

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

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4	LG ENERGY SOLUTION,	:	
	LTD.,	:	
5		:	
	Petitioner,	:	
6	-vs-	:	CASE NO. IPR2024-01006
		:	U.S. PATENT NO. 8,808,909
7	MOLECULAR REBAR DESIGN,	:	
	LLC,	:	
8		:	
	Patent Owner.	:	

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Deposition of YU ZHU, PhD, an expert witness herein,
taken by the Patent Owner as upon Cross-Examination and
pursuant to the Federal Rules of Civil Procedure and Notice
via Zoom videoconference on March 21, 2025 at 10:00 a.m.,
before Jennifer K. Starner, RPR, a Notary Public within and
for the State of Ohio.

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1 S T I P U L A T I O N S

2 It is stipulated by and between counsel for the
3 respective parties that the deposition of YU ZHU, PhD, an
4 expert witness herein, called as upon Cross-Examination by
5 the Patent Owner may be taken at this time and place
6 pursuant to the Federal Rules of Civil procedure and Notice
7 as to the time and place of taking said deposition; that the
8 deposition was recorded in stenotypy by the court reporter,
9 Jennifer K. Starner, RPR, and transcribed out of the
10 presence of the witness; and that said deposition is to be
11 submitted to the witness for his examination and signature,
12 and that signature may be affixed out of the presence of the
13 Notary Public.

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1	I N D E X	Page 4
2	WITNESS:	
3	YU ZHU, PhD	
4		Page
5	Cross-Examination By Mr. Zinda	5
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1 YU ZHU, PhD,

2 of lawful age, as having been duly sworn, as hereinafter
3 certified, was examined and testified as follows:

4 CROSS-EXAMINATION

5 BY MR. ZINDA

6 Q Good morning, Dr. Zhu. How are you?

7 A Good morning. Very good. How are you?

8 Q I'm doing well. Thank you for asking.

9 I won't ask you if you've been deposed because I now know
10 you have been. You were deposed -- I think it was last
11 week -- by me. So I know you're familiar with this process.
12 I'll just repeat a few of the ground rules just to be safe.
13 If you don't understand a question I'm asking -- because I
14 do know that I speak pretty fast. If you don't understand a
15 question I'm asking, can you just please ask me to clarify
16 it?

17 A Yes, I can.

18 Q If you answer a question that I ask, I'm
19 going to assume you understood it; is that fair?

20 A Yes, that is fair.

21 Q And then, of course, your counsel may
22 object throughout the deposition for certain questions I
23 ask. I'll ask you to please answer the question unless your
24 counsel instructs you otherwise. Does that make sense?

25 A Yes.

1 Q And then breaks, you know, from our last
2 depo, you know I'm fine taking breaks whenever you want to
3 take breaks. Typically it's 45 minutes to an hour or so.
4 And your counsel may chime in. The only thing I'll ask is
5 that we don't take a break during a pending question. So if
6 I ask you a question, I'd like you to answer it before we
7 try to go on break. Does that make sense?

8 A Yes, it does make sense.

9 Q Now, you're here today to testify about
10 testimony that you provided in your declaration addressing
11 U.S. Patent 8,808,909 correct?

12 A Yes.

13 Q And for short, I'm just going to refer
14 to that as the '909 Patent. Does that make sense?

15 A Yes.

16 Q If I could get you to go to the end of
17 the 909 Patent, which is LGES 1001.

18 A At the end of the patent?

19 Q Yes, sir. The claims.

20 A Yes, I am on that page.

21 Q And you see in Claim 1 it says "Discrete
22 carbon nanotubes"?

23 A Yes. I saw the discrete carbon
24 nanotubes.

25 Q And I previously asked you -- in your

1 prior deposition I asked you questions about your
2 understanding of the meaning of that term, right?

3 A Yes. I understand.

4 Q And your understanding of the meaning of
5 that term -- is your understanding of the meaning of that
6 term in this claim any different than your understanding of
7 the meaning in the other patent I asked you about?

8 MR. IN: Objection. Form.

9 A In my understanding, the discrete carbon
10 nanotube in this patent, Patent '909, describe a similar
11 situation as the status of carbon nanotube. And it is a
12 description of the carbon nanotube, I believe, related to
13 the use in the lithium ion battery electrode preparation,
14 and it would present a status like in those carbon nanotubes
15 uniformly dispersed in the medium and forming electrode
16 materials.

17 Q Okay. And then I also asked you -- if
18 you go to Claim 7 -- oh, no I'm sorry. Excuse me. Not
19 Claim 7. Claim 6. If you go to Claim 6.

20 A Okay. Claim 6.

21 Q And you see the last clause there that
22 says, "Wherein the carbon nanotubes are uniformly dispersed
23 without clustering on a dimension scale less than 1
24 micrometer"?

25 A Yes, I saw that.

1 Q And do you recall that I asked for your
2 opinions about the meaning of that same phrase in the other
3 patent, the '483 Patent?

4 MR. IN: Objection. Form.

5 A Yes. I remember we have discussed this
6 regarding uniform dispersed nanotube and regarding there is
7 no clustering in dimension scale less than 1 micrometer.
8 And I have described this is because, as grown carbon
9 nanotube, typically forming a bundled structure and the
10 bundled structure was formed because there are strong
11 interaction force between the wall of the carbon nanotube,
12 which is pi pi stacking force. And due to the pi pi
13 stacking force as grown, non-functionalized carbon nanotube,
14 were forming bundles, and those bundles have nanotube very
15 close to each other. And this pi pi stacking force will be
16 disrupted by the functionalization of the carbon nanotube in
17 which oxygen functional groups typically will be attached on
18 the sidewall of the carbon nanotube, which prevent the wall
19 of the carbon nanotube to be very close to each other. And
20 we have discussed this is generally a significant distance,
21 much larger than the pi pi stacking distance, which cause
22 the separation of the carbon nanotube as from the bundles.
23 And, therefore, you can achieve uniform dispersion generally
24 by functionalization of carbon nanotube typically using
25 oxidation functionalization.

1 Q And to determine whether or not carbon
2 nanotubes meet the claim requirements of Claim 6 of the '909
3 Patent, you have to look at them under a microscope,
4 correct?

5 MR. IN: Objection. Form.

6 A Microscope is one of the technique, as I
7 mentioned, to characterize the status of the carbon nanotube
8 dispersion. And there are also many other ways to explore
9 what is status of the carbon nanotube. And one of the
10 examples I have mentioned is the conductivity of the
11 electrode composite as a whole rather than just looking on
12 individual carbon nanotube's conductivity because the carbon
13 nanotube needed to forming a good connected network in the
14 electrode in order to improve the electrical conductivity of
15 the component.

16 Therefore, if the conductivity of the
17 electrode was improved, generally it's an indication of good
18 dispersion. The dispersion was usually achieved by
19 providing collective evidence from different
20 characterization tools rather than just focusing on one
21 single technique to determine exclusively whether the
22 nanotube is dispersed without forming any clusters.

23 Q Well, how -- how -- I guess I'd like --
24 can you walk me through the ways -- all the ways you could
25 determine -- how would you determine whether two carbon

1 **nanotubes are more than 1 micrometer apart?**

2 A So, first, there would be no significant
3 bundle formed in the composite in the dispersion medium.
4 And this can be actually explored by a number of techniques,
5 right. So you can certainly use microscope technique to see
6 if there's any bundles which is parallel packed carbon
7 nanotubes. Those will be significant under microscopic
8 technique, like, electro microscopic technique to see if
9 there's any parallel carbon nanotube actually aggregated in
10 a specific area. If you see those bundled areas, that is
11 indication of the clustering. That is one technique. But,
12 as I said, there are many other techniques. And, for
13 example, the conductivity measurement of the composite can
14 be an alternative technique. And if the bundled carbon
15 nanotube is a significant portion in the dispersion in the
16 composite medium, then generally the percolation network
17 will be formed in relatively poor way. This means you have
18 to use higher percentage of carbon nanotube in your
19 composite to achieve similar electrical conductivity. So a
20 good dispersed status generally means you -- you need a
21 small fraction of carbon nanotube with percentage in your
22 composite and still achieve good electronic conductivity --
23 electrical conductivity of the composite.

24 Q Okay. So you talked about -- and
25 correct me if I'm wrong. So you said one way to determine

1 whether or not carbon nanotubes are more than 1 micrometer
2 apart is microscopic. And then the other way is electrical
3 conductivity, correct?

4 A Yeah. Those are the two techniques you
5 can collectively consider to determine if -- if the -- if
6 there's a significant cluster in your composite dispersion.

7 Q Are there any other techniques that
8 you're aware of to determine whether or not two carbon
9 nanotubes are more than 1 micrometer apart?

10 A Yeah. There are also some other
11 technique. For example, you can use a technique like XPS to
12 monitor what is oxygen and carbon spectrums and to see if
13 there's any oxygen-containing functional group in the
14 nanotube. If you have oxygen-containing functional group on
15 the nanotube, then there will be a good indication that the
16 nanotube was separated from each other. And you can also
17 explore the XPS of carbon atoms with other atoms that exist
18 in active materials. So if you see some bundles in between
19 the carbon nanotubes, carbon peak or oxygen peak, with other
20 element in active materials, that is an indication that
21 active materials was attached with carbon nanotube as well
22 as oxygen-containing functional group. And that is an
23 indication that a nanotube was dispersed in active materials
24 metrics and, therefore, the nanotube was individual -- it
25 was dispersed well and is a discrete nanotube in this case.

1 So yeah.

2 Q So we've got -- the three that I've got
3 down so far: Microscopic, electrical conductivity, XPS.
4 Are there any other ways that you're aware of to determine
5 whether or not two carbon nanotubes are at least 1
6 micrometer apart?

7 A I think it's also quite a general
8 understanding for the -- for the POSITA and because the
9 purpose of -- of carbon nanotubes and lithium ion battery
10 active materials composite to forming electrode is generally
11 dispersed conductive fillers in medium, right. In this
12 case, the conductive filler is carbon nanotube. And this is
13 basically understanding of how this composite need to be
14 made. And I think based on the size of the carbon nanotube,
15 right, typically the size of the carbon nanotube is -- with
16 a length about a few tenths of micros and with a diameter
17 just a few nanometer to a few tenths of nanometers. And it
18 is generally considered needed to be -- those nanotube needs
19 to be separated significantly based on their size of the
20 length and the size of the diameter in order to forming a
21 dispersed medium. So this is also quite a general
22 understanding, I think, for the POSITA to consider that.
23 The dispersed nanotube has separation scale larger than 1
24 micrometer because this is actually determined by the size
25 characteristics of the nanotube itself.

1 So, in this case, people can consider
2 those nanotube was separated beyond that distance, for
3 example, 1 micrometer, by providing sketching scheme, which
4 presents that status of the nanotubes should be in those
5 composite -- in those dispersion medium and to describe the
6 status of the -- of the nanotube dispersion.

7 Q Okay. Are you aware of any other way to
8 determine whether two carbon nanotubes are at least 1
9 micrometer apart?

10 A Well, certainly this is not an
11 exhaustive way, right. So my opinion here is that you have
12 several techniques and you have determined based on the
13 several techniques that carbon nanotubes is dispersed and it
14 was separated with significant distance and is not really
15 necessary for any of the researchers for any of the -- any
16 POSITAs to exhaust every available technique that can be
17 used to -- to determine whether the distance between the
18 nanotubes are beyond a certain level. I think people
19 already get the information by the techniques that I have
20 mentioned in previous answers. That is enough to
21 characterize and determine the distance between the nanotube
22 and the status of the nanotube more importantly, whether
23 they are well distributed in the medium, whether there are a
24 significant amount of bundles in this nanotube dispersion.
25 And those questions should be answered -- should already

1 have been answered.

2 And I -- as I said, certainly there's
3 always additional technique for people to explore those
4 conditions and characterize nanotubes as a technique. It is
5 also important there are new techniques are coming out every
6 decade to characterize those carbon nanotubes. But with all
7 those technique I have mentioned, it's already forming a
8 formed conclusion of the status of the carbon nanotube
9 dispersion. I do not think the POSITA and other researchers
10 will need to exhaust additional methods even though it's
11 still possible to characterize the status of carbon
12 nanotubes.

13 Q You -- one of the opinions that you
14 offer is that Claim 6 is invalid because it would be
15 obvious -- that claim would be obvious based on Ohata and
16 Kavan, correct?

17 A This is the -- Claim 6 is -- is obvious,
18 yeah, based on -- based on available reference I cited in my
19 declaration.

20 Q And you said "available reference."
21 That includes the combination of Ohata and Kavan, correct?

22 A That included Ohata and Kavan. That
23 included the other one I cited which is Lead and Wepasnick.

24 Q So I want to focus on Ohata and Kavan
25 for now.

1 A Okay.

2 Q My question to you is: Did you do any
3 experimentation to -- did you -- did you attempt to or do
4 any -- did you attempt to perform any experiments that
5 replicate the combination of Ohata and Kavan as you
6 presented in your declaration?

7 MR. IN: Objection to form.

8 A I -- I want to clarify here with your
9 question. You mean have I done any experiment by myself
10 to -- to confirm the conclusion from Ohata and Kavan? Is
11 that your question?

12 Q Well, let's start with you. Have you
13 done any experimentation?

14 A With what?

15 Q To replicate the combination of Ohata
16 and Kavan?

17 A I have research experience of
18 functionalized carbon nanotube, which is pretty much what
19 Kavan has done in his work to first treat it as a carbon
20 nanotube and oxidized it. I have done intensively for this
21 kind of work using different oxidation reagent including
22 different mixed acids. And I have done very detailed work
23 about analyzing those oxidized carbon nanotubes using --
24 using XPS technique. And I have done those XPS
25 determinations to calculate what is exact oxygen peak atomic

1 ratio as well as the weight ratio regarding different oxygen
2 functional group like hydro carboxylic acid as well as
3 carbolic group and other things. And I have also worked
4 with using those carbon nanotube as electrode materials and
5 including lithium ion batteries and -- either as anode
6 material itself or as conductive fillers in other acting
7 materials. Could be cathode, could be anode and could be
8 lithium ion battery. I have done those work by myself. I
9 build those carbon cell by myself as well and actually grow
10 carbon nanotube by myself as well to -- built those four
11 carbon nanotube materials even before they were
12 functionlized. So I have done all of those procedures
13 mentioned in Kavan's work, in Kavan's battery. And I have
14 general understanding and also working experience of
15 building lithium ion battery as described in Ohata.

16 Q Okay. So I want to -- I want to back up
17 because I'm asking you a very specific question. My
18 question is have you tried to replicate the experiment from
19 the combination of Ohata and Kavan?

20 A Well, by the time I was working with
21 carbon nanotube -- I think it is probably a time of 2008,
22 2009 -- I think it's a very obvious general understanding
23 that you need to oxidize the carbon nanotube in order to get
24 a better dispersion if you want to prepare a composite in
25 the battery electrode. So it can be used in the lithium

1 iron phosphate. Lithium iron phosphate was very well known
2 by that time when I was working with carbon nanotube and
3 lithium iron phosphate composite. And it was probably
4 introduced a decade ago at the time of 2008, 2009. And so
5 it's very well known. And carbon nanotube needed to be
6 dispersed is also very well known. And oxidation method has
7 already been introduced by that time. So I've done all
8 those things. And I think the general consideration here is
9 if you worked with lithium ion battery research, if you are
10 interested in using carbon nanotube, you are actually in a
11 position to understand how to oxidize them as a dispersion
12 and how to actually combine them together with active
13 materials as mentioned in those patents, lithium iron
14 phosphate, titanium oxide and so forth. Those are all known
15 materials. And other researcher at that time I think --

16 Q Dr. Zhu, I'm going to have to ask you to
17 answer my question.

18 A Yes.

19 Q It's a yes or no question and you're
20 giving me, like, three-minute answers. That's not going to
21 work in this process. My question is -- I'm going to move
22 to strike your response as nonresponsive because none of
23 your response was directed to what I asked you.

24 I'm asking you a very simple question.

25 I'll back up a little bit to try to make this easier. But

1 you're proposing in your declaration that it would be
2 obvious to take certain steps from Ohata and combine them
3 with certain steps from Kavan, right?

4 A Yes.

5 Q Okay. Have you performed an experiment
6 where you replicated those combined steps?

7 A Your question is whether myself did the
8 experiment?

9 Q Yes. Have you ever performed the
10 experiment?

11 A Well, I -- I -- I think myself not
12 necessary to do exactly the same approach as this, too, but
13 I think myself has done an oxidation of the nanotube. And
14 myself has -- has understanding of putting these two
15 together. And this is a general understanding not only by
16 myself, but everybody working on that lithium ion battery
17 and oxidized carbon nanotube or nanotube materials, topics
18 by that time where everybody will do that. It's not only
19 me.

20 Q And, again, Dr. Zhu, that was not my
21 question. I'm going to strike it as nonresponsive.

22 I'm asking you a yes or no question.

23 Did you perform the combination of Ohata and Kavan that you
24 proposed in your declaration as an experiment? It sounds
25 like to me you're telling me you did not perform an

1 experiment to do the combination of Ohata and Kavan. And
2 I'm just looking for you to confirm one way or another
3 whether that's true.

4 A I did all those experiments, yeah. But
5 if you say if I explicitly referred to exact reference, I
6 think there are a lot of reference represented in the same
7 concept, represented the same idea. And I think that the
8 POSITAs may refer this to reference, which are just examples
9 that are showing the spirit of how to combine those two
10 together, but it's -- it's obvious for many researchers by
11 that time that this two -- this two concept can be combined
12 by using oxidized nanotube and electrode materials. And
13 certainly we have done those experiments in the lab and
14 build the battery in the lab with exactly the same approach
15 by combined oxidized nanotube and active materials of
16 electrode to build the lithium ion battery by that time.
17 Yeah, certainly I have done those work.

18 But what I say here -- what I want to
19 emphasize is the Ohata and Kavan reference is just two of
20 the good examples I would like to cite and to describe this
21 as a general understanding of every battery researcher by
22 that time. And they may have a slightly different
23 reference, but they still follow the same concept. And this
24 is a very well known concept by that time and it's a general
25 understanding for the battery researchers. They don't

1 really need to sometimes find exactly the same -- exactly
2 the same reference to understand this topic because it's
3 already obvious, I think, by that time for the researchers
4 in the battery study.

5 Q All right. Well, I'm moving to strike
6 that entire response as nonresponsive and irrelevant to what
7 I asked.

8 I mean, again, I'm going to ask you one
9 last time yes or no. Maybe it's better to put it this way:
10 Have you performed any actual experiments for purposes of
11 this IPR proceeding?

12 A I certainly did a lot of the experiment,
13 which is almost identical as some of the experiment in this
14 IPR, like, the combined carbon nanotube in the lithium ion
15 battery. This is my research. I have done it for 20 years.

16 Q When did you perform those experiments?

17 A It was starting from when I worked with
18 carbon nanotube. That is back to --

19 Q Okay. I'm going to -- let me save us a
20 lot of time because you just keep talking and you don't
21 answer my questions and it's starting to get a little bit
22 frustrating.

23 So I'm asking you for the purposes of
24 this IPR -- so from when you were approached about this IPR
25 and after, have you performed any experiments for purposes

1 of this IPR proceeding? I'm not asking you about your past
2 experiments that you've done 20 years ago. I'm asking you
3 about things you've done for this IPR proceeding.

4 MR. IN: Objection. Badgering.

5 A So let me clarify your question. You
6 are asking me whether I've done anything after I started to
7 work on this IPR?

8 Q Any experiments for purposes of this IPR
9 proceeding.

10 A I -- I do not think I have -- I needed
11 to do any experiment for this IPR proceeding because all
12 those experiment mentioned in my declaration in my IPR is
13 basically based on my previous experiment. And it's -- it's
14 easier. I have done it by myself or it has been done by my
15 graduate student or it has been done in the community and I
16 was aware it was well discussed with other committee members
17 in this -- in this research committee. So those are obvious
18 results for me. I do not need to do any specific experiment
19 in order to -- by myself after the IPR to confirm any of
20 those descriptions and conclusions I have made in the IPR
21 and the declaration, so yeah.

22 Q Dr. Zhu, is it your opinion that a
23 person of ordinary skill in the art would consider -- would
24 consider uniformly dispersed carbon nanotubes to be the same
25 as discrete carbon nanotubes?

1 MR. IN: Objection. Form.

2 A So I think this is a question I probably
3 already answered, but I would like to answer it again. And
4 this is actually related to the purpose of this -- of this
5 application. It will be used in lithium ion battery
6 electrode as a conductive filler to build electrical
7 conductive network in the electrode. So under this
8 consideration the nanotube has conducting filler materials
9 that in the matrix, which is electrode composite materials,
10 needed to be distributed uniformly in order to achieve
11 several purposes. First is to reduce the amount of the
12 carbon nanotube weight, which means the population network
13 needed to be built in a good way. The second is the
14 nanotube itself needed to have good conductivity which can
15 contribute to electrical conductivity of the composite as a
16 whole.

17 So under those conditions, it's obvious
18 that the nanotube has to be -- nanotubes have to be
19 dispersed uniformly and connect -- forming a connective
20 conducting pathway. And the uniform distribution and
21 discrete carbon nanotube are very similar description under
22 this application's purpose. So it's just used to build
23 good, dispersed and connected electrical network in the
24 composite to achieve this purpose and the nanotube should
25 have those status.

1 Q Okay. And I want to ask you about -- if
2 you could go to the 909 Patent, which is LGES 1001.

3 A Uh-huh.

4 Q I was going to ask you if you go to
5 Column 4, Line 4 --

6 A Uh-huh.

7 Q -- you see where it says, "This cutting
8 of the tubes helps with exfoliation"?

9 A "The cutting of the tubes reduce the
10 length of the tube." That's what it's saying here.

11 Q And what does it mean when it says, in
12 your opinion -- as a person of ordinary skill in the art,
13 what does it mean when it says, "The cutting of the tubes
14 helps with exfoliation"?

15 A The cutting of the tubes helps with
16 exfoliation is generally used to describe how you separate
17 individual nanotubes. So here the exfoliation more focusing
18 on if you originally have carbon nanotube bundles and to
19 separate individual tubes from each other. And cutting the
20 tubes in principal could help the exfoliation because the
21 longer tube, they form bundle, they can form an entangled
22 bundle. And it's relatively -- require relatively more
23 energy to separate it out. And if it's principally a
24 shorter tube, then the chance to forming the entangled
25 bundle will be less as compared with longer tube. So that

1 is what it's saying here, that cutting the nanotube will
2 help the exfoliation, which means de-bundle those nanotubes
3 from their initial status.

4 Q Okay. So this is describing a step
5 where they -- where they cut the nanotubes to shorten them,
6 which, in your opinion, can help untangle the nanotubes from
7 the bundle?

8 A Right. In principal, yes, but it's not
9 really necessary to say that it's needed to cut the nanotube
10 in order to exfoliate them, right. So in principal, it will
11 be easier to exfoliate if you have shorter tube.

12 Q Understood. And -- and what does --
13 when this passage is called for -- Line 4 to 6 talks about
14 exfoliation, as a person of ordinary skill in the art, what
15 is your understanding of exfoliation?

16 MR. IN: Objection. Form.

17 A So you are talking about the same, from
18 Line 4 to Line 6?

19 Q Correct. Let me rephrase the question.

20 A Yeah.

21 Q From a perspective of a person of
22 ordinary skill in the art, what is the meaning of the word
23 "exfoliation"?

24 A Well, from the person of state of the
25 art, the meaning of exfoliation means the nanotube is

1 de-bundled. They do not have -- have any bundled status.

2 Q So exfoliation refers to de-bundling and
3 it's your opinion that discrete refers to dispersion?

4 MR. IN: Objection. Argumentative.
5 Form.

6 A The de-bundle and the exfoliation and
7 discrete and also well dispersed, those are some of the
8 descriptions which describe the nanotube status in a similar
9 fashion, I want to say. They share some similarity. So the
10 de-bundle means -- means initially those bundled nanotubes
11 was forming parallel lines and bundled each other and
12 probably twisted, and it will form due to the pi pi stacking
13 interaction. And exfoliation essentially means you have
14 separated them from those pi pi stacking status. And,
15 therefore, tube was not bundled and together. And this
16 could be discrete nanotube status, right. So when it's
17 discrete, it means that the single nanotube was not
18 aggregated with other nanotube. And that is also dispersed
19 status, if you can see the nanotube and dispersion medium
20 and there are individual nanotubes distributed in the
21 dispersion medium uniformly. This is a good distributed
22 status, so it's dispersed well.

23 So those are under the consideration of
24 prepared battery electrode composite materials. And those
25 description of the status of the nanotube has fairly close

1 meaning. They are similar. They describe a similar status.

2 They were interconnected for their meaning.

3 Q Understood. Give me one moment.

4 MR. ZINDA: I'm ready to pass the
5 witness if you want to do your redirect then.

6 MR. IN: Sure. Yeah. Can we come back
7 in ten minutes?

8 MR. ZINDA: Yeah, that's fine with me.

9 MR. IN: Okay.

10 MR. ZINDA: Thank you.

11 (Whereupon, a brief recess was taken.)

12 MR. IN: No further questions. Thank
13 you.

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1 A C K N O W L E D G E M E N T

2

3 STATE OF OHIO :
4 COUNTY OF HAMILTON : SS:
5 :

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7 I, YU ZHU, PhD, have read the transcript
8 of my testimony given under oath on March 21, 2025.

9 Having had the opportunity to note any necessary
10 corrections of my testimony on the errata page, I hereby
11 certify that the above-mentioned transcript is a true and
12 complete record of my testimony.

13

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YU ZHU, PHD

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20 (DEPOSITION CONCLUDED AT 10:50 A.M.)

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1 C E R T I F I C A T E

2 STATE OF OHIO :
3 COUNTY OF HAMILTON : SS:
4 :

5 I, Jennifer K. Starner, the undersigned, a duly
6 qualified and commissioned Notary Public within and for the
7 State of Ohio, do hereby certify that before giving of the
8 aforesaid deposition, the said YU ZHU, PhD was by me first
9 duly sworn to depose the truth, the whole truth and nothing
10 but the truth; that the foregoing deposition was given at
11 the said time and place and was taken in all respects
12 pursuant to Notice; that the deposition was taken in
13 stenotypy by me and transcribed into typewritten form under
14 my supervision; that the transcribed deposition is to be
15 submitted to the witness for his examination and signature,
16 and that signature may be affixed out of the presence of the
17 Notary Public; that I am neither relative, attorney, nor
18 employee of any party or their counsel and have no interest
19 in the result of this pending action.

20 IN WITNESS WHEREOF, I have hereunto set my hand
21 and official seal of office at Cincinnati, Ohio, this
22 24th day of March, 2025.

23 *Jennifer K. Starner*

24 My commission expires: Jennifer K. Starner, RPR
25 March 7, 2029 Notary Public

1 CHANGES AND SIGNATURE

2 WITNESS NAME: Yu Zhu, Ph.D., 03/21/2025

3 PAGE LINE CHANGE REASON

4 _____

5 _____

6 _____

7 _____

8 _____

9 _____

10 _____

11 _____

12 _____

13 _____

14 _____

15 _____

16 I, Yu Zhu, Ph.D., have read the foregoing
17 transcript and hereby affix my signature that same is
18 true and correct, except as noted above.

19 _____

20 _____

21 Yu Zhu, Ph.D. Date

22 Sworn to and Subscribed before me

23 _____, Notary Public.

24 This _____ day of _____, 20____.

25 My Commission Expires:

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