 And it says, "D 0.8 sensitivity notation
16 added."

17 Did you add that notation?

18 A. I must have. I don't remember. But I must
19 have.

20 Q. What is D 0.8?

21 A. I'm going to go in and find if it's a density.
22 Not a density.

23 Here it is. "For negative tone resist, the
24 resolution was 0.8." So I'm -- that must be what it's
25 from.

1 Q. So you're saying the resolution is --

2 A. Was 0.8. That's what he puts in his paper.

3 Q. You're reading from the middle of the
4 paragraph where it says, "For positive tone image, the
5 resolution is 0.9 micrometers [sic], while for negative
6 tone, it's 0.8 micrometers [sic].

7 Is that where you're reading from?

8 A. Microns.

9 Yeah.

10 Q. Microns.

11 And you're saying that is D 0.8?

12 A. It's the only 0.8 I can find, so it must be
13 what I was referring to at the time.

14 Q. Okay. And --

15 A. Let's see. NA 0.8. Sorry. I did not write
16 it down. I was waiting so long to do this.

17 So I'd have to go back and spend some time to
18 make sure I understand where I got 0.8 because there's
19 two different things that use 0.8. One is the numerical
20 aperture of 0.8. It's also listed in here. So I'd have
21 to go back and read through.

22 Q. Okay. And looking at the claim language on
23 page 84, it says, "The structure of claim 1, wherein the
24 coating material can be effectively patterned with UV
25 radiation or EUV radiation at a dose of no more than 100

1 microjoules per centimeter squared"; right?

2 A. Yeah.

3 Q. So how does D 0.8 relate to this claim
4 limitation?

5 A. So his paper shows that the exposure dose was
6 about 25 millijoules per square centimeter for the
7 positive tone.

8 Q. Right. But if you look at Exhibit 1024 at
9 Figure 5A, which is the positive tone resist, it doesn't
10 say anything about 25 microjoules per centimeter
11 squared; does it? It's on page 19.

12 A. Yeah, that's where I am.

13 Yeah, the positive tone resist is this picture
14 here. And you see the dose, about 25. It starts to --
15 with the dose at 25, it has a strong reaction. So you
16 go from having a full thickness down to a very thin
17 thickness. So that happens at 25, well below a hundred.

18 Q. Sitting here today, do we have any way to know
19 what you meant by D 0.8 in paragraph 161 that was added
20 to the figure?

21 A. I'm going to have to go back and look. I'm
22 sorry. I do not remember. I'm sure at the time...

23 Q. But right now, you don't remember?

24 A. Correct; I don't remember right now.

25 MR. WOLFE: Okay. I think we can take a short

1 break and then we might be done.

2 A. Okay.

3 (Recess.)

4 MR. WOLFE: We have no further questions.

5 MR. BREGMAN: All right. Let's take a break.

6 We'll need about 15 minutes, I think.

7 (Recess.)

8 EXAMINATION

9 BY MR. BREGMAN:

10 Q. Thanks, Dr. Holland, for your testimony
11 earlier.

12 I just want to clarify some points that you
13 made earlier, if you don't mind.

14 Can we turn to your declaration, to
15 paragraph 68. And I'll read it out loud to you while
16 you're looking for it.

17 A. Okay.

18 Q. So this is a section dealing with -- well, I'm
19 not going to tell you. I'll just read this paragraph.

20 "Thus, I do not believe that the challenged
21 claim should be entitled to a priority date earlier than
22 September 18th, 2015, i.e., when the inventors first
23 presented the 'new' claims reciting the thickness range
24 limitations."

25 Do you see that?

1 A. Yes, I see that.

2 Q. What -- what do you mean by that?

3 A. Well, since they had new claims, that means
4 that it started a new patent time frame, so the new
5 priority date is September 2015.

6 Q. Okay. So if I understand you correctly,
7 you're saying that because they added these new
8 "claims," they're only entitled to a September 18th,
9 2015, priority date; right?

10 A. That is my understanding.

11 MR. WOLFE: Objection. Leading.

12 Q. Okay. So we -- earlier, we looked at two
13 different references. One is Exhibit 1013 and the other
14 one is Exhibit 1022.

15 Can you find those, please?

16 MR. WOLFE: Objection. Form.

17 Q. 1013 looks like this, if it helps.

18 A. Let's see. Oh -- 1025? Oh, this one. Yes.

19 Q. That one.

20 Okay. And the one with the yellow on the
21 front page.

22 A. And what was the other one?

23 Q. This one with the yellow strip?

24 A. Oh, with the yellow stripe on it.

25 No, not this one? Where is it? I got a

1 different yellow.

2 MR. BREGMAN: Alison might have a empty copy
3 for you.

4 THE WITNESS: This one doesn't have the
5 yellow. Sorry.

6 MR. BREGMAN: I may have turned this page back
7 to front. Did I?

8 Yeah. I think that's the front page.

9 THE WITNESS: What's the name of it?

10 MR. BREGMAN: It's "Proceedings of SPIE" with
11 a big yellow block.

12 MR. WOLFE: There's multiple of those, I
13 think.

14 (Discussion held off the record.)

15 BY MR. BREGMAN:

16 Q. Okay. So you got the 1013 and 1022 in front
17 of you; right?

18 A. Yes, that's an right in front of me.

19 Q. This one and this one?

20 A. Yes.

21 Q. Okay.

22 A. You can take this back. It's right here in
23 front of me the whole time.

24 Q. Okay.

25 A. Sorry.

1 Q. And I believe you said earlier, but correct me
2 if I'm wrong, that the date that -- of the -- of the
3 1013 one was October 20th, 2010?

4 MR. WOLFE: Objection. Leading. Objection.
5 Mischaracterizes the document.

6 Q. And can you tell me what date is on the front
7 page of that -- on the front page of 1013?

8 A. 2010. October 2010.

9 Q. And what's the date on the front page of the
10 1022?

11 A. 2011.

12 Q. Are both of those dates before September 18th,
13 2015?

14 A. They are.

15 MR. WOLFE: Objection. Leading.

16 Q. Would you consider these references to be
17 prior art?

18 A. Prior art, yes.

19 Q. Okay. Why don't we start with -- let's come
20 back to those in a minute.

21 Why don't we now turn to the -- let me try, as
22 well as my friend and counselor, to pronounce this name
23 of the reference. It is the Trikeriotis reference,
24 Exhibit 1024. That's the one with a completely yellow
25 front page.

1 A. Thank you.

2 Q. Do you remember looking at this reference
3 earlier?

4 A. Yes, sir.

5 Q. Can you read from the abstract -- one, two,
6 three, four, five -- six lines down about four words in.
7 It starts with "hafnium oxide." Can you start reading
8 that aloud for a few more -- a few sentences.

9 A. Yes, sir.

10 "Hafnium oxide nanoparticles are used as a
11 core to build the inorganic nanocomposite into an
12 imageable photoresist. During the sol-gel processing of
13 nanoparticles, a variety of organic ligands can be used
14 to control the properties."

15 Did I miss --

16 Q. "To control the" --

17 A. "Surface chemistry of the product." Sorry.

18 "The different ligands on the surface of the
19 nanoparticles give them unique properties, allowing
20 these films to act as a positive or negative tone resist
21 for 193 nanometers or e-beam lithography."

22 Q. Okay. What does a variety of organic ligands
23 mean?

24 A. It means they checked -- they tried different
25 ligands, which means it is a material that's chemically

1 attached to the metal.

2 Q. Okay. And the sentence that says (as read)
3 "The different ligands on the surface of the nanometers
4 give them unique properties, allowing these films to act
5 as positive or negative tone resists for 193-nanometer
6 or electron beam lithography," what does that mean?

7 A. It means that the ligands must be sensitive to
8 the -- to the exposure doses.

9 Q. Does that mean that they are
10 radiation-sensitive ligands?

11 A. That --

12 MR. WOLFE: Objection. Leading.

13 A. That's what I mean, radiation-sensitive.
14 "Exposures" meant sensitive.

15 Q. And -- and if we go down further in this
16 document to page 17, the second line, it says, "The" --
17 tell me when you're there.

18 A. There.

19 Q. "The surface ligands are replaced by other
20 carbolick [sic] --

21 A. Carboxylic.

22 Q. -- whatever acids via direct ligand exchange
23 reaction."

24 Do you see that?

25 A. Yes.

1 Q. Are they -- are those the same ligands that
2 you were talking about earlier?

3 MR. WOLFE: Objection. Leading.

4 A. So surface ligands are replaced by other
5 carboxylic acids via direct ligand exchange reaction.
6 So it is the surface ligands are being changed depending
7 on what they want as the surface ligand.

8 Q. Okay. And if we keep going down to the bottom
9 paragraph of page 18, third-to-last line, it says, "The
10 absorption coefficient of the films depends on the
11 ligand and the synthesis method that was used."

12 Do you see that?

13 A. Remind me again where you're looking?

14 Q. The fourth-from-the-bottom line.

15 A. Okay.

16 Q. "The absorption coefficient of the films
17 depends." We read it earlier.

18 A. Yeah. "The absorption coefficient of the
19 films depends on the ligand and the synthesis method
20 that was used." That's in my deposition [sic].

21 Q. And what does the "and" mean there where it
22 says it "depends on the ligand and the synthesis method
23 that was used"?

24 A. It means that it - it's -- it's -- potentially
25 how the ligand is attached to the metal, the hafnium.

1 Q. Okay. And if we keep going down to page 19,
2 there's a Section 1.5, "Optical Lithography."

3 Do you see that?

4 A. Yes, I do.

5 Q. And it says, "The hafnium oxide nanoparticle
6 films are intended for use as organic photoresists. To
7 evaluate their potential application in lithography, the
8 hafnium nanoparticle forms were patented using DUV
9 light."

10 Do you see that?

11 A. Yes, I do.

12 Q. And it goes on to say, "Various aspects of
13 their performance, such as their patterning resolution
14 capability, their sensitivity, and their etch resistance
15 were studied."

16 Do you see that?

17 A. Yes.

18 Q. And then, underneath it, it shows two
19 different graphs, the one on the left and the one on the
20 right, and it says, Figure 5, "Contrast curves of the
21 nanoparticle forms under 254-nanometer light exposure:
22 Positive tone (left) and negative tone (right)."

23 Do you see that?

24 A. Yes.

25 Q. And then, if we skip the next paragraph on

1 that page and we go to next paragraph, the second
2 paragraph on the page.

3 A. Which one? Which page are you on?

4 Q. Page 20.

5 A. Okay.

6 Q. That second paragraph in the middle it says,
7 "Using the same conditions, the films were exposed at
8 254 nanometers through a mask to determine the
9 resolution of the positive and negative tone imaging
10 period. The optical microscope images of the resulting
11 patterns are presented in Figure 6. For the positive
12 tone image, the resolution is 0.9 micrometers, while in
13 the negative tone, it is 0.8 micrometers."

14 Do you see that?

15 A. Yes, I do.

16 Q. Okay. And if we turn back to your
17 declaration --

18 A. My declaration...

19 Q. Page 84 or paragraph 161.

20 Do you remember discussing this paragraph
21 earlier?

22 A. I do.

23 Q. And you say here in paragraph 161, "As shown
24 in figures 5 and 6 of Trikeriotis 2010, the Hf
25 nanoparticle forms can clearly be patterned in positive

1 tone with DUV radiation doses of less than 100
2 millijoules per centimeter squared. Specifically,
3 Figure A shows a sensitivity of less than 25 millijoules
4 per centimeter squared for positive tone resist." And
5 then you've got a colon and then you show a figure.

6 What's the relationship of that figure to the
7 figure we just looked at in the reference?

8 A. So it's the same --

9 MR. WOLFE: Objection. Form.

10 A. So it's the same as the one in the Trikeriotis
11 for the positive tone resist. And in this case, it
12 shows that you got significant reduction in -- almost
13 down to zero with less than 24 millijoules per square
14 centimeter, and if you -- and it's consistent once you
15 get to about 35 or 40 millijoules, that you've got full
16 exposure dose.

17 Q. So is this for positive tone resist?

18 A. Positive tone.

19 Q. What is -- what is positive tone resist?

20 A. Positive tone means if you expose it, it comes
21 off.

22 Q. So what is being --

23 A. In development.

24 Q. Right. So what is being shown in the figure?
25 If you can explain that with respect to positive tone

1 resist.

2 A. Okay. So what it shows is that at zero dose,
3 that you have a hundred percent of the film thickness.
4 And then, as you expose it and then develop it, the film
5 is thinning and thinning, and very quickly, at 24, 25,
6 whatever this is. You're pretty close to a zero amount
7 of film left when you do the development because the
8 exposure dose was sufficient to --

9 Q. And did you -- and did you add that annotation
10 there in red?

11 MR. WOLFE: Objection. Leading.

12 A. So I added the D 08, and after reading back in
13 here, my guess is that that was supposed to be a D --
14 oh, what was the word there I wanted to use? Anyway,
15 the 08's a typo. I believe it's a 09.

16 Q. Why -- what does the 09 relate to?

17 A. Oh, heavens. Here I go having trouble finding
18 stuff that I just read.

19 Q. So are you referring to what we just read a
20 minute ago that said 0.9 micrometers?

21 MR. WOLFE: Objection. Leading.

22 Q. Is that the 0.9 you're referring to?

23 MR. WOLFE: Objection. Leading.

24 A. Help me find it. Is it an earlier page?

25 That's probably what it is.

1 Q. Do you need help finding that?

2 A. Yeah, I do.

3 Q. Are you referring to the second paragraph on
4 page 20?

5 MR. WOLFE: Objection. Leading.

6 A. Oh, yeah. There it is.

7 So for the positive tone image, the resolution
8 was 0.9, while for the negative tone, it was 0.8. So
9 that's what that was supposed to mean. With that dose
10 we got a 0.9 resolution, so...

11 Q. Sorry. I'm not understanding that. The
12 annotation says D 08 less than 25 millijoules per
13 centimeter squared.

14 A. Right. So what that should be is the dose of
15 you can get a 0.8 resolution -- 0. -- excuse me -- 0.9
16 resolution, Karey, for -- for positive tone. 0.9
17 resolution and less than 25 millijoules per square
18 centimeter to get that.

19 So you can see it's well under the 50 -- it's
20 right here, about -- it's even under 25 to get the
21 essentially full exposure and development off of the
22 exposed resist.

23 Q. Okay. But this says D 0.8?

24 A. Yeah. It's supposed to be D 0.9 for positive
25 tone. That's why I think I think I screwed that up. I

1 think it was supposed to be 0.9.

2 Q. Understood.

3 Okay. Can we turn to the document we're
4 looking at, the 1022 document. That's the "Proceedings
5 of SPIE" 1022. Probably directly in front of you, is my
6 guess. Not there. Right next to your cup. Is it not
7 next to your cup? Next to your cup.

8 A. Next to my cup.

9 Q. What's underneath that one?

10 A. Oh, underneath this one? Thank you.

11 Q. Okay. Is that 1022?

12 A. Yes.

13 Q. Okay. So this is a paper; is that correct?

14 A. I believe it's a paper written after a
15 presentation, related to a presentation.

16 Q. And it's -- who are the authors of this -- of
17 this paper?

18 A. Stowers. One of the -- Greenville. Keszler.
19 All members of Inpria now.

20 Q. Is -- this is the same Stowers as one of the
21 inventors on the patent?

22 A. That is correct.

23 Q. Okay. And let me read the abstract.

24 It says, "This paper describes a metal oxide
25 patentable hard mask design for EUV lithography."

1 Do you see that?

2 A. Yes.

3 Q. Why does it say "metal oxide" there, then?

4 A. Because it is referring to, in general, metal
5 oxides.

6 Q. Okay. And if we look at the next page, page
7 number 3, it's got a Section Number 2 that says, "Metal
8 Oxide Resist Platform."

9 Do you see that?

10 A. Yes.

11 Q. And it's got a paragraph, the second
12 paragraph, and I'll -- I'll read to you from that second
13 paragraph.

14 It says, "By combining the metal oxide
15 precursors described above with a high-contrast
16 solubility switch, the system is transformed into a
17 directly patternable inorganic mask -- hard mask. We
18 start with a metal oxide sulfate (MSOx) and introduce a
19 peroxy complexing agent (see Figure 1)."

20 Do you see that?

21 A. Yes.

22 Q. So in the first sentence that I just read, it
23 said, "combining the metal oxide precursors."

24 What does -- what does that mean?

25 A. So that is the same as what is in the -- the

1 patents. So this is taking the metal oxide precursors,
2 which is probably -- could be hafnium, could be
3 zirconium oxychlorides, and then adding to them the --
4 let's make sure I get it in the right order here. So
5 and then they add the hydrogen peroxide and then the
6 sulfuric acid to make their MSOx.

7 So they're just using the word "metal" as a
8 general here, as could be a number of different metals.

9 Q. So I see a --

10 A. Similar to what's in their patent.

11 Q. I see a metal oxide sulfate; right? We read
12 that. And it says, "a peroxo complexing agent."

13 What is that?

14 A. Yeah. So that would be the peroxide that most
15 likely is hydrogen peroxide, but there could also be
16 other type of peroxide that they would add that would
17 then, when mixed together, combine.

18 Q. Okay. And if we look at the next paragraph,
19 the one just before the table, second to last sentence
20 says "for comparison."

21 Do you see that?

22 A. Yes.

23 Q. "For comparison, conventional polyhydrostyrene
24 (PHS) CARs have an EUV absorption coefficient of
25 approximately 4 micrometers to the negative one, so the

1 MSOx materials are approximately 4X more absorptive (See
2 table 1)."

3 Do you see that?

4 A. Yes.

5 Q. What does it mean by the MSOx materials are
6 approximately 4X more absorptive than conventional PHS
7 CARs? What does that mean?

8 MR. WOLFE: Objection. Leading.

9 A. So the CARs would be a -- probably an organic
10 photoresist that's a chemically amplified resist, is
11 what CAR typically means. And these have -- so
12 polyhydroxystyrene is a chemically -- anyway. Let's
13 see. Sorry, I'm getting tired. And the EUV absorption
14 is one, but the metal sulfoxides that they have -- so
15 they're generally saying metal sulfoxides here are four
16 times more absorptive, means they're 4X more sensitive
17 to the EUV exposure lights.

18 Q. And if we go to page 7, there's a Section 3.3,
19 improved materials.

20 Do you see that?

21 A. Yes.

22 Q. It says, "New resist compositions and
23 synthesis approaches have resulted in and improved
24 formulation-Inpria FF20JD. The primary expected
25 advantage is increased photo speed with retention of

1 high resolution and small LWR. The
2 22-nanometer-half-pitch feature shown in Figure 8 were
3 patterned by e-beam at 2.49 $\mu\text{C}/\text{cm}^2$ (30keV). This does
4 has been separately well characterized to correspond to
5 an EUV dose of 25mJ/cm2."

6 Do you see that?

7 A. I do see that.

8 Q. What does it mean when it says this dose has
9 been separately well characterized to correspond to an
10 EUV dose of 25 millijoules per centimeter squared?

11 A. What that means is if they are trying to
12 expose the photoresist and then develop it successfully
13 as we saw in that other -- in the graph over here, that
14 if they use 249 microcoulombs per square centimeter
15 using e-beam, that for EUV dose, it is only required to
16 use 25 millijoules per square centimeter.

17 Q. So is this saying that an EUV dose of 25
18 millijoules per centimeter squared is used for what?

19 MR. WOLFE: Objection. Leading.

20 Q. What's it used for?

21 A. I didn't hear what you said.

22 Q. What is the dosage of 25 millijoules per
23 centimeter squared for EUV? What do they do with that?

24 MR. WOLFE: Objection. Leading.

25 A. That means to do an exposure, you only need 25

1 millijoules of exposure dose to get the photoresist to
2 react, which is similar to what we saw over in the
3 Trikeriotis thing, which at 25, he was getting full
4 exposure.

5 Q. And is 25 millijoules per centimeter squared
6 smaller than 100 millijoules per centimeter squared?

7 MR. WOLFE: Objection. Leading.

8 A. Yes.

9 Q. Why don't we turn to a different exhibit,
10 Exhibit 1025. Title is "Theoretical Estimation of
11 Absorption Coefficients of Various Polymers At
12 13 Nanometers."

13 Do you see that?

14 A. Yes.

15 Q. And if you don't mind turning to page 4 of the
16 Bates number -- the page number on the reference itself
17 is 574?

18 A. Yeah.

19 Q. Do you recognize that chart that's shown on
20 the top of the page?

21 A. Yes, we talked about this for quite a while.

22 Q. Can you tell me again what that chart is?

23 A. So looks at the calculated linear absorption
24 coefficient of the -- of the compound or the chemicals
25 in the photoresist and the calculated density of that

1 photoresist in looking at the exposure and how it
2 changes the density.

3 Q. And does it show any conventional or
4 traditional photoresists in that chart?

5 MR. WOLFE: Objection. Leading.

6 A. Yeah, PMMA is a very well-known photoresist.

7 Q. And what is the range of the calculated
8 density in grams per centimeter cubed that's provided in
9 this chart?

10 A. The chart here shows between about .78 to
11 about little over 1.4.

12 Q. And the metal -- or metallic resist or metal
13 ion resist that we discussed earlier in your deposition,
14 did you determine any densities for those?

15 A. So --

16 MR. WOLFE: Objection.

17 A. -- the densities do vary depending on how it
18 is put into the coating, what the additives are, but
19 it's somewhere between like 4 and -- I think it was 8.
20 So it's way up here, as far as --

21 Q. When you say "way up here," what do you mean?

22 A. So if this chart only goes to 1 and a half, to
23 go to 4 we'd be going -- 4 to 8, we'd be going at least
24 3X at the bottom --

25 Q. So the --

1 A. -- the calculated density.

2 Q. So when you say 3X, do you mean the density is
3 3 times as high as the density shown in the chart?

4 MR. WOLFE: Objection. Leading.

5 A. It's 3X --

6 (Reporter clarification.)

7 MR. BREGMAN: If you just give a moment for
8 counsel to object before you answer. Thanks.

9 A. Yeah, yeah. Sorry.

10 Q. So let me ask that again.

11 So the density of the materials that we've
12 been discussing throughout the day, the metallic
13 photoresists, that -- did you just say that that has a
14 density of three times what's shown in this chart?

15 MR. WOLFE: Objection. Mischaracterizes.
16 Objection. Leading.

17 A. So what I said was that the density of those
18 metal organic photoresists typically are 4 to 8, and
19 since this only goes to 1 and a half, 4 would be close
20 to, you know, three times what this 1 and a half. So
21 this bottom graph would have to come out about here to
22 get -- (indicating).

23 Q. So what you're showing me on the table is you
24 would need, sort of, three more pages side by side. Is
25 that what you're saying?

1 A. That's correct.

2 MR. WOLFE: Objection. Leading.

3 Q. And what would you expect if you were to plot
4 the densities on an expanded chart? What would you
5 expect the calculated linear absorption coefficient to
6 be of those high-density metallic photoresists?

7 MR. WOLFE: Objection. Form. Objection.
8 Calls for speculation.

9 A. So, I'd have to estimate it. But even if you
10 took the lower line, to go up 3X would still be
11 significantly higher than the photoresists that they
12 have here.

13 Q. And if it's got a high calculated linear
14 absorption coefficient, what does that mean?

15 MR. WOLFE: Objection. Leading.

16 A. A high linear absorption coefficient means
17 that you need less exposure for the material to be
18 photoactively changed.

19 Q. Okay.

20 A. To be exposed properly.

21 Q. Good. And while you've still got that open,
22 can you open this Exhibit 1013. And earlier I believe
23 we looked at a chart in this reference on page 12. Do
24 you remember seeing that?

25 A. Yeah.

1 Q. And the Y-axis of this one is atomic
2 absorption cross-section in centimeter squared per mole.

3 Do you see that?

4 A. Yes, I do.

5 Q. Is that the same as the Y-axis in the chart
6 that you relied on, calculated linear absorption
7 coefficient?

8 A. No, it is not.

9 Q. Have you provided any opinion so far on how
10 the atomic absorption cross-section applies to
11 photosensitivity or absorption?

12 MR. WOLFE: Objection. Leading.

13 A. I -- I have not analyzed this at all.

14 Q. Okay. And then if we turn to a different page
15 in this document while we have it open, I think you were
16 also looking at the diagram on page 11. Do you remember
17 looking at that?

18 A. Yeah.

19 Q. And can you remind us, there's this -- figures
20 on the top, next to it, it says P-CAR and then some
21 figures at the bottom saying metal oxide resist.

22 Do you see that?

23 A. Yes.

24 Q. What is P-CAR again?

25 A. That's the -- sorry I'm getting tired.

1 Q. Chemically amplified resist?

2 A. Chemically amplified resist. Thank you.

3 MR. WOLFE: Objection. Leading.

4 Q. Is a chemically amplified resist -- would you
5 consider that a conventional resist?

6 MR. WOLFE: Objection. Leading.

7 A. Chemically amplified resists are the -- yes,
8 are very often used throughout the industry. And for
9 EUV right now, they are also used so that is common
10 for -- that is probably the most common -- in fact, if I
11 go to the work I've done, volumes, it's chemically
12 amplified resist, right now, is the highest volume.

13 Q. And the claims of the '564 patent, are they
14 directed to one of these types of resists that are shown
15 on this page?

16 A. I believe to the metal oxide resist.

17 Q. Okay. And what does this diagram somehow as
18 the thickness of that metal oxide resist?

19 A. So they're saying here that the resist
20 thickness from 10 to 20 is optimum to get rid of the
21 pattern collapse, to mitigate the pattern collapse.

22 Q. What do you mean by "the pattern collapse"?

23 A. That's on the one above with the chemically
24 amplified resist where the patterns, as I described
25 earlier, if they're tall and thin and they're close

1 together and they have enough issues, they'll just lean
2 into each other. It's unfortunately a well-known issue
3 with chemically amplified resists.

4 Q. And if we look at some of these pages -- I'll
5 just flip through them. If we look at page, for
6 example, 4, it says pushing LBNL map resolution.

7 Do you see that?

8 MR. WOLFE: Objection. Scope.

9 A. Pushing LBNL. Okay.

10 Q. What is the -- I see something that says
11 approximately 17 millijoules per centimeter squared.

12 Do you see that?

13 A. Yes, I do.

14 Q. Is that a dosage?

15 MR. WOLFE: Objection. Leading. Objection.
16 Scope.

17 Q. Is that a dosage?

18 A. So it's -- this is done -- I know the lab this
19 is done at -- so, yes, that would be the dose used the
20 make these images.

21 Q. Okay. And if I turn to page 7, I see
22 another -- I see a 40 millijoules per centimeter
23 squared, and I see a 34 millijoules per centimeter
24 squared. Do you see those?

25 A. Yes.

1 Q. And a 51 millijoules per centimeter squared.

2 Do you see those?

3 A. Yes.

4 Q. Are those all dosages?

5 MR. WOLFE: Objection. Leading.

6 A. Yes. These were all done with the Imec at --
7 the ASML tool, probably.

8 Q. The next page says 56 millijoules per
9 centimeter squared.

10 Do you see that?

11 (Reporter clarification.)

12 Q. 56 millijoules per centimeter squared. That's
13 mJ/cm².

14 MR. WOLFE: Objection. Scope.

15 Q. Do you see that?

16 A. Yes.

17 Q. And the next page says 65 millijoules per
18 centimeter squared.

19 Do you see that?

20 A. I see that.

21 MR. WOLFE: Objection. Scope.

22 Q. Next page says 24 millijoules per centimeter
23 squared.

24 Do you see that?

25 MR. WOLFE: Objection. Scope.

1 A. Yes, it does.

2 Q. Are those all less than 100 millijoules per
3 centimeter squared?

4 A. They all are, yes.

5 MR. WOLFE: Objection. Leading.

6 MR. BREGMAN: Okay. I think that's all I've
7 got. Thank you very much, Dr. Holland.

8 MR. WOLFE: We'll take a short break.

9 MR. BREGMAN: Yeah.

10 (Recess.)

11 MR. WOLFE: Thank you, Dr. Holland. We have
12 no further questions.

13 THE WITNESS: Thank you very much.

14 MR. BREGMAN: Thanks. Pleasure working with
15 you.

16 (Deposition concluded at 6:38 P.M.)

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