

UNITED STATES PATENT AND TRADEMARK OFFICE

JIANGSU FAVORED
NANOTECHNOLOGY CO., LTD.,

Petitioner,

vs.

P2I LTD.,

Defendant.

Case No. IPR2024-00380
Patent No. 11,041,087

DEPOSITION OF JAY J. SENKEVICH, PH.D.

VIA ZOOM VIDEOCONFERENCE

Cross Plains, Wisconsin

Thursday, November 21, 2024

Reported by:

Lynden J. Glover
CSR No. 5510

Job No.: 10153053

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DEPOSITION OF JAY J. SENKEVICH, PH.D.,

taken on behalf of the Petitioner Favored
Tech Corporation, via Zoom videoconference,
Cross Plains, Wisconsin, commencing at
11:04 a.m. CST, on Thursday, November 21,
2024, reported by LYNDEN J. GLOVER,
CSR No. 5510, a Certified Shorthand Reporter
for the State of California, pursuant to
Notice.

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25

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Jay J. Senkevich, Ph.D.

1 Cross Plains, Wisconsin, Thursday, November 21, 2024
2 11:04 a.m. CST

3
4 JAY J. SENKEVICH, PH.D.,
5 produced as a witness by and on behalf of the Petitioner,
6 and having been first duly sworn, was examined and
7 testified as follows:

8
9 EXAMINATION

10 BY MR. MC KEEVER:

11 Q Is it morning where you are, Dr. Senkevich?

12 A Thankfully it's still morning. And I'm going
13 through Babebisia treatment right now, so I -- thankfully,
14 I could sleep in a little bit this morning. Yeah.
15 It's -- I'm in Wisconsin. It's 11 o'clock.

16 Q Gotcha. Well, good late morning to you. Nice
17 to meet you through Zoom at least. Have you ever been
18 deposed before?

19 A No.

20 Q Okay. Have you ever been an expert witness
21 before in a litigation?

22 A I have, yeah.

23 Q In what types of -- or how many times have you
24 been an expert witness before?

25 A I don't recall. It's, you know, less -- like

1 maybe a handful.

2 Q And have those previous engagements as an expert
3 witness been in patent-related legal proceedings?

4 A No. They're more related to, like, contentious
5 issues of something went bad and then -- and the folks
6 trying to defend themselves or the other side wanted an
7 expert letter or someone who could write something on
8 their behalf mostly. That's how -- those sorts of --

9 Q Okay. So this is the first case, then, where
10 you're serving as an expert witness in a patent-related
11 matter; is that right?

12 A Yes.

13 Q And do you have -- or, I guess, how did you come
14 to be engaged in this matter by P2i?

15 A P2i needed an expert, and I'm an expert in this
16 area. I know the P2i people --

17 Q Okay.

18 A -- from previous -- so the coating industry is
19 relatively small. I wouldn't say we all know each other,
20 but we all, sort of, work globally. I have relations in
21 China, Japan, Korea, Taiwan, Europe, North America.

22 So --

23 And I've been doing this for more than 30 years.
24 So we, kind of, all know what's going on. Like, the guys
25 in the auto industry, kind of, know each other, too, you

1 know. It's, like, each industry has their relationships.

2 Q Got it. So, I guess, just looking at a high
3 level here but, like, what was your, kind of, prior
4 relationship with -- with P2i, I guess?

5 What's your involvement been with P2i over the
6 years?

7 A So when P2i first started, they were seeking out
8 people that were knowledgeable in the industry. And the
9 founders traveled quite a bit, and so I -- they visited
10 me at MIT at one point. And we're talking a long time
11 ago. Like, 15 years ago.

12 Q Okay.

13 A And then I got invited out at one point to -- to
14 the UK, visit them, you know. And then -- that's about
15 it.

16 I mean, other than that, you know, I just, kind
17 of, keep track of, like, what they're doing; but we don't
18 work together. Just sort of colleagues; right?

19 And some of the folks want to get a feel for
20 each other, like, what they're doing, what's going on.

21 Q Okay. So -- so you've never been, like, hired
22 as a consultant for P2i or anything like that before?

23 A No.

24 Q Okay.

25 A I wish I was, you know. I guess now it's --

1 I started a false setting, you know. They mostly -- they
2 mostly work in Asia; right? So it's a little rough;
3 right? To travel global aspects of the case.

4 (Stenographer clarification.)

5 BY MR. MC KEEVER:

6 Q And I think, if I was tracking what you were
7 saying, the time that you visited P2i in the UK, that
8 was also, kind of, a number of years back 15 years ago
9 or so?

10 A Yeah. Same time frame; right? Probably within
11 the couple-year period there, you know, maybe a year
12 period. It's been a long time.

13 Q Got it. Well, since you haven't been deposed
14 before, I'll just, kind of, go over a couple of the
15 ground rules.

16 Before we went on the record, the court reporter
17 was kind of flagging some of these things already, but --
18 she's taking down everything that we're saying. And as
19 she noted, it can be even more challenging doing this
20 over Zoom.

21 So I would just ask, if you can, please let me
22 finish my question before you start answering, and I will
23 try to let you finish your answer before I follow up with
24 the next question.

25 Does that sound fair?

1 A Fair, yeah.

2 Q Great. You know, I'll try to keep an eye on the
3 clock and, kind of, take a break -- we can take maybe a
4 five- or 10-minute break every hour or so. But if at
5 some point you need to take a break to use the restroom
6 or grab a drink of water or something like that, just let
7 me know.

8 Typically, we just -- would want to have you
9 answer whatever the question is that's -- that's pending.
10 But once you finish answering that question, I don't mind
11 just taking a break, kind of, impromptu. It's not a big
12 deal.

13 A Thank you.

14 Q Okay. And, I guess, is there any -- any reason
15 that you can't provide truthful and accurate testimony
16 today?

17 A No, there's no reason why.

18 Q Okay. What did you do to prepare for the
19 deposition today?

20 A I reviewed -- there's -- there's two patents
21 under consideration. There's a -- there's a publication.
22 So I reviewed those.

23 Obviously, I wrote my IPR, and then Karen
24 Gleason -- Dr. Gleason's IPR. It's rather lengthy. So
25 if -- if something comes up where you have a specific

1 question, I can bring up that document, like -- you know,
2 it's not a memory test; right?

3 Q Yeah. No. Of course. And then just so for
4 clarity, so when you say you referred to your IPR, you're
5 talking about the declaration --

6 A Right.

7 Q -- with your -- the number paragraphs in it;
8 correct?

9 A Correct.

10 Q Okay. And then same thing for Dr. Gleason, her
11 document with her numbered paragraphs. If I refer to
12 that as her declaration, will you understand that's what
13 I'm talking about?

14 A I will.

15 Q Okay. I guess, in reviewing your own
16 declaration, was there anything that you saw in there
17 that struck you as a mistake or anything that you want to
18 change, you know, now that you're looking at it again?

19 A I think it's solid.

20 Q Okay.

21 A We spent a lot of time preparing it, reviewing
22 it, yeah.

23 Q And then, again, just for clarification, you
24 referred to two patents -- or maybe a patent and a
25 publication. One of the patents I'm sure you're

1 referring to is the 087 Patent; correct?

2 A Yeah. I forgot to mention that it's the patent
3 in consideration, obviously, which is -- would be the
4 heart of the matter, but then the three -- the two
5 patents and the publication which is under consideration
6 to support or not support the patent, I guess.

7 Q Got it. So that's -- you're referring to, like,
8 Cohen and Legein and Francesch, the prior art; correct?

9 A Correct.

10 Q Okay. Got it.

11 And do you have -- just so I know. Like, do you
12 have copies of the exhibits, kind of, in front of you or
13 on the computer that you have?

14 I'm able -- I have copies of the exhibits.
15 I can share them to you through the chat window, and I'm
16 happy to do that if that's the, kind of -- you know, the
17 easiest way to proceed.

18 But, you know, if you have a paper copy of your
19 declaration in front of you and prefer to use that or
20 something, that's -- you know, that's also fine by me.
21 It doesn't really matter.

22 A I currently have open the main patent by Coleson
23 (phonetic).

24 Q Okay.

25 A And then -- and then the two -- two patents and

1 the publication in support. I currently have that. I
2 can scroll through there if -- specific questions. I
3 don't have the other declarations open right now. I
4 could open those.

5 Q Okay. I definitely will be asking you questions
6 about -- about your declaration, at the very least. So
7 if you want to -- if you want to go ahead and open that,
8 that's fine.

9 And then if there's other documents that I --
10 that I want to ask you about, again, I can -- I can, sort
11 of, upload them through the chat, and you can open them
12 that way. It shouldn't be a big deal.

13 A Yeah. I mean, maybe that would be helpful if
14 you --

15 Q Okay.

16 A I want to make no assumptions, you know, because
17 there's a lot of details.

18 Q Right. Of course.

19 Okay. And then I don't know if you maybe talked
20 about this with -- with your counsel or not, but there's
21 a rule in IPR proceedings that you're not supposed to
22 discuss the substance of your testimony during breaks in
23 the deposition.

24 Is that something you're aware of?

25 A No, but that's fine. Thank you.

1 Q Okay. Do you have, Dr. Senkevich, your CV that
2 you could open, as well, that was Exhibit 2008?

3 A Let me see if I can find it. I know my CV
4 pretty well, so -- I don't think I need to probably open
5 that. Go ahead.

6 Q Let me -- just in case, let me just open the
7 chat window and go ahead and do this just in case.
8 I don't want to -- I'm not trying to trip you up with any
9 details. It's a long CV.

10 Okay. So I just put that in the chat window.

11 A There we go.

12 Q So when were you first exposed to plasma
13 polymerization in your -- you know, your academic career
14 or your industry career?

15 A Please clarify. Like, exposed -- as far as me
16 doing public -- publishing, doing research, other -- you
17 know, aware of other people doing work.

18 Q Sure. I guess, when was the first time you,
19 kind of, learned about what plasma polymerization is?

20 A So -- so I graduated with a bachelor's degree in
21 chemistry officially in '93. I did a master's degree.
22 It took me a year to do that. And I graduated that '94,
23 and I moved to Virginia. I did doctoral work at Virginia
24 Tech.

25 I was doing some coating work before that, but

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1 the principal doctoral research was the vapor deposition
2 of polymers.

3 And so at that point I attempted to be the
4 expert -- you know. I mean, I'm a young guy, around 21
5 years old, 22 years old -- 22 years old at the time --
6 to -- to be, like, the coating guy.

7 So that's, like -- you know. And -- and you do
8 it -- a Ph.D., you become, like, the world's expert in
9 the topic.

10 So I wasn't doing plasma deposition at that
11 point, but I was doing the equivalent coatings; right?
12 And -- and we call them more like thin films than
13 coatings. So thin film is something -- (indecipherable).

14 (Stenographer clarification.)

15 THE WITNESS: So -- and so -- anyway, yeah. So
16 around that time frame, I'd say, like, the mid '90s, I
17 was aware and exposed to not only the deposition of
18 coatings but plasma deposition. Yeah.

19 And -- and, I mean, soon after I met Karen
20 Gleason, for example -- we go to the same conferences,
21 present at the same -- we are in the same community at
22 that point, even though I'm a student; right? Yeah.

23 BY MR. MC KEEVER:

24 Q And so it sounds like at least when you began
25 your -- your Ph.D. work at Virginia Tech, you were

1 **digging into plasma deposition techniques; is that right?**

2 A That's correct. And there's -- there's more
3 that -- there's more than just so plasma is a big topic.
4 Plasma -- the PECVD -- plasma enhanced chemical vapor
5 deposition of polymers is a specific topic within the
6 plasma community.

7 But, for example, if you talk about the -- the
8 concept of sputtering, sputtering uses plasma, as well.

9 (Stenographer clarification.)

10 THE WITNESS: Sputtering, s-p-u-t-t-e-r-i-n-g.

11 So, customarily, I'll -- thin film labs have
12 sputtering capabilities for metals or ceramics. So it's
13 pretty -- it's pretty common, like, plasma technologies.
14 And those are dominated by physicists and electrical
15 engineers. It's not a chemistry topic.

16 BY MR. MC KEEVER:

17 Q Got it.

18 And so did -- I guess, did any of the work while
19 you were pursuing your -- your master's degree -- did any
20 of that relate to plasma polymerization?

21 A So a master's degree was funded by the
22 Department of Energy. And that was related to
23 coatings -- polymer coatings, oxide coatings -- but
24 it wasn't -- it was the degradation and study of the
25 coating, not the deposition of the coating.

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1 **Q Got it.**

2 **A And that's for nuclear waste repository in**
3 **Nevada, so -- the storage of high level nuclear waste.**
4 **So it's kind of -- it's a corrosion and degradation**
5 **topic, not a --**

6 (Stenographer clarification.)

7 BY MR. MC KEEVER:

8 **Q So I see on your CV you received your Ph.D. from**
9 **RPI in 2002; correct?**

10 **A Correct.**

11 **Q So at some point did you move from Virginia Tech**
12 **to RPI?**

13 **A I had a difficult advisor. I had won multiple**
14 **awards. I had 20 publications, five patents. And I**
15 **wrote my dissertation, and it didn't work out that I**
16 **could defend my dissertation. So there was issues there.**

17 So I had to do, essentially, another Ph.D. So
18 **I -- essentially, I was a postdoc at RPI at that point,**
19 **even though I was a student, because I had a lot of**
20 **experience, more experience than most postdocs.**

21 **Q And the -- on your CV for your dissertation**
22 **research, you list, you know, chemical vapor deposition**
23 **of polymers amongst other research areas; correct?**

24 **A Correct.**

25 **Q And is that something you would've researched**

1 both when you were at Virginia Tech and then also when
2 you were at RPI?

3 A Yeah. There was more emphasis on polymer --
4 physics polymer chemistry at Virginia Tech. That's
5 what -- I'm a polymer physicist. I do synthetic
6 chemistry, as well.

7 But when I went to -- into New York, I was
8 specifically tasked to develop atomic layer deposition --
9 we call it C-layers -- develop C-layers for
10 electrochemical deposition of copper.

11 So it's -- we can talk more about it, but
12 it's -- and then I was allowed a lot of freedom in
13 New York to do what I wanted to do.

14 For example, I published -- I invented a lot of
15 different chemistries. One of the chemistries I -- I
16 didn't invent but I -- because of me, it's
17 commercialized. It's called parylene, p-a-r-y-l-e-n-e.

18 And that wasn't, like, official research. It
19 was just sort of a collaborative effort with a professor.
20 And now it's been commercialized, and it will be the next
21 generation coating for electronics.

22 It's a -- and so that's a CVD polymer, but
23 it's -- so as a -- as a student, we're sometimes -- if we
24 have a good advisor, we're afforded a lot of opportunity
25 to explore.

1 Some advisors are very rigid in how they think
2 about the world and -- almost like a dictator. "You have
3 to work on this" -- you know, you're treated like an
4 employee. And others, "Hey, you can do what you want."

5 And I had a fellowship at RPI from a wealthy
6 individual, and I was -- I just -- to have fun. And
7 after I left I think it was -- my colleague told me
8 something like eight Ph.D.'s were given my topics that
9 I developed. It was, like, ridiculous.

10 And so those guys went off to do different work
11 in different places. Like one colleague I stay in touch
12 with, he's at San Diego National Lab, you know, high
13 level labs, high level organizations in the world.

14 But -- yeah. So, anyway, yeah, I've -- I've
15 continuously done polymer -- CVD polymer coating, thin
16 film work, molecular work, from 1995 until now; and I'm
17 considered an industry expert in this area.

18 **Q So a few things I want to follow up on from your**
19 **answer.**

20 **So you, kind of, described yourself as a -- as a**
21 **polymer physicist. To someone that doesn't really know**
22 **what that is, can you just sort of explain what -- you**
23 **know, what is a polymer physicist?**

24 **A So the simplest terms, a significant portion of**
25 **chemists get employed working with polymers; right? It's**

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1 not something that -- very few people study these
2 topics -- polymer -- polymer science -- as an undergrad.

3 It's more -- it's a graduate level -- it's a
4 higher level education. But a lot of folks, when they
5 graduate -- the polymer industry employs a lot of
6 chemists doing polymer work.

7 For example, I live in back of a company called
8 Plastic Ingenuity right now. And they make the lids for
9 Starbucks. They make snack packs for Sargento.

10 I was in California earlier this year, and the
11 chemist was -- had the snack pack there. And I was,
12 like, "Yeah, those are made right down the street from
13 me," you know. We like to -- we get excited when we see
14 our technology somewhere.

15 Anyway, that company does significant revenue.
16 It's the largest custom plastic thermoformer in the
17 country, and they do polymers. And -- and so, you know,
18 we see plastics, polymers everywhere. Yeah.

19 So -- so a polymer -- a polymer chemist -- so --
20 yeah. Polymer chemistry -- you have polymer physics.
21 Polymer chemistry is the science of synthesizing
22 polymers.

23 So there's -- that's a whole topic we can
24 discuss. Then there's polymer physics is how to
25 characterize the polymer, the metrology of the polymer.

1 So it's -- for example, you would say, "I want
2 to characterize its glass transition temperature."

3 So a glass transition temperature is a very
4 important parameter of a polymer, as well as ceramics.
5 But polymer -- that's one of the most important
6 parameters you can talk about of a polymer.

7 And so there's methods of analyzing them,
8 techniques of analyzing them. And that's under the
9 umbrella of a polymer physicist.

10 And then those groups interact with each other.
11 Hopefully. Maybe not all the time, but hope- -- they
12 normally interact with each other, because they're not
13 independent.

14 So collaboration is very, very important in the
15 sciences, and it's more than just chemists talking to
16 each other. But that often happens. Physicists only
17 talk to each other; chemists only talk to each other;
18 electrical engineers only talk to each other. Yeah.

19 **Q Okay. And you mentioned parylene and maybe**
20 **Parylene E. I guess, can you just -- tell me a little**
21 **bit more about how parylene coatings are applied, if you**
22 **could.**

23 **A So there's -- there's -- if you talk about**
24 **polymers that are vapor deposited, for example, the PECVD**
25 **of polymers -- PECVD of polymers; right? -- that's a --**

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1 its own topic, and that's very -- I wouldn't say it's
2 common. It's very specialized knowledge, but --

3 You can put a lot of chemistries in there to
4 make your product. And it's very complicated. It's a
5 very complicated technology.

6 In the -- in the mid-sixties, there was a group
7 at Union Carbide. And the main guy's -- his name is
8 Gorham, G-o-r-h-a-m. He -- he used a chemistry called
9 cyclophanes. Those cyclophanes were studies by Cram,
10 C-r-a-m.

11 (Stenographer clarification.)

12 THE WITNESS: So Cram won the Nobel Prize for
13 cyclophanes. He was a UCLA professor.

14 (Stenographer clarification.)

15 THE WITNESS: Cram won the Nobel Prize in the
16 topic of cyclophanes; right? So he won it. He's no
17 longer alive, unfortunately.

18 Okay. And -- and Gorham was able to take this
19 chemistry and sublime it, in situ make the monomer, and
20 then be able to deposit the polymer, called parylene, at
21 room temperature. And it's -- it's an amazing chemistry.

22 So the first customer was the Air Force and
23 during Vietnam. The circuit boards were -- were dying
24 in the planes. They were actually flying into the humid
25 canopy in Vietnam, water was getting on the printed

1 circuit boards, and they were losing planes in Vietnam.

2 This solved that problem by putting parylene on
3 electronics, printed circuit boards. And -- and so it's
4 a very -- it's a very niche technology but very
5 economically important.

6 It's sort of the -- it's the gold standard for
7 all electronic devices to parylene-coated PCBs. And we
8 can talk more about that, as well, if you like.

9 Q And so when parylene was being used to coat
10 PCBs, I guess, in the era of the, you know, Vietnam War,
11 was that using -- was that using PECVD or other CVD
12 techniques?

13 A No plasma. So it's -- it's all thermally
14 driven. It's very simple. If -- if you call a local
15 parylene company, the most -- the most notable parylene
16 company is in Indianapolis, Indiana. It's a Union
17 Carbide technology, so it's an American technology.

18 And you ask their -- their background, their
19 educational background, and they -- they will say -- some
20 of these guys are real estate agents. Like, you don't
21 need a lot of background for parylene.

22 But with plasma, you need a lot of background, a
23 lot of education. Even then it's not enough. And
24 it's -- for lack of a better word, it's humorous to see a
25 plasma-based company struggle to do basic things because

1 of lack of knowledge/education.

2 But on the other side with the parylene -- I'm
3 working with some -- some of these folks, and they're
4 just not knowledgeable. Like, it's --

5 So, in industry, we look for simple solutions.
6 If it's too complicated, it falls apart. It just -- it
7 doesn't work. You have to have something simple. And
8 then it has economic value.

9 Q And so I may have, I guess, misheard you
10 initially when you -- when you brought up parylene,
11 but --

12 Did you say you invented parylene, or what
13 was -- what was the -- what was sort of the -- your
14 contribution, I guess, to maybe the evolution of parylene
15 coatings that you were referring to earlier?

16 A So there -- I think it's on my CV. The first
17 one I invented is called Parylene F. It's a fluorinated
18 parylene.

19 Q Okay.

20 A And it's commercially -- it's been
21 commercialized. So you can buy -- we initially called it
22 Parylene VT4. Because my advisors -- Virginia Tech 4;
23 right?

24 At the time my comment was, "Seshu (phonetic),
25 this is silly. Why are we calling it Virginia Tech 4?

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1 That seems silly." The Chinese renamed it Parylene F.
2 And it has commercial value.

3 And then there's many other inventions after
4 that. Most of those don't have commercial value. The
5 Parylene E, I didn't invent that; but without me, it
6 wouldn't have gone forward. It was essentially a dead
7 technology.

8 I published a paper in the year 2000, and so now
9 it's -- it has value now, but it takes time to develop
10 the market. It doesn't -- these things don't happen
11 instantly.

12 It's sort of like at the end of -- end of your
13 life, if you have a movie after you and you feel like
14 you're -- wow, you're really, you know, amazing.

15 And if you -- if you have this -- I'm the
16 polymer dude. And, you know, on my grave stone it'll be,
17 like, "I'm the polymer dude."

18 **Q You mentioned -- so you mentioned Parylene F is**
19 **fluorinated. I guess, what's the difference between**
20 **Parylene F and Parylene E, just at a high level?**

21 A So parylene is short for poly-para-xylylene.
22 Poly-para-xylylene. So poly, p-a-r-a, xylylene is
23 z-y-l-y-l-e-n-e [sic].

24 And so para-xylylene -- which is a solvent. So
25 para-xylylene -- which we say P-dash-z-y-l-e-n-e [sic] --

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1 is something you can buy at Home Depot.

2 So -- so if you polymerize that -- you can
3 actually polymerize para-xylylene. Go to Home Depot;
4 throw it in a vacuum system; you can polymerize that.

5 If you take the -- so if you look at that
6 structure, it has a phenyl ring. And you put fluorine
7 groups on there. That's Parylene F.

8 So you put four fluorine atoms on the ring.
9 That's Parylene F. On the thermo ring. That's
10 Parylene F. It's easy to visualize it. You like a --
11 it's a hexagon, and it has four -- four fluorine atoms on
12 the hexagon.

13 And chemists visualize everything because the
14 names get crazy. So we don't try to name things. Like
15 I -- we -- my girlfriend and I go to an Amish store and
16 we -- it's at a surplus grocery store. And we -- we read
17 all the labels.

18 And I have a -- you know, essentially, I'm a
19 Ph.D. in chemistry; right? And I don't know what the
20 chemicals -- you can't even pronounce them.

21 Parylene E is actually -- so this is kind of a
22 trade secret here; right? So it should be kept
23 confidential.

24 Parylene E has -- well, more or less, has an
25 ethyl group on -- just one ethyl group on the ring. So

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1 ethyl, like ethanol, one ethyl group.

2 And it's not that simple. It's -- it's a little
3 more complicated than that. But there's some -- there's
4 some secret sauce there that should stay that way.

5 Lynden, did you get that?

6 THE STENOGRAPHER: I did.

7 THE WITNESS: Okay. All right. Don't worry --
8 don't worry about interrupting me. It's fine. I was a
9 professor; I talk a lot.

10 BY MR. MC KEEVER:

11 Q So -- looking at your CV again, so under
12 "Professional Experience," you list a research affiliate
13 position from 2017 through the present with MIT.

14 Do you see that?

15 A Yes.

16 Q So can you just tell me a little bit about what
17 that position is?

18 What's your relationship with MIT since 2017?

19 A So I advised a research group in the mechanical
20 engineering department. And -- and so, essentially,
21 the -- most of the MIT professors are kind of like
22 politicians.

23 They -- they really don't have time to advise
24 their own students. They -- they're on the board of
25 directors of companies. They're giving talks globally.

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1 Sometimes they're doing depositions.

2 And they're not a typical professor. So you
3 might say -- you might think in your head a professor
4 teaches. Not at MIT. They teach maybe one class a year.
5 Sometimes zero.

6 That's not the emphasis that MIT is, teaching.
7 There is teaching involved, but it's a very minor
8 component. It's a very major research university.

9 So it's customary for a professor to collaborate
10 or hire other scientists or engineers to help advise
11 their students. And sometimes they have full staff.

12 Like at MIT, there's many scientists that are
13 called -- I was this way -- a research scientist, which
14 would manage the lab, manage students, manage postdocs.

15 And in this particular position I have, which
16 is -- it's, kind of, expired now because my -- the
17 professor I advise is in Kuala Lumpur in Malaysia. So
18 he's a president of a university in Kuala Lumpur.

19 And -- and so things are a little crazy right
20 now. But, essentially, I'm volunteer role which helps
21 consulting. So as a consultant, I need a brand.

22 So as a consultant, I have a -- I have a
23 position at MIT. I have an agent that represents me,
24 that helps me find work.

25 And so, like, if you're at a law firm, you need

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1 branding. You need to have somebody -- some people call
2 you, but sometimes it's good to have people go find your
3 work. Similar situation. And branding's important
4 for -- every company needs a brand.

5 Q Okay. So the professor that you mentioned
6 that's over in Malaysia right now, that was -- he was a
7 mechanical engineering professor that brought you in to
8 help advise his students?

9 A Correct.

10 Q Okay. And you said that's -- this is kind of a
11 volunteer gig that -- but helps -- helps bring in
12 business -- consulting business for you?

13 A Correct.

14 Q Okay.

15 A So it's -- it's mutually beneficial. I help --
16 typically help one of his students at a time, and then he
17 helps me. And, to be honest, being paid by some
18 organizations is just difficult. It's a lot of drama
19 and -- everybody's friendly to volunteers.

20 Q Got it. And so does that -- I guess, you know,
21 you list that position from 2017 to the current. I would
22 gather that doesn't -- that doesn't take up that much of
23 your time relative to your consulting work; is that
24 right?

25 A No.

1 Q Just a terminology question for you that I think
2 might be helpful for later.

3 So I notice on your first page of your CV where
4 you talk about a German master's student -- this is most
5 of the way towards the bottom of the first page --
6 there's a reference to free radical polymerization.

7 I was just going to ask you; can you, kind of,
8 explain what free radical polymerization is?

9 A Sure.

10 Lynden, you've got to get ready for this.

11 (Stenographer clarification.)

12 THE WITNESS: Okay. So we're talking about
13 now -- we're talking about polymer chemistry; okay?
14 And -- and this is what you would consider polymer
15 chemistry in a beaker with -- right?

16 So it's not vacuum science. Vacuum science is
17 driven by physicists, not chemists. So and -- and
18 you're -- you have a beaker. And let's keep it simple.

19 You have a solvent. You put a solvent in a
20 beaker; okay? And then you put a monomer in the beaker.
21 A monomer. And -- right? And certain monomers are free
22 radical generators; right?

23 So in order to start the -- the polymerization,
24 you add in what's called an initiator. And that can be
25 done -- initiated via UV light, photon-initiated, or it

1 can be thermal-initiated or -- it needs to be initiated.

2 And then -- so you add this initiator in a small
3 amount to start the polymerization. And -- and then
4 just -- like, again, certain type of monomer that make
5 free radicals. The most common type are vinyl -- vinyl
6 moieties.

7 (Stenographer clarification.)

8 THE WITNESS: Moities. M-o-i-t-i-e-s, [sic]
9 moities. That's a good word to know.

10 And so -- and there's other types of
11 polymerizations. There's anionic, cationic; right?
12 There's oxidative polymerization.

13 (Stenographer clarification.)

14 THE WITNESS: So, like -- you know, oxidative,
15 like antioxidant; oxidative polymerization. So in -- and
16 it depends on the monomer system. It depends on the
17 initiator, how to do that.

18 Some vinyls can be made anionic, or cationic, as
19 well, depending on the local chemistry -- chemical
20 environment. But free radicals are the classic
21 polymerization.

22 BY MR. MC KEEVER:

23 Q Why do you say free radicals are the classic
24 polymerization?

25 A It's sort of the -- I think -- I don't know the

1 history, but I want to say it's the first one that was
2 developed.

3 And some monomers will automatically make
4 polymers by free radicals. So a free radical is an
5 unpaired electron. That's what that means.

6 And in your body there's free radicals. And
7 there's whole processes that quench the free radicals,
8 because they're very reactive. And it takes two -- two
9 free radicals to come together to make a bond -- chemical
10 bond.

11 (Stenographer clarification.)

12 THE WITNESS: It sounds like someone from the
13 '70s -- you know, '60s. You know, free radicals, making
14 bonds, you know. But that's how we talk. And there's
15 single bonds, double bonds, triple bonds. Yeah.

16 BY MR. MC KEEVER:

17 Q In the "Professional Experience" portion of your
18 CV, you talk a little bit about being a technical advisor
19 to KISCO, K-I-S-C-O, Conformal Coatings USA; is that
20 right?

21 A Correct.

22 Q I guess, can you tell me a little bit about what
23 KISCO does and what your -- you know, what your role was
24 in working with them?

25 A KISCO'S a Tokyo-based international company.

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1 Their revenue's around a billion U.S. dollars. Their
2 primary focus is not conformal coatings, not parylene.

3 They -- they're a pharma-based company. They
4 do -- I'm not sure all what they do. They have many
5 different products.

6 What happened was the original founder was --
7 was ill. He died of pancreatic cancer. His son, in his
8 30s, took interest in parylene. And they had set up a
9 facility in San Jose and in Connecticut -- in
10 New Milford, Connecticut.

11 And so these guys -- I think I explained before
12 the parylene guys aren't so knowledgeable. So typically
13 you have an operation there, vacuum tools. So vacuum
14 deposition tools is what makes polymers.

15 And you have a salesperson; one, two, three,
16 depending on how -- five -- how big the company is.
17 There's no technical support really.

18 And so in this particular capacity, I was
19 working with the salesmen to help drive new business.
20 And it's -- to have someone who has credentials show up
21 to customers helps sales quite -- quite a bit.

22 So in this case, my colleague would open the
23 door, get us into the door to talk to the founders of the
24 company and high level people, and then I would talk with
25 the goal of trying to provide them a solution.

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1 And then -- and my colleague would just be quiet
2 and -- and then -- that was a very successful business
3 model, and I enjoyed it. We traveled. We connect -- we
4 closed the deal on Apple.

5 So -- before that time, PCBs were coated with
6 conformal coats; solution-based conformal coats,
7 principally. And Steve Jobs connected that to making
8 high -- very high performance coatings with us to
9 electronic devices, consumer electronic devices. So that
10 was the start of that.

11 **Q So -- so are you saying that Apple began coating**
12 **PCBs using parylene based on working with -- with you and**
13 **KISCO?**

14 A Correct.

15 **Q And that would've been in this time frame on**
16 **your CV of 2009 to 2010?**

17 A Yeah. I forget exactly the time. I think it
18 was even before that. I mean, it was, like -- it was,
19 like, 2008/'9, that time frame. I don't know. Yeah.
20 Yeah, '9.

21 **Q And were there -- sorry. I didn't mean to cut**
22 **you off. Go ahead.**

23 A Yeah. Correct.

24 **Q And did you say that prior to using parylene,**
25 **they were using a different type of coating technology,**

1 or were they just using no -- no coating technology?

2 A They were using a fluorinated acrylate at the
3 time. Fluorinated acrylate. Do you want me to spell it?
4 It's -- so acrylate is -- I'm not very good at spelling.

5 A-c-r-y-l-a-t-e, acrylate. And fluorinate.
6 It's like "flower," but the "O" and the "U" are switched.
7 I don't spell "fluorine" very well either.

8 Q And so what's the -- was there a benefit of
9 using parylene coatings over using the old fluorinated
10 acrylate coatings they were using previously?

11 A Fantastically beneficial. So, at the time,
12 Apple was putting down spray coat. They were spray
13 coating their -- their boards -- PCBs -- with 25 microns
14 of fluorinated acrylate.

15 We were able to put down five microns of
16 Parylene N, and it totally outperformed their standard.
17 Not even -- no comparison. They loved it.

18 Q And do you know whether they're still using --
19 whether Apple is still using parylene -- parylene
20 coatings today?

21 A So Apple -- they try to drive the price down.
22 And -- so there's always a new company that raises their
23 hand to lower the price.

24 And so parylene competes with plasma deposition
25 technologies, and they have more than one line. So they

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1 don't -- it's not just one line, one part. There's
2 multiple parts, multiple lines.

3 And I'm not privy -- more recently I worked with
4 Apple. I'm not -- I'm not supposed to even say I work
5 with Apple. It's a secret. We have code names for them.

6 But -- yeah. So there's -- it depends on the
7 customer. So I'm not privy to everything. It's very,
8 very confidential.

9 You -- only way you would know is you take an
10 iPhone and you cut it in half and you start to analyze
11 it; right? That's what -- that's what groups do. They
12 reverse engineer coatings.

13 **Q And so the parylene coatings that you were**
14 **working on with KISCO, is that what they refer to as**
15 **diX coating?**

16 **Do you know that terminology?**

17 A Correct. They say, "diX."

18 **Q Okay.**

19 A It's a -- clearly, a problem between Japanese
20 language and English. That's a whole 'nother topic. But
21 I -- I tried to tell them that's not really what you want
22 to call your chemistry, diX. "Would you like diX-A or
23 diX-B?"

24 They -- but -- so I think -- I think you can
25 appreciate when you work globally, there's a lot of

1 language barriers, cultural barriers.

2 And the Japanese are very special, Americans
3 are very special, and sometimes there's some language
4 communication issues.

5 Q And the parylene coatings that KISCO was
6 offering, those were not applied using PECVD; is that
7 correct?

8 A No.

9 Q Is there any other industrial experience or
10 industry experience on your CV where you worked
11 specifically with plasma polymerization?

12 A So, typically, a lot of the companies I advise,
13 they have plasma deposition and parylene or other -- they
14 have a coating technology suite.

15 So, for example, I advised a company by the name
16 of HCO. They're now in North Carolina. They have a
17 PECVD suite that I advised on, and they have a parylene
18 suite that I advised on.

19 And this is pretty typical. And -- and I'm
20 considered, like, one of the world's experts in parylene;
21 so I get a lot of consulting work with parylene.

22 But I have a lot of knowledge on this other
23 side, too, where people call me and -- and it's -- it's
24 mostly -- well, I wouldn't say "mostly."

25 If I talk about that part of the consulting,

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1 manufacturing drama. The manufacturing line shut down;
2 there's a problem. The other half is technology
3 development where a company wants to develop something.
4 They need some horsepower there.

5 And so I've done both with both plasma
6 technologies, parylene, many other things. I do a lot
7 of work, a lot of different work.

8 **Q Is there a particular client that you've worked**
9 **with, kind of, most extensively in the area of PECVD,**
10 **would you say?**

11 A No. It's -- I think -- no, I don't think
12 there's, like, one that's, like, stands out that's,
13 like -- there's quite different companies.

14 And so PECVD has a lot of aspects of chemistry
15 in it, but it's -- it's a physics-driven technology.
16 And, therefore, like, that -- same principles apply to
17 ceramics, to metals, to many other industries.

18 So, like, if someone said, "I'm just an expert
19 in PECVD," that would be very limiting for that person.
20 So we -- and I don't tell people what to do. They have a
21 problem, they call me, and I try to provide the best
22 solution, make it efficient.

23 Most -- most companies do not like PECVD. It's
24 complicated. They prefer not to be part of that. It's
25 too complicated for them. And it takes too much --

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1 there's too much drama, too much cost.

2 It's -- it's used, but it's -- it's a
3 complicated topic. And we talked about that before.

4 Industry solutions need to be simple.
5 Manufacturing solutions need to be simple. Because
6 everything that can go wrong will go wrong eventually.
7 I have -- I have lots of stories about serious drama with
8 PECVD.

9 **Q Have you ever taught PECVD in the context of,**
10 **you know, when you were working as a professor at RPI or**
11 **any other point in your career?**

12 A I was never a teaching professor. I taught
13 guest lectures, and I've advised many students. So I've
14 advised students on PECVD, and I've given some guest
15 lectures, but I don't teach courses.

16 So that's another thing. Most folks go, "What
17 do you teach?" And I go, "No, I don't teach." And they
18 get confused. Because I was a physics professor for a
19 couple years, for example. "And so what do you teach?"
20 I'm like, "No, I don't teach anything."

21 I'm not even a physicist really. I mean, like,
22 I'm -- I know a lot about physics, but I don't have any
23 degrees officially in physics; but I can talk all day
24 about physics.

25 So you eventually -- scientists -- we have

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1 formal education, and then eventually you teach yourself
2 topics.

3 You know, I think some folks say, "Well, I need
4 to go back to school." I say, no, I'm in school all the
5 time. I don't -- that's fine. I don't need to go back
6 to anything.

7 **Q Okay. We've been going about an hour, and I'm**
8 **about to, kind of, pivot to a different -- a different**
9 **topic. Why don't we take a break here, if that's okay.**

10 **A Thank you. Yeah.**

11 **Q I mean, I don't expect we're going to go all**
12 **day, so, I mean, I don't -- you know, should we do, like,**
13 **maybe 10 minutes as a break?**

14 **Is that okay with -- with you, Doctor?**

15 **A That's completely fine.**

16 **MR. MC KEEVER: Ariel, yeah?**

17 **Okay. So I'll come back in about 10?**

18 **THE WITNESS: 10 after?**

19 **MR. MC KEEVER: Yeah. Sounds good.**

20 **MR. REINITZ: Dr. Senkevich, I'm just going to**
21 **remind you to -- if you're going to do anything else --**
22 **you're not going to be talking to me, but just put**
23 **your -- turn off your video and mute it, as well.**

24 **THE WITNESS: Okay. All right. Thanks, guys.**
25 **(Recess.)**

1 BY MR. MC KEEVER:

2 Q All right. Welcome back, Dr. Senkevich. I'm
3 going to shift gears to your declaration in a moment, but
4 I just had a couple of last questions on your CV before
5 moving on.

6 You've got a lot of papers on here for sure.
7 I looked at a couple of these. I didn't -- I didn't make
8 any attempt to look at all of them or anything like that,
9 but I was just curious.

10 Are there any particular papers that you've
11 published that are especially relevant to PECVD? And
12 you're welcome to take a look at your CV if you want to,
13 kind of thumb through the list there.

14 A I know you just sent it to me. Well, I don't
15 know -- I can tell you. So I published a couple of
16 papers on the PECVD of fluorocarbons. That was some
17 years ago. And then a nanocomposite material --

18 (Stenographer clarification.)

19 THE WITNESS: Nanocomposite.

20 And then -- and then there's other publications
21 on plasma deposition of other materials, as well.
22 Tongston. For example, I published a couple papers on
23 Tongston. They're in there.

24 And, of course, the industry folks, they don't
25 care about publishing anything. It's a fight to publish

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1 anything with companies. Even to tell -- even to say
2 their name is a fight.

3 BY MR. MC KEEVER:

4 Q Got it.

5 A Every day's a big secret now.

6 Q I guess the first category you mentioned, the
7 PECVD of fluorocarbons, can you just maybe pick out one
8 of those for me so I know what time frame we're talking
9 about here?

10 A Yeah. We're talking about the '90s at this
11 point, I think. Or maybe early -- like, late '90s.

12 Q Okay. Or maybe -- would number 15 -- under the
13 "Peer Reviewed Publications," it looks like there's one
14 in 2000 that references -- yeah, "Plasma Enhanced
15 Chemical Vapor Deposition of Fluorocarbon Thin Films"?

16 A Yeah, let me look it up here.

17 Q Okay.

18 A Yeah. Yeah. So you see number 14. Number 13,
19 14, 15, yeah. 13, 14, 15, for example.

20 Q And those would've been from the time period you
21 were at RPI; is that right?

22 A No. I was at a start-up company that eventually
23 got bought by Dow Chemical.

24 Q Okay.

25 A So that's a -- that was another job that I could

1 just have fun and do what I wanted. I've had a lot of
2 those jobs, or whomever paid me allowed me to have fun.

3 Q Got it. And what was the name of that start-up?

4 A That was -- I don't know what's on my CV. It
5 was originally ACT MicroDevices.

6 Q Okay.

7 A It became halos. And then it became Shipley,
8 and then it became Rohm and Haas, and then it became
9 Dow Chemical.

10 Q That name -- the first name you mentioned sounds
11 familiar. I think I did see that on one of the papers.
12 ACT Micro?

13 A Yeah. Right. So that was in Virginia.

14 Q Okay. And then I was just going to, kind of,
15 ask you a similar question about the patents that are on
16 your CV.

17 Are any of the patents, kind of, especially
18 relevant to PECVD or related to PECVD?

19 A There's a lot of patents related to polymer
20 deposition but not PECVD; right?

21 Q Okay.

22 All right. So let's shift away from the CV.
23 Obviously, you're welcome to refer to that if you want
24 to; but I'm not going to ask you, I don't think, any more
25 specific questions about that.

1 I want to turn to your declaration. I did put
2 Exhibit 2007 into the chat window, so you're welcome to
3 use that.

4 A Okay.

5 Q Pull it up. And if you could turn to page four
6 of your declaration, there's a section titled "Materials
7 Considered." Do you see that?

8 A Is there a number on the line?

9 Q Paragraph 22 is the first paragraph in that
10 section. Is that what you're asking?

11 A Yeah. Okay. I see it. I have it now.

12 Q Yeah. Not a -- not a tricky question or
13 anything. Just -- I guess, can you just explain what
14 this section talks about?

15 A Just that I read the Gleason declaration.
16 I read Cohen Legein Francesca, you know. Just basically
17 the background information.

18 And then -- and then substantiated references as
19 well. So you can see those. They go -- they go down the
20 references page. Were consulted to prepare my
21 declaration.

22 Q Okay. So does this section accurately identify
23 the universe of materials you considered in working on
24 your declaration?

25 A Yeah. Yes, I would.

1 **Q Okay.**

2 **A And, of course, my experience in the area, as**
3 **well, but -- so that I could share references with you**
4 **and counsel as well, obviously.**

5 **Q Of course. Okay. Can you turn forward to page**
6 **18 and paragraph 52?**

7 **A Okay.**

8 **Q Do you see there paragraph 52 is under a section**
9 **titled of "Person of Ordinary Skill in the Art"?**

10 **A Yes.**

11 **Q And so in that paragraph -- actually, why don't**
12 **we just do it this way. Can you just read that paragraph**
13 **aloud slowly, I guess, for Ms. Glover?**

14 **A Paragraph 52?**

15 **Q Yes, please.**

16 **A Okay.**

17 **"It is my understanding that a person of**
18 **ordinary skill in the art, POSITA, at the time**
19 **of the effective filing date of the European**
20 **application that led to the 087 Patent is**
21 **someone who would have had a bachelor's degree**
22 **in chemistry, chemical engineering, or similar**
23 **discipline, and at least two years of**
24 **experience with plasma-polymerization techniques.**

25 **"A POSITA would have at least a general**

1 knowledge of plasma polymerization. An
2 advanced degree in these fields may be
3 substituted for professional experience and
4 vice versa."

5 Q Okay. And so -- thank you, Dr. Senkevich.

6 Does that -- does the level of skill in the art
7 that you identify in that paragraph -- paragraph 52 --
8 that's -- that's what your opinion is as to the level of
9 ordinary skill in the art for the 087 Patent; correct?

10 A Yes, that's correct. We borrowed that from
11 Dr. Gleason, and we agree with it.

12 Q Okay. So that includes at least two years of
13 experience with plasma-polymerization techniques;
14 correct?

15 A Correct.

16 Q So what does that mean to you?

17 What -- you know, a person having this level of
18 skill in the art, what would -- what would that person be
19 doing -- what are some of the things they would be doing
20 during their two years of experience with
21 plasma-polymerization techniques?

22 A So in the sciences there's generally a
23 distinction between a bachelor level person and a Ph.D.
24 level person. Master's degrees are basically bachelor
25 level people.

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1 A bachelor's degree scientist or engineer a
2 considered a technician. And a Ph.D. is considered a
3 researcher, a manager, and someone -- a spokesperson,
4 someone who would speak on behalf of the technology.

5 And -- and so a POSITA in this, sort of -- in
6 this context -- but it could be any context really -- is
7 a technician who would not be -- not be doing research,
8 not developing technology.

9 They would be undertaking experiments at the --
10 at the behest of a Ph.D. or a manager. So they're
11 basically told what to do. They're not developing
12 knowledge.

13 So it's essentially like having a cabana boy at
14 the beach. You know, you would say, "Hey, I need to do
15 this," and they would follow orders.

16 They're not -- it's not customary for a
17 technician to be creative. And bachelor level people
18 don't read literature. They -- they're very focused on,
19 sort of, following orders because their knowledge base is
20 very limited.

21 And in the case of, say, plasma, they could get
22 hurt. There's high voltage involved. So it's more than
23 just not being able to do good work. It's -- could be
24 dangerous.

25 Q And so even if they're working, I guess, under

1 the direction of a Ph.D., I mean, what -- you know, if a
2 person with this level of skill is -- is spending two
3 years working on plasma-polymerization techniques, like,
4 what -- what kinds of activities would they be carrying
5 out, even if it's under the direction of a Ph.D.?

6 A The Ph.D. would give them direction.

7 I would say -- as well as orders of, like, "I
8 would like you to carry out these experiments with these
9 parameters to" -- so -- because sometimes you need --
10 there's just a lot of labor that needs to be undertaken.

11 It could be as simple as washing dishes. I know
12 that sounds ridiculous, but someone has to wash the
13 dishes.

14 And so as a Ph.D., I would hire younger folks
15 with less experience to do, sort of, the dirty work to --
16 because -- just division of labor. I have so much -- I'm
17 busy and -- so, as a lawyer, you'd have a paralegal do
18 this. So -- that's a good example.

19 A Ph.D. is to a senior lawyer as a partner, as
20 is a paralegal is to a bachelor level person.

21 So they have knowledge, basic knowledge, but
22 it's more of just getting things done; right? It's not
23 get creative.

24 Q And would they -- would they be able to -- you
25 know, if you're the -- the Ph.D. researcher and you're

1 relying on one of these people, you know, could you have
2 them run -- run tests, "And try -- you know, try flow
3 rates within this range and report back to me what flow
4 rate -- you know, what -- what -- you know, which one
5 hits the sweet spot and gives us a better coating with
6 the -- you know, the compounds we want to use"?

7 A So two years is very, very minimal for these
8 fields. So if you -- in the scenario of making a coating
9 or depositing a coating, you first have to establish,
10 more or less, a design and experiment.

11 So there -- there can be 12 parameters. The
12 Ph.D. would set up and say, "We'd like to look at this
13 one parameter."

14 So the easiest thing to do is say keep all the
15 parameters consistent, the same, and change one
16 parameter. And say -- so just change the flow ratio of
17 the monomers. But once that's done, you have all these
18 samples. Now they have to be characterized.

19 And so then the Ph.D. would give some -- some
20 advisement to the technician to say, "We want to use this
21 characterization -- maybe it's in-house; maybe it's
22 outsourced to -- to look at how that ratio of the
23 monomers change a certain property of the material."

24 Could be the glass transition temperature; could
25 be the hardness; could be solvent resistance. But

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1 it's -- it's -- again, it's -- someone needs to get the
2 work done.

3 And some -- some companies, some labs, the Ph.D.
4 does everything. And in some -- some companies that have
5 more money, they would hire a younger person that's less
6 experienced.

7 But that younger person would never be left
8 alone, because, again, there's safety issues. And this
9 is a real concern. Like, I'm -- I'm considered, like --
10 kind of like a cowboy. Like, I do some crazy research
11 that is dangerous, but --

12 You don't want to see someone hurt. Because --
13 so often these gases that we use are toxic, the high
14 voltage involved. And even experienced folks make -- can
15 make poor decisions.

16 At MIT I'd have physicists that were theoretical
17 physicists, and they were playing with high voltage.
18 And, no joke, I thought they were going to kill
19 themselves. Like, "Put -- put it down," you know.

20 **Q I guess I meant to follow up on this earlier,**
21 **but when you, kind of, referenced washing dishes, that**
22 **wasn't like an analogy.**

23 You're actually saying one of the jobs that
24 someone with this level of experience might have would
25 actually be just cleaning off the -- the materials to get

1 **ready for the next test or something like that.**

2 A Yeah. So you can -- you can visualize, I think,
3 that I have a vacuum chamber; right? It's made out of
4 generally stainless steel, sometimes aluminum. And I'm
5 depositing a polymer in there.

6 Well, at some point you have to clean that
7 chamber. I mean, you know, the polymer is all over the
8 place. And if you don't clean it, it'll get
9 contaminated. So someone has to clean that chamber.

10 And -- and -- but, I mean, we're talking about,
11 you know, like, samples, cleaning samples put in there
12 for experiments, cleaning circuit boards, cleaning
13 glassware. Yeah.

14 Q And would you say that, you know, a POSITA with
15 this level of skill, you know, after working on
16 plasma-polymerization techniques for a couple of years,
17 they would have an understanding of what the different
18 parameters are that can impact the coating and the
19 reaction; right?

20 A So they would -- they would be able to identify
21 the parameters, but the parameters -- if you take all
22 those parameters together, how those parameters can make
23 a better coating, they would have a very vague
24 understanding of that. Because it's a complex system.

25 So, yeah, it's really -- it's not like they can

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1 read a book. This is a lot of -- there's a lot -- so
2 I think by the time I -- I published my first paper, I
3 had already -- I probably had -- I think, at the time, I
4 basically had an equivalent of a Ph.D.

5 And I didn't have, I would say, a great
6 understanding of the parameters. Like -- but I had -- at
7 that point I had an equivalent Ph.D.

8 I could -- I could publish papers. I knew how
9 to publish. I knew how to communicate. I knew what to
10 do based on reading the literature.

11 But I wasn't, like, at a bachelor level, which
12 is, like -- someone with a bachelor's level has no
13 experience in this area at all, zero. It's not taught in
14 schools. So they're going to learn everything they know
15 on the job.

16 (Stenographer clarification.)

17 THE WITNESS: It's not -- it's not taught in
18 school, any bachelor level program. And then you -- they
19 would -- they would -- all their knowledge would be their
20 mentorship with -- with the Ph.D.

21 So -- plus, if we're talking two years -- and
22 two years is a very, very short time for a mentorship.
23 Like, that's -- that's -- that's not much.

24 If they had a really good advisor and they were
25 smart, they could get up to speed somewhat. But from my

1 experience, that's -- that POSITA would have very -- very
2 limited knowledge.

3 If you left them on their own and said, "Okay.
4 Go do it," and -- it would be a disaster. Like, you left
5 for the weekend, and, "You'd go what happened here?"

6 Like -- because it's not just the parameters.
7 It's also vacuum science, characterization techniques
8 or -- or metrology. So -- so the heart of the matter
9 with --

10 Okay. So take a step back. You're going to
11 deposit a polymer on a surface. We typically use silicon
12 for that. We use a piece of silicon wafer; we put it in
13 the chamber; we deposit a polymer coating.

14 And then you say, "Well, that's cute. What do I
15 have now?" It's completely -- "Oh, okay. I have this
16 coating. Now I have to run tests on it." Metrology.

17 So they're -- and that's not straightforward.
18 Like, what do I do with that. It's not -- and the people
19 even -- it's even an issue for Ph.D.'s. What do I do
20 with that coating; how do I know I have a better coating?

21 So you typically would have a metrology tool
22 in-house, if you're -- if you're lucky, that can give you
23 some fast feedback, some in-house feedback so that the --
24 the cycles of learning are tight.

25 But in many cases, if it's in a company, you

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1 don't have access to that. You have to outsource the
2 coating.

3 And if you look at like, for example, the one
4 patent, which is Legein, the characterization is really
5 bleak.

6 If that was a publication, I would've rejected
7 that. Like it's -- it's almost meaningless. You read
8 that, and you're like, "What are they doing?" Because
9 they don't have money to spend with nice metrology.

10 And so there's a lot of, like, weirdness,
11 like -- (indecipherable).

12 (Stenographer clarification.)

13 THE WITNESS: So -- yeah. All -- the polymers
14 have to be characterized initially. And then typically
15 there's follow-up characterization or metrology, and it's
16 a problem.

17 This is a problem in the industry to
18 understand -- so the young engineer or the young chemist,
19 they all do this. They produce a lot of samples. Like,
20 a ridiculous amount of samples.

21 And then -- and then I would walk in there and
22 go, "What are you doing? Like, why did you do this?"

23 And, like, "Well, I wanted to keep doing
24 things."

25 "Yeah, but you don't know where you're going."

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1 And the same thing happens in industry. I get
2 called in to solve manufacturing problems, and they give
3 me this data. Like, you can't imagine how much data
4 sometimes they have. Like, just -- like, thousands of
5 data points. You gotta slow down.

6 So the real problem actually is not the
7 deposition. The real problem is characterization.
8 And -- and when you do a Ph.D. -- you do a Ph.D. based on
9 metrology.

10 Doctoral people know how to characterize things;
11 bachelor's level people don't.

12 So that -- and then -- and then -- so once you
13 know how to characterize something, now you can say,
14 "Wow, let's start with deposition. Now let's do
15 deposition."

16 So I hope that makes sense. Like -- yeah.
17 Maybe you can continue on. It's a -- it's a difficult
18 topic to talk about.

19 BY MR. MC KEEVER:

20 Q Yeah. I want to follow up on what you said
21 there. And I think I -- I think I get where you're
22 going, but I just want to make sure we're on the same
23 page, so --

24 So you said that the problem is -- is not really
25 the deposition. It's more the characterization. So --

1 A Because -- because you can produce a lot of
2 samples very rapidly. And now you say, "Wow, I'm lost."

3 So it's equivalent to going in a car, and you
4 start driving. It's really easy to get in the car and
5 drive, you know, but where am I going? What's the plan?

6 And -- but in the street, you can have a street
7 sign; you can have GPS. But in science there is no GPS
8 or street sign. You have to -- you have to stop and --

9 And -- and so I'm not saying that deposition is
10 easy. It's very complicated. But you can produce
11 sample, sample, sample, sample, and -- so making progress
12 is very difficult because of metrology, not because of
13 deposition.

14 **Q Got it. And so -- so would the POSITA with the**
15 **level of skill that you've identified in paragraph 52 --**
16 **I mean, is that someone who's going to be able to**
17 **determine that a coating that they have produced is a**
18 **good coating or -- or not a good coating?**

19 A Only -- so it would be the job of the
20 doctoral -- the Ph.D. to identify the proper metrology
21 and -- and that's not trivial. That -- that takes some
22 trial and error.

23 But say, "Yeah. This is our plan," and then
24 follow the plan. So -- yeah. So you have -- the senior
25 person has -- makes the plan; the POSITA undertakes the

1 plan.

2 And the POSITA is not reading -- reading the
3 literature. They're not developing new knowledge.
4 They're just following the plan. And that's how all labs
5 work, basically.

6 Q So on the characterization side of things, the
7 POSITA would really need to be relying on detailed
8 guidance from someone more senior in order to be able to
9 determine whether coatings that they -- they produced
10 were -- were good coatings or were not?

11 A That's correct. And the hope is that, for me,
12 I have a smart, young person who learns very rapidly. So
13 I don't have -- every time they do something, they're not
14 talking to me.

15 They can -- they can go one day or maybe even a
16 week, but never that -- it's probably at least a few days
17 and that they're going to leave me alone so I can do
18 other things.

19 You can imagine your paralegal, every two hours,
20 calling you going, "What do I do next?" And you go,
21 "God, man, you're making me nuts." This -- this happens.
22 This happens with Ph.D.'s, too, so --

23 Q Got it. And so just to follow up on this again
24 and, kind of, make sure I understand the distinction, so
25 the -- the deposition piece is -- is less difficult maybe

1 for the POSITA than the characterization piece because on
2 the deposition side -- is it because they're using, like,
3 these deposition tools where you can tweak the
4 parameters, or why -- why is the deposition component of
5 it easier than the characterization piece?

6 A So -- so there's some processes where it either
7 works or doesn't work. If you get it to work, wow, man,
8 you have something. Like, I've worked on two -- let's
9 take two topics.

10 You have one that is -- is a difficult process.
11 But if you're able to accomplish the process, you have
12 it. You're like, "Wow. Great."

13 The second area is everything you do works.
14 When I say "works," you have a deposition, for example.

15 So in PECVD, everything -- almost everything you
16 put into that chamber gives you a deposition. So -- so
17 you say I'm going to start -- where do you start?

18 Well, if you don't have knowledge, you've got
19 problems. So you -- you start with initial gas, and then
20 you get a deposition. Then you have to take that and
21 say, "What's its properties?"

22 And that can take -- initially it can take a
23 month, two months, to go, "I have this. I know what I
24 have." Then -- and then you say, "Okay. Based on that,
25 we have a discussion where to go next with the

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1 deposition."

2 The young -- the young people will keep
3 depositing. They'll keep depositing. And I tell them,
4 "You gotta stop. Stop. You don't have a roadmap. We're
5 trying to develop the roadmap."

6 And so people say, "I pay you to do something."
7 I've had bosses like this. "I pay you to do something;
8 not to sit around and think. You've gotta go work."

9 And the young people are all in this mode --
10 because they have an undergrad degree -- "I need to work.
11 I have an assignment."

12 And then the Ph.D.'s, we -- we meditate. We do
13 a lot of meditation. We -- we don't have real jobs.
14 We -- we do a lot of thinking, a lot of strategy.

15 Like, in -- in law, if you don't have a
16 strategy, you have nothing. You have to have a strategy.
17 And I've hired lawyers that had no strategy. Like,
18 "You're taking my money, but you're not doing anything."
19 We go in circles. You gotta have a -- "Stop. Stop. We
20 need a strategy."

21 So it's really about strategy, but the -- the
22 comment was about that in PECVD everything works in terms
23 of getting a deposition. Trying to optimize a deposition
24 is a nightmare.

25 For example, you would say in a beaker -- so

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1 we're talking about beaker chemistry, which is
2 traditional chemistry. You don't worry about the
3 volatility of the precursor; right? Precursors go
4 insolvent.

5 So if it's soluble, that's all you care about.
6 But if you -- if you're trying to do it in a vacuum and
7 it's not volatile, you've got a problem.

8 And -- and if it's a big molecule and it's
9 volatile, then it doesn't give uniformity. So even
10 though you can get a deposition, it's no different
11 industry, because you need uniformity to coat all the
12 samples.

13 So, for example, in -- in PECVD, one reason why
14 fluorine chemistry is used is because it's volatile. So
15 you get good uniformity.

16 Now, there's a lot of issues with fluorine
17 chemistries, but the big reason you can use standard mass
18 flow controllers, they're volatile and you get
19 uniformity.

20 And that's not even consideration. That's
21 something that -- that young people don't even think
22 about that. Like, you -- that -- that precursor sounds
23 cute, but you can't use that because it's -- it's bigger
24 chemistry. We don't do that.

25 And even some of the -- the literature here from

1 this case, it's, like, those aren't volatile chemistries.
2 So it's very difficult to commercialize them because
3 they're not -- they're not very volatile.

4 And that's -- I've dealt with this issue with
5 young people -- the young engineers in my lab, in my
6 companies I advise. They -- they go, "We'll just use
7 this." I'm like, "Look what you're going to get. You
8 get no uniformity."

9 And so that's cute for a publication, but it
10 doesn't -- it doesn't work for -- it doesn't work for
11 your customer. You can't just deposit one sample. You
12 need to deposit a thousand samples, you know, a thousand
13 boards; right?

14 Q Right. And so I'm just trying to get a clearer
15 sense of, sort of, you know, what's within the
16 capabilities of this POSITA and what's not on the -- on
17 the deposition side.

18 So, like, if you had a client that came to you
19 and brought you in, and they're like, "Hey, we've got,
20 you know, John Smith, who's got a bachelor's degree in
21 chemistry. And he's been working on, you know, plasma
22 polymerization for two years, you know. Can you work
23 with him on -- you know, on improving or coatings?"
24 what -- what would be your expectation of what, you know,
25 John Smith could handle?

1 How much -- you know, how much -- how much
2 latitude would you -- would you give him in doing the --
3 the deposition side of things?

4 A Well, I would -- we would -- I would, sort of,
5 interview -- I would interview him -- in this case, John,
6 I guess -- like, you're interviewing me. "What's your
7 background?"

8 You know, "Where did you study? Did you do an
9 internship? What was your emphasis in undergrad? If
10 you're -- if you're in the industry, where did you work?
11 What experience did you have there?"

12 You know, "Tell me something about your
13 projects. What do you -- what are you good at? What are
14 you -- you know, what's your passion about?"

15 And then it would be, like -- to give them --
16 typically, in the situations, I've never seen it happen
17 where you have someone that is limited -- so a chemistry
18 background knows nothing about vacuum science.

19 So the first thing would be, "Have you ever used
20 high voltage? Have you -- do you know anything about
21 plasmas? Have you" --

22 You know, "Oh, yeah. I worked at this company."
23 "Okay. Okay."

24 So, yeah, I would start off with something
25 probably simple and just follow orders. If they -- if

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1 they're a little more motivated, they would probably
2 start to contribute to group -- a group discussion, a
3 meeting, weekly meeting.

4 And if someone's really motivated, I would go,
5 "You need to go to grad school." Like -- so I had that
6 happen with my student in Munich.

7 Yeah, he was a bright student. He contacted me
8 to get a master's degree, and I recognized that he was
9 exceptional. And so he -- I said, "You should pursue a
10 Ph.D."

11 And he's working at a start-up company in
12 Munich. He's a technician. He's very frustrated. All
13 he does is follow orders. There's no creativity at all.

14 And he works with Ph.D.'s. He's developing
15 technology. He folds DNA. It's called nanogomy
16 (phonetic).

17 It's very frustrating for a bachelor level
18 chemist to have any creativity at all. If they have any
19 creativity, they're not allowed to have creativity.
20 They're just not.

21 It's -- and there's a pecking order in the
22 medical field, in the science field. So, hey, I have
23 a Ph.D. That's not enough. Like, "Where did you do your
24 postdoc? Were you a professor?" It just keeps going on
25 and on.

1 And so there's some hubris in these fields,
2 but -- the -- the concern is, is that it's very expensive
3 to do development work, very -- and the reason why it's
4 time.

5 So there's equipment; there's materials to buy.
6 But it's very time-consuming. And a company can't afford
7 to have a technician trying to be creative for 10 years.

8 And you might think, "Well, you can develop
9 technology in two years." No. No. It takes years and
10 years to develop technology.

11 And it's very frustrating to work with, say,
12 even a new supplier. I want to get chemistry made with a
13 new supplier, and they don't have basic knowledge,
14 very -- a lot of drama.

15 So, you know, the -- the moral of the story is
16 it's good to hire experienced people. They cost more.

17 Same in the legal field. If you have good
18 lawyers, everything goes forward. If you have a bad
19 lawyer, it's a disaster. If you have a good accountant,
20 things happen good.

21 And then they say, "Man, you really charge a
22 lot." But there's no drama. You pay your bill; you move
23 on. You hire the bad lawyer, you're like, "Man, you give
24 me headaches, you know. I'm fighting you -- I'm fighting
25 you; I'm fighting the judge; I'm fighting the other

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1 lawyer."

2 So it's a similar situation with a paralegal;
3 it's a similar situation with the legal field.

4 And, for me, I try not to have a lot of hubris.
5 It's not, like, man, I'm -- I'm the smart dude. It's
6 just -- so if I have a young student or recently
7 graduated and they're smart, man, let's go. I push you
8 as far as you can go.

9 But it takes time. It's -- I mean, I was, like,
10 the best student at Virginia Tech and RPI. Like, I had
11 won every award. I -- I published a lot of papers.
12 Like, a ridiculous amount of papers, patents.

13 And it's painful to learn how to -- to publish a
14 paper, for example. It doesn't just happen overnight.
15 How to write properly doesn't happen overnight. And
16 I had people -- young students, "I know how to write."
17 Okay. I hope you do.

18 Q Yeah. So -- I mean, so -- so I just want to --
19 I just want to kind of make sure I -- we're on the same
20 page on this.

21 So a POSITA or POSITA who's doing the -- the
22 deposition side -- and correct me if I'm wrong, but this
23 is what I'm taking away from -- from your testimony here.

24 If they're being told by someone more senior, a
25 Ph.D., kind of what -- you know, what tests to run, what

1 parameters to tweak, they would be able to do that.

2 But they might not be able to independently
3 figure out how to tweak parameters and what parameters to
4 tweak and whether a coating that results from a
5 particular set of parameters is any good.

6 A Correct.

7 Q Is that about right?

8 A Correct.

9 Q Okay.

10 A Correct. I mean -- and, honestly, you can apply
11 it to Ph.D.'s even. I mean, this is not just like, "Hey,
12 this person doesn't have experience."

13 (Stenographer clarification.)

14 THE WITNESS: So, yes. Yes, that's correct.
15 And -- and it's even difficult for doctoral level people
16 to be able to decipher where to go next. I advise
17 Ph.D.'s what to do next, what -- how to develop
18 technology. It's -- because it's complicated.

19 (Discussion off the record.)

20 BY MR. MC KEEVER:

21 Q So I think near the end of your -- your last
22 answer there, or maybe it was the previous answer, you
23 talked about how even, you know, Ph.D.'s can struggle
24 with this. And it reminded me, I guess, of -- if you can
25 take a look at paragraph 33 of your declaration.

1 Are you on that page?

2 A Yes.

3 Q Paragraph 33?

4 A Just a second.

5 Q Sure.

6 A There we go. Okay.

7 Q It seems like this is kind of similar to what
8 you were just saying live a minute ago, that -- you know,
9 the end of this paragraph 33 you state that:

10 "Even experts in the field would be challenged
11 to arrive at the -- would be challenged to arrive
12 at the invention disclosed in the 087 Patent."

13 Is that -- am I reading that right?

14 Is that, sort of, the same idea you were getting
15 at in paragraph 33?

16 A Correct.

17 Q And so why -- I get -- you know, you've
18 explained to me, like, you know, why a person with maybe
19 just two years of -- of experience in industry, you know,
20 might -- might be still somewhat limited, but why -- why
21 would someone maybe who's an expert still not really have
22 the -- the knowledge that they would need to -- you know,
23 to arrive at this kind of invention?

24 A Two reasons. Unfortunately, a lot of the
25 Ph.D.'s now are basically technicians. They're put on a

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1 very tight leash in grad school, and the standards are
2 not the same as they used to be.

3 So, for example, I've had students -- co-advised
4 students, no publications, at MIT. Not -- PH.D., MIT.
5 Not one publication. So there's some dilution of
6 standards.

7 The second -- the second reason is that in the
8 context of PECVD, it's complicated. You have knowledge
9 about physics, electrical engineering, and -- and
10 chemical fields, as well, chemistry polymer physics,
11 polymer chemistry.

12 So if you just take physics and chemistry as a
13 general topic, those guys don't talk to each other. They
14 don't even relate to each other.

15 I was -- I have a skill set that's both
16 chemistry and physics. I was a physics professor, and I
17 couldn't even relate to those guys. I'm more of a
18 chemist.

19 We would go to social events, and I couldn't
20 even relate to these guys. They're just in a different
21 world. The jokes they tell, the clothes they wear,
22 like -- so it's a -- it's a significant problem in our
23 world -- the technical world -- where people don't
24 collaborate.

25 Give you an example. I was hired by Midtronic

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1 [sic], a major medical -- the medical device
2 manufacturer. And they had a problem. They were
3 developing a strain gauge for a surgical device.

4 And the surgical device was for laparoscopic
5 surgery; right? And it could cut, but it couldn't
6 staple. It could staple, but there was no control of the
7 stapling; okay?

8 So they want to put a strain gauge which told
9 you -- told them how much you could -- the strength of
10 the staple so there was no tearing in the -- in the
11 sutures.

12 And I went to the vice-president -- I'm -- I'm
13 being paid by them -- and I go, "I need to work with a
14 chemist here. Do you have chemists?"

15 "We don't have any chemists."

16 "You have no chemists. You make \$1 billion on
17 this device; one device, \$1 billion. Where's your
18 chemist?"

19 "We don't have any chemists."

20 "That's interesting. Well, this is a chemistry
21 problem."

22 They go, "Yeah. We don't have any chemists
23 here."

24 "Well, who do you hire?"

25 "Well, we hire medical device people."

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1 "Oh. Do you hire electrical engineers?"

2 "Well, we have a couple consultants."

3 "Do you have any chemical engineers?"

4 "No, no chemical engineers. We have medical
5 device people."

6 A billion dollars. And -- so if you -- it's
7 very common to go to a company where they hired the same
8 person over and over again. They're like cookie-cutters.

9 And yet all the advancement in our technology
10 is, hey, the bio just needs to talk to the chemist, and
11 the chemist needs to talk to the physicist. But they
12 don't go to the same conferences. They don't -- they
13 don't -- they can't even relate to each other.

14 So it -- that's -- so when you talk about a
15 Ph.D., one is the dilution, and one is the lack of
16 collaboration, and one is the system is collaborative.
17 They need to work with other groups, but they don't know
18 how to do that. It's a cultural impairment.

19 **Q And so you might -- a lot of Ph.D.'s that maybe**
20 **would work in this area might not have, sort of, the**
21 **right cross-section of -- of technical knowledge from the**
22 **physics side, electrical engineering side, and the**
23 **chemistry side to be able to -- to understand really how**
24 **PECVD works?**

25 **A That's correct. That's actually the norm.**

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1 That's normal. It's -- for someone to have that
2 experience is very, very rare.

3 I found -- I'm one of the few people in the
4 world that have that experience. It's really -- because
5 I had to do two Ph.D.'s; one in polymer physics, one in
6 plasma deposition -- atomic plasma deposition physics.
7 So -- I was in school -- I was in grad school for nine
8 years. Craziness.

9 Q Gotcha. Okay.

10 A And -- but nobody -- everybody has hubris.
11 Nobody wants to admit, "I don't know that."

12 Q Yeah.

13 Can you take a look at paragraph 37 of your
14 declaration, please? Just let me know when you have that
15 in front of you.

16 A Okay. I'm getting there. Okay. 37. Sure.

17 Q I'm going to ask you like -- like with the other
18 one. I promise I won't -- I won't be doing this all day,
19 but can you just go ahead and read paragraph 37 allowed
20 into the record?

21 A Sure.

22 "The state of the relevant art preceding the
23 European application filed on June 9th, 2015, was
24 the following: The plasma-enhanced chemical vapor
25 deposition (PECVD) of organic coatings was common.

1 "The companies and persons (POSITAs) working
2 in this field typically used a low-density
3 continuous wave radio frequency plasma to deposit
4 hydrocarbon, fluorocarbon, and siloxane polymers."

5 **Q Thank you, Dr. Senkevich.**

6 **And so you agree with that characterization of**
7 **the -- the state of the art at the time the -- the**
8 **European application was filed; correct?**

9 A Yeah. Sure. Yes.

10 **Q So -- and it references continuous wave in that**
11 **last sentence; correct?**

12 A Correct.

13 **Q So can you just explain how -- at a high**
14 **level -- and I'm sure we'll get into more detail -- but**
15 **just at a high level what is continuous wave -- let's**
16 **just start with that.**

17 A Continuous wave system is analogous to you turn
18 on the light, and you leave it on. That simple. So you
19 strike the plasma, leave it on. Don't do anything to it.

20 **Q And that is contrasted with -- with pulsed --**
21 **pulsed wave systems; is that right?**

22 A Correct. So in a pulse system, on a high level,
23 it's turned off and on. So the switch goes on, off, on,
24 off. We call that the duty cycle.

25 **Q And so why -- why was it that companies and**

1 **POSITAs that were doing PECVD around 2015 were focused on**
2 **continuous wave methods as opposed to pulse methods?**

3 A So the -- the status quo was -- so -- okay.
4 We'll take a step back.

5 You have -- we talked about their solution
6 chemistry; right? Beaker chemistry. We talked about
7 vacuum chemistry.

8 Okay. Now, within the vacuum community, there's
9 people called etch people -- they do etching -- and
10 there's deposition people that do deposition. So etching
11 is the art of removing material, and deposition is the
12 art of adding material.

13 So in the etch community, you're trying to
14 optimize, essentially, the etch rate. You want to etch
15 something very rapidly with a certain -- other parameters
16 give you importance; right?

17 In that community, what's called the self-bias,
18 RF self-bias is important. So there's -- there's
19 electrons and ions that -- so a plasma is -- is a state
20 of matter. It has -- it's the fourth state of matter.

21 Our sun is -- is a plasma. So it's -- it's a
22 very high energy state where electrons are ripped off --
23 off of atoms. You actually rip off electrons.

24 And then it glows. It's called glow discharge.
25 It glows different colors. The sun has a color, too.

1 And -- and then you drive -- the ion -- the
2 electrons develop a bias between the ions because the
3 mass difference -- roughly speaking. It's more
4 complicated. Just talk about mass difference -- that you
5 get a charge between the surface and -- and the plasma
6 such that you get a bias; okay?

7 And -- and that's called a self-bias. So
8 that's -- that's actually good to have for etch. For
9 certain -- for the -- in the -- (indecipherable) --
10 community.

11 (Stenographer clarification.)

12 THE WITNESS: Deposition. We say "dep" for --
13 short for "deposition," the dep community.

14 You have ceramics; you have metals; you have
15 polymers. There's only three types of condensed matter
16 in the world; right? Three types of condensed matter:
17 Metals, ceramics, polymers.

18 For metals and ceramics, that bias is good. You
19 like that. For polymers, it's bad. Because -- and
20 what's the difference between a metal, a ceramic, and a
21 polymer?

22 Well, polymers are very gentle. They're very
23 delicate. Like, they're generally -- the bonds are low
24 energy, and they can be broken really easily. So for
25 many years the status quo was we like this bias to

1 develop.

2 But in the case of polymers, that bias destroys
3 the polymer. It creates cross-links, which most people
4 think are good, but it also creates defects.

5 So, again, the bias that develops for polymers
6 creates cross-links, but it also creates defects. So
7 what you would like to have happen is not to have the
8 defects, but everybody just assumed that's the way it
9 was.

10 And some -- I don't know who -- a smart -- a
11 smart person said, "Man, if we -- we pulse this plasma,
12 we don't get the bias. We don't get the defects." So
13 that's where -- that's where the pulsing came about.

14 And, ironically, one of the publications --
15 one -- two of the -- two of the references under
16 consideration, they don't know how to -- they don't know
17 how to pulse the plasma.

18 If you follow their direction, you'd blow up.
19 They don't -- because this was new at the time. These
20 are older publications. They don't know how to pulse the
21 plasma.

22 So there's a criteria about how to study the
23 pulsing, what a duty cycle should be, and they don't know
24 how to do it. So it's -- at that time, very few
25 people -- it was just becoming known at that time how to

1 pulse the plasma.

2 Q Sorry. In what time frame was it just becoming
3 known how to pulse the plasma?

4 A That was that time frame of the -- 2015, 2012,
5 2011. I mean, it's in that early 2000s/2010s, you know.

6 Q Okay.

7 A That's so -- so you're giving a person who knows
8 nothing about plasma, "Here's a new black box. Here.
9 And it'll -- it'll make miracles." And you go, "I don't
10 know how to use this thing."

11 And then -- and so people started to learn.
12 They published, and they learned. But initially it was a
13 disaster. People didn't know what to do. I'm going to
14 slow down. Sorry. I got passionate.

15 Q That's okay. And so -- and I don't need, like,
16 a crazy detailed answer, but I'm just trying to make sure
17 I'm following you.

18 So why does the -- why does pulsing as opposed
19 to continuous wave -- you said it reduces the self-bias;
20 is that right?

21 A Correct. So -- so you turn on the plasma, and a
22 bias develops between the surface and the -- and the
23 plasma sheathe. And if you leave it on, you have a bias.

24 And it -- and it shoots ions to the surface, and
25 it damages the polymer. It also cross-links the polymer.

1 If you -- if you turn it on for a short time and
2 leave it on for a long time, you never get damage. You
3 never get any cross-linking.

4 But that's hindsight. That's known now. At the
5 time, that was not known. That was -- that was -- the
6 knowledge was being developed at that time.

7 Q And I just want to make sure I get what you just
8 said. So you said if you leave it on for a short time --
9 so that's -- you're talking about pulsing.

10 A Right.

11 Q Then you don't get -- you don't get the high
12 self-bias, and that avoids the defects; right?

13 That also avoids -- that also reduces
14 cross-linking, or no?

15 A Yes.

16 Q Okay.

17 A So cross-linking and defects are related.

18 Q Okay.

19 A They're -- they're a parameter that's connected.

20 Q Okay. But -- so prior to -- if we're talking
21 about prior to 2010, though, like, a person with this
22 level of skill in the art we've been talking about is not
23 going to know how to do pulse-plasma polymerization?

24 A No. I mean, it's difficult to know, like, exact
25 dates; but, yeah, that's an accurate statement.

1 Q Okay. Just give me a moment. There was
2 something you said earlier I just wanted to follow up on.
3 I just want to make sure -- see if I can find it.

4 A I think Ariel is going to get us some lunch --
5 send me some lunch.

6 MR. REINITZ: You certainly earned it,
7 Dr. Senkevich.

8 (Discussion off the record.)

9 BY MR. MC KEEVER:

10 Q Okay. I'll try to come back to what I was going
11 to ask you, I think, after the next break.

12 I want to take a -- take a minute to look at
13 the -- look at the transcript and see if I can find what
14 I was -- what I was looking for; but I don't want to use
15 our -- use our time on the record to do that.

16 So in this paragraph 37, which had this state of
17 the art that you read out a little while ago, you also
18 talked about specific, kind of, classes of polymers:
19 Hydrocarbon, fluorocarbon, and -- is it siloxane is the
20 last one?

21 A That's correct.

22 Q I guess, are there particular reasons why
23 these -- these polymers were, kind of, the ones that
24 people were focused on around 2015, or are they easier to
25 work with, or is there some other reason why people would

1 **be -- would be using these -- you know, these materials?**

2 A It's a general class of -- of materials that are
3 worked with even now. Obviously, within hydrocarbons,
4 you can talk about more specifics, but --

5 So when you -- you have a plasma, and you're
6 adding chemistry to the plasma, and it fragments. The
7 bonds break. Like, if you put chemistry into the sun,
8 it'll just combust. It'll just blow up; right?

9 So you can imagine the chemistries can't be
10 complicated. They have to be simple. So what are simple
11 chemistries? Hydrocarbons, fluorocarbons, siloxanes.

12 If you put something more complicated in there,
13 it just fragments. So -- at the time, you keep things
14 very simple. So, for example, hydrocarbon, you would
15 add -- you might add toluene.

16 That's a good one. T-o-l-u-e-n-e, toluene.
17 That's a Home Depot chemical.

18 Yeah. So you keep chemistries very simple
19 because of fragmentation.

20 **Q And you've used that term a few times, and I've**
21 **seen it in other places, too. So the record is clear,**
22 **when you talk about fragmentation of the monomer, what**
23 **does that mean?**

24 **What are you referring to?**

25 A Breaking bonds. So toluene is -- is benzene

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1 with a methyl group. And you might crack the -- the
2 methyl bond. It would come up.

3 The methyl would come off. That would be the
4 first one to come off because that's the -- that bond is
5 the weakest bond.

6 And so the -- what has to happen with the plasma
7 is fragmentation. It has to happen. But you don't --
8 you want to control the fragmentation, and that's where
9 it gets complicated.

10 Whereas, if you're working with ceramics, you
11 just want full fragmentation, basically. Like, it's --
12 it's much easier to deposit a ceramic than a polymer
13 because the bonds are simple.

14 For example, silicon dioxide, SiO₂. That's all.
15 If you talk about methacrylate --

16 (Stenographer clarification.)

17 THE WITNESS: Methacrylate is
18 m-e-t-h-a-c-r-y-l-a-t-e.

19 That's a complicated molecule, and it's going
20 to -- it's going to blow up in the plasma. So the goal
21 of the PECVD scientist is to understand the degree of
22 fragmentation so they can make a proper material.

23 BY MR. MC KEEVER:

24 Q And I think you kind of already got at this a
25 little bit, but I just want do make sure it's clear.

1 **So to do PECVD, you need a certain amount of**
2 **fragmentation in order to -- for the deposition to occur;**
3 **right.**

4 A Yeah. You can imagine in a beaker there's
5 no fragmentation. You control bond breakage, bond
6 formation. In a plasma, by definition you have
7 fragmentation. But you don't want fragmentation.
8 So it's a nightmare.

9 Again, you want fragmentation, but you -- you
10 don't. I mean, you know, it's -- it's nonsense; right?
11 You're trying to do -- yeah.

12 **Q I'm sorry.**

13 A You're trying to do something that's basically
14 not -- the system doesn't want to do.

15 **Q And I think I -- I think I understand why you,**
16 **on the one hand, want fragmentation, or at least some**
17 **fragmentation. Can you just explain why you don't want**
18 **too much fragmentation when we're talking about PECVD?**

19 A So we're talking about material science.
20 Material science is -- tries to connect physics and
21 chemistry. And there's a concept in material science
22 called structure proper relations.

23 So in order to engineer a material, you engineer
24 the structure to get a certain property out of it. And
25 so we have discussions about how to design materials.

1 And if something's fragmented, you're not
2 designing anything; right? It's fragmented. It's --
3 it's garbage. A fragmented molecule, for the most part,
4 is nonsense. It's -- there's no value at all.

5 Like, you have a -- you have a -- let's say a
6 bottle for juice, a juice bottle. And now I'm going to
7 start cutting it up and cutting it up in pieces. And you
8 say, "But it's not a juice bottle anymore."

9 I just want a -- a hole in the top. But now
10 I've got holes in the side and everywhere, and that's no
11 good. So it's equivalent that you want to control where
12 the hole is for the juice bottle.

13 **Q Okay.**

14 THE STENOGRAPHER: When you get to a good point,
15 could we have another break, please?

16 MR. MC KEEVER: Yeah. And -- so I think this
17 is my last question on this topic, and then we can take a
18 break.

19 BY MR. MC KEEVER:

20 **Q And so the -- the use of continuous wave causes**
21 **too much fragmentation. And then that's what -- that's**
22 **where you end up with this, sort of, useless garbage**
23 **material that -- that would be included in the -- in the**
24 **coating layer, and you don't want that; is that -- is**
25 **that right?**

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1 A No, it's not.

2 Q Okay.

3 A There's two concepts. One is the degree of
4 ionization of the plasma. So we call it the plasma
5 density. That fragments the molecule.

6 And then I'm -- I'm depositing under reducing
7 conditions to make the polymer on the surface; right? On
8 the silicon wafer or on the printed circuit board or on
9 the phone.

10 And you have the -- another problem that
11 develops, the bias, the RF self-bias. And it starts --
12 then you can imagine, okay, I have this beautiful
13 polymer. And now I have ions shooting down to the
14 surface, bombarding the surface, and it's creating
15 defects and cross-links.

16 So one is the problem of the bias, and one is
17 the problem of the fragmentation. So pulsing or
18 continuous wave plasma do the same fragmentation, more or
19 less.

20 That's not -- that's not the issue there. It's
21 the bias with the continuous wave plasma that causes the
22 problem.

23 MR. MC KEEVER: Okay. Let's take a break here,
24 and we can go off the record.

25 (Lunch recess.)

1 Cross Plains, Wisconsin, Thursday, November 21, 2024
2 (Afternoon Session)
3

4 BY MR. MC KEEVER:

5 Q Welcome back, Dr. Senkevich. Can you take a
6 look at paragraph 40 of your declaration, please?

7 A Let me get it up here again. Okay.

8 Q And as with a couple of the other ones, just
9 because I'm going to ask you some questions about it, can
10 you just go ahead and read paragraph 40 in the record
11 before I do?

12 A Okay.

13 "For the relevant POSITA, the modus operandi
14 in 2015 was, for example, to add a fluorocarbon
15 to the plasma deposition tool to deposit a
16 fluorocarbon coating, then test the coatings
17 for its properties.

18 "This iterative approach was repeated until
19 the properties were optimized while adjusting
20 the parameters of the plasma deposition tool.
21 This approach is time-consuming, lengthy, and
22 often did not achieve complete success in
23 creating a coating with optimized properties."

24 Q Thank you.

25 A Sure.

1 Q And so this iterative approach that you talk
2 about in paragraph 40, is this, kind of, the same process
3 that we were talking about earlier, that, you know, maybe
4 a POSITA could execute some of this, but they would need
5 guidance from, you know, a Ph.D. or -- or someone with
6 more -- more experience?

7 A Yeah. So you have -- if you didn't have a Ph.D.
8 there, I'm not sure if you would ever be able to achieve
9 anything that would be desirable, because there's just
10 too many parameters.

11 You know, if you add up all the parameters, all
12 the different knobs to turn, there's just too many.

13 And so the -- the idea is you try to hire
14 someone with a lot of experience who can turn the knobs
15 into the right direction and then -- and then optimize
16 them with the POSITA or the technician.

17 Q Okay. And you reference in this paragraph,
18 like, a plasma deposition tool. Can you just explain
19 what -- what that is?

20 A For the lack of a better word, it's just the
21 terminology we use in the industry. So a deposition tool
22 is a -- is a tool that's used for depositing coatings.

23 In this case, it's a vacuum deposition tool with
24 plasma, you know, capabilities. So, you know, I guess
25 it's -- for me, it's kind of self-explanatory.

1 Q Okay.

2 A It's just a terminology we use, yeah.

3 Q Okay. And so -- and I don't -- I don't know
4 this industry super well, so apologies if this is sort of
5 a dumb question, but --

6 So is this -- is this -- these tools and these
7 equipment that are used -- you know, would be used in
8 testing and -- and, you know, experimenting with -- with
9 coatings, is this, like, stuff that you could buy, like,
10 you could go -- like, a company makes and sells these
11 things, or is this all, like, companies would -- would
12 create their own tools for -- for them to use themselves?

13 A There are companies that build them, but they're
14 typically built to spec. So what that means is that you
15 would work with a company to build something to your
16 specifications.

17 Q Okay.

18 A Right.

19 Q I think in one of the -- one of the papers that
20 I looked at from your CV -- I can't remember if it was
21 one of the ones that you -- that you, kind of,
22 highlighted this morning or not.

23 There was a reference to, like, Plasma-Therm,
24 which appears to be a vendor. So do they make plasma
25 deposition tools?

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1 A Correct. Plasma-Therm is traditionally -- I
2 think it was upstate New York originally, and it might be
3 now, I think, in Florida, but -- I forget.

4 But -- yeah. So -- and the other aspect is that
5 you can take an etch tool, and you can make a deposition
6 tool. And -- so with the right chemistries and the right
7 parameters optimized.

8 But, yeah, you can -- you can buy a tool.
9 Deposition is a lot more complicated than etch. And --
10 and the challenge is that the Ph.D. scientists don't
11 sometimes even know what they need.

12 So it's a very dangerous game in terms of
13 capital, because these are expensive tools. They're
14 not -- they're not millions of dollars, but they can get
15 to that point, the basic tools. And -- and so -- yeah,
16 they exist, and you can buy them.

17 Q And so you, kind of, referred to, you know,
18 which knobs to turn and turning knobs and stuff like
19 that. I mean, are there literally, like, knobs on these
20 things?

21 Are these, like, computer-controlled devices?

22 Like, what -- what do one of these things
23 actually look like, you know, that you're -- if you want
24 to adjust some parameters of the reaction, like, how do
25 you actually do that using a plasma deposition tool?

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1 A So it's funny because I'm building a tool right
2 now in India. And traditionally a research tool would
3 have manual controls, and it's not built for
4 user-interface friendliness.

5 But most of the commercial tools have a PLC --
6 so an integrated computer -- to control things. And, you
7 know, it's such that commercial tools might be a little
8 more optimized than -- so that you've got a good head
9 start of where to go, at least.

10 Q So, I guess, they know that -- you know, that
11 their customers are going to want to tweak various
12 parameters; the commercial tool might make it easy for
13 you to adjust the kinds of parameters that -- that they
14 know you'd want to mess with?

15 A Yeah. There's a -- it's known that bachelor's
16 level people -- and sometimes they have no bachelor's
17 degree -- are the ones operating the tool.

18 And Ph.D.'s are expensive such that you buy a
19 tool, and you want them to just press a button and it
20 goes.

21 And that's always a point of contention with
22 these major OEMs, major customers, to -- to, like, hey,
23 it's -- it's sort of the difference between a Macintosh
24 computer, traditionally like a -- I grew up with, like,
25 PCs. And you had to, like, almost code to -- to use a

1 PC.

2 And a Macintosh you turned on, and it was point
3 and click. But if something went bad, you didn't know
4 what to do with the Macintosh. It was, like, "Wow. It's
5 crashed. What do I do now?"

6 Q So the -- following that analogy to its
7 conclusion, like, the -- the commercial plasma deposition
8 tools would be kind of more like the Mac that would be
9 designed for someone who's maybe just got a bachelor's to
10 turn -- be able to, kind of, turn the knobs and -- and
11 run things?

12 A Yeah. The companies that build these normally
13 have more than one design. And they have, you know,
14 bigger systems, smaller systems, but there's a push to
15 make everything integrated, which if you're trying to
16 develop technology, that's a big -- that's a problem.

17 So commercial systems are difficult to use for
18 research to develop patents, to develop intellectual
19 property to develop knowledge.

20 And so -- yeah. It's always -- and they're more
21 expensive -- the commercial tools, right? -- because
22 they're bigger. They're made to produce a lot of parts,
23 produce a lot of production.

24 Q Do, like, researchers and academia, like, build
25 their own plasma deposition tools, then, to, sort of,

1 **have more control over, you know, how they want to use**
2 **them?**

3 A Correct. And we have -- we have small budgets,
4 too, so -- the tool I'm building in India right now, I'm
5 like, "Hey, we should use a vacuum pump, we should keep,
6 you know, the budget low." Because they get -- it gets
7 expensive.

8 Q Yeah.

9 A It's very, very expensive to build a tool, to
10 operate the tool, to have an engineer. Even a bachelor
11 level person, it's expensive. And the management always
12 underestimates the cost and complexity of the technology.

13 Q And so the last -- last sentence of paragraph 40
14 you talk about, you know, this iterative approach, you
15 know, being time-consuming and -- and often doesn't
16 achieve complete success in creating a coating with
17 optimized properties.

18 What do you -- what do you mean there by
19 "optimized properties"?

20 What kind of properties are we -- are we talking
21 about when we're talking about these kinds of coatings?

22 A Well, in the case of -- relevant to this case,
23 we're trying to coat printed circuit boards to protect
24 them from moisture.

25 And you can imagine a printed circuit board has

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1 electrical contacts going into the board and out of the
2 board. If -- and it's not -- the wires aren't built in.
3 So you just have a blank board.

4 And I'm going to coat that board with a polymer.
5 And let's say that polymer is five microns, and it's
6 insulating. How am I going to electrically connect my
7 wire to that board?

8 Now, it's -- there's no connections. So --
9 so -- for example, to optimize a property, you'd want the
10 thinnest coating possible but to have the best properties
11 possible.

12 When I say "properties," maybe the best water
13 barrier. So we're developing coatings for moisture.
14 Because water kills electronics. I mean, it's --
15 electronics and water are not compatible in any way, and
16 so we have this coating to protect it.

17 If it's a thick coating, now we have a problem
18 of how to connect electrically to this board. So that's,
19 like, one of the -- one of the -- the optimization that
20 we have to try to achieve with the coating.

21 And there's -- that's a whole topic. We can
22 keep talking about that, but that's kind of like an
23 example.

24 Q Okay. And then, like, for -- you mentioned
25 water barrier. So there are -- there are specific tests

1 that you would apply to the -- to the sample that's been
2 coated in order to, sort of, measure the effectiveness of
3 the coating, you know.

4 In terms of being a water barrier, that's part
5 of the characterization and metrology that you talked
6 about earlier?

7 A Correct. So you have the choice of either
8 working with the customer -- you deposit for the
9 customer. They test it in their lab to their
10 specifications, and who knows what they do.

11 But -- but it's important to have -- you would
12 think it's important to have metrology in your own lab
13 before you get it to the customer. Because if you give a
14 bad sample to the customer, you lose the customer.

15 So if you're developing the technology,
16 developing IP, you need to test things. And it's -- it's
17 always a bit of an iterative approach, you know.

18 It's -- there's no -- in science at least
19 90 percent of what we do is failure. Sometimes it's
20 99.9 percent. Success is not the norm.

21 When you go to the store and you say, "Things
22 work," that -- that took a lot of effort. We call them
23 armies of soldiers, armies of engineers developing
24 technology that work long hours and have lots of
25 education.

1 Q I can put it through the chat, although maybe --
2 do you have a copy of the 087 Patent in front of you?
3 I'll put it in the chat anyway. Let me just go ahead and
4 do that.

5 A I do. Putting it in the window is good.

6 Q Okay. So I was just going to ask you a question
7 about Claim 1 of the 087 Patent, if you can turn to that.

8 A Okay. Give me a second to download and --

9 Q Okay.

10 A The Zoom is really nice, but the interface is a
11 little off sometimes.

12 Q Yeah.

13 A I mean, for novices like me. Okay. Yeah, I
14 have it.

15 Q And so, you know, take your time, look at the
16 claim language, look at whatever you want to look at, but
17 my question is just, you know, does -- do you understand
18 Claim 1 to require any optimized properties of the
19 polymer coating?

20 A Let me look at Claim 1.

21 Q Okay.

22 A I guess that's on column 19, no?

23 Q Yeah. It starts on column 18 about halfway
24 down, yeah. These are -- along with all the diagrams.

25 A From my opinion, Claim 1 is establishing a

1 material parameter space. It's not about optimizing
2 parameters. It's about this is the chemical class
3 that -- that establishes the claim.

4 Q Okay.

5 A As -- right.

6 Q If I can have you turn back to your declaration,
7 can you take a look at paragraph 49, please?

8 A Okay. I've got 49.

9 Q I just want to make sure I understand something
10 that you say in this paragraph.

11 So you're talking here about the cross-linking
12 reagent, and you talk about the monomer compound in this
13 paragraph; right?

14 A Uh-huh. Correct.

15 Q And you say that the monomer compound --
16 actually, you know what, I'm going to skip this. I'm
17 going to come back to this later. I think that would
18 make more sense. I'll withdraw the question.

19 If you can look at paragraph 50 instead, the
20 next paragraph.

21 A Okay.

22 Q Towards the end of that paragraph, five lines up
23 from the bottom, I'll just read the last -- I think it's
24 just the last sentence. It states:

25 "The 087 Patent discloses multiple parameters

1 for optimization, including but not limited to the
2 sequence of the on/off pulse cycle, the power
3 density of the plasma, the time and power of the
4 application of voltage, the rate at which the
5 precursors are fed into the chamber, and the
6 amount."

7 And then in parentheses it says:
8 "V/v of the cross-linking reagent used."
9 Do you see that?

10 A Yeah, I do.

11 Q So these are some of the -- these are some of
12 the parameters that you would -- that you would try to
13 optimize in doing PECVD; right?

14 A Yeah. A few of the parameters. Like --

15 Q Okay. There's more than just what's in this
16 list; right?

17 A Yeah. Probably triple that much, right.

18 Q Okay. And then you've got a citation there to
19 the patent, column 13, line 23 to column 14, line 36. Do
20 you see that?

21 A Yeah. I do, yeah.

22 Q I just -- can you take a look at that portion of
23 the 087 Patent? I just want to, sort of, ask you a
24 little bit what -- you know, what the patent is
25 describing in that section, if I could.

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1 A Okay.

2 Q And with any of this stuff, where I'm asking you
3 to look at a portion of the patent or look at, you know,
4 something in the patent, take as much time as you need.
5 I'm not trying to rush you with this stuff. I know it's
6 pretty dense.

7 A Maybe it would be helpful if you asked, like, a
8 specific question.

9 Q Sure.

10 A If you have something there.

11 Q Yeah. So the question I was going to ask you is
12 does this portion of the patent -- is this telling us
13 what the optimal parameters are, or is this, sort of,
14 telling us -- you know, just telling us what the
15 parameters are that we need to optimize and telling us,
16 you know, some ranges that we may want to look within?
17 Does that make sense about my question?

18 A Yeah. It's customary when writing intellectual
19 property to not give one number but to give ranges. And
20 so, typically, you'd say a bigger range, a more narrow
21 range, than optimally this range. And then follow that
22 up with an example; right?

23 Q Okay.

24 A So this is -- this is in the description of the
25 patent; right? Which would give a background to the

1 patent, and then you'd have examples, and then you'd
2 eventually have claims.

3 So there's a -- there's a certain -- yeah.
4 There's a little bit of optimization there; right? But
5 it's -- there's an optimal range, which is typically how
6 it's done in IP.

7 Q Okay. And so -- like, if I just pick a
8 paragraph as an example, so if you look at column 13,
9 line 49, there's some talk about -- I don't know if
10 there's a -- is there a shorthand name for what this
11 parameter would be where you're talking about how long
12 the -- the field is applied?

13 A Oh, the pulse field. So that's, like,
14 deposition time.

15 Q Okay. So we can use that, "deposition time."

16 A Yeah.

17 Q So here it says, you know:

18 "Optionally the voltage is applied as a
19 pulsed field for a period of from 30 seconds
20 to 90 minutes."

21 Right?

22 A Correct.

23 Q I mean -- so that's a pretty -- pretty big
24 range. I mean from a half a minute to 90 minutes, agree?

25 A Yeah. Well, it depends on how thick -- how

1 thick you want a coating. That's really what that says.

2 Q Okay. And then, I guess, as you said a moment
3 ago, like, sometimes they maybe then provide some -- a
4 more specific range. So it looks like in this instance
5 they've done that. So the next -- the next sentence,
6 column 13, line 50 to 51, says:

7 "Optionally the voltage is applied as a
8 pulsed field for from five to 60 minutes."

9 Right?

10 A Correct.

11 Q So that's, sort of, a smaller range that's
12 within that earlier broader range, but that's still a
13 pretty -- pretty large range; right?

14 A Well, the coating thickness isn't a parameter.
15 It's based on the customer need; right?

16 So -- a very thin film something that's less
17 than a hundred nanometers, we call those -- you're in the
18 nano range. That's the nano range. And the properties
19 change as a function of thickness.

20 From a hundred nanometers to a micron, it's
21 called a thin film And that's defined by -- the thin film
22 can exist without the substrate. Above a micron, it's --
23 it's a coating.

24 And -- and so there's -- going back, there's an
25 optimal coating thickness depending on the customer need,

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1 depending on what they're trying to achieve.

2 But that's not a parameter of the system really.
3 That's more just like, "Hey, you know, this is my
4 application. Based on my application, what are my --
5 what's my thickness need? How much" --

6 For example, my customer has high voltage
7 applied to the board. It's a high voltage board. And so
8 this is my -- and this is my breakdown strength of my
9 coating.

10 So I put down a micron, and it can handle a
11 thousand volts, something like this. And so, like, I
12 might have to put a little more thickness down for
13 that -- for that customer.

14 Another customer might say, "I'm only applying
15 five volts." Okay. That's not a consideration. I can
16 do a much thinner coating. I can do a thin film.

17 And the thicker the coating, the more drama
18 there is with cleaning the chamber, with deposition time.
19 This is an expensive tool. So the more time that those
20 parts are in the tool, the more expensive the coating is.

21 And so that's -- that's, sort of, a
22 customer-driven parameter, not a plasma parameter.

23 **Q Okay. Are the other examples of the parameters**
24 **that you identified in paragraph 50, are certain of those**
25 **other parameters more of a -- more of a plasma parameter**

1 **than, sort of, a customer parameter?**

2 A Correct.

3 **Q Is it all of those or certain ones?**

4 A Let me see. Yeah. So sequence on/off,
5 that's -- that's a plasma parameter. Power density,
6 that's a plasma power. That's a parameter of plasma.

7 (Stenographer clarification.)

8 (Discussion off the record.)

9 THE WITNESS: So there's customer parameters,
10 which relates to the application. There's parameters
11 that can be adjusted in the tool to obtain a certain
12 property of the coating. And there's some that are
13 fairly fixed.

14 Like, so the power density of the plasma can be
15 adjusted, but it's not something that's easily adjusted
16 without having a different type of plasma. But -- but it
17 is a parameter.

18 BY MR. MC KEEVER:

19 **Q I'm not sure -- I'm not sure I followed that.**

20 **So that is something you can adjust, but it's**
21 **not -- it's harder to adjust that parameter than many of**
22 **the other parameters that -- that impact the coating?**

23 A So I wrote that in a, kind of, equivocal way.
24 So power density would say applied power is a function of
25 area, is really what that means.

1 And so that is a parameter that's -- that's
2 adjusted in a plasma tool. But you don't adjust the
3 area. Your area would be fixed; right?

4 Q Okay. So you're adjusting how much -- how much
5 power you're pumping into a -- the fixed area that's,
6 sort of, based on -- (indecipherable).

7 A Right. Correct.

8 (Stenographer clarification.)

9 MR. MC KEEVER: Yeah. I think I had said like
10 the -- you know, volume of the -- of the chamber or
11 something like that.

12 BY MR. MC KEEVER:

13 Q So, I guess, just to make that piece clear if it
14 wasn't.

15 So the power density, you can adjust the power
16 that you're pumping into the chamber, and that could
17 impact the power density; but you're probably not
18 changing the size of the chamber on the fly or something
19 like that.

20 A Correct.

21 Q Okay. And is that -- I mean, is that a
22 parameter that has a big impact on the resulting coating,
23 or -- or is that something that's -- you said it's a hard
24 one to change.

25 Is that something that you find one that works,

1 and it works pretty well across different monomers you
2 may want to use?

3 A I misspoke. So the power that's applied, that's
4 a knob that's -- that's -- has a big impact, and that can
5 be easily changed.

6 If you talk about plasma density, I was --
7 that's a separate topic. That has to do with the type of
8 plasma that's used. And that's not a parameter that
9 would be easily changed, to clarify my statement.

10 Q Got it. So -- so you're making the distinction
11 between power density and plasma density; right?

12 A Right. Right. Yeah, I think it just --

13 Q Yeah.

14 A It's easy to confuse them.

15 Q Okay. So focusing on power density as opposed
16 to plasma density, is power density something that --
17 that does have a big impact on the -- the reaction or
18 the -- the resulting coating, or is that something where
19 it's you find one and it works and it's pretty -- it's
20 going to work for different monomers that you're going to
21 use and stuff like that?

22 A It's a big impact.

23 Q So that's one you really need to optimize for
24 the monomer you're using?

25 A So the parameters are convoluted. They're not

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1 separate. If you change the power, it changes other
2 parameters by default.

3 And that's the problem with PECVD, is that in a
4 science experiment or an R&D effort, you'd like to have
5 the parameters independent of each other.

6 So you change one, it doesn't change the other
7 one. But when you change the power, it changes other
8 parameters. And that's frustrating, you know.

9 It's like -- you can imagine there's an example
10 of a -- you know, I'm cooking pancakes on the stove, and
11 I'm cooking potatoes on the stove. I turn up the pancake
12 burner, and the potato burner increases, too. And the
13 chef is, like, crazy because they're all convoluted.

14 **Q And so why -- I guess, like, to use power**
15 **density as an example, why would -- why would, like,**
16 **switching from one monomer to another maybe require you**
17 **to change the power density?**

18 **A** Because the chemical bonds have different bond
19 energies. So you say the degree of ionization is
20 dependent on the bond energy. If you have bonds that are
21 stronger, you need to put more power into the system to
22 get the same degree of ionization.

23 **Q And the -- the sequence of on/off pulse cycle,**
24 **that's another parameter that you referenced in**
25 **paragraph 50. Do you see that?**

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1 A Yeah.

2 Q That's the -- is that the same thing you
3 referred to as the duty cycle earlier?

4 A Correct.

5 Q So that's kind of like if you're -- I think you
6 used the light switch analogy. If you're flipping the
7 switch on and off and using a pulsed plasma, how -- how
8 long is it on for, how long is it off for?

9 A Correct. To clarify a point, when you say
10 "power density," that makes sense for certain types of
11 plasmas. Other types of plasma it makes no sense; right?

12 So there's not just one type of plasma -- you
13 can make plasmas different ways, different voltages,
14 different configurations. And it's -- so that language
15 is used for what's called capacitively coupled plasma.

16 (Stenographer clarification.)

17 BY MR. MC KEEVER:

18 Q "Capacitively" I think is the word you said.
19 Capacitively coupled --

20 A Plasma.

21 Q -- plasma.

22 A Yeah. We basically have a capacitor is what we
23 have.

24 Q And, frankly, that's sort of a little over my
25 head. I guess, can you explain that?

1 So why -- why is that a term that -- that is
2 only, kind of, relevant if you're talking about a
3 capacitively coupled plasma?

4 A So in a capacitively coupled plasma, a CCP;
5 right? You have two electrodes. And they're planer
6 electrodes, and they have a -- they have a size. They
7 have an area; right?

8 So there's -- it's like two pancakes on top of
9 each other, and they're going to have an area. So,
10 therefore, you can talk about a power density because
11 it's power divided by area of electrode.

12 Did you get that?

13 THE STENOGRAPHER: I think.

14 BY MR. MC KEEVER:

15 Q And so what would be a different -- if you're
16 not using capacitively coupled plasma, there are -- there
17 are alternative approaches where -- like, what's --
18 what's an alternative approach where power density is
19 just, kind of, irrelevant or doesn't make sense?

20 A The other common plasma it's called inductively
21 coupled plasma.

22 Q Okay.

23 A Like "inductor." It's ICP. So it's inductor --
24 inductively coupled plasma. And that's -- capacitors and
25 conductors are circuit elements. They behave -- they're

1 different geometry.

2 So when someone uses the term "power density,"
3 they're using a capacitively coupled plasma. But that's
4 not the only way to do materials -- deposit materials.

5 Q Okay. I'm going to turn now to the portion of
6 your declaration that discusses the Cohen prior art
7 reference. And so -- and so can you turn to
8 paragraph 62, Dr. Senkevich?

9 A Sure. Okay. I'm here.

10 Q I just want to make sure I'm understanding
11 everything that's in this paragraph.

12 So it wasn't clear to me what -- near the end of
13 the paragraph, you refer to the unpredictability of the
14 PECVD of the coating. And I just want to make sure I'm
15 clear on what unpredictability you're referring to there.

16 A So traditional PECVD, you have chemistries.
17 You put those chemistries into the system with a certain
18 set of parameters, and you get out a coating. And you
19 can't predict that. It's a black box. That's what's
20 meant by that.

21 Q So -- and that, kind of, ties back to the
22 iterative approach that you talked about earlier that,
23 kind of, the only way to -- to come up with a coating
24 that works is -- is you just continue testing and
25 tweaking all the parameters until you get a result that

1 **meets your goals?**

2 A Yeah, that's typically what happens. It's very
3 painful, very expensive. And, clearly, if someone has a
4 lot of experience, it helps substantially.

5 It's like taking a long trip, and you're halfway
6 there already. But there's always an inner approach,
7 adjusting different parameters to get -- there's no --
8 every PECVD system is different.

9 And so to say, "Well, I can do it on system A
10 and, therefore, it transfers to system B," there's --
11 like, no, it's not like that. You have to get to know
12 the new system to even use your existing knowledge, you
13 know, previous knowledge.

14 **Q Are there any of, like, the parameters -- I**
15 **guess what you were referring to as the plasma**
16 **parameters -- not the customer parameters -- that really**
17 **are, kind of, fixed in your -- in your view that, you**
18 **know, ah, you know, this is -- this is something that**
19 **never really requires tweaking if you're -- you know,**
20 **you're using the -- the same range everybody else uses?**

21 A Well, there's certain parameters that you can't
22 adjust because it comes as the manufacturer. Or you're
23 building a tool, and it's --

24 So, for example, I'm using a capacitively
25 coupled plasma. I'm not using an ICP plasma, inductively

1 coupled plasma. So that would be a parameter that it's
2 fixed. It's the geometry of the system. It's fixed.

3 Q Got it. Everything else -- it sounds like
4 everything else that can be tweaked, you might want to
5 tweak when you're -- when you're dealing with PECVD.

6 A That's true. It's very, very painful, yes.
7 Yeah.

8 Going back to the parylene, the parylene is not
9 like that. It's very simple. You don't have to almost
10 tweak anything. It's -- it's a very simple system.

11 So you could be a real estate agent and go,
12 "Hey, I want to start a parylene company." You're good.

13 Q Okay. And then can you take a look at
14 paragraph 67, Dr. Senkevich?

15 A Sure. I'm there.

16 Q So here, if I'm understanding you, it sounds
17 like you're drawing this distinction between a
18 hydrophobic coating and -- is it a barrier coating?

19 Is that what you're distinguishing between here?

20 A Correct.

21 Q And so, just so the record is clear, can you
22 just, sort of, explain what the difference is between
23 those types of coatings?

24 A So a hydrophobic coating repels water, and
25 that's defined by a contact angle test. You put a drop

1 of water on a surface, and you measure the contact angle.

2 And -- and a hydrophobic coating has roughly a
3 value of 80 degrees or more. And so it doesn't
4 necessarily have good barrier properties. That's --
5 barrier properties are a separate concept from
6 hydrophobicity.

7 Hydrophobic -- a barrier coating is measured by
8 the penetration of water through a coating called the
9 water vapor transmission rate, WVTR.

10 And -- and so to paint on the application,
11 certain -- one coating's good, and another application
12 it's not good. It depends on application. It's an
13 application-driven concept.

14 **Q So -- so for a -- you know, a particular**
15 **customer who was working on a coating for a particular**
16 **type of device or product, they may be more concerned**
17 **about water repellency or maybe more concerned about**
18 **water effusion?**

19 **A** Yeah. So the state of the art for water
20 diffusion is a potato chip bag. Because water and potato
21 chips don't -- don't get along.

22 And when we were young -- years ago when we were
23 young, potato chip bags weren't aluminized. They were
24 clear plastic, and the bag didn't last very long. The
25 chips got bad. They went stale pretty fast.

1 And so now bags are -- it's called aluminized
2 mylar. Aluminized mylar. That's the technology.

3 And you don't really care that the bag is
4 hydrophobic. That's not the consideration. Like I'm
5 going to go run out in the rain and snow with my potato
6 chip bag.

7 What you care about is that the chip -- potato
8 chip gets manufactured, it gets backfilled with nitrogen
9 to exclude oxygen, and then it's sealed such that water
10 doesn't go in there.

11 And so water vapor transmission rate or bare
12 coating is the only primer that you care about for a
13 potato bag. So that's like an example of, like --

14 But if you imagine, if you have a jacket and
15 you're going out in the rain, you have a GORE-TEX jacket.
16 You're not jumping in the lake with your jacket. You're
17 out in the rain, and you want the water to run off your
18 jacket.

19 And the lack of distinction in Gleason's
20 declaration is troubling, you know. These are two
21 different concepts that are very important. In almost
22 all cases, water vapor barrier is what's needed for the
23 applications in electronics.

24 **Q So what about if your -- you know, your customer**
25 **is a TV manufacturer or something like that. I mean,**

1 wouldn't -- wouldn't they be more worried about, sort of,
2 you know, moisture maybe or -- you know.

3 You're not -- you're not going to be worried
4 about someone dropping the TV in the bathtub, I would
5 think.

6 You'd be more concerned about -- would you be
7 more concerned about water repellency, hydrophobicity --
8 which I'll never say correctly -- than diffusion with a,
9 you know, product like that?

10 A They don't do either one. So if you have a
11 monitor in an indoor environment, it's sealed. There's a
12 package. So -- and so that's --

13 It's actually a problem because the standard
14 laptops' monitors have no water protection at all. And
15 then if they're used in a manufacturing environment where
16 there's a lot of water, they can die.

17 And this happens all the time. My son killed my
18 laptop with some -- he spilled formula on it, and it
19 killed my laptop.

20 The mother board of a laptop is below the
21 keyboard. And he spilled formula on it, and it did crazy
22 things and died. And I thanked my one-year-old for his
23 service. Yeah.

24 Q I can kind of relate to that.

25 A The joys of being a father.

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1 **Q Yeah.**

2 A And, by the way, that conformal coat for my
3 Lenovo laptop would've been one dollar for a basic
4 conformal coat, that -- that mother board. One dollar.
5 And the, you know, laptop was a thousand dollars. One
6 dollar. So frustrating, you know.

7 We -- yeah, we can -- we don't need to talk
8 about conformal coats. They will probably come up.

9 **Q Well, why don't we go ahead since I think you've**
10 **used the term a few times. What do you mean by a**
11 **"conformal coating"?**

12 A Conformal coating is when a polymer is applied
13 to a printed circuit board. And -- and -- to protect it
14 from moisture, et cetera. Okay. That's what they're
15 called, conformal coats.

16 And the reason why it's called conformal coat,
17 it's coating, but the conformality means it -- it coats
18 all the geometries uniformly.

19 So you can imagine a printed circuit board isn't
20 flat. It has -- it has computer chips, you know,
21 capacitors. It coats all that uniformly. So we say it's
22 conformal. That's the -- the terminology.

23 **Q Dr. Senkevich, can you take a look at**
24 **paragraph 71 of your declaration?**

25 A Sure.

1 Q I guess -- read the -- read the paragraph.
2 You're welcome to read above it or below it. I just want
3 to ask you, kind of, what -- what point are you making in
4 paragraph 71.

5 A So we talked about in a continuous wave plasma,
6 this RF self-bias develops naturally. And in some cases
7 that's a good thing. In the cases of a polymer, it's
8 bad. Generally speaking.

9 I mean, it's not always bad, but it -- and so
10 you get -- by default, when you put -- we call soft
11 materials. You make soft materials; they cross-link with
12 ion bombardment.

13 So RF self-bias creates ion bombardment, which
14 creates cross-links. And you can't eliminate that unless
15 you pulse the plasma. So that -- the main thing there is
16 that pulsing the plasma opens up a new way of making
17 better materials.

18 Q And then you talk about, you know, "For each
19 type of PECVD method utilized" -- do you see where I am
20 with that? That's, like, the second line down on
21 page 24.

22 A That's still on 71; right?

23 Q Yeah, still paragraph 71.

24 A Okay. Yeah.

25 Q So can I just ask -- maybe I'll ask kind of a

1 cleaner question there. I think that may help.

2 So where you say in paragraph 71, "For each type
3 of PECVD method utilized," you're referring to continuous
4 versus pulsed as the two different -- or at least two
5 different PECVD methods; is that correct?

6 A Yeah. I think it's logical to say that. We're
7 making a distinction -- I'm making a distinction between
8 continuous and pulsed. Right.

9 Q And so even for pulsed PECVD, all of these
10 parameters that -- that you list in paragraph 71 impact
11 the -- the resulting parameter -- sorry -- the resulting
12 polymer coating and its properties?

13 A That's correct. It's frustrating; right? If
14 you -- if you had a system that was optimized, man -- and
15 you say, "All I have to do is pulse now, and life will be
16 good," no. Totally changes everything.

17 It's one reason why companies shy away from this
18 technology, because there's so much uncertainty in the
19 parameter space. And they're convoluted, the parameters.
20 They -- one parameter will change another parameter. But
21 the -- so that's a problem, you know.

22 Q And I think you used that terminology before,
23 too, about the parameters being convoluted. Can you
24 just, sort of, explain what you -- what you mean by that?

25 I think you maybe talked about this already, but

1 I just want to make sure the record's clear about what
2 you mean when you refer to the parameters being
3 convoluted.

4 A Yeah. It's the -- the stove analogy, like, I'm
5 making the pancakes on the stove with the potatoes.

6 So there -- you have -- in science you have
7 convoluted and deconvoluted or separate. So a convoluted
8 parameter would say this parameter, when I adjust it, it
9 changes another parameter. So there's a -- they're
10 paired. They're linked.

11 Whereas, if it's deconvoluted or separate, then
12 I change this parameter, and it's isolated. I can change
13 it, and nothing else changes.

14 Q Is the monomer -- the choice of monomer that you
15 use, that's one of the convoluted parameters; is that
16 right?

17 A So the general way is you would choose a
18 chemical system, and you would start simple. You
19 wouldn't try to make it complicated.

20 You start with, like, a very simple -- simple
21 chemical system, and you try to optimize based on --
22 around that chemical system.

23 You wouldn't have an optimized parameter to
24 start putting stuff there. Like, six different monomers
25 or different -- you would -- right?

1 So you say, "I'm going to -- I want an
2 fluorocarbon polymer." Okay. What's the best choice of
3 precursors for that fluorocarbon polymer? And then you
4 would -- you'd optimize around that to get to the
5 properties.

6 Q Okay. I get it. So the premise of my question
7 is kind of backwards in that, like, you're not going to
8 start with parameters and then try different monomers,
9 and then you're going to start by picking a monomer, and
10 then trying to optimize for that monomer.

11 A Huh-uh. I mean, as a -- as a first guess, you
12 would start, let's say, well, these parameters are
13 working pretty well. Let's put it in there. But,
14 practically speaking, that doesn't work that way.

15 Now, some monomers are very similar. So that
16 can be done. Because they have -- they're very similar
17 to each other.

18 Whereas, like, obviously, chemicals, there's --
19 how many chemicals exist in the world? Five million? So
20 you can imagine just monomers. How many monomers exist?
21 10,000 monomers? You go crazy.

22 And then there's considerations of many --
23 there's many considerations with monomer choice. Is it
24 volatile? Is it toxic? So --

25 You know, the scientist doesn't care about

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1 toxicity; right? You go in there. You go, "Hey, Boss, I
2 got this great coating. I got this great monomer."

3 And he's like, "Wow, man, you finally did it.
4 Well, what are you using?"

5 "I'm using this class -- you know, this super
6 toxic chemical."

7 "We can't do that. Like, what are you -- what
8 are you thinking?"

9 Q So when you -- you referred a moment ago to, you
10 know, there are some -- you know, maybe some monomers
11 that are similar to one another.

12 Would that -- that would be, like, similarity in
13 terms of chemical makeup or the kinds of bonds and kinds
14 of atoms that are -- that are in there, or what would
15 make two monomers maybe -- what would make -- what would
16 have -- scratch that.

17 What would lead you to infer that maybe two
18 monomers might behave similarly in a PECVD application?

19 A So, for example, there's a series of monomers
20 called acrylates. We talked about those before. And you
21 can have -- there could be one that just has an extra
22 methyl group. And so it's -- it's almost the same.

23 The analogy is aspirin. So aspirin is
24 acetyl- -- acetylsalicylic acid. Acetylsalicylic acid,
25 aspirin. And if you put another group on there, it

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1 becomes ibuprofen.

2 Just one little group makes it ibuprofen.

3 Another group makes it acetaminophen. And chemists
4 don't -- so all these chemical classes are related very
5 simply, and that's how chemists think.

6 They start with a basic chemical, and then they
7 add, like -- they'll change a methyl group to an ethyl
8 group to an isopropyl group. I don't want to get crazy
9 with the chemicals.

10 Q And are -- are those -- I've seen in some --
11 I can't remember if it's in the 087 Patent. I've
12 certainly it in some of the -- some of the patents in
13 this case, like, references to functional groups.

14 Are those also -- are those -- those groups you
15 were talking about, are those also functional groups, or
16 they're not the same thing?

17 A The term "functional group" is thrown around a
18 lot. So -- yeah. So you'd say, like -- yeah. That's
19 correct. I think -- I think what you're saying is
20 correct.

21 So when you say, "I have a base chemistry.
22 There's a methyl ethyl" -- that would be called
23 functional groups. That would be one way to term -- one
24 way to characterize it.

25 Q Okay. So can you take a look at paragraph 73,

1 **Dr. Senkevich?**

2 A Yeah, I'm here.

3 Q And, again, with that one, if I could, can you
4 **just read that paragraph into the -- into the record?**

5 A "With PECVD, the plasma vacuum deposition
6 tool is a black box. Precursors go in and a
7 coating is produced, but there is no a priori
8 predictability.

9 "This is because the plasma energy is
10 orders of magnitude higher than bond energies,
11 so too many bonds are broken, and the chemical
12 reaction sequence does not follow general
13 chemical thermodynamics."

14 Q And so -- thank you.

15 **In paragraph 73 are you talking about continuous**
16 **PECVD only, or are you talking about both continuous and**
17 **even pulsed PECVD there?**

18 A It's -- it's -- it's both, but principally
19 that's talking about continuous. It's not a -- it's not
20 either/or.

21 So continuous can be optimized. So it's that
22 minimal bonds broken. There's always bonds broken that
23 you don't want broken. And in some cases that same thing
24 happens with pulsed plasma.

25 But we now know -- this is hindsight now -- that

1 pulsed plasma can be optimized such that only the bonds
2 you want broken can be broken. You can optimize the
3 system in a really good way, and that's very powerful.

4 Q And so how -- how -- how do we know now to do
5 that?

6 Like, what's -- what's the hindsight that you're
7 talking about?

8 What do we know now that enables us to, using
9 pulsed plasma, you know, break the bonds we want to break
10 but not the ones we don't want to break?

11 A So the principal learning was that during pulsed
12 plasma, the duty cycle was -- was such that the on time
13 was very short and the off time was very long. We're
14 talking about one- to 200-type ratio.

15 And -- and then there's other parameters that we
16 knew before, but that's --

17 So if you look at the -- the Legein patent and
18 the Francesch patent, they both -- they don't know how to
19 pulse the plasma. They didn't learn that at that --
20 those two references.

21 And if you weren't knowledgeable in this area,
22 you would think, well, it's fine. They're doing a good
23 job there. But we know now that they weren't doing the
24 proper parameter optimization.

25 Q And that the -- the parameter op- -- excuse me.

1 The parameter optimization that you're referring
2 to now is -- is the duty cycle, so how -- how long the
3 plasma switches on versus how long it's off?

4 A Yeah. So you have how the plasma ionizes the
5 monomers, and then you have this bias that develops.
6 And -- and so what we knew already, that we need a low
7 density plasma; right?

8 We knew that already. You have to be very
9 gentle with polymers. Organics are very fragile. We
10 knew that already. But then the additional piece of
11 information that was learned was that you don't want this
12 RF self-bias to develop.

13 And so that was where the duty cycle -- you have
14 a very short on time, and you want no bias developing. A
15 very small bias will kill your polymer.

16 Q Okay. So I think -- I think now I'm kind of
17 understanding the relationship between all of this that
18 you're laying out.

19 So the -- if you have pulsing and the on time is
20 short relative to the off time, that limits the RF
21 self-bias; is that right?

22 A Correct.

23 Q And then by limiting the RF self-bias, you avoid
24 that issue that you've talked about, about too many ions
25 bombarding the -- the polymer coating and creating the

1 defects and undesired -- maybe undesired cross-linking or
2 desired cross-linking?

3 A Correct. And it's -- obviously, you can have
4 that problem with a higher density plasma, too.

5 But it was -- the scientists were frustrated
6 because they were trying to optimize the continuous wave
7 plasma, and they were still getting defects.

8 And they were, like, "Where are these defects
9 coming -- where are these cross-links coming from?
10 You're not getting clean chemistry."

11 And so this opened the door up with if you
12 pulse the plasma, now you can optimize the plasma
13 properly to get a proper coating, because you eliminate
14 the RF self-bias.

15 Q But your opinion is that, like in the prior art
16 prior to 2015 that we're talking about in this case, you
17 know, people of skill in the art didn't really know how
18 to -- they didn't really know how to do pulsed plasma
19 with the right optimizations to make it -- make it work?

20 A It was -- it was not well-known. There was a
21 lot of -- the companies that produce these units were
22 selling them -- some people make their own -- but they
23 were selling these units.

24 And then these guys -- these engineers, these
25 chemists had a new trick. And they didn't know how to do

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1 the trick.

2 And so, with time, the scientists published, and
3 then everybody learned -- learned this information. But,
4 at the time, a lot of the groups didn't know what to do
5 with the new -- with their new toy.

6 Q Got it.

7 And so the 087 Patent is, sort of -- in your
8 opinion, is in this time period where it wasn't yet -- it
9 wasn't yet understood, you know, or certainly widely
10 understood that -- you know, effectively, how to use
11 pulsed plasma effectively for -- for depositing polymer
12 coatings.

13 A Correct. Right. Correct.

14 Q Okay.

15 A Generally, it takes -- it takes a little time
16 for -- someone discovers something new, and then it takes
17 them time for everybody understands, yeah, this is the
18 new idea; this is the new process. And every -- and then
19 there's a tendency to copy this other person.

20 MR. MC KEEVER: Okay. I think we've been going
21 for -- for about an hour. We can take another break
22 here.

23 (Recess.)

24 BY MR. MC KEEVER:

25 Q Okay. Welcome back, Dr. Senkevich.

1 A Thank you, Patrick.

2 Q Okay. So before we took a break, we were -- we
3 looked at paragraph 73. I think you -- you read that one
4 aloud. So in that paragraph, when you talk about -- a
5 couple questions from me.

6 So when you talk about the precursors that go in
7 and then the coating comes out, precursor, that certainly
8 includes the monomer; right?

9 A Yeah. So in chemical vapor deposition, CVD, we
10 use the term "precursors." We wouldn't say "monomer."
11 Monomers -- it can be used, but we typically use the term
12 "precursors." It's the language of that system, of
13 that -- of that area of study.

14 Q Okay. So if you're using an a cross-linker like
15 in the 087 Patent, is that -- would you also refer to the
16 cross-linker as a precursor or --

17 A Correct.

18 Q So if -- at a really high level, we're talking
19 about Claim 1 of the 087 Patent. The monomer compound
20 that's required and the cross-linker that are required,
21 those are both precursors?

22 A Correct.

23 Q Okay.

24 A Yeah. A monomer cross-linker would be
25 terminology that's used with chemists, and that means you

1 can predict chemistries. And if you're playing in a
2 black box and you can't predict them, you start to use
3 the term "precursor."

4 Q Got it.

5 A Predictability is a very critical parameter of
6 science as well as life. I mean, predictability is,
7 like, everything. It's very important.

8 Q And so when you say, "There is no a priori
9 predictability," are we talking about there is no
10 a priori predictability to a POSITA or even, you know,
11 maybe the Ph.D. that the POSITA is -- is working under?

12 A That's, like, for everybody. So you -- you
13 might deposit a coating and say, "Yeah, I know how to do
14 that now," but that's not a priori. A priori means
15 without prior knowledge.

16 So I -- I can say, "These chemicals will make
17 this," without knowledge of that already happened. If
18 I -- if I tell you the answer, you go, "Yeah, of course I
19 know."

20 Q If I'm pausing, you can just ignore me. I've
21 got, like, my, kind of, questions, but a lot of these
22 things we've hit already; and I don't want to ask you
23 questions that I feel like we've already covered.

24 A Take your time.

25 Q Yeah. Okay. So in the next paragraph, which is

1 paragraph 74, you talk about using a low density plasma
2 and pulsing to get back some of the predictability;
3 right?

4 A Correct.

5 Q Okay. So first question is just a terminology
6 question.

7 We talked -- earlier you distinguished power
8 density from plasma density. When you say "low density
9 plasma" here, you're talking about plasma density; is
10 that right?

11 A Correct.

12 Q And -- and can you just remind me again what
13 is -- what's low density plasma?

14 What is that -- what is that referring to?

15 A Degree of ionization. So you have a molecule,
16 it starts to fragment, and it creates ions and electrons.
17 And you can -- that's a measurable quantity degree of
18 ionization.

19 So a low level of degree of ionization is a low
20 density plasma. We're talking about less than
21 10 percent, in that range. A high density plasma might
22 be 50 percent ionization or more.

23 Q Can you have low density plasma with continuous
24 plasma, or is continuous plasma, sort of, always going to
25 be high density?

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1 A No. It has to do with the type of plasma used.

2 Q Okay.

3 A So in these, typically, you're talking about
4 capacitively coupled plasma.

5 (Stenographer clarification.)

6 THE WITNESS: Capacitively coupled plasma, the
7 CCP. So capacitor; capacitively coupled plasma. That's
8 the traditional low density plasma that's used.

9 BY MR. MC KEEVER:

10 Q So if you're -- even if you're using continuous
11 plasma with CCP, it would be a low density plasma; is
12 that right?

13 A (No audible response.)

14 THE STENOGRAPHER: You need to answer out loud.

15 THE WITNESS: Yes.

16 BY MR. MC KEEVER:

17 Q And then I think I know what you're getting at,
18 but I just want to ask you and give you an opportunity to
19 explain.

20 So when you say using low density plasma and
21 pulsing can get back some of the predictability -- some
22 of the predictability of the chemical reaction, a priori,
23 what are you -- what does that really mean?

24 Like, in what way is it -- are you getting some
25 of the predictability back?

1 A So "predictability" refers to I can start with
2 these chemistries, I can write them on a dry-erase board,
3 and I can predict what the -- what the products will be.

4 So when you take organic chemistry in college,
5 it's all about predictability. This reactant plus this
6 reactant gives you this product. And it's less about
7 black box and more about predicting what will happen with
8 a chemical system.

9 And -- and so you can imagine I have a low
10 density plasma. I don't want to fragment the molecule so
11 much, and I want to deposit a polymer from it, and then
12 I don't want to damage it.

13 So the damage part is coming from the -- the
14 continuous plasma.

15 So the combination of low density plasma, not
16 ionizing it too much, and then not damaging it once it's
17 deposited with the RF self-bias. So -- and that --
18 that's rectified by the pulsing the plasma with a -- with
19 a short on time.

20 **Q And so would it be -- would it be -- it becomes**
21 **more predictable in the sense that the polymer coating**
22 **that you end up with is more consistent with what you**
23 **would expect based on the precursors you're using?**

24 A Yeah. And based on principles of polymer
25 science. So then you start to use the terminology

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1 "monomer," "cross-linker," "initiator."

2 You start to use that terminology because now
3 you have some predictability. You're not using the term
4 "precursors."

5 Q Got it. So -- so the -- the cross-linking
6 reagent is doing its job that you would expect it to do;
7 and the -- the monomer is behaving in a way you would
8 expect in terms of, you know, chain polymerization or
9 whatever.

10 A Correct. So you're -- now you're in the world
11 of polymer chemistry, not physics. And if you have -- if
12 you have knowledge of polymer chemistry, now you can
13 apply that knowledge.

14 But before you could not apply that knowledge,
15 because you're in the realm of physics. And -- and so
16 now, theoretically, you can have a physicist build you a
17 tool.

18 You can put your chemistries in there, and you
19 can tell the physicist, "Hey, these are the knobs that
20 need to turn." Well, he's telling you, "This is the knob
21 I'll turn to get you where you want to go."

22 So it -- but it's not a hundred percent. It's
23 getting there. It's still not predictable, but it's
24 getting there.

25 It's still a very complicated system with lots

1 of knobs, and -- and you're not learning this in school.
2 None of this knowledge is coming from organic chemistry.

3 If you go to your organic chemistry teacher and
4 say, "I want to do this -- what you're doing in a
5 vacuum."

6 And he's, like, "You're out of your mind. We
7 don't teach that. You better go to MIT. You better go
8 somewhere else."

9 Q Okay. And then the last sentence of your
10 paragraph 74 says:

11 "A POSITA in 2015 could not make that
12 connection between plasma techniques and
13 predictability."

14 Do you see that?

15 A Correct.

16 Q So what do you mean by that, the connection
17 between plasma techniques and predictability?

18 A The plasma techniques was basically like linking
19 the technology to the parameter space such that I can
20 take these chemical systems to make somewhat predictable
21 polymers.

22 Q So the idea that pulsed plasma and load --
23 sorry. Let me break that apart.

24 I think earlier you said low density plasma was
25 sort of -- or that was sort of already known that you --

1 that you would use that with PECVD; right?

2 A It's a preferred -- it's a preferred direction
3 to go.

4 Q Okay. But the -- but this pulsing aspect to it
5 which makes it at least somewhat more predictable, that's
6 not something a POSITA in 2015 would have known or
7 understood at that time?

8 A No.

9 Q Okay. Can you look at paragraph 76,
10 Dr. Senkevich?

11 A I'm reading it here. Okay.

12 Q So, I think, based on our earlier discussion,
13 I understand some of these things more clearly than I did
14 before the deposition today, but let me just, sort of,
15 make sure.

16 So in paragraph 76, you talk about you know even
17 if a POSITA had motivation to use benzyl, b-e-n-z-y-l,
18 acrylate, a-c-r-y-l-a-t-e, and benzyl, again,
19 b-e-n-z-y-l, methacrylate, M-e-t-h-a-c-r-y-l-a-t-e, as a
20 precursor, that it wouldn't have been within the level of
21 skill of a POSITA to prepare and test co-polymers using
22 those compounds.

23 Is that right?

24 A No. Yeah, that's correct.

25 Q And so -- and is that for the same reasons

1 we've, sort of, been talking about all day, which is just
2 that a POSITA doesn't have the level of skill that they
3 would need in order to be able to figure out how to
4 optimize the parameters to get a good coating that uses
5 those precursors?

6 A Yeah. Yeah. So there's -- there's challenges
7 with using those precursors alone. Those are very big
8 molecules. So that's not an easy system to play with
9 already.

10 And that has nothing to do with even the
11 parameters. Just to get the chemistry to the substrates
12 uniformly is very difficult.

13 But then you talk about optimizing the
14 parameters, it's -- it would be -- it would be
15 insurmountable to achieve a good quality coating with an
16 inexperienced person there.

17 I have my doubts that that's commercially viable
18 just looking at it from here.

19 Q And so you said part one of the challenges with
20 those compounds is that those are very big molecules; is
21 that right?

22 A Right. So they have limited volatility.
23 Limited volatility is the -- is the primary concern.

24 Q So what do you -- what do you mean by that?
25 (Simultaneous talking.)

1 BY MR. MC KEEVER:

2 Q Yeah. Sorry.

3 A So you have a box, and the precursor has to be
4 delivered to the box. And the box has electrodes in it
5 for plasma; right? But you -- and you have shelves in
6 there or substrates in there that the printed circuit
7 boards are on.

8 And I have to deliver these chemistries
9 uniformly to every one of those shelves in the box. And
10 the box is at room temperature typically.

11 And these -- these are big molecules that don't
12 want to fly. They're not good fliers. They don't want
13 to fly.

14 And so what -- the first challenge that that
15 POSITA would face, that research group would face, or
16 that company would face is how to deliver those
17 chemistries uniformly to the whole box.

18 You've got a thousand parts in there, and it has
19 to -- that chemistry has to be uniform to every one of
20 those parts.

21 And if you have not one chemistry but two
22 chemistries but three chemistries but four chemistries,
23 they have to be together -- have the same ratio, every
24 one of those parts.

25 And -- and this is not theoretical. I have

1 dealt with this many times.

2 Q This is a bit of a stupid question, but I'm
3 going to ask anyway.

4 A All right.

5 Q So when you're considering different precursors
6 or -- or monomers, whether -- whether a molecule is, sort
7 of, a large molecule that's going to have these drawbacks
8 in a PECVD application, is that just a function of, sort
9 of, the -- the compounds and the bonds and just the
10 chemical makeup of the compound and, sort of, how complex
11 it is, or, like what -- what controls the -- you know,
12 whether -- whether it's a -- you know, big molecule or
13 not?

14 A So in the chemical world, there's
15 hydrocarbons -- generally speaking, hydrocarbons and
16 fluorocarbons. I know there's other names of chemicals,
17 but --

18 When -- when you take a molecule -- you take a
19 molecule and you start to add fluorine to it, so you --
20 you exchange a proton for a fluorine atom.

21 What happens is that the molecule gets heavier,
22 but it becomes more volatile; okay? So if you're talking
23 about PECVD, that's a good thing. The more volatile the
24 molecule, the better.

25 So the -- the chemists and the physicists that

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1 work in PECVD, they love fluorocarbons, because they're
2 highly volatile.

3 And if you talk about "now I'm going to
4 eliminate fluorine" -- and in many cases fluorine is
5 becoming illegal. There's a lot of issues with fluorine
6 for environmental issues.

7 P-phos, for example; right? That's -- there's a
8 lot of nasty chemicals coming out of fluorine.

9 Now, the bigger the molecule gets, the less
10 volatile it is, generally speaking; right? There's no
11 weirdness to it like with fluorine.

12 And so it's -- when I say "big molecule," it's
13 about molecular weight. Is the molecular weight 50, a
14 hundred, 200, 300? At some point it's so big it doesn't
15 fly.

16 If you heat the molecule in a vacuum, it doesn't
17 go anywhere. It actually will degrade. It just -- it
18 just stays there. You're like, "Come on, baby. Let's
19 go," and it doesn't want to go anywhere.

20 Q Got it. Thank you.

21 Okay. Can you -- I want to skip forward to the
22 discussion of the Legein reference. Can you take a look
23 at paragraph 82 of your declaration, Dr. Senkevich?

24 A Okay. I'm there.

25 Q So the second to the last sentence of that

1 paragraph says:

2 "Taken one step further, a monomer could
3 be added with a cross-linking reagent" --
4 r-e-a-g-e-n-t -- "under the same mild conditions
5 using pulsed plasma such that there could be a
6 higher correlation between the structure of the
7 polymer and the properties of the resulting
8 coating."

9 And then the next sentence says:

10 "This is not a simple process of combining
11 chemicals but recognizing how the plasma interacts
12 with the precursor chemistries and the surface of
13 the object, which would be wholly unpredictable to
14 a POSITA as described."

15 Do you see that, Dr. Senkevich?

16 A I do.

17 Q And so what do you mean here -- and I think some
18 of this, I'm sure, is -- is consistent with what we've
19 talked about already, so don't feel like you have to
20 re-explain everything if that's the case.

21 But when you say this would "require," you know,
22 "recognizing how the plasma interacts with the precursor
23 chemistries and the surface of the object," can you just,
24 sort of, explain what -- you know, what you're getting at
25 there?

1 **You know, what -- what is that referring to?**

2 A The parameters are all highly convoluted to each
3 other. So I think it refers in a way that, well,
4 having -- pulsing the plasma doesn't solve your problems;
5 can you get to the solution by a continuous wave plasma.
6 Yeah.

7 So it would be nice to say a continuous wave
8 plasma always gives you bad results. And then you pulse
9 it; life's good. But it's not -- there are certainly
10 viable industrial processes with continuous wave plasma,
11 PECVD.

12 And -- and then -- and why is that. Well, the
13 pulse generator is very expensive. It's very -- very
14 finicky.

15 So if you can -- you're trying to arrive at a
16 solution, and -- and that can be done potentially in the
17 continuous wave, the pulsed plasma.

18 But in either case, the parameter space is very
19 large, very complicated. And -- and it's -- it's --
20 there's a lot of development effort a lot of time, and
21 someone not knowledgeable is not going to get there.

22 **Q And so -- so someone with -- with a higher level**
23 **of skill or, you know, a lot more experience doing this,**
24 **they might understand, you know, what's really -- what's**
25 **really happening, how the -- how the plasma is**

1 interacting with the chemistries.

2 But for -- for a POSITA and a lot of even people
3 above the level of the skill of a POSITA, they're just,
4 sort of, turning knobs and -- and hoping for the --
5 hoping for the best?

6 A Correct. You can see where this takes place.
7 If you're in a -- in a research group that's highly
8 educated, you have people with decades of experience,
9 they're all Ph.D.'s. And -- and they have a pretty good
10 handle on things, and they're developing new knowledge.

11 But you're in an industry situation where you
12 have a customer; you have a lot of money; time is of the
13 essence. You have to get the product to the market, to
14 the customer, and, "Hey, keep working. You're going to
15 get it eventually."

16 And these -- these meetings get very contentious
17 because the boss is saying, "Hey, we've spent all this
18 money. Where are you at here?"

19 You know, "Well, I'll work later tonight, Boss.
20 I'll work on Saturdays."

21 But it's frustrating because it's a very
22 complicated system. We -- we -- at one of the companies
23 I advised, we bought the technology from an UK company.
24 This is not to do with our case. Different company.

25 They bought the technology, and they couldn't

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1 even -- could not even reproduce what the company did in
2 the UK. They bought the company. These guys are, like,
3 "We can't figure it out."

4 Like, "But you have the tool. You have the
5 chemistries. You have the parameter space."

6 "No, can't do it. We're having all kinds of
7 problems."

8 This goes -- this went on month after month, six
9 months, a year. And it's -- and these are -- these guys
10 are coming here, and they have Ph.D.'s. And they still
11 can't even reproduce what the company did in the UK.

12 And it's really embarrassing; right? It's --
13 you know, we spent \$50 million for an acquisition and
14 can't even reproduce what they did in the UK. My advice
15 was, "Give up. Go home."

16 Q Okay. Can you look forward to paragraph 101 in
17 your declaration, which is now in the section addressing
18 the motivation to combine Cohen and Legein?

19 A I'm there.

20 Q So I just want to make sure I -- again, I am
21 following you here.

22 So when you say -- when you reference achieving
23 the specific named properties of the products in the
24 087 Patent that make them suitable for the coating of
25 electronic devices, what -- what properties are we

1 **talking about there?**

2 A Those are barrier properties.

3 **Q Okay.**

4 A And -- and that's undertaken with immersion --
5 immersion testing. You actually physically have to take
6 the part and put it in -- immerse it in water or some --
7 you know, salt water or something like this.

8 **Q Okay.**

9 A That's the principle. Obviously, there's other
10 properties, too, but that's -- and so you'll see in the
11 patent they -- that the inventors measure conductivity of
12 the coating.

13 And so you would say, "Okay. I have a coating.
14 It's coated to printed circuit boards. I tested for its
15 conductivity," which is a very basic test. This is very
16 basic.

17 And then I -- I dip it in, say, water for a
18 period of time. I take it out, wipe it dry, blow it dry
19 with some nitrogen, and then I test it again.

20 And -- and then, you know, with time you'll see
21 an increase in conductivity, but there's a -- there's a
22 point where it's not legit. It's not legitimate because
23 it's too conductive.

24 And why is that? You have a printed circuit
25 board, and you're going to have a short, a short-circuit,

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1 between components on the printed circuit board.

2 So that's, like -- some form of that test in
3 different ways is -- is at the heart of coating PCBs for
4 protection from environmental stress.

5 It's not always water. There's other
6 chemistries. We used artificial sweat at Apple. We
7 actually bought artificial sweat for \$500. This little
8 tiny bottle of artificial sweat. And we -- and we dipped
9 parts in artificial sweat.

10 It was unbelievable. I -- I thought to myself
11 I should be in that business. I'll donate some sweat,
12 you know.

13 Q Yeah. It sounds like high margins.

14 Okay. And then if you can skip forward to
15 paragraph 103, you say there that pulse -- sorry. You
16 say:

17 "This pulsed plasma polymerization technique
18 is well outside the field of the relevant POSITA."

19 Right?

20 A Correct.

21 Q And is that because of the timing, you know,
22 being in 2015, or -- or would you still say today even
23 someone with a couple of years of, you know, PECVD
24 experience wouldn't -- you know, wouldn't be
25 knowledgeable or have experience with pulsed plasma?

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1 A Well, principally it's the time. That time.
2 But the challenge with pulsed plasma is that you have to
3 measure the RF self-bias. So many of the groups just
4 guess. They say, "Well, maybe this will work."

5 But if you have a way of measuring it, then you
6 can make an improvement on it. And then you have to have
7 a pulse generator. You have to buy a pulse generator.
8 Those are very expensive.

9 So it's a combination of, like, having the
10 budget to buy it and not messing it up -- you can kill
11 plasma systems by doing dumb things -- and then measuring
12 the bias that develops on the surface.

13 And then you can -- you can tweak the knobs such
14 that you arrive at a position where, hey, I'm not
15 developing the RF self-bias anymore; right?

16 But guessing, though -- and that's what they
17 were doing in these other papers. They were guessing.
18 They said, "Oh, this looks like fun. I'm just going to
19 throw a 50 percent duty cycle."

20 It's like, "Well, where's the data?"

21 "Oh, there's no data," you know.

22 Q Yeah. And so -- so how -- how do you measure --
23 I guess, like, how would you go about measuring RF
24 self-bias, you know, even now in a PECVD system if you
25 were, you know, building one or buying one?

1 **Like, how does that actually work?**

2 A So it's not -- you can use a multimeter to do
3 this. But it's in a vacuum. So what is simple --

4 So if you have a work bench or a desk, and I --
5 I apply a voltage thing -- a DC voltage, I can take a
6 multimeter and say, "This has 10 volts on it." Like a
7 battery; right? I can measure the battery.

8 But this is done in a vacuum, so you need vacuum
9 feed-throughs; right? Electrical feed-throughs and --
10 and it's not complicated, but no one -- people are not
11 set up to do that.

12 **Q Yeah.**

13 A And so now I have the box, and I have to now
14 drill holes in that box. I have to weld -- weld a
15 feed-through in there.

16 **Q Got it.**

17 A So this is where the problem comes in. You're
18 in vacuum. It's not you just go measure it.

19 **Q And it sounds like it's not even -- it's not so**
20 **much that it -- that it's difficult to do, but -- but**
21 **people weren't even thinking to -- people weren't even**
22 **thinking to do it. Is that part of it?**

23 A Yeah. I mean, obviously, it depends on the
24 group, you know. If you're talking about a research
25 group, yeah, maybe they're doing it. Maybe they didn't

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1 publish it. Maybe that company has no idea. They have
2 the wrong people.

3 But in all cases you're talking about
4 experienced people here. Just the concept of RF
5 self-bias, that's, like, an advanced concept in physics.

6 That's not -- you can read about it. I mean,
7 you can probably do a Google search. But it's not, like,
8 "Should I take Vitamin D this morning?" you know.

9 Q Can you take a look at paragraph 112,
10 Dr. Senkevich?

11 A Okay.

12 Q Again, a lot of these things, I think, are
13 things, I think, you've, kind of, already -- you've
14 already talked about.

15 So I was going to ask you about the statement
16 in -- in paragraph 112 where you say that:

17 "Two companies could start with the same
18 precursor chemistries and end up with very
19 different coatings."

20 Do you see that?

21 A Yes. Correct.

22 Q But I feel, like, your -- the story you told two
23 minutes ago about the same company or the acquisition,
24 sort of, maybe, kind of, makes that clear.

25 So even where, you know, you're using the same

1 equipment, the same chemistries, there's so much
2 unpredictability that the results still may not turn out
3 the same.

4 A The reason why CVD is used is that once the
5 parameters are adjusted properly, you get -- your
6 reproducibility is fantastic.

7 Really good quality coatings, highly conformal,
8 reproducible, very manufacturable; but getting there is a
9 lot of research and development.

10 If you talk about solution chemistries -- wet
11 chemistry; right? There's almost no R&D. You spray it
12 on; you're done. It's cheap. But the properties aren't
13 as good. It's not as reproducible.

14 Traditionally, CVD has been used for all of the
15 memory logic in the semiconductor industry. And
16 reproducibility is very, very important for high quality
17 manufacturing.

18 So the reason why these companies use PECVD is
19 because it's highly reproducible once the parameters
20 are -- are known and the properties are attained.

21 So there's a -- there's a good payoff. High --
22 high initial cost; high payoff when you -- once you
23 finish. And ultimately it comes down to, hey, I have a
24 basic conformal code. Its technologies exist since the
25 '70s -- '60s '70s, long time.

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1 And I have a CVD coating. I can then -- I have
2 a better coating. My customer likes that better. I can
3 outcompete them. Because I have a higher performance
4 coating, more reproducible, less environmental
5 degradation, no solvents.

6 More and more the issue is do I -- am I leaving
7 an environmental impact by doing manufacturing. And --
8 and CVD is very clean.

9 My -- the company next to me gives off chemicals
10 every day. If the wind's the wrong direction, I'm
11 getting methyl ethyl ketone coming at my house. And
12 methyl ethyl ketone will do nasty things to your body.
13 MEK.

14 And -- and so CVD does not have that. It's very
15 clean.

16 **Q I'm going to put Dr. Gleason's declaration in**
17 **the chat.**

18 (Discussion off the record.)

19 BY MR. MC KEEVER:

20 **Q Okay. Dr. Senkevich, I uploaded Dr. Gleason's**
21 **declaration into the chat. It's Exhibit 1002. I just**
22 **wanted to ask you about something in there, if I could.**

23 **Can you turn to page 57 of Dr. Gleason's**
24 **declaration?**

25 **A Okay. It's actually 57 on the paper; right?**

1 Q Yeah, 57 on the paper.

2 A Okay. There's one -- it kind of starts with
3 "aryl."

4 Q Yes. Exactly. So -- yeah, there's a Section A
5 that has the heading "aryl"; right?

6 Do you see that?

7 A Yeah.

8 Q And so I'll kind of give you a high level
9 summary here, but --

10 So in this section she talks about, you know,
11 the -- the term "aryl" that shows up in the -- the claim
12 language in the 087 Patent and -- and what -- you know,
13 how -- how that term would be understood, you know, to a
14 person of skill in the art.

15 I just wanted to ask you -- because I don't --
16 I don't think you, kind of, responded to this in -- in
17 your declaration. I just wanted to know, like, is -- are
18 you in agreement with -- with her?

19 I mean, I guess the conclusion she has here
20 on -- on paragraph 143, basically, says aryl, you know,
21 should be read to mean an aromatic ring system.

22 Is there any dispute about that, or are you in
23 agreement on what the term "aryl" means in the 087 Patent
24 claims?

25 A An aryl group is -- has a specific meaning.

1 I don't call it aromatic ring system. That's not true.
2 An aryl -- an aryl group is a phenyl ring that's --
3 things are bonded to; right?

4 So a phenyl ring is -- by itself is called
5 benzene. So it's benzene -- when it's by itself, it's a
6 phenyl moiety -- Lynden likes that, moiety -- a phenyl
7 moiety.

8 And it could be a -- a functional group, or it
9 could be -- it can be pulverized across the phenyl ring.

10 But an aryl is basically a phenyl ring. It's
11 not an aromatic system. Aromatic system could be -- an
12 aromatic system is defined in a different way.

13 Q Okay.

14 (Stenographer clarification.)

15 (Discussion off the record.)

16 MR. MC KEEVER: I was just going to suggest --
17 why don't we go off the record for a second.

18 (Discussion off the record.)

19 BY MR. MC KEEVER:

20 Q Dr. Senkevich, can you take a look at Claim 1 of
21 the 087 Patent again?

22 A Sure.

23 Q And, again, that starts on column 18.

24 A All right. I'm there.

25 Q And it looks like the portion of Claim 1 that's

1 in column 18 covers the monomer compound; right?

2 A Yeah. That looks like -- correct. Yeah.

3 Q Okay. And if you look at the second set of
4 diagrams, it says that, "R3 is selected from," and it
5 gives, kind of, two -- two options there; right?

6 A Right.

7 Q So in -- and both of them -- or, actually,
8 before I go to the -- the diagrams, so if you read the
9 "where" clause that follows the diagrams, it says where
10 "A" is aryl optionally substituted by halo.

11 Do you see that?

12 A Yeah.

13 Q And so both of the options for R3 in Claim 1
14 have a terminal aryl group; right?

15 A It looks like it, right.

16 Q Okay. And then you have -- you know, to the
17 left of the aryl group in either option, you've got,
18 like, a CX2 group. Is that what you'd refer to that as?

19 A Right. I mean, "X" is just whatever it could
20 be.

21 Q Yeah. Just so that -- I'm referring to the --
22 yeah. Like, kind of the X with the -- the two Xs with
23 the carbon in between and there's brackets around that;
24 right? And then it's -- there's an N1 there?

25 A Right. That's the polymer.

1 Q Okay. And so -- and then in the claim language
2 below the diagrams, after the part about aryl, it says
3 N1 is an integer from zero to 27; right?

4 A Right. Correct.

5 Q So -- so you might have 27 -- up to 27 of those
6 CX2 groups in between the -- you know, the oxygen and the
7 aryl or as few as zero; right?

8 A Correct.

9 Q Okay. So if it was zero, you would just have --
10 I mean, that bracketed CX2 group disappears and your "0"
11 is just -- your oxygen is bonded to your aryl group.

12 A Correct.

13 Q Okay.

14 A I don't know what you'd have at that point,
15 but -- you know. We call those repeat units.

16 Q The -- the CX2 in the brackets is the repeat
17 unit?

18 A Correct. It's a mer or a repeat unit.

19 Q Wait. I missed the first thing you said.

20 Before you said "repeat unit," what did you say? A mer?

21 A Yeah, mer. M-e-r.

22 Q M-e-r?

23 A Yeah. So in Latin, "mer" means unit. So in
24 English, we would say "repeat units" or "mers."

25 Q Got it. And so -- so Claim 1, the R3 component

1 of the monomer compound, you can have a mer or a repeat
2 unit -- up to 27 of those, but you can also have none of
3 them in that -- in that compound; right?

4 A Correct.

5 Q Okay. Is there something weird -- you said
6 something about "I don't know what you'd have if you had
7 the -- the oxygen bonded to the aryl group."

8 Is that -- is there something weird about not
9 having any of the repeat units in there?

10 A Yeah. You don't have polymer at that point.
11 I don't know what you have. Like -- so there's what is
12 called -- we talked about monomer, which is one unit.

13 If you have a few units, it's called an
14 oligomer. O-l-g-i-o [sic], oligomer. And then -- and
15 then you get a low molecular weight compound or a low
16 molecular weight polymer.

17 And then at some level you have what's called
18 polymer. And it's defined by the -- the molecular weight
19 of entanglement. Molecular weight of entanglement.

20 And so -- this is polymer physics language.
21 Like, you have to build up to a certain level before you
22 have a legitimate polymer. Other than that, you just
23 have an organic basically, organic solid.

24 And if you have zero, you have -- I don't know
25 what you have when you have zero. I don't -- it's almost

1 nonsense; right? You just -- you know, whatever. It's
2 in there, you know, as a -- as a primer space, you know,
3 zero to 27, but --

4 Q Got it.

5 A And I don't know how they're measuring that or
6 how they're proving that. I don't know. That's a whole
7 new topic, you know, for another discussion, I guess,
8 but --

9 Q Okay. Can you look at -- so there's a bunch of
10 examples in the patent specification of the 087 Patent;
11 right?

12 So if you look at column 15, there's a heading
13 there that says, "Example 1." Do you see that?

14 A Correct.

15 Q And so I'm not going to ask you about these
16 in a -- in too much detail, but -- so Example 1, like,
17 the -- sort of almost following that heading, it says:

18 "Example of plasma polymerizing PFAC6 with
19 no cross-linker in a three-liter chamber."

20 Do you see that?

21 A Yes.

22 Q So is -- PFAC6 is a monomer; right?

23 A Correct.

24 Q And I think if you look at column one -- just
25 for -- just so the record's clear, so column one, line

1 58.

2 A I have it there.

3 Q Yeah. Yes. So column one -- I mean, at least
4 it gives the -- you know, it gives the full description.
5 It says, "For example, when PFAC6," and then in
6 parentheses it says, "1H, 1H, 2H, 2H-perfluorooctyl" --

7 MR. MC KEEVER: Do you want me to spell that,
8 Lynden?

9 THE STENOGRAPHER: Please.

10 MR. MC KEEVER: Okay.

11 P-e-r-f-l-u-o-r-o-o-c-t-y-l, and then the next word is
12 acrylate, a-c-r-y-l-a-t-e.

13 BY MR. MC KEEVER:

14 Q So that's -- that seems to be describing what --
15 what they're referring to as PFAC6; right, Dr. Senkevich?

16 A Correct.

17 Q Does that monomer have an aryl group?

18 A No.

19 Q Okay.

20 A Aryl groups are very big and bulky, and they're
21 not -- they're not always -- they're not really preferred
22 in these applications.

23 Q Okay.

24 A They can be used, but they have a problem. They
25 don't -- they don't -- they're not -- they have low

1 volatility typically.

2 **Q They don't fly, as you were talking about**
3 **earlier?**

4 A Right. Yeah, that's our -- that's our slang
5 term in -- in the chemical vapor world. They don't fly.

6 **Q Okay. So can you turn to column 16 of the**
7 **087 Patent?**

8 A Column 16?

9 **Q Yeah.**

10 A Okay.

11 **Q And there there's an Example 2?**

12 A Correct.

13 **Q It says, "Examples of Perfluoro Alkyl Acrylate."**
14 **So this --**

15 MR. MC KEEVER: And I'll spell that, Lynden.
16 That's p-e-r-f-l-u-o-r-o, space, alkyl, a-l-k-y-l, space,
17 acrylate, a-c-r-y-l-a-t-e.

18 BY MR. MC KEEVER:

19 **Q Is that -- do you know if that's the same -- the**
20 **same monomer as PFAC6 or if that's different?**

21 A That's -- well, one is -- so, first of all, it's
22 alkyl. That's how you say it, alkyl.

23 **Q Okay.**

24 A And the -- the PF-whatever-6, that -- that
25 PFAC6, that's a specific monomer.

1 And then these are just a general -- these are
2 general -- that's a general terminology, "perfluoro alkyl
3 acrylate." That's a general term for a lot of different
4 chemicals.

5 **Q And would a perfluoro alkyl acrylate include an**
6 **aryl group?**

7 A It can. It can. Yeah. Because an alkyl can be
8 a substitute for an aryl -- aryl chemistry, like we
9 talked about phenyl ring. And so, yeah, it could. But
10 it's not preferred because it doesn't fly.

11 **Q Okay.**

12 A So I think here, if you go below that, there's
13 no alkyl -- aryl groups in there in Example 2. There's
14 nothing.

15 **Q So none of the -- none of the -- the monomers**
16 **that's described in Example 2 include an aryl group?**

17 A No.

18 **Q Okay. And then Example 3, which is further down**
19 **column 16, if you look specifically at -- if you look**
20 **specifically at column -- sorry -- yeah, column 16, line**
21 **62, it looks like that one -- that example was again**
22 **using PFAC6?**

23 A Yes.

24 **Q If you look at column 17, there's an Example 4.**
25 **Do you see that?**

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1 A Correct.

2 Q And that one -- again, if you look at column 17,
3 line 26, it looks like that one was also using PFAC6?

4 A Correct.

5 Q And then there's an Example 5 further down
6 column 17. And if you look at column 17, line 43, it
7 looks like this one again is using PFAC6; right?

8 A Correct.

9 Q Okay. So it looks like none of the five
10 examples in the 087 Patent are talking about using a
11 monomer with an aryl group; right?

12 A Correct.

13 Q Okay. Is there any description that you can
14 point me to in the 087 Patent of any parameters for --
15 you know, for use in a PECVD system when using a monomer
16 with an aryl group?

17 A I don't know. Yeah, I don't know. Should we go
18 through each -- each line?

19 There's not -- there's -- typically in this area
20 there's not a lot of aryl chemistry used because it's
21 so -- it doesn't fly, and it causes all kinds of
22 uniformity problems.

23 So it's not that common to do aryl chemistries
24 in CVD environments like -- like this PCV business.
25 I mean, you can certainly do it.

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1 It's just -- it's not very industrially good to
2 do it because of -- because of uniformity issues. It's
3 an engineering problem; not a properties problem.

4 **Q Okay.**

5 A But the same principles would be applied from
6 alkyl chemistries as aryl chemistries within the PECVD
7 system. It's just you have to overcome the issue of --
8 of the volatility of the precursor.

9 And I don't know -- I don't know -- there's
10 this -- I don't know what -- what -- fully what -- what's
11 at stake here as far as, like, what they've done, what
12 they've proven, what they've shown.

13 I don't know. I'm not privy to all that
14 information.

15 **Q Yeah.**

16 A It might be somewhere in the description.
17 I don't know. It sort of -- it's a lot, you know.

18 MR. MC KEEVER: Yeah. Yeah, I don't want to
19 make you go through, you know, line by line, so I think
20 I'll just -- I'll just leave it there.

21 So I have no further questions, you know,
22 pending any questions from Ariel.

23 THE WITNESS: You mean that's it?

24 MR. MC KEEVER: Yeah.

25 MR. REINITZ: Yeah. And I appreciate that,

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1 Patrick. We will reserve -- I am inclined to say we are
2 not going to have any redirect. We might. We'll reserve
3 the right, and I don't know if we can take that up
4 between now and beginning of next week.

5 As far as I'm concerned, we're entitled to --
6 I have it in front of me -- four hours. That four hours
7 is past my bedtime tonight. It's the end of the day
8 here, so -- does that work?

9 MR. MC KEEVER: So you're proposing to -- to,
10 like, do the -- do the redirect on a different day?

11 MR. REINITZ: Yes.

12 MR. MC KEEVER: I mean --

13 MR. REINITZ: And that's what would happen,
14 I mean, if we -- if you would've gone the full seven --
15 and, I mean, you can't do it all in one day.

16 So that's my experience in the past, just -- you
17 have to do it over two days. Because I think it's, from
18 memory, seven for cross, four hours for redirect, and
19 then I think you get another two hours in the back end of
20 that. We can pull up the -- the rules.

21 So that, by my count, has to happen over two
22 days, doesn't it?

23 MR. MC KEEVER: I don't know. I've never --
24 I've never done it that way. I mean, I've always -- if
25 there's not redirect, it's always followed on -- on the

1 heels of the --

2 MR. REINITZ: I'll look it up here. Give me a
3 second. I'll pull it up.

4 THE STENOGRAPHER: Do you want this all on the
5 record?

6 MR. REINITZ: Yeah, that's fine.

7 MR. MC KEEVER: That's fine.

8 MR. REINITZ: It's 30- -- I think it's
9 37CFR42.53. That's C(2), cross-examine --

10 "Cross-examination, redirect examination, and
11 recross-examination shall be subject to the following
12 time limits: Seven hours for cross, four hours for
13 redirect, and two hours for recross."

14 So what I'm saying, Patrick, is that you do that
15 math -- seven and four and two -- and it's got to be over
16 two days; right?

17 MR. MC KEEVER: I mean, are you saying you're
18 going to take a multi-hour redirect?

19 MR. REINITZ: Not necessarily. I'm working
20 backwards from the premise that it has to happen over --
21 we can agree that if we're all taking our full amount of
22 time, it has to happen over more than one day; right?

23 MR. MC KEEVER: I mean, if -- if we were, but
24 I didn't take seven hours. I don't think I even took
25 really close to seven hours. So, I mean --

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1 MR. REINITZ: Understood.

2 MR. MC KEEVER: -- if you want to take a
3 redirect, then we just do it, you know.

4 MR. REINITZ: All good. We're -- we'll leave it
5 at that. I mean, if you want, we can, I guess, take it
6 up with the board or make a motion.

7 I don't expect sitting four hours. I'm not even
8 saying we will necessarily redirect. We could do that
9 now. Like I said, we'll reserve the right to take the
10 full four hours, the same way you did not reserve the
11 right to take your full seven hours.

12 But given the timing and where we are in the
13 day, that will have to be at another day. If you take
14 issue with that, that's -- -- you're entitled to do that.
15 But, I guess, we can take it up with the board separately
16 if that's --

17 MR. MC KEEVER: Yeah. I mean, you know, I'm
18 certainly not going to agree to that right now. I mean,
19 we can look at it. But let -- let us know if you want to
20 proceed that way, and then we can -- we can, you know,
21 talk about it and figure out how we want to do that.

22 MR. REINITZ: Yes. That -- that would be our
23 proposal, and we can take it up separately. That's fine.

24 MR. MC KEEVER: Okay. Sounds good.

25 Thank you very much, Dr. Senkevich.

1 THE STENOGRAPHER: Hold on just a minute.

2 Ariel, would you like to purchase a copy of the
3 transcript?

4 MR. REINITZ: We'll let you know. What's the
5 best way to get in touch?

6 THE STENOGRAPHER: E-mail.

7 MR. REINITZ: Okay. I'm not sure I have --

8 THE STENOGRAPHER: We can go off the record and
9 take care of that.

10 MR. REINITZ: Sure.

11 THE STENOGRAPHER: If you want to go off.

12 MR. REINITZ: Yeah, that's fine.

13 (Deposition concluded at 2:44 p.m.)

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Case Name: Jiangsu Favored Nanotechnology vs. P2i LTD.

Date of Deposition: 11/21/2024

Job No.: 10153053

I, JAY J. SENKEVICH, PH.D, hereby certify
under penalty of perjury under the laws of the State of
_____ that the foregoing is true and correct.

Executed this _____ day of
_____, 2024, at _____.

JAY J. SENKEVICH, PH.D

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Subscribed and sworn to (or affirmed) before me on
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basis of satisfactory evidence to be the person
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1 DEPOSITION ERRATA SHEET

2 Case Name: Jiangsu Favored Nanotechnology vs. P2i LTD.
3 Name of Witness: Jay J. Senkevich, Ph.D.
4 Date of Deposition: 11/21/2024
5 Job No.: 10153053
6 Reason Codes: 1. To clarify the record.
7 2. To conform to the facts.
8 3. To correct transcription errors.

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