

1 (1 to 4)

Zhuhai CosMX Battery Co. - EX1037
Zhuhai CosMX Battery Co. v. Ningde Amperex Tech. Ltd.
IPR2025-00432 - Page 1 of 81

Transcript of Dean R. Wheeler, Ph.D.
Conducted on January 30, 2026

2 (5 to 8)

5			7		
1	REFERENCED EXHIBITS		1	works, any questions?	
2	NUMBER	PAGE	2	A. I'm good, thank you.	
3	Exhibit 1001	19	3	Q. And is there any reason you can't give	
4	Exhibit 1005	71	4	your full and truthful testimony today? For	
5	Exhibit 1007	111	5	example, if you're on any sort of medication that	
6	Exhibit 1009	126	6	could affect your memory or mental faculties?	
7	Exhibit 1010	135	7	A. No reason.	
8	Exhibit 1011	145	8	Q. Okay. And the parties agree that we	
9	Exhibit 1032	102	9	don't need to go over your background again. That	
10	Exhibit 1034	105	10	was covered in the '131 deposition yesterday.	
11	Exhibit 1035	88	11	Just to clarify, has anything changed in	
12	Exhibit 2015	8	12	the last two days regarding your background?	
13	Exhibit 2034	8	13	A. That – it wasn't yesterday, but	
14			14	Wednesday.	
15			15	Q. Two days. Yeah, you're right.	
16			16	A. But nothing has changed.	
17			17	Q. Okay. So in this proceeding, you	
18			18	understand you're here today to testify regarding	
19			19	U.S. Patent number 11,575,148?	
20			20	A. Yes.	
21			21	Q. Is it okay if I call it the '148 patent?	
22			22	A. Yes.	
6			8		
1	-----		1	Q. And in this proceeding, you've provided	
2	P R O C E E D I N G S		2	three declarations, correct?	
3	January 30, 2026, 9:18 a.m. MST		3	A. Can you draw my attention to the – what	
4	-----		4	the third one is?	
5	DEAN R. WHEELER, Ph.D.,		5	Q. Yeah. So there's one declaration that	
6	having been duly sworn,		6	you gave that was just authenticating certain	
7	testified as follows:		7	exhibits.	
8	-----		8	A. Oh, okay. I remember that now.	
9	EXAMINATION		9	Q. And so in that declaration, you didn't	
10	-----		10	provide any opinions, right?	
11	BY MR. PHILBIN:		11	A. Right.	
12	Q. Hello, Dr. Wheeler. We met a couple of		12	Q. And you were just authenticating that the	
13	days ago when you were deposed regarding the '131		13	exhibits that were provided in this proceeding were	
14	patent.		14	authentic and accurate.	
15	A. Correct.		15	A. Yes.	
16	Q. So you generally know how a deposition		16	Q. But you did provide two substantive	
17	works now, right?		17	opinions, correct?	
18	A. Yes.		18	A. Correct.	
19	Q. You don't need me to go over the rules		19	Q. And the first opinion, that would be	
20	again?		20	Exhibit 2015.	
21	A. No.		21	A. Yes.	
22	Q. Anything you need a reminder on how it		22	Q. And the second one is Exhibit 2034.	

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9 1 Right? 2 A. Yes. 3 Q. So in your first declaration, 4 Exhibit 2015? 5 A. Yes. 6 Q. If you'll go to paragraph 70. 7 So in this first declaration, you did not 8 offer any opinions on claim construction, correct? 9 A. I stated that I applied the plain and 10 ordinary meaning of all claim terms from the 11 perspective of a POSITA. 12 Q. Okay. 13 And then in the second declaration, the 14 second substantive declaration, Exhibit 2034, you 15 did offer opinions as to three different claim 16 terms, correct? 17 It starts at paragraph 42. 18 A. I expressed an opinion, as you referred, 19 in paragraph 42, in response to a separate district 20 court action in which I expressed the opinion that 21 there was a problem with the other side's arguments 22 about the meaning of terms.	11 1 Q. And when you wrote "other components of 2 the porous layer," that refers to filler particles; 3 is that right? 4 MR. COX: Objection, form. 5 A. So that term is kept general so it could 6 encompass any materials that are included in the 7 porous layer. 8 BY MR. PHILBIN: 9 Q. But that would include the filler 10 particles or the inorganic particles that are the 11 subject of the '148 patent, correct? 12 A. Yes. 13 The inorganic particles would be included 14 within that broader term. 15 Q. So then, it's your opinion that for a 16 pore to be formed by the binder, the boundary of the 17 pore has to exclusively be binder? 18 A. No, not exclusively. 19 Q. Well, what else can the boundary of the 20 pore be made of? 21 A. So it's our position that -- or my 22 position that the -- being defined by the boundaries
10 1 Q. Okay. Well, let me direct you to 2 paragraph 43. 3 So in your paragraph 43, you reiterate 4 that the terms in the '148 patent should be given 5 their plain and ordinary meaning. But because there 6 appears to be a dispute by the parties as to what 7 that plain and ordinary meaning is, you go on to 8 define what your -- what in your opinion the plain 9 and ordinary meaning of certain terms are; is that 10 right? 11 A. That's correct. 12 Q. And the first one of those is Pores 13 "Formed By the Binder." Right? 14 A. Yes. 15 Q. In paragraph 47, you state that: A 16 POSITA would have understood the plain and ordinary 17 meaning of this phrase, "formed by the binder," to 18 require that the pore geometry itself is defined by 19 the boundaries of the binder, rather than by some 20 other component of the porous layer. 21 Is that your opinion? 22 A. That's my opinion.	12 1 of the binder does not require that it is 100.00% 2 only having binder on the boundaries of the pore. 3 Q. Okay. 4 A. So there could be some portion of the 5 boundaries of the pore that are not exclusively 6 binder, as long as the binder is having the largest 7 and most important effect on that boundary. 8 Q. So then, is it your opinion that some 9 small portion of the boundary could be -- could 10 comprise or be comprised of an inorganic particle? 11 A. It could. 12 Q. So then has your opinion changed since 13 you offered this second declaration? 14 A. No. 15 Q. So then how do you define the geometry 16 being defined by the boundaries of the binder? 17 There seems to be some percentage that the boundary 18 has to be a binder. Is that understanding correct? 19 A. So, no is the answer. 20 Q. Okay. Well, you said -- you said not 21 100% of the boundary has to be made of binder, but 22 instead that the binder has to have the largest and

Conducted on January 30, 2026

13 1 most important effect on that boundary. 2 How did you define -- how do you quantify 3 whether the binder has the largest and most 4 important effect on the boundary of a pore? 5 A. So I purposefully did not quantify, 6 because there -- it would be difficult to have an 7 exact percentage or other quantity; however, I did 8 state that it needs to be the most important or the 9 largest factor in determining the boundaries of the 10 pore. 11 Q. So to have the largest effect it just has 12 to -- I guess I'm -- can you try to explain that 13 better, what you mean by having the largest effect 14 on the boundary? 15 A. So in this case, we're talking about 16 three-dimensional porous structures for these porous 17 layers. Obviously in a three-dimensional pore 18 structure, there are many, many variables and 19 possibilities of ways things could be arranged. And 20 so in a patent and in claim language, we are trying 21 to encapsulate that. And in specification, we get 22 additional information on how that might look. So	15 1 It's difficult to take that three-dimensional 2 structure and describe it by one thing or two 3 things. But we look at a range of things, like the 4 size of the pore relative to the walls, the size of 5 the pore relative to the inorganic particles if 6 they're present, the amount of binder and other 7 materials present. 8 So you look at all of these factors and 9 you -- and if possible, if you have an SEM or other 10 optical image of the material, that can help in 11 understanding what the pores are doing and what's 12 happening on the edges of those pores. 13 So it takes -- you have to look at a lot 14 of factors. 15 Q. Paragraph 48. 16 A. Yes. 17 MR. COX: In the second declaration 18 still? 19 MR. PHILBIN: Yeah. Yeah. Sorry. 20 Presume I'm in the second declaration 21 unless I say otherwise. 22 A. Okay.
14 1 it's an imperfect way of describing a 2 three-dimensional structure, but we do the best that 3 we can with English language. 4 And so the idea is that the way that the 5 binder is arranged is the primary factor in how the 6 pores are shaped, that what defines the limit of the 7 pore and -- rather than one of the other materials 8 present in the porous layer. 9 Q. How would you know if the binder is 10 having the primary effect on the boundary or the 11 geometry of the pore? 12 A. So one indicator -- not exclusive, but 13 one indicator is that the binder is the principal 14 material that is on the edges of the pore. Meaning 15 that if you -- when you get to the edge of the pore, 16 you find an interface between the pore and binder. 17 And so that indicates that the binder is -- whatever 18 shape that binder is doing, that's determining the 19 shape of the pore. 20 Q. Are there any other indicators? 21 A. You can -- again, as I said, pores in a 22 three-dimensional porous material are complicated.	16 1 BY MR. PHILBIN: 2 Q. So paragraph 48, I believe you define 3 what the term pore means, and you define it as voids 4 or interstitial spaces that do not include the wall 5 that defines the outer limits of a pore. 6 But what is an interstitial space? 7 A. So again, I would use the plain and 8 ordinary meaning of that. An interstitial space is 9 a gap or a void in between other materials. 10 Q. So then interstitial space isn't 11 different from void? 12 A. Right. It's restating that in case that 13 meaning has more applicability in a certain context. 14 Q. What's your definition of void? 15 A. The absence of a material. 16 Q. And when you say that the pore doesn't 17 include the wall that defines the outer limits of 18 the pore, the wall, that's the pore wall, correct? 19 A. Correct. 20 Q. And when you say that the wall or pore 21 wall defines the outer limits of the pore, is that 22 the same as saying that the pore wall defines the

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Zhuhai CosMX Battery Co. v. Ningde Amperex Tech. Ltd.

IPR2025-00432 - Page 4 of 81

17 1 geometry of the pore? 2 A. Can you restate that question? 3 Q. Sure. So in paragraph 48 you state that: 4 The wall, which is also the pore wall, defines the 5 outer limits of the pore. 6 And in paragraph 47, you say the pore 7 geometry is defined by the boundaries of the binder? 8 So I guess what I'm getting at is the 9 boundaries are the pore walls, correct? 10 A. Correct. The pore is defined by its 11 bound -- by the limit of the pore, which is where 12 the wall starts. But it doesn't include the wall. 13 The wall is not part of the pore. 14 Q. Okay. And it's -- so it's the pore wall 15 that defines the geometry of the pore, correct? 16 A. Correct. Or -- and I should include that 17 pore wall basically means where some other material, 18 other than the void, is now present. 19 Q. So in your opinion, for a pore to be 20 formed by the binder, that requires that the pore 21 walls be made of binder, correct? 22 MR. COX: Object to form.	19 1 evidence that there are some inorganic particles 2 that made contact with the pore. 3 Q. So those inorganic particles, they're 4 visible in Figure 1 and 2, correct? 5 A. Yes. 6 MR. COX: And just for clarity on the 7 record, you're referring to Exhibit 1001. 8 MR. PHILBIN: Yes, the '148 patent is 9 Exhibit 1001. 10 BY MR. PHILBIN: 11 Q. So those particles that you can see in 12 Figures 1 and 2 of the '148 patent, they form part 13 of the pore wall; is that correct? 14 A. So it's important to distinguish between 15 a particle that's totally subsumed within the 16 wall -- 17 (Interruption.) 18 A. Excuse me. 19 MR. COX: Do you want to take a 20 five-minute break? 21 A. I'm okay. 22 Let me try again. It's important to
18 1 A. So the pore wall would not necessarily be 2 exclusively made of binder. 3 BY MR. PHILBIN: 4 Q. So the pore wall can be made of both 5 binder and inorganic particles, for example? 6 A. Yes. 7 Q. Is there a requirement as to how much of 8 the pore wall has to be made of binder versus other 9 particles in order to be classified as a pore formed 10 by the binder? 11 A. As I previously stated, no, there's not a 12 hard cutoff. But it doesn't -- the definition that 13 I'm using does not require that it's 100% binder. 14 There could be some inorganic particles that's -- 15 that makes contact with the pore. 16 Q. In paragraph 50, you state that Figures 1 17 and 2 of the '148 patent show that the boundaries of 18 the pores are delineated by the binder. 19 Do you agree that the pore walls in 20 Figure 1 and 2 of the '148 patent are not 21 exclusively binder? 22 A. When I look at those images, I see	20 1 distinguish between a particle that's fully subsumed 2 within the pore wall, that we'd talk in terms of it 3 being encapsulated by binder, where it's -- there's 4 a complete -- ordinarily complete coating of binder 5 around those particles that are within that pore 6 wall. And then there are particles that protrude 7 into the pore and may be exposed to the pore where 8 they don't have binder completely coating them. And 9 there appears to be evidence of that in Figures 1 10 and 2 of the '148 patent. 11 BY MR. PHILBIN: 12 Q. Okay. Can you go to paragraph 69 of 13 your -- of Exhibit 2034, your second substantive 14 declaration. 15 This is -- you reproduced Figure 2 from 16 the '148 patent and annotated it, correct? 17 A. Correct, although it -- this came from 18 the file history, where there was a higher quality 19 image than is present in the patent, the published 20 patent. So we -- that's reproduced here. 21 Q. And you identify a particle that's 22 visible in one of the pores, correct?

21 1 A. Yes. 2 Q. And so it is your opinion that that 3 particle is not encapsulated by binder, correct? 4 A. It appears that it is not fully 5 encapsulated with binder, although I would add, it's 6 difficult from an SEM image to fully determine that. 7 You make a judgment -- based on contrast between 8 light and dark, and make your best judgment from the 9 information that you have, but it appears that that 10 particle does not have a complete coating of binder 11 on it. 12 Q. So that was going to be one of my 13 questions was even from this SEM image, you can't be 14 100% certain whether that particle is fully 15 encapsulated by binder or not, right? 16 A. Right, you can't be 100% certain. 17 Q. Okay. Now, this particle that you've 18 identified, it's your opinion that part of the 19 particle, because it's visible, extends into the 20 pore, correct? 21 A. Correct. 22 Q. And another portion of that particle is	23 1 A. You said paragraph 54? 2 Q. Paragraph 53. 3 A. Or 53. Okay. 4 Q. You talk about a process of coagulation 5 and separating out the binder, and you state that 6 because this coagulation process is used, the pore 7 voids are -- yeah, the voids must be defined by the 8 binder, correct? 9 MR. COX: Objection, form. 10 Do you mean 52? Or are you referring 11 to 53? 12 MR. PHILBIN: I mean 53. 13 MR. COX: Okay. I don't see voids in 14 53. 15 MR. PHILBIN: Yeah, I think I added 16 in the word void. Pores. 17 A. Will you restate the question, please? 18 BY MR. PHILBIN: 19 Q. Sure. Let me reread 53 to myself 20 quickly. 21 [Document review.] 22
22 1 encapsulated in the pore wall, correct? 2 A. Correct. 3 Q. So then is it your opinion that this 4 particle that extends into the pore defines the 5 geometry of the pore? 6 A. It's my opinion it does not principally 7 define the geometry of the pore. 8 Q. But it does in part? 9 A. It has some effect, but it's a minor 10 effect. That's not the primary or most substantial 11 effect of determining that -- the pore geometry. 12 Q. If you can go back to paragraph 53 of 13 this second declaration. 14 And just for the record, I keep calling 15 it the second declaration. I think it's technically 16 the third, but when I say second declaration, I mean 17 Exhibit 2034. 18 A. Yes, that's how I understand it too. 19 Q. Okay. 20 A. Thank you for making it easy for me. 21 Q. Yeah. I don't want to have to keep 22 explaining that.	24 1 BY MR. PHILBIN: 2 Q. So paragraph 53 is explaining the reason 3 as to why you believe that pores formed by the 4 binder means that the binder defines the geometry of 5 the pore, correct? 6 It's your second reason? 7 MR. COX: Objection, form. 8 A. Sorry, I was still reading the paragraph 9 when you said your question. Can you repeat one 10 more time? 11 BY MR. PHILBIN: 12 Q. Sure. So we're in the section of your 13 declaration explaining why your opinion is what it 14 is for what "pores formed by the binder" means, 15 right? 16 A. Right. 17 Q. And in this paragraph, in paragraph 53, 18 you're talking about how the '148 patent in the 19 specification describes the use of a coagulation and 20 separating out of a solution in order to form the 21 porous film, right? 22 A. Right.

25 1 Q. So it's your opinion that by using this 2 process of coagulation and separating out the 3 solution, that the pores must be formed by the 4 binder, meaning that the pores are primarily defined 5 by binder, correct? 6 MR. COX: Object to form. 7 A. Not as you state it. This is one factor, 8 as I indicated earlier, among many, that you can 9 look at to indicate that you're forming -- that the 10 pores are formed by the binder. 11 When you coagulate the binder in this 12 manner, in the '148 patent, there's still solvent 13 present. And so materials are quite mobile. The 14 binder, the inorganic particles, they can move 15 around a bit as things are happening. 16 When you coagulate that binder, things 17 get organized in a way that can promote the scenario 18 that we're -- that I'm talking about, which is pores 19 formed by the binder, because the binder is pushing 20 things around and moving things around and the 21 particles are moving. And when things kind of 22 settle in their final form, and things -- when the	27 1 of salivants. And so taken in its entirety, the 2 '148 patent has a teaching that would be a factor 3 that could lead to the pores formed by the binder. 4 Q. Let me ask the same question: The NIPS 5 process, that's not in any of the claims in the '148 6 patent, correct? 7 A. Correct, it does not specify NIPS. 8 Q. Is it possible to use the NIPS process or 9 a different coagulation and separating out process 10 and -- to create a porous film where the pores are 11 formed primarily by filler particles? 12 MR. COX: Objection, form, compound. 13 A. Sorry, can you repeat the question? 14 BY MR. PHILBIN: 15 Q. Sure. Can you use the NIPS process to 16 create pores that are formed primarily by particles 17 instead of primarily by binder? 18 MR. COX: Objection, form. 19 A. Again, there are many factors that 20 would -- you'd have to look at to determine whether 21 something is formed by the binder versus some other 22 way of forming the pores.
26 1 binder is fully coagulated, then there's a tendency 2 for the pores to be formed by the binder. 3 BY MR. PHILBIN: 4 Q. Okay. Do any of the claims in the '148 5 patent require the use of coagulation and separating 6 out of a solution? 7 A. I don't recall that that's the case, but 8 give me a moment to verify that. 9 Q. Sure. 10 [Document review.] 11 A. I don't see anything in the claims of the 12 '148 patent that require coagulation, but I would 13 add that coagulation is a term that can mean 14 different things in different contexts, so in a 15 sense, anytime you form a film that -- where you 16 started with solvent and binder, polymeric binder, 17 coag- -- it could be argued that coagulation is 18 going to happen at some point. 19 I would mention, also, that the 20 specification in the '148 patent does have a heavy 21 emphasis on using the NIPS process, which is 22 inherently coagulating a binder with a combination	28 1 NIPS is a way of manipulating how the 2 binder behaves. It requires certain combinations of 3 materials to create -- to go through the NIPS 4 process. And I wouldn't say that NIPS exclusively 5 creates pores formed by the binder. 6 I can -- it's conceivable that someone 7 could use NIPS and have a different scenario of how 8 they're creating the pores. However, as I 9 previously stated, it's -- NIPS is something where 10 you're deliberately trying to achieve a 11 configuration of the binder in your final porous 12 layer and manipulate that binder to be in a certain 13 configuration, and that can strongly suggest that 14 you are forming pores by the binder. 15 BY MR. PHILBIN: 16 Q. So just to clarify, the NIPS process 17 doesn't guarantee that the pores must be formed by 18 binder, correct? 19 A. Right. My opinion is that it's 20 conceivable that one could attempt to use NIPS, and 21 yet not form pores by the binder. 22 For instance, if you had a very small

29 1 fraction of binder compared to an inorganic 2 particle, you could attempt to use NIPS. There's 3 nothing that stops you from going through the steps 4 of that recipe of exchanging solvents, et cetera, 5 but it wouldn't necessarily lead to the outcome of 6 pores formed by the binder. 7 Q. Okay. Paragraph 54, you state that: A 8 key variable -- 9 A. Are we back to the second -- 10 Q. Your second declaration, yes. 11 A. Paragraph 54. Okay. 12 Q. So we were just talking about, or you 13 were just talking about how if the amount of binder 14 is too low, that the NIPS process, when formed -- 15 pores formed by the binder, is there -- 16 A. I said not necessarily. 17 Q. Not necessarily. Okay. Is there a 18 minimum amount of binder that is required in order 19 to form pores that are formed by the binder? 20 A. Again, it -- I couldn't give you an exact 21 percentage or ratio that -- where pores formed by 22 the binder incurs or doesn't occur, but it is one	31 1 50%, end quote, then, quote, the particles are 2 generally separated from one another and surrounded 3 by binder, end quote. And, quote, it is necessary 4 to generate porosity in the binder polymer itself, 5 end quote. 6 BY MR. PHILBIN: 7 Q. So is it your understanding, then, that 8 Dr. Guido was saying that if there's 50% or more of 9 binder, that the pores will be formed by binder? 10 MR. COX: Object to form. 11 A. He uses the term "perhaps," so he's not 12 making a definitive statement either. But he is 13 agreeing with the concept that when you have a high 14 proportion of binder, you're more likely to have 15 particles that are surrounded by that binder, and 16 that is a strong factor indicating pores formed by 17 the binder. 18 That's not the only factor, however, 19 because if you add a binder that doesn't like to wet 20 the particles, then if the binder is in a 21 particulate or a blob-like shape and doesn't wet the 22 particles, then that would, again, indicate that
30 1 factor that contributed to it, where a greater 2 portion of binder would contribute toward making 3 pores formed by the binder. 4 Q. So you quote Dr. Guido's testimony that if 5 more than 50% of the binder -- or if more than 50% 6 of the porous film is binder, it seems like he was 7 stating that the pores would need to be formed by 8 the binder. He uses other words. He states: 9 Perhaps more than 50% of the binder would make it 10 necessary to generate porosity in the binder polymer 11 itself. 12 Do you see that? 13 A. This is in paragraph -- my paragraph 54. 14 Q. Yeah, it's on page 29. Paragraph 54 is 15 long. 16 A. Yeah, I'm looking. 17 [Document review.] 18 A. So I quote in my paragraph 54 from -- 19 Dr. Guido's testifying in a different IPR proceeding 20 that for separators, quote, in which the amount of 21 polymer binder in the ceramic particle containing 22 layer is significantly greater, perhaps more than	32 1 it's not as much -- it's not as likely to have pores 2 formed by the binder. 3 BY MR. PHILBIN: 4 Q. Would a POSITA know how much binder is 5 required in order to have pores that are primarily 6 defined by binder? 7 MR. COX: Object to form. 8 A. A POSITA wouldn't have a percentage in 9 mind. They would have to look at all of the factors 10 that I've been alluding to. And, you know, like I 11 said before, it helps if you can get an image of the 12 structure and see what you made and see -- ask 13 yourself, what does that look like? Have I made a 14 porous structure where the binder is encapsulating 15 particles? Where the binder is defining those 16 walls. Then you'd know, okay, it's working how I 17 intended to have pores formed by the binder. 18 BY MR. PHILBIN: 19 Q. If you can go to the '148 patent, 20 Exhibit 1001 column 5, lines 50 through 52. 21 A. So I'm at column 5. You said lines 50 22 something?

Conducted on January 30, 2026

33 1 Q. Yeah. The 50 through 52. 2 A. Okay. 3 Yes, I see that. 4 Q. You see where it defines the volume ratio 5 of inorganic particles to binder? 6 A. Yes. 7 Q. Can you tell me what that ratio is? 8 A. It says: In the above-described porous 9 film, the volume ratio of the inorganic particles to 10 the binder in the porous film is in a range of .2 to 11 3.0. If the volume ratio of them is lower than .2, 12 the average pore size of the porous film is reduced, 13 the porosity is decreased, and the rate of 14 performance of the lithium-ion battery is 15 deteriorated drastically. 16 Q. Yeah. You don't have to keep reading. 17 My question -- so the ratio of .2, that means a 18 ratio of .2 to 1, correct? 19 MR. COX: Object to form. 20 BY MR. PHILBIN: 21 Q. As in there would be .2 parts of 22 inorganic particles for every one part of binder.	35 1 A. Unless those other components are binder, 2 yeah. 3 Q. Well, but, I mean, lines 50 through 52, 4 it talks about binder. Do you think there's -- are 5 you saying that there could be a second binder that 6 wouldn't be included in that? 7 MR. COX: Object to form. 8 A. I would have to look at all of the 9 details -- of how someone would be putting together 10 their material. 11 BY MR. PHILBIN: 12 Q. Well, does the '148 patent describe using 13 two different binders? 14 A. It does say, in the several lines above 15 there, line 43: The binder is at least one of -- it 16 lists multiple components. 17 Q. So the binder can be made of multiple 18 components, but in lines 50 through 52, is it your 19 understanding that the term binder would refer to 20 the amalgamation of those different binder 21 components? 22 A. That appears to be the case.
34 1 Right? 2 A. Yes, that would be my understanding of 3 that language. 4 Q. Okay. And for the ratio of three, that 5 would be three parts of inorganic particles to one 6 part of binder, right? 7 A. Correct. 8 Q. So then the '148 patent is describing 9 that the porous film can be 75% by volume of 10 inorganic particles. 11 Is my math right? 12 A. So three parts inorganic and one -- to 13 one part -- 14 Q. Binder. 15 A. -- binder would be 75% by volume, if 16 you're only including those two. Of course, there 17 could be other materials in the porous layer. 18 Q. And those other materials, though, would 19 increase the ratio of particles or other components 20 to binder, right? 21 So the percentage of binder would be 22 decreased, if there are other components?	36 1 Q. Okay. 2 So if you have a porous film or 75% or 3 possibly even more is made of inorganic particles or 4 other filler-type particles, can the pore voids 5 still have their geometries defined primarily by the 6 binder? 7 A. It's possible, yes. 8 Q. How do you know that? 9 A. Because, first of all, it's a 10 hypothetical, so it's -- there's not an experiment 11 being shown right here that -- where one can see the 12 SEM, for instance. But it's possible to conceive of 13 a scenario where you have a binder that really likes 14 to wet the particles, so it forms a very strong, 15 thin film covering all the particles. And in that 16 sense, it would be very efficient in how it could do 17 its job with a minimum volume. 18 And so if you had all of those layers 19 covering the particle, and then you have a 20 fabrication method, such as NIPS, where you're -- 21 the particles are mobile and you're coagulating the 22 binder and it's kind of pulling things around and

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Zhuhai CosMX Battery Co. - EX1037

Zhuhai CosMX Battery Co. v. Ningde Amperex Tech. Ltd.

IPR2025-00432 - Page 9 of 81

37 1 moving things until they get to the best or most 2 favorable configuration, and then you evaporate the 3 solvent and what's left behind are pores formed by 4 the binder, even though the fraction of binder was, 5 in this hypothetical example, 25% of the solids, 6 that's possible. 7 Q. Would your answer change if 90% of the 8 film was made of inorganic particles? 9 A. It's conceivable, but it becomes less 10 likely. 11 Q. Okay. 12 A. Again, the -- one of the factors that you 13 would look at as a POSITA would be a higher fraction 14 of binders more likely to promote pores formed by 15 the binder. 16 Q. So in paragraph 55 of your second 17 declaration, you state that: The pore wall -- 18 A. Can you hold one minute? 19 Q. Oh, sure. 20 A. Go ahead. 21 Q. In paragraph 55 you state that: The pore 22 walls are claimed to be made of binder.	39 1 very end of the patent. 2 A. Yes. 3 Q. Does Claim 1 make any reference to the 4 pore wall? 5 MR. COX: Object to form. 6 A. I don't see any reference there. But 7 going back to my paragraph 55, it's alluding to 8 that, again, I said as a shorthand, about the 9 binder. And then it's referring to dependent 10 Claims 3 and 12 as giving additional context to what 11 is meant. 12 BY MR. PHILBIN: 13 Q. And the context in Dependant Claims 3 and 14 12, is that based on -- well, let's look at Claim 3. 15 It states that the average wall thickness between 16 the pores is in a range of 20 nanometers to 500 17 nanometers. What about Claim 3 makes you believe 18 that the pore walls are made of binder? 19 A. My point in paragraph -- my paragraph 55 20 is that the pores are not formed by interstitial 21 cavities between the relatively tight -- between the 22 relatively tightly packed particles. So I was
38 1 Are you referring to the patent claims 2 from the '148 patent? 3 A. Give me a minute. 4 Q. Sure. 5 [Document review.] 6 A. Can you restate the question? 7 BY MR. PHILBIN: 8 Q. Yeah. In the first line of paragraph 55, 9 you say: The pore walls are claimed to be made of 10 binder. 11 I'm just wondering, when you use the word 12 "claimed," are you referring to the patent claims or 13 are you using it more colloquially? 14 A. I think that was a shorthand to indicate 15 the claim language. 16 Q. Okay. 17 A. But it's not -- the claim language 18 doesn't precisely say what I said. 19 Q. Can you look at Exhibit 1001 of the '148 20 patent? 21 A. Mm-hmm. 22 Q. Can you look at Claim 1? It's at the	40 1 making the point about what pores formed by the 2 binder is not. 3 Q. Okay. So then what about exhibit -- or 4 Claim 3 gives you the opinion that the pore walls 5 are not -- or that the pores are not formed by 6 particles. 7 A. If pores are primarily interstitial 8 cavities or spaces between particles, then it 9 becomes very difficult to define a wall thickness, 10 because the wall is basically the inorganic 11 particles which are irregular and don't really have 12 a defined wall thickness, or at least it's a very 13 difficult thing to envision how you would measure 14 that. 15 And so Claim 3 in the '148 patent, 16 insofar as it discusses average wall thicknesses 17 between the pores, has an implication that it is 18 something that can be measured, averaged, and that 19 implies pores formed by the binder. 20 Q. Well, you can measure an inorganic 21 particle, right? 22 A. Which measurement are you referring to?

Conducted on January 30, 2026

41 1 Q. Well, for example, the Dv10, Dv50, Dv90, 2 those give diameters of inorganic particles, right? 3 A. Yes, you can measure diameter of an 4 inorganic particle, or at least an average or an 5 effective diameter. 6 Q. Wouldn't the diameter of a particle, if 7 the diameter is serving as the pore wall, be the 8 pore wall thickness? 9 MR. COX: Object to form. 10 A. Again, the shape of a pore that's in -- 11 that's in the interstitial space between inorganic 12 particles would be -- it would be difficult to 13 define a pore wall thickness. You wouldn't just say 14 it's the diameter of the particle. That wouldn't 15 describe it well. 16 BY MR. PHILBIN: 17 Q. So Claims 3 and 12, they both talk about 18 an average wall thickness? 19 A. Yes. 20 Q. And they give a range of 20 to 500 21 nanometers. 22 If you convert that to microns, that's	43 1 wall thickness, correct? 2 MR. COX: Object to form. 3 A. So again, we have to distinguish between 4 average and, let's say, an individual sample. 5 Yes, you know, in -- hypothetically you 6 could have a pore wall that's a million times bigger 7 than that average, but it would be extremely 8 unlikely. 9 BY MR. PHILBIN: 10 Q. Sure. But a pore wall, say as thick as 11 one micron, that's possible, right? 12 MR. COX: Object to form. 13 A. So again, in the context of the '148 14 patent, you need to look at how they do that 15 measurement. 16 BY MR. PHILBIN: 17 Q. Well, does the way that the '148 measures 18 the wall thicknesses dictate what the possible wall 19 thicknesses are? 20 A. Yes. 21 Q. Why? 22 A. Because it's a measurement, and the
42 1 .02 to .5, right? 2 A. Yes. 3 Q. So you agree that if the average wall 4 thickness can be as high as .5 microns, that means 5 the pore wall thickness can be greater than 6 .5 microns, right? 7 MR. COX: Object to form. 8 BY MR. PHILBIN: 9 Q. An individual pore wall could be thicker 10 than five -- than .5 microns, right? 11 A. So in the context of the '148 claims, you 12 would -- a POSITA would look to the specification 13 for how that measurement was conducted. And so I 14 would refer to that description of how they make 15 that measurement. 16 Q. I don't think that quite answered my 17 question. 18 Average implies that there would be wall 19 thicknesses greater than and less than, correct? 20 A. Right. 21 Q. So then nothing in the claim language 22 from Claim 3 or 12 puts an upper limit on the pore	44 1 manner in which you perform the measurement can have 2 an affect on what value you get. 3 Q. But you agree that the pore walls have 4 innately a certain thickness to them, correct? 5 A. No, I don't agree with that. 6 Q. That's not just a material property? 7 A. No. Because as previously testified, 8 we're talking about a complex, three-dimensional 9 geometry that's irregular. So you have to -- at 10 some point, if you're going to make a measurement 11 and call that a wall thickness, you have to define a 12 procedure by which you will make those measurements. 13 There's no single right answer of what is the wall 14 thickness. 15 Q. Let's move on to the next claim term. If 16 you'll go back to your second declaration starting 17 at paragraph 57. 18 MR. COX: I guess, Counsel, is this a 19 good time for like a five-minute break. 20 MR. PHILBIN: Yeah. 21 MR. COX: We're going to break at 22 11:00.

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IPR2025-00432 - Page 11 of 81

45 1 MR. PHILBIN: Sure. 2 MR. COX: Otherwise, we'll push for 3 two hours. 4 MR. PHILBIN: No, this is a good 5 time. 6 THE WITNESS: Okay. 7 (Recess taken, 10:20 a.m. to 8 10:29 a.m. MST) 9 BY MR. PHILBIN: 10 Q. So if you can go to your second 11 declaration, paragraph 57. 12 Let me know when you're there. 13 A. I'm there. 14 Q. So in this section, you give your opinion 15 as to what "the Pores at Least Comprises a Part of 16 the Inorganic Particles" means. 17 And in paragraph 57, you state that -- 18 specifically in Murakami: The inorganic particles 19 do not (and cannot) be part of the pores like they 20 are in the '148 patent. 21 Did I read that right? 22 A. I'm not seeing it yet, but if you --	47 1 your opinion that the particle has to be part of the 2 pore? 3 A. You have to interpret this in the context 4 of everything else that's in the claim language. 5 So we've already established that the 6 pores are formed by the binder, and, in the context 7 of that, have this additional limitation that then 8 the pores at least comprise a part of the inorganic 9 particles. And that -- in that context of that 10 additional limitation, then that means that the 11 particle is protruding or sticking into the pore in 12 some fashion. 13 Q. But if a particle sticks into or extends 14 into the void, then isn't it still part of the pore 15 wall? 16 MR. COX: Object to form. 17 A. So again, you have to interpret it in the 18 context of the previous limitations. 19 So we're thinking of the pore walls in 20 the context of '148 as having a -- something that 21 you can measure, that has some boundary that you can 22 detect. And then you see a particle protruding out
46 1 MR. COX: Continue on to the next 2 page. 3 A. Okay. 4 Okay. I state: This means that the 5 inorganic particles themselves do not (and cannot) 6 be part of the pores like they are in the '148 7 patent. 8 BY MR. PHILBIN: 9 Q. And is that because, in your opinion, the 10 inorganic particles in Murakami are the pore walls? 11 A. In Murakami, the pores are basically 12 interstitial spaces between inorganic particles, for 13 the most part. 14 So you could try to make an argument that 15 the pore walls are made of inorganic particles. And 16 then it wouldn't make sense to also say that the -- 17 those same particles are comprising part of the 18 pore. 19 So it's like you can't have the inorganic 20 particle be the wall and also be comprising part of 21 the pore. 22 Q. And comprising part of the pore, is it	48 1 from that, then that's interpreted as a particle 2 that's comprising the pore. 3 BY MR. PHILBIN: 4 Q. But doesn't the particle form part of the 5 boundary? 6 MR. COX: Object to form. 7 A. The particle can be seen as forming part 8 of the boundary in some instances, but in the 9 context of the '148 claim language, that particle 10 that's protruding out is not. 11 BY MR. PHILBIN: 12 Q. So then is it fair to say that your 13 opinion of comprises a part of the inorganic 14 particles means that the inorganic particle needs to 15 extend or poke into the void? 16 A. Yes. And not every particle. Like it's 17 a -- you get the context of it by -- again, if you 18 have an SEM image of the structure that you made, 19 you can start to see what -- in my opinion, what the 20 claim language is trying to describe is helped by 21 looking at the specification, and in the 22 specification you see particles protruding into the

49 1 pores. 2 Not every particle. There are many 3 particles that are encapsulated and form part of the 4 pore walls, and then you see some particles 5 protruding into the pore. 6 Q. So -- 7 A. Sorry, let me finish one more statement. 8 Q. Go ahead. 9 A. So it's -- when we make -- when the '148 10 claim language was drafted, I'm sure they were 11 trying to describe what they made, and a POSITA 12 would see that language, see the SEM image, see the 13 manner in which they made the structure and can 14 interpret it accordingly. 15 Q. You agree that the particle isn't part of 16 the void, right? 17 MR. COX: Object to form. 18 A. It's -- the part -- in the instance that 19 we're talking about, a particle that's protruding 20 that we would stipulate is fulfilling this statement 21 that the pores at least comprise a part of the 22 inorganic particles, that part of the inorganic	51 1 BY MR. PHILBIN: 2 Q. But you agree that the particle defines 3 the void space, correct? 4 MR. COX: Object to form. 5 A. I stated that it intrudes into the pore, 6 and that the particle is obviously not void but it 7 is a solid. But in the context of the '148 claim 8 language, the pore is defined by the -- by the 9 binder, the pore walls are. And then these 10 occasional particles of inorganic material are 11 protruding into the pore space that's defined 12 previously by the binder. 13 It's imperfect language, but it's the 14 best that they came up with to describe what they 15 made. Again, if you look in the context of the 16 specification, you can see what they were trying to 17 indicate. 18 When you have a complex three-dimensional 19 structure, trying to describe that with one or two 20 English sentences is pretty difficult. So they're 21 doing the best that can be done to describe that -- 22 what they made and what they claim. And in that
50 1 particles that we're talking about here, it's poking 2 into the pore. It's not void, because it's not -- 3 it is a solid, but it's intruding into the pore 4 that's otherwise formed by the binder, as was 5 previously stipulated in the claim language. 6 BY MR. PHILBIN: 7 Q. If you can go to paragraph 61 of your 8 declaration -- second declaration. 9 A. Yes. 10 Q. A few lines down, you state that: In 11 other words, the plain and ordinary meaning of the 12 term "pore" does not include the physical walls that 13 define the outer limits of the pore. The "pore" is 14 the space between those walls. 15 A. Yes, I said that. 16 Q. When the particle that we've been talking 17 about that extends into the void, wouldn't that 18 particle be part of the physical wall that defines 19 the outer limits of the pore? 20 MR. COX: Object to form. 21 A. No. 22	52 1 context of all of the claim language, it's my 2 opinion that the occasional particle protruding into 3 the pore is not part of the wall. 4 BY MR. PHILBIN: 5 Q. But it's not part of the void space 6 either, right? 7 A. Again, it's an imperfect way that 8 they're -- that they have to describe this, because 9 they're trying to describe a complex structure with 10 a few sentences in English, but when you have that 11 particle poking into the pore, they're saying, 12 effectively, it's part of the pore. 13 And yes, you could try to look at it in a 14 different way, but you have to look at it in the way 15 that -- in the context of the entire claim language. 16 Q. I'm just asking, is the particle part of 17 the void? 18 A. Right. 19 And I'm saying in the context of the 20 claim language, I wouldn't interpret it that way. 21 Q. You would -- sorry, can you clarify that 22 answer? Are you saying it's not part of the void?

53 1 A. I'm saying I stated that the particle is 2 not void, but in the context of the claim language, 3 that the particle that we're talking about, that's 4 protruding into the space previously defined by the 5 binder, is -- it's not void, but it's comprising the 6 pores. 7 Q. Okay. Let's go to paragraph 65 of your 8 second declaration. 9 A. Okay. 10 Q. Can you define "porosity"? 11 A. Porosity is volume fraction. The 12 numerator is the void or open space and the 13 denominator is the total volume that you're 14 considering. 15 Q. And so the particle that extends into the 16 pore, is that part of the numerator or the 17 denominator when measuring porosity? 18 MR. COX: Object to form. 19 A. So the term porosity has a fairly 20 well-accepted meaning. It's hard to apply that in 21 the context of the '148 claim language. The Claim 1 22 that we're talking about right now, that any	55 1 have an easier pathway for ions to move. 2 Q. Paragraph 67 of your second declaration. 3 A. Yes. 4 Q. You state that: The specification is 5 explicit throughout that the inorganic particles are 6 a separate component from the pore walls. 7 Haven't you said today that the inorganic 8 particles can be part of the pore walls? 9 MR. COX: Object to form. 10 A. I stated that the pore walls could 11 contain inorganic particles in the interior, yes. 12 BY MR. PHILBIN: 13 Q. So then has your opinion changed in 14 relation to what you previously put in paragraph 67? 15 A. No. 16 Q. So then are you saying that an inorganic 17 particle can be in the pore wall but not part of the 18 pore wall? 19 A. I think this is an imprecise way I worded 20 it. I can clarify it to mean that when you -- if 21 you know, for instance, the particle size of the 22 inorganic particles, that's a distinct measurement
54 1 particle or any binder would not be part of the 2 numerator in that porosity calculation that we 3 referred to. 4 BY MR. PHILBIN: 5 Q. In that same paragraph you say that 6 porosity is indicative of how effectively ions can 7 be transferred from one side of the layer to the 8 other. 9 A. Yes. 10 Q. So what is important is the amount of 11 open space or void space in the layer, right? At 12 least for purposes of how effectively ions can be 13 transferred? 14 A. So when ions need to move through this 15 porous material that we're making, that's complex. 16 Just having a certain porosity doesn't tell you how 17 easily that's going to happen, but that's why I use 18 the word indicative. It's one factor, it's related, 19 but it's not the only thing you need to know for how 20 easily the ions will move. 21 In general, if you have a greater amount 22 of void space or a greater porosity, then you will	56 1 from wall thickness. That's a distinct measurement 2 from pore size. And so I'm explaining that concept 3 in this paragraph. 4 Q. Okay. So then, just to clarify, are -- 5 can inorganic particles be a component of the pore 6 wall? 7 A. In the context of the '148 claim? Is 8 that what you're asking? 9 Q. Yes, let's start there in the context of 10 the '148 patent claim. 11 A. So my interpretation is that -- and 12 again, looking at the SEM image that's in the '148 13 specification, there -- I observed particles inside 14 pore walls, but they are -- the pore walls are 15 defined by the binder primarily, so the particles 16 are mostly encapsulated by binder. The binder is 17 determining where those particles are located, and 18 therefore, the particles that are present in the 19 pore wall are not determining what the pore wall is 20 doing in terms of its shape or thickness. 21 So it's -- they're present, but they're 22 not the determining factor, the binder is.

57 1 Q. Okay. So then is it fair to say, your 2 opinion is that binder is the primary component of 3 the pore walls, but that the inorganic particles can 4 be a nonprimary component of the pore walls? Does 5 that summarize it? 6 MR. COX: Object to form. 7 A. When you say "nonprimary," you have to 8 say for -- in what context you mean. 9 BY MR. PHILBIN: 10 Q. Can you give context? Can you take my 11 analogy or explanation and expand so that it becomes 12 your opinion? 13 MR. COX: Object to form. 14 A. I'm going to set aside what you said. 15 BY MR. PHILBIN: 16 Q. Sure. 17 A. And I will state my opinion. 18 That there are particles present in the 19 pore walls. They're mostly encapsulated by binder. 20 The binder is determining where the wall -- the 21 boundaries of the walls are located. So yes, there 22 are -- I do not dispute that there are particles	59 1 BY MR. PHILBIN: 2 Q. It's in column 12. Starts at 15 in: 3 Preparation of Separator. 4 A. Yes, I see that. 5 It states, where you identified: 6 Inorganic particles (boehmite) are mixed with the 7 binder (polyvinylidene fluoride) at a volume ratio 8 of 1.2. 9 Q. So yeah. Is boehmite commercially 10 available? 11 A. Yes. 12 Q. Can you buy it at the specified particle 13 size distribution that's listed in column 12, line 14 34 to 35? 15 A. I can't speak to whether you can purchase 16 it that -- those exact sizes. 17 Q. Well, let's talk a little more broadly, 18 then. 19 In general, you can buy inorganic 20 particles such as boehmite at specified part size 21 distributions, right? 22 A. Most likely you -- unless you are willing
58 1 inside the walls. 2 Q. All right. I think we can move on to 3 talking about Dv10, Dv50, and Dv90. Which in your 4 second declaration starts at paragraph 75. 5 But actually, let's look at the '148 6 patent, Exhibit 1001. Can you look at column 11, 7 lines 49 -- well, starting at line 49. 8 A. Okay. 9 Q. If you want to just read to yourself 10 that -- it's a single sentence. 11 [Document review.] 12 A. Okay. 13 BY MR. PHILBIN: 14 Q. So this states that the materials used in 15 the examples are commercially available unless 16 otherwise specified. 17 A. Yes, I see that. 18 Q. Is it your understanding that that would 19 include the inorganic particles disclosed as part of 20 Example 1? 21 A. Give me a minute. 22 [Document review.]	60 1 to pay a lot of money, you can't specify the 2 distribution in advance. But the vendor that's 3 selling the particles might have made their own 4 measurements and say, this is what -- this is what 5 we're selling, and you can take it or leave it. 6 Q. Okay. So there are some preset 7 distributions that are like off the shelf, and 8 then -- but it is possible to -- well, let me stop 9 there. 10 There are preset distributions that are 11 available off the shelf, right? 12 A. Yes. 13 Q. And then, it is possible, although 14 potentially expensive, to custom order part size 15 distributions? 16 A. I've never done that, but I suppose for 17 some amount of money someone will do that for you. 18 Q. Does the '148 patent describe how to 19 create this specified particle size distribution in 20 Example 1? 21 A. Within Example 1, I don't see any 22 specification for them making their own particle

61 1 size distribution. 2 Q. Does the '148 patent specify a method 3 elsewhere? 4 A. I don't believe so. I would have to look 5 through the remainder to make sure. 6 Q. That's okay. Just off the top of your 7 head you don't remember? 8 A. It doesn't -- I don't remember seeing 9 that. 10 Q. No need to read the entire patent right 11 now. 12 A. Okay. 13 Q. So then would it be reasonable for a 14 POSITA to understand that the '148 patent is 15 teaching you to use a commercially available 16 inorganic particle that comes at this specified 17 particle size distribution? 18 MR. COX: Object to form. 19 A. A POSITA would see that the -- that 20 this -- that the '148 patent is concerned with 21 particle sizes. They're important for the outcome 22 of the -- of their invention. And so if you can	63 1 particles with the binder? 2 A. No. 3 MR. PHILBIN: I'm just noticing it's 4 11:00. I have a couple more questions, then 5 we can break. Is that okay? 6 THE WITNESS: We can keep going, yes. 7 MR. PHILBIN: I'll wrap up this line. 8 THE WITNESS: Please continue. I 9 don't want to end before you're ready. 10 BY MR. PHILBIN: 11 Q. Is there a standard way to mix particles 12 with binder? 13 A. No, there is no standard way, but there 14 are obvious, easier ways to do things. 15 Q. So what are those -- 16 Well, first, do you understand mixing to 17 be different from disbursing? 18 A. So in the context of the sentence we just 19 read -- you just read about inorganic particles are 20 mixed with the binder? 21 Q. Mm-hmm. 22 A. I would probably not call that -- and I
62 1 find a way to have that particle size in your film, 2 I don't think '148 cares how you get there. They 3 just -- it just cares what you have in your porous 4 layer that you're making. 5 BY MR. PHILBIN: 6 Q. If you want to go back to your second 7 declaration, paragraph 80. 8 A. Yes. 9 Q. You state that -- this is like the fourth 10 line of the paragraph: There is nothing in the '148 11 Patent's manufacturing process that involves 12 significantly altering the sizes or distribution of 13 sizes of the particles when manufacturing the 14 separator. 15 That's correct, right? 16 A. Yes, that's what I said. 17 Q. And if you'll go back to the '148 patent, 18 column 12, lines -- starting at line 15, it states 19 that the: Inorganic particles (boehmite) are mixed 20 with the binder at a volume ratio of 1.2. 21 A. Yes, it states that. 22 Q. Does it say how to mix the inorganic	64 1 don't think a POSITA would call that disbursing. 2 Q. Okay. What is the difference between 3 mixing versus disbursing? 4 A. Again, in context, because you could -- 5 if you broaden this too much you'll find many 6 counter examples, but in the context of mixing two 7 powders, you would take two powders and make it so 8 that they're -- it's -- when you're done, it's 9 homogenous. 10 That doesn't typically require any real 11 effort. You know, you could literally take a 12 teaspoon and take two powders and mix them up and 13 they would be homogenous. 14 When it comes to mixing a particle with a 15 liquid, that can require more effort. And that's 16 more typically what I would expect the word 17 dispersing to be referring to. 18 Again, I'd have to see the context, 19 because I don't want to generalize that to any 20 instance. 21 Q. Is it your understanding that, for 22 Example 1, that dispersion is included in the

65 1 manufacturing process? 2 MR. COX: Object to form. 3 A. I can only go by what language is used in 4 Example 1, so let me look at the language. 5 [Document review.] 6 A. So I am going to assume that we're 7 talking solely about the preparation of the 8 separator. 9 BY MR. PHILBIN: 10 Q. Yes. 11 A. So we're not talking about the positive 12 electrode, the negative electrode, or the 13 electrolyte? 14 Q. Correct. 15 A. So in the language of Example 1, in 16 column 12, after the powders are mixed, it says: 17 Then N-methylpyrrolidone (first solvent) is added 18 and uniformly stirred to obtain a coating solution. 19 So that's the first mention of adding a 20 liquid to the solids, and it says it's uniformly 21 stirred. I don't see the word dispersion there. 22 I see uniformly stirred, which sounds	67 1 (Recess taken, 11:08 a.m. to 2 12:03 p.m. MST) 3 BY MR. PHILBIN: 4 Q. Let's go to your first declaration, 5 paragraph 84. 6 So you state: That imaging, to include 7 SEM imaging, would be required to determine the pore 8 structure and composition with any level of 9 reliability. 10 And you're saying that in reference to 11 Murakami, right? 12 A. Yes. 13 Q. So without imaging, is it your opinion 14 that a POSITA would not be able to know if 15 Murakami's pores are formed by binder or not? 16 MR. COX: Object to form. 17 A. Give me a minute. 18 [Document review.] 19 A. My opinion as stated there in the first 20 declaration, is that Murakami does not provide any 21 disclosure regarding formation of its porous layer, 22 and Murakami also does not provide any images of the
66 1 like a fairly routine thing where you would take a, 2 like a stirring rod, which is a glass rod used in 3 chemistry labs or some kind of similar implement, or 4 like I said, it could be a spoon. But you mix until 5 it's uniform. 6 Q. Would simple stirring as described in 7 Example 1 of the '148 patent, would that guarantee 8 uniform distribution of the particles? 9 A. So if your purpose is to make sure that 10 it's uniform, it doesn't take much effort. 11 The entropy is on your side when you're 12 trying to mix things, so -- nature favors things 13 being mixed, so you need to just move them around 14 and they will tend to mix and be uniform. 15 If you -- if that's -- you know, it says 16 uniformly stirred, so sounds like that was their 17 goal, was to make sure that all of the powders were 18 wetted and then when it's -- when everything is 19 wetted and uniformly stirred, then you're done. 20 MR. PHILBIN: Okay. I think we can 21 stop here. I think we're good. 22 MR. COX: Okay. Off the record.	68 1 porous layer by which a POSITA would be able to 2 determine the pore structure, let alone how they are 3 formed, including whether they are formed by 4 Murakami's binder. 5 It's a combination of -- Murakami doesn't 6 have an explicit disclosure, and not having an image 7 makes that even more difficult for someone to judge 8 that Murakami's pores are formed by the binder. 9 BY MR. PHILBIN: 10 Q. Okay. So then, for example, in the '148 11 patent, there are some SEM images, correct? 12 A. There's one. I would need to verify if 13 the second one is a subset or is a second -- is an 14 independent image, but... 15 Q. Well, Figure 1 and 2 are both SEM images, 16 right? 17 A. Right. I'm just trying to determine if 18 the second one is just an enlargement of the first 19 one. I'm not sure of that. 20 But anyway, for purposes of discussion, 21 yes -- 22 Q. Okay.

Conducted on January 30, 2026

69 1 A. -- two SEM images. 2 Q. And both of those are images of 3 Example 3, correct? 4 If you go to column 2, at the very 5 bottom. It describes what Figures 1 and 2 are. 6 A. Yes. It says there those are images of a 7 porous film according to Example 3, yes. 8 Q. There are 20 examples in the '148 patent, 9 right? 10 Starts in column 11. 11 A. Yes, there are 20 examples. 12 Q. And there's no SEM imaging for those 13 other 19 examples, right? 14 MR. COX: Object to form. 15 A. That's correct. 16 I think the principle is that that image 17 illustrates what the '148 patent is attempting to 18 say with their claim language, and can be 19 interpreted by a POSITA in light of the claim 20 language, and a POSITA can look at the multiple 21 examples and comparative examples and interpret them 22 altogether.	71 1 declaration, I cite to paragraph 70 of Murakami. So 2 I'm relying on more than just a specific example. 3 But in the general context of talking about 4 Murakami, I'm particularly responding to Dr. Gido's 5 reliance on Examples 1 and 2. 6 Q. Well, paragraph 70 gives -- well, 7 paragraph 70 says: Filler content is preferably 60% 8 mass or higher, more preferably 70% mass or higher. 9 Does that tell you how much binder is 10 present? 11 A. Sorry, can I have a moment to find that 12 paragraph you just recited? 13 Q. Sure. Yeah. It's on page 5 of 14 Exhibit 1005. Left-hand column, very bottom 15 paragraph. 16 MR. COX: That's PDF page 7? 17 BY MR. PHILBIN: 18 Q. Yeah, PDF page 7. Page 5 at the top. 19 A. Okay, please proceed. 20 Q. Sure. 21 So this paragraph, do you see where it 22 says what the filler content is? And it gives
70 1 BY MR. PHILBIN: 2 Q. Go to your first declaration. 3 A. Yes. 4 Q. It's Exhibit 2015. 5 A. Yes. 6 Q. Paragraph 87, you state that: The amount 7 of binder resin provided by Murakami is minimal and 8 is just enough to bind the filler together. 9 What amount of binder resin is disclosed 10 by Murakami? 11 A. My memory is that the Examples 1 and 2 12 that Dr. Gido relies upon in his testimony have 3% 13 mass. But let me verify that. 14 [Document review.] 15 BY MR. PHILBIN: 16 Q. While you verify that, let me just 17 clarify, then. 18 When you say the amount of -- in 19 paragraph 87 you say that the amount of binder resin 20 is minimal, are you specifically talking about 21 Examples 1 and 2 from Murakami? 22 A. Well, in paragraph 87 of my first	72 1 examples of mass percentages? 2 A. Yes. 3 Q. Are you able to determine from those the 4 amount of binder? 5 A. So first of all, when I recited 6 paragraph 70 in my declaration, I was reciting the 7 earlier part of paragraph 70, which says that: The 8 filler is bound by the binder resin. 9 And then it also says: That is, a porous 10 layer in which a filler is dispersed in a resin 11 (binder resin) is not suitable as the porous layer 12 containing a filler and a binder resin. 13 So in answer to your question, are mass 14 percentages given in that paragraph? It gives 60 15 mass percent, 70, 80, 90, and even 99 mass percent 16 or lower, relative to the total mass of the porous 17 layer. 18 So it's talking about porous layer that 19 has filler, that has binder, and so we can conclude 20 that those are the only two solids. 21 So the percentages that are recited in 22 that paragraph would be the filler percent. And so

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Zhuhai CosMX Battery Co. v. Ningde Ampere Tech. Ltd.

IPR2025-00432 - Page 18 of 81

73 1 you would do 100 minus that to get the binder 2 percent. 3 Does that answer your question? 4 Q. Maybe. 5 Let's look at paragraph 69 of Murakami. 6 A. Okay. 7 Q. So here, it says: The porous layer 8 contains a filler, and the filler content is 9 preferably 1 volume percent to 99 volume percent. 10 If the filler content is one volume 11 percent, what would the binder volume percentage be? 12 A. I'm reading that paragraph to see what 13 its intention is. 14 It's a little more challenging to 15 interpret because, in contrast to paragraph 70, 16 which is talking about mass, paragraph 69 is talking 17 about volume, and the pores also occupy volume. So 18 we have to decide if -- or determine if Murakami is 19 talking about the volume excluding the pores or the 20 volume including the pores. 21 Q. Well, let's take the first example. If 22 we exclude the volume of pores, what would the	75 1 correct. 2 But I can't be sure that that's what 3 Murakami means in this paragraph. 4 BY MR. PHILBIN: 5 Q. Let's go to paragraph 88 of your first 6 declaration, Exhibit 2015. 7 A. Okay. 8 Q. So you quote from Murakami that: Gaps 9 formed by contacts of particles of the filler are 10 less likely to be blocked by a resin and the like. 11 So is it your opinion that the gaps that 12 Murakami is referring to here that are formed by the 13 contacts particles, those would be the pores? 14 A. Yes. The gaps between the particles of 15 filler are the pores. 16 Q. And is it your opinion that all of the 17 pores in Murakami's porous layer are gaps formed by 18 contacts of particles? 19 A. So Murakami obviously discloses some 20 fraction of binder. So it necessarily means there's 21 some small amount of binder that has an interface 22 with a pore.
74 1 volume of binder be if the filler content is 1% 2 volume? 3 MR. COX: Object to form, lacks 4 foundation. 5 A. I don't know if that's what this 6 paragraph is stating so I can't make that assumption 7 yet. 8 BY MR. PHILBIN: 9 Q. Well, I'm asking you to make the 10 assumption that it excludes the pores' volume. 11 You previously stated that this layer has 12 binder, filler content, and pores. Right? 13 A. Correct. 14 Q. So -- 15 A. According to paragraph 70. 16 Q. If the filler content is 1% by volume, 17 then wouldn't the binder volume percentage be 99%? 18 MR. COX: Object to form, lacks 19 foundation. 20 A. So that would be correct if we're only 21 considering the solids and we're only considering 22 percentage of the solid, then yes, that would be	76 1 So in the case of Murakami, as in the 2 case with '148, a POSITA has to look at the entirety 3 of the teachings and any evidence that is presented 4 to understand what they mean, and essentially no 5 porous layer that contains both inorganic particles 6 and binder. And you can't make an extreme judgment 7 about -- you know, which material is in contact with 8 the pores. 9 So you have to look at the entirety of 10 the teachings, and in this case, Murakami is 11 teaching the POSITA that there are gaps between the 12 particles of filler, and that's what the pores are. 13 Q. If you'll go to Murakami, Exhibit 1005, 14 paragraph 37, which is on PDF page 4. 15 A. Yes. 16 Q. It states that the voidage in Murakami's 17 porous layer can be up to 80% volume. 18 Do you see that? 19 A. I see it says: A voidage of the porous 20 film is preferably 20 volume percent to 80 volume 21 percent. 22 And then it continues to give other

77 1 information. 2 Q. So when the porous layer is 80% pores by 3 volume, is it possible for all of those pores to be 4 formed solely by the gaps between where the 5 particles contact? 6 A. It's possible. 7 Q. Do you see in that same paragraph it says 8 that the pores are preferably three microns or less? 9 A. I see that. 10 Q. And then in paragraph 66, it states that 11 the D50 for the particles is between .01 to 1 12 micron. 13 A. Give me a moment to refer to that. 14 Q. Sure. 15 A. You said paragraph... 16 Q. 66. 17 A. 66. 18 Q. PDF page 6. 19 [Document review.] 20 A. Okay, yes, it -- that paragraph talks 21 about D50 is preferably .01 micrometers to 1.0 22 micrometers.	79 1 necessarily true that every particle within that 2 range can -- is capable of producing every pore size 3 within that other range. 4 BY MR. PHILBIN: 5 Q. Well -- 6 A. That's all I said. 7 Q. Okay. Is it possible? 8 A. Is what possible? 9 Q. That if you took the preferred particle 10 size range in paragraph 66, could you create pores 11 that were three microns that are formed by the 12 contacts of those particles? 13 A. It's possible, yeah. 14 But let me give a counterexample. If you 15 have really large particles, it's difficult to make 16 really small pores in between those particles. 17 Right? 18 So it's not that it -- you couldn't do 19 it. Especially when you have a distribution of 20 particle sizes, you can -- they can pack together in 21 certain ways that can enable different pore sizes to 22 be made.
78 1 BY MR. PHILBIN: 2 Q. So how are particles of this size, as 3 described in Murakami paragraph 66, creating pores 4 up to three microns by just contacting each other 5 and forming gaps between the particles if the 6 particles are -- well, I'll stop there. 7 MR. COX: Object to form. 8 A. So your question has a hidden assumption, 9 and that is that every possible preferred range of 10 particle size can produce every possible range of 11 preferred pore size, and that -- I don't believe 12 that's the case. 13 BY MR. PHILBIN: 14 Q. Okay. So then you're saying that if the 15 preferred particle size was less than a micron, then 16 you would not create pores that were up to three 17 microns large. 18 A. Well -- 19 MR. COX: Object to form. 20 A. -- that's not what I said. I said if -- 21 if Murakami has a preferred pore size, and Murakami 22 also has a preferred particle size, it's not	80 1 I would say that Murakami's description 2 of pores was a little bit sloppy in my view. Going 3 back to paragraph 37, Murakami says: A pore 4 diameter of each of the pores in the porous film is 5 preferably 3 micron or less. 6 And so I think that's not a very careful 7 description, because a POSITA could interpret that 8 pretty easily to mean I've got this entire large 9 film, potentially meters in length, and each of the 10 pores is less than 3 microns. 11 Well, how do you define a pore? In 12 principle, a pore could be -- have a very, very 13 large length depending on how you define the 14 diameter of a pore. 15 So you have to figure out how they 16 measure pore diameters, what method did they use, 17 and in most cases, those methods could not guarantee 18 that each of them are 3 microns or less. 19 Q. Can you go to your second declaration, 20 paragraph 91. 21 A. Yes. 22 Q. So you created this figure. It's not

81 1 labelled, but it looks like -- 2 A. We'll say it's part of paragraph 91. 3 Q. Yeah. It's in between 91 and 92. 4 A. Yeah. 5 Q. Did you make that figure? 6 A. Yeah. The one on the left? 7 Q. Yeah. 8 A. Yes. 9 Q. So in that figure, this is supposed to be 10 an illustration of what Murakami's pore structure 11 would look like, right? 12 A. Right. It's -- with the caveats that are 13 given in the text. 14 Q. Sure. 15 The white space is pore, right? 16 A. Yes. 17 Q. And all of the white space here is 18 connected. So is this one big pore? Or is it 19 multiple, distinct pores? 20 A. Well, this gets back to my previous 21 answer, that when you want to define what's a pore 22 size, it's very difficult to say without giving a	83 1 to best understand the pore sizes. 2 Secondly, I would mention that my figure 3 is meant as a cross-section. And so in a 4 cross-section, you can't see or the user -- or the 5 person who is looking at it can't see what's 6 happening in the layer above and below. So that 7 also has an impact on the pore size, so... 8 Q. How does the '148 patent measure pore 9 size? 10 A. Let's go there. 11 Q. If it helps, I think it's columns 21 into 12 22. 13 A. Thank you. 14 Q. So it says that: The maximum diameter L1 15 in the transverse direction and the maximum diameter 16 L2 in the longitudinal direction for each pore in 17 images are measured and the pore size of the pore is 18 equal to (L1+L2) divided by 2. 19 So the average of L1 and L2, right? 20 A. Yes. 21 That's what it says. 22 Q. So what does it mean by longitudinal and
82 1 method by which you're measuring that pore size. 2 For instance, if you do a geometric 3 method, where you were to look at an SEM image, 4 something like what this is showing, then you ask 5 the question, what's the pore size? Well, you could 6 lay a ruler across and say the pore size is, you 7 know, where does it contact a particle and where 8 does it contact a particle on the other side. And 9 whatever gap there is on that ruler, that's a 10 measurement of -- one measurement of a pore. 11 So if I were to lay a ruler across that 12 image at some random location, it's going to cross 13 over potentially multiple pores and multiple 14 particles, and then I could measure gaps between 15 those and say, that's my pore size. 16 Or, you can do methods such as BET, that 17 are well-known to people in the field, that measure 18 pore sizes in a different way, but they're measuring 19 some kind of average or effective pore size. 20 And so yes, it's difficult to measure 21 pore size unambiguously. So that's why you need to 22 specify a method that you're using to help someone	84 1 transverse directions? 2 A. So I would interpret this as you have a 3 two dimensional image produced by your scanning 4 electron microscope. 5 And as I was describing previously, you 6 lay a ruler -- a virtual ruler across the image and 7 you measure distances. 8 So in their case, they're picking -- 9 they're calling it transverse direction and 10 longitudinal direction. One of those, I would -- it 11 would make most sense for one of those to be the X 12 direction and the other the Y direction, because 13 this is a two-dimensional image. And it's implied 14 that longitudinal and transverse are orthogonal 15 directions to each other. 16 And so it -- it actually wouldn't matter 17 which one is which, because you're just averaging 18 them. 19 And it also wouldn't matter if you were 20 to rotate the image, it wouldn't matter, assuming 21 that it's an isotopic material, which is a 22 reasonable assumption.

85 1 So given all of that, you lay your 2 virtual ruler across the image and you start 3 measuring some distances. When you think you found 4 a pore, you measure that distance in both 5 directions, and then you average them. 6 In contrast to Murakami, this is a 7 well-defined method. It can be produced by another 8 scientist. 9 Q. Come back to Murakami. In paragraph 87 10 of Murakami, which is on PDF page 9. 11 A. Yes. 12 Q. Murakami teaches that the solvent can be 13 removed by a drying method alone, but it also 14 teaches you can first use solvent substitution, then 15 the drying method. Right? 16 MR. COX: I'm sorry, Counsel. You 17 said paragraph 87? 18 MR. PHILBIN: Yes. 19 A. So you're asking, does this paragraph 20 discuss more than just a drying method? 21 BY MR. PHILBIN: 22 Q. Right. Does it also discuss using	87 1 what they meant by solvent substitution, but, as I 2 said, NIPS could be considered a subset of solvent 3 substitution; however, NIPS is a highly specific 4 method that ordinarily when people want to mean 5 NIPS, they'll say NIPS, as a specific way of doing 6 it, and outcomes. 7 BY MR. PHILBIN: 8 Q. If you'll go back to your declaration, 9 your second declaration. 10 A. Mm-hmm. Yes. 11 Q. Paragraph 117. You state that the 12 inorganic particles themselves, in Murakami, operate 13 as the pore walls. 14 So therefore, is it correct that it's 15 your opinion that inorganic particles are not part 16 of the pore itself? 17 A. That would be correct. 18 Q. And that's because it's your opinion that 19 the pore and the pore wall are two distinct things, 20 correct? 21 A. Right. The pore wall defines the outer 22 boundary of the pore but is not part of the pore.
86 1 solvent substitution? 2 A. Yes, it says: Alternatively, it is 3 possible to carry out drying after the solvent 4 (dispersion medium) contained in the coating liquid 5 is substituted by another solvent. 6 Q. Is NIPS a method of solvent substitution? 7 A. Yes, I would consider NIPS a subset of 8 possible solvent substitution methods. 9 Q. Does paragraph 87 of Murakami limit which 10 type of solvent substitution can be used? 11 A. It starts by saying: The solvent 12 (dispersion medium) is generally removed by a drying 13 method, period. 14 And then it recites, there's an 15 alternative, and it's possible to use the 16 alternative, which is a solvent substitution. 17 So it does not exclude solvent 18 substitution, but it also expresses a clear 19 preference for drying. 20 Q. Does it exclude NIPS? 21 MR. COX: Object to form. 22 A. It doesn't mention NIPS. So it's unclear	88 1 Q. Okay. If you can look at paragraph 104 2 of your second declaration. 3 Or I guess it's between 104 and 105. 4 A. Yes. 5 Q. Is this another figure you created? 6 A. Yes. 7 Q. And this one is meant to illustrate the 8 '148 patent's pore structure, right? 9 A. Right. Again, with the caveats that are 10 given in the text. 11 Q. Can you open up Exhibit 1035? 12 MR. COX: That's one of the new ones. 13 THE WITNESS: Yes, I will. Hold on. 14 A. I see it. 15 BY MR. PHILBIN: 16 Q. Okay. So does this look like it's a copy 17 and paste of the figure you made for paragraph 104, 18 just with some annotations in red? 19 A. Yes, it looks like my figure with 20 annotations added. 21 Q. And I'll represent that it is. I copy 22 and pasted it in and just annotated it because I

89 1 thought it would be easier to discuss. 2 A. Sure. 3 Q. So if you'll look at Pore 1, is it your 4 opinion that Pore 1 comprises -- or at least 5 comprises a part of the inorganic particles? 6 A. So first of all, as previously discussed, 7 you have a complex 3D structure. This is an 8 illustration of that. Not meant to be true in every 9 particular, but meant to illustrate some important 10 principles. 11 It's not a substitute for the actual SEM 12 or other data of the '148 materials. So it's meant 13 to illustrate things, and to contrast with 14 Murakami's structure. 15 It's never expected that every pore or 16 every particle obeys, you know, some hard rule, but 17 you look at the entirety of the structure and you 18 look at the, sort of the typical or average behavior 19 of the pores and the particles, and then you make 20 judgments as a POSITA, about how those things are 21 arranged, et cetera. 22 So I think it would be unfair to pick one	91 1 context of '148, in trying to describe this complex 2 structure, we would say the pore is defined -- is 3 determined by the binder, and then the particles, in 4 some cases, some particles and some pores have a 5 meeting place, right? Where some particles are 6 protruding into some pores. 7 And this would be an example where a 8 particle is protruding into the pore, at least 9 partially. 10 Q. Okay. Let's look at Pore 2. 11 A. Okay. 12 Q. You agree that Pore 2, at least, 13 comprises a part of the inorganic particles, right? 14 A. Yeah. In the same way that Particle 1 15 and Pore 1 do. 16 Q. Sure. So just to summarize this, because 17 Particle 2 extends into Pore 2, right? 18 A. Correct. 19 Q. Now, Particle 2 has a greater effect on 20 the geometry of Pore 2 than Particle 1 had on 21 Pore 1, right? 22 A. What do you mean by greater effect?
90 1 pore and say, does that one pore have a certain 2 behavior, and therefore invalidates everything? No. 3 So all of that is just background to say, 4 let's look at Pore 1, as you asked, and you asked 5 does Pore 1 have a -- if I recall, you said does 6 Pore 1 have -- sorry, will you repeat the question? 7 Q. Sure. Does Pore 1 at least comprises a 8 part of the inorganic particles? 9 A. I would say yes. That was my intention 10 when I drew that. 11 Q. And that's because what I've annotated as 12 Particle 1 extends into what I've labeled as Pore 1. 13 A. Correct. 14 Q. Does Particle 1 define part of the 15 geometry of Pore 1? 16 A. So in the context of '148's claims, the 17 pore is formed by binder. And you can see, as an 18 example of this illustration, the shape of that pore 19 is defined by binder. 20 Q. But the Particle 1 -- 21 A. Particle 1 is protruding into Pore 1, and 22 so it has an effect on the geometry. But in the	92 1 Q. Well, we've talked about how -- or you've 2 talked about how the pores are formed by the binder 3 because the binder is the primary definer of the 4 shape of the pore, right? 5 A. Yes, I said something to that effect. 6 Q. And so Particle 1, kind of, would just 7 create a little indent into Pore 1, right? 8 A. Right. 9 Q. Particle 2 creates a pretty big indent 10 into Pore 2, right? 11 A. Right. 12 Q. So Particle 2 has a greater effect on the 13 geometric boundary of Pore 2 than Particle 1 has on 14 Pore 1, right? 15 MR. COX: Object to form. 16 A. So, yeah, we have to be careful about 17 saying "geometric boundary of the pore." 18 In the context of '148's specifications 19 and claims, the pore is defined by the binder and 20 then the particle is protruding into that pore that 21 was defined by the binder. And so that's what it 22 means in that context.

93 1 BY MR. PHILBIN: 2 Q. Okay. That was saying -- 3 A. Let me kind of finish. 4 Q. Sure. 5 A. So this illustration is meant to 6 illustrate a conception of the SEM that is provided 7 in '148. So it's not -- this illustration is not -- 8 should not replace that SEM. It's meant as a way of 9 explaining or understanding it, from my view, in 10 what a POSITA would see. 11 So in that SEM, you can find examples 12 where the pore wall has a particle partially poking 13 in, and then you have some examples where it's much 14 more extreme. There's -- the particle is only 15 barely touching the pore wall, it appears. So this 16 is an attempt to illustrate that phenomenon that's 17 seen in the SEM. 18 Q. So then, what if I say -- what if we talk 19 about void space instead. The Particle 2 has a 20 pretty large effect on the shape of the void space 21 that I label as Pore 2. Is that fair? 22 A. One could say that, but that wouldn't be	95 1 patent, you don't actually see a slice, like this 2 is. You instead have an SEM image that has a high 3 depth of field, and that allows you to see 4 essentially what's at the bottom of the pore. And 5 so you might see a particle popping up out of the 6 bottom of the pore that wouldn't be apparent in a 7 slice like this. 8 Q. If we can go back to Murakami. 9 If you can look at paragraph 66. 10 A. Okay. I'm at 66. 11 Q. Do you see that Murakami describes a 12 particle size distribution? 13 Yes? 14 A. I do see that they're giving ranges for 15 D10, D50, D90. That's not the entire particle size 16 distribution, but those are common distributors of 17 that distribution. 18 Q. Okay. Do you see farther in that 19 paragraph, it states that by using filler particles 20 within that specified range, between D10, D50, D90, 21 that, quote: A degree of variability in voidage of 22 the porous layer tends to become small?
94 1 fair to say that in the context of the '148 2 specification and claims. 3 Q. Pore 3, does that comprise -- at least 4 comprise a part of the inorganic particles? 5 A. As illustrated, Pore 3 doesn't have any 6 particles protruding into it, so that would be an 7 example of a pore that did not. 8 This goes back to the principle that I 9 previously discussed, that you look at the entirety 10 of this structure. You're not -- you don't define 11 it by the outliers, but you look at it in terms of 12 what you see on average or over the whole. It would 13 be unrealistic to expect every pore to have a 14 particle poking into it. 15 Secondly, this is a cross-section, so 16 we're not actually seeing the entirety of pore 17 number three. There could in fact be a particle 18 poking into it in this -- this is a hypothetical, 19 but, you know, at a layer further away from the 20 viewer or closer to the viewer, there might -- we 21 might see something else. 22 In the SEM image that is in the '148	96 1 And that it: Allows an increase in 2 voidage of the porous layer. 3 Which allows you to: Reduce a weight per 4 unit area while retaining a moderate ion 5 permeability. 6 A. Yes, I see that. 7 Q. So Murakami is claiming that those -- if 8 you used particles in that distribution, you get 9 those benefits. Right? 10 A. So Murakami's main motivation, which they 11 state at the beginning, is to avoid variability in 12 voidage across the porous layer. 13 So they, for instance, look at different 14 regions of their porous layer and say, what's the 15 voidage there? What's the voidage in a different 16 region? And they want to make sure that it doesn't 17 vary from one location to another. That's their 18 motivation. So they're saying they think they found 19 something that will lead to that outcome. 20 Q. So are you saying that paragraph 66 does 21 not say that using these particle sizes will result 22 in these benefits? That a degree of variability in

97 1 the voidage becomes small, an increase in voidage in 2 the porous layer, and a reduction in weight per unit 3 area? 4 MR. COX: Object to form. 5 A. They -- that's what -- they say in this 6 paragraph, that if you have this -- these particles 7 at these preferred sizes, that you can get these 8 beneficial outcomes. 9 BY MR. PHILBIN: 10 Q. And these outcomes would be dependent on 11 the size of the particles in the finished porous 12 layer, wouldn't they? 13 MR. COX: Object to form. 14 A. I can't say, because I haven't done the 15 experiment. I can only rely on what Murakami states 16 about their procedure and their experiments. If 17 they say they got a benefit following a certain 18 procedure, then, unless I see some obvious 19 scientific error, I can't -- I don't have any basis 20 to question. 21 If they say that they started with a 22 certain particle size and they manipulated that	99 1 MR. COX: Object to form. 2 A. A POSITA reading this would take the 3 plain and ordinary meaning that a homogenizer takes 4 some mixture to be more homogenous. 5 BY MR. PHILBIN: 6 Q. Would a POSITA read this to -- with the 7 understanding that the homogenizer would pulverize 8 particles? 9 A. Without more specifics, a POSITA wouldn't 10 necessarily assume that. But you have to get to a 11 specific device and a specific procedure in order to 12 determine if pulverization is going to happen. 13 Q. What is a medium type dispersing device? 14 A. Again, it's -- the language is not very 15 clear as far as what they mean, but a POSITA would 16 interpret that to mean a device that causes 17 dispersion. 18 Q. Would a POSITA interpret that to mean a 19 device that would also pulverize particles? 20 A. As with the homogenizer, you would need 21 to know specifics about the device and the procedure 22 used -- using the device in order to determine what
98 1 particle size through a series of steps and it led 2 to a benefit, okay. You know, I can accept that. 3 But there's nothing in this paragraph that says that 4 this is the particle size in the finished product. 5 BY MR. PHILBIN: 6 Q. Look at paragraph 73 of Murakami. 7 A. Okay. 8 Q. It states that: The filler can be 9 dispersed in the solvent (dispersion medium) by the 10 use of a conventionally known dispersing device such 11 as a three-one motor, a homogenizer, a medium type 12 dispersing device, or a pressure type dispersing 13 device. 14 What is a three-one motor? 15 A. I am not sure what they mean by three-one 16 motor. 17 Q. Do you know what a homogenizer is? 18 A. Homogenizer is a general term. I'm not 19 sure what they had in mind for homogenizer, but 20 there are companies that sell devices that could be 21 described as homogenizers. 22 Q. What would a homogenizer do?	100 1 would happen to the particles. 2 Q. Do you know what a pressure type 3 dispersing device is? 4 A. In the context of Murakami? I would 5 interpret it to mean the device that they used for 6 their embodiments. 7 Q. So a Star Burst? 8 A. Mm-hmm. Or something comparable to that. 9 I meant "yes" instead of "mm-hmm." 10 Q. All right. So still in paragraph 73 of 11 Murakami, it talks about wet grinding. What is wet 12 grinding? 13 A. So grinding in general means taking 14 particles and reducing their size by placing them in 15 a device where they contact each other and the walls 16 in an energetic way, and causing them to fracture, 17 and that would reduce their size. 18 Wet grinding is a modification of that, 19 where you add some liquid in addition to the 20 particles, and that can improve the grinding or 21 change it in some way. 22 Q. So paragraph 73, then, suggests using a

101 1 wet grinding method to obtain the desired particle 2 size distribution, right? 3 A. Well, you said "the." This says "an" 4 intended average particle diameter. 5 Q. Sure. 6 A. It's not clear what they mean by 7 intended, but this is a general statement that, yes, 8 you can modify particle sizes with one of these 9 devices. 10 Q. If you go to paragraph 140 of Murakami. 11 A. Okay. 12 Q. The filler particle, alpha alumina? Is 13 that commercially available? 14 A. As a -- well, I can't speak to whether 15 it's available now, but they apparently bought it 16 from some source. And I don't know what size they 17 bought, but sounds like this is what they -- this is 18 what they bought. 19 MR. PHILBIN: We've been going about 20 an hour, if you want to take a five-minute 21 break. 22 MR. COX: Sure.	103 1 MR. PHILBIN: Crystal. We can fix 2 that later. 3 But yeah, I will represent -- 4 MR. COX: I'll accept your 5 representation. 6 MR. PHILBIN: Yeah. 7 BY MR. PHILBIN: 8 Q. Really just what I want to look at is 9 this -- the figures. There's one for dispersion. 10 And it describes dispersion as: Loosen agglomerated 11 particles into primary particles. 12 Is that your understanding of what 13 dispersion is? 14 A. I would interpret dispersion more broadly 15 than that. 16 Q. As in it could just be distributing 17 primary particles that weren't agglomerated 18 together? 19 A. No. 20 Q. Then what do you -- what is your 21 definition of dispersion? 22 A. It could include everything you see on
102 1 (Recess taken, 1:05 p.m. to 2 1:10 p.m. MST) 3 BY MR. PHILBIN: 4 Q. Can you open up Exhibit 1032? 5 MR. COX: That's one of the new ones. 6 A. Okay, I have that. 7 BY MR. PHILBIN: 8 Q. Have you been to the Sugino Star Burst 9 website? 10 A. Yes. 11 Q. So then do you recognize this exhibit? 12 A. Not specifically. I don't recall it. 13 Q. Why don't you go to page 3. 14 Do you recognize the illustration -- 15 there's four of them side-by-side. 16 A. I don't recall seeing that on the 17 website, but I understand the principles in this 18 illustration. 19 MR. COX: And I'll just object to 20 this exhibit in general as it's not 21 transparently from a specific URL. We'll take 22 counsel's representation on it.	104 1 this page. 2 Q. Pulverization is dispersion? 3 A. As a subset, yes. 4 Q. Well, this is how -- do you agree that 5 this is how Sugino defines dispersion? 6 A. As I don't recall seeing this on the web 7 page and I don't have the context of everything else 8 they teach, I wouldn't want to make that statement. 9 But as far as them teaching it here, there -- I 10 would interpret this to mean they're educating their 11 potential customers on some of the capabilities of 12 their devices. 13 I think they're making a little bit of a 14 hard -- hard line between things, because where 15 does -- again, accepting for purposes of this 16 discussion, their definition of dispersion on this 17 cartoon, where does dispersion end and pulverization 18 start? That gets a little murky, because, you know, 19 what does it mean to loosen agglomerated particles 20 into primary particles versus crush the primary 21 particles? Well, that assumes you have a very clear 22 idea of what was the primary particle and what was

Conducted on January 30, 2026

105 1 the agglomerated particle, and so... 2 It's a way of describing, over the course 3 of the -- if you look at all of these cartoons, it's 4 a way of describing what their devices can do, and 5 so... 6 I see the point of why they're doing it, 7 why they're trying to educate potential customers of 8 what their devices can do, but I don't accept the 9 exact definitions here. 10 Q. Okay. Open up Exhibit 1034. 11 A. Yes. 12 Q. Do you recognize these materials? 13 A. Meaning the image that's shown on the 14 first page? 15 Q. Well, the entire document. 16 A. Oh, the entire document? 17 Yes, I do. 18 MR. COX: Same objection to the 19 exhibit about it not being clear where it's 20 from. 21 A. Yeah. I don't -- it's not that I recall 22 every specific that I'm seeing in this exhibit, but	107 1 application for the single nozzle chamber? 2 A. It says: Dispersion and exfoliation are 3 performed by cavitation and turbulence when injected 4 into the liquid (into the raw material) at 5 ultra-high pressure. It is effective for cleaving 6 minerals (mica, montmorillonite, etc.) and raw 7 materials that crack when a force is applied 8 locally. 9 I interpret this caption as, again, this 10 is a -- trying to illustrate to potential customers, 11 here's a -- if this is what you need done, you might 12 want to buy this option. 13 I don't consider this a technical 14 document strictly delineating what can and can't be 15 done with this device. 16 Q. Would you like to answer my question now? 17 MR. COX: Object to form. 18 A. Will you repeat? 19 BY MR. PHILBIN: 20 Q. Sure. Does it list pulverization as an 21 application with a single nozzle chamber? 22 A. It does not list it in this. But you
106 1 I do recall seeing the images here. 2 BY MR. PHILBIN: 3 Q. So then on page 2 of the PDF, do you see 4 where it says: Star Burst can be customized based 5 on the client's requirements and the materials being 6 processed? 7 A. Yes, I see where it says that. 8 Q. And is it your understanding that one of 9 the ways to customize the Star Burst machine is 10 using different chamber types? 11 A. It states: Customization options include 12 several chamber types that perform different 13 functions for processing raw materials. 14 Q. Can you go to PDF page 3? 15 A. Yes. 16 Q. Do you see the single nozzle chamber? 17 A. I see that. 18 Q. And on page 4, it lists the applications 19 for the single nozzle chamber? 20 A. Well, it's giving a caption of sorts for 21 that image, yes. 22 Q. Does it list pulverization as an	108 1 used the word application, so I -- it does not use 2 the word pulverization. 3 Q. We'll go back up to page 2 of the PDF. 4 A. Mm-hmm. 5 Q. Do you see the oblique collision chamber? 6 A. Mm-hmm. (Witness nods.) 7 Yes. 8 Q. Does the oblique collision chamber have 9 pulverization as an application? 10 A. In this instance, the caption says: 11 Applications: Dispersion, pulverization, 12 emulsification, surface modification. 13 Again, I would add, this is not a 14 technical document. This is a sales type document, 15 in my opinion. 16 Q. Have you ever used a Star Burst machine? 17 A. No, I have not. 18 Q. Let's go back to your second declaration. 19 Paragraph 153. 20 A. Give me a second. 21 Q. Sure. 22 A. Okay, I'm there.

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Zhuhai CosMX Battery Co. v. Ningde Ampere Tech. Ltd.

IPR2025-00432 - Page 27 of 81

109 1 Q. So here, you state that: A POSITA would 2 have to (at the very least) reduce the inorganic 3 particles to the sizes of Honda's pore walls. 4 Why is that? 5 A. So this is in the context of would a 6 POSITA be motivated to combine Honda and Murakami; 7 is that correct? 8 Q. Yes. 9 A. Okay. So Honda discloses a very regular 10 honeycomb structure, very easily identified pore 11 walls of a fairly uniform thickness. Those pore 12 walls are quite smooth. They appear to be made of 13 resin, which we would interpret as a type of binder. 14 And so if you're going to combine 15 Murakami with Honda, you have to -- you can't just 16 say that you can use Murakami's particles in Honda's 17 pore walls, because it would disrupt everything that 18 Honda is attempting to do and it would disrupt 19 everything that Murakami is attempting to do, and 20 the combination would not be functional as each of 21 those separate references teaches. 22 If the particle size is significantly	111 1 according to Claim 1, wherein the average wall 2 thickness between the pores is in a range of 20 3 nanometers to 500 nanometers. 4 So we have to accept all of the 5 limitations already present in Claim 1. And as we 6 already discussed, if you express those nanometers 7 in microns, then yes, you can have a thickness of up 8 to 500 -- sorry, up to .5 micrometers. 9 BY MR. PHILBIN: 10 Q. And Honda discloses that the pore walls 11 can be up to 2 microns, right? 12 MR. COX: Object to form. 13 A. Can you point me to where it says that? 14 BY MR. PHILBIN: 15 Q. Yeah. You state it in paragraph 153 of 16 your declaration. And let me find it in Murakami. 17 A. Honda, you mean? 18 Q. Honda. Yeah, sorry. That's why ctrl F 19 wasn't working. 20 Yeah, in Honda, it's paragraph 45. 21 A. Sorry, which exhibit is Honda? 22 MR. COX: Exhibit 1007.
110 1 larger than the pore wall and you're trying to have 2 it still be inside the pore wall, then that's a 3 problem. 4 Q. So you're saying the particle sizes of 5 Murakami wouldn't fit in the pore walls of Honda? 6 A. Basically, yes. 7 Q. Do the particles in the '148 patent fit 8 within the pore walls of the '148 patent? 9 MR. COX: Object to form. 10 A. The '148 patent has multiple disclosures 11 and limitations in the claim that define what is 12 meant by these terms, so it -- I would be reluctant 13 to try to compare them to Honda and Murakami that 14 way. 15 BY MR. PHILBIN: 16 Q. Well, okay. Let's take it this way: The 17 pore walls of the '148 patent are -- or the average 18 pore wall of the '148 patent is a max of half a 19 micron, right? That's from dependent Claim 3 and 20 12? 21 MR. COX: Object to form. 22 A. Claim 3 recites: The porous film	112 1 MR. PHILBIN: Yeah. 2 A. Sorry, go ahead. 3 BY MR. PHILBIN: 4 Q. So paragraph 45 of Honda states that the 5 thickness of a partition wall is 0.1 micron to 2 6 micron. 7 A. Yes. And that's what I recited in my 8 paragraph 153. 9 Q. Right. 10 So why wouldn't the Murakami particles 11 fit in pore walls that are 2 microns thick? 12 [Document review.] 13 A. So I'm looking in Murakami Example 1. 14 The particle sizes are given as initial values, 15 giving D10, D50, D90 values. 16 It's our contention that POSITA would 17 recognize that using the high pressure dispersion 18 device of Sugino at high pressure with three passes, 19 that there would be a significant alteration of 20 those particle sizes, making them smaller. 21 We don't actually know what the maximum 22 particle size is, because D90 doesn't tell us that.

113 1 It would appear that some of Murakami's 2 particles are small enough to fit within some pore 3 walls, but not all of the pore walls that are 4 recited by Honda. 5 I would add that we have expressed 6 opinions on why one would not combine Honda and 7 Murakami beyond just that single factor. 8 BY MR. PHILBIN: 9 Q. Sure. And I'm sure you guys will brief 10 that, but I'm just going to ask about specific 11 points. 12 Paragraph 163. You say that: There is 13 no basis to use Murakami's particle sizes with 14 Honda. 15 A. Sorry, paragraph 163? 16 Q. Yeah. Of your second declaration. 17 A. Can you begin again? 18 Q. Sure. You state that: There is no basis 19 to use Murakami's particle sizes with Honda. 20 Does Honda describe the filler particle 21 sizes that can be used? 22 A. Honda says that use of a filler is	115 1 the filler particle. 2 A. So our contention is that those particle 3 sizes are not the particle sizes that are in the 4 eventual porous layers. 5 Q. If those were the particle sizes in the 6 finished layer, those would fit within the range 7 prescribed by Honda in paragraph 58, right? 8 A. Honda says average particle size? 9 I'm not seeing a definition of what they 10 mean by average particle size. Is there something 11 you want to point me to that defines that? 12 Q. I mean, average has a well-known meaning, 13 right? 14 A. Not necessarily. 15 Q. Okay. Well, normally average would be if 16 you added up all of the particle sizes and then 17 divided it by the number of particles, that would 18 give you an average particle size. 19 A. That would be a number-based average, 20 yes. 21 Q. And I guess an alternative would be D50? 22 Would you consider that to be a measurement of
114 1 possible, but the only embodiments in Honda that 2 contain inorganic filler or filler of any kind are 3 examples B5 and B6 and comparative example B3. 4 So Honda does suggest filler is possible. 5 Q. Can you look at Honda, Exhibit 1007? In 6 paragraph 58. 7 A. Yes. 8 Q. This gives a range of what the average 9 particle size of the filler can be, right? 10 A. Yeah. This paragraph says the average 11 particle size of the filler is preferably 0.01 12 micrometers to 10 micrometers. 13 Q. And Murakami's filler particles, the 14 average filler particle of Murakami fits within that 15 range, right? 16 A. Can you show me where you're referring to 17 Murakami's -- 18 Q. Sure. 19 A. -- average particle? 20 Q. Well, we can take Example 1, 21 paragraph 140, where it defines -- this is in 22 Exhibit 1005 -- it defines the D10, D50, and D90 of	116 1 average particle size? 2 A. That's one of the possible meanings of 3 average. 4 Q. Well, under any definition of average 5 particle size, wouldn't the particles described in 6 paragraph 140 of Murakami fit within the range of 7 .01 microns to 10 microns? 8 A. Given the stipulations that you made, it 9 would be likely that that would fit within the 10 range. But without having more details, one can't 11 be 100% sure. 12 Q. Paragraph 59 of Honda says that the 13 particle size distribution of the filler is 14 preferably D90 minus D10 is between the values of .1 15 micron and 3 microns. 16 Do you see that? 17 A. Sorry, can you point me to the paragraph 18 again? 19 Q. Yeah. Paragraph 59 of Honda, which is 20 Exhibit 1007. 21 A. Okay. Proceed. 22 Q. Do you see where it describes a particle

117 1 size distribution of the filler? 2 A. Yes. It gives D10 and D90 values, which, 3 again is not the full distribution, it's a -- some 4 selective information from that distribution. 5 Q. Right. And actually, it doesn't give the 6 D90 or D10 value, right? It gives the value of what 7 D90 minus D10 is, right? 8 A. It gives a preference for a difference 9 between D90 and D10, yes. 10 Q. If you take the D90 and D10 values from 11 Example 1 of Murakami -- and those are in 12 paragraph 140 of Exhibit 1005 -- that D90 minus D10 13 value fits within the D90 minus D10 range of 14 paragraph 59 of Honda, right? 15 MR. COX: Object to form. 16 A. Yeah, I haven't done that analysis yet. 17 BY MR. PHILBIN: 18 Q. Well, the D90 value is 1.03, and the D10 19 is .22. 20 So 1.0 -- 21 A. If they were using the same distribution. 22 Or since they were both using the volume based	119 1 BY MR. PHILBIN: 2 Q. So it's your opinion that Claims 4 and 13 3 are not rendered obvious by Murakami and Tanaka 4 solely because -- well, because Tanaka and Murakami, 5 there's no motivation to combine them -- scratch 6 that. 7 Is it your opinion that Tanaka does not 8 disclose the pore size distribution coefficients in 9 Claims 4 and 13? 10 A. I don't believe I formed an opinion on 11 that. My analysis was based on whether that pore 12 size distribution has relevance to combination with 13 Murakami or with, frankly, any battery separator 14 material. 15 Q. How do you control pore sizes in a 16 separator? 17 MR. COX: Object to form. 18 A. There's a fairly lengthy section of my 19 declaration -- second declaration, as we're calling 20 it, discussing all the multitude of complicated 21 interactions that lead to a particular geometry of 22 22 pores and other materials in the separator. So
118 1 distribution and they were measuring the same -- 2 with the same instrument, et cetera, then there 3 would be a basis for saying that one is within the 4 range of the other. However, I again object to 5 using paragraph 140 of Murakami as the basis for 6 that analysis, because we contend that those 7 particle sizes do not represent what's in the actual 8 material -- end material of Murakami. 9 Q. If you can go to your second declaration? 10 A. Yes. 11 Q. And if you can go to paragraph 169. 12 A. Okay. 13 Q. So this is in regards to ground three, 14 which is the Murakami and Tanaka ground. 15 A. Mm-hmm. Yes. 16 Q. Is it -- so it's your opinion that Claims 17 4 and 3 are not rendered obvious -- 18 MR. COX: Object to form. 4 and 13? 19 MR. PHILBIN: Yeah. What did I say? 20 MR. COX: 4 and 3. 21 MR. PHILBIN: Yeah. Sorry. 22 * * *	120 1 there's a lot to it. There's not a simple answer of 2 how you achieve certain pore size or distribution 3 pore sizes. 4 BY MR. PHILBIN: 5 Q. Are there certain levers you can pull, 6 though, that will allow you to increase the pore 7 size or to decrease it? 8 MR. COX: Object to form, vague. 9 A. Again, there are multiple factors. 10 They're nonlinear, meaning you change one and it 11 changes something else unexpectedly. 12 If it was easy to obtain a certain pore 13 size, people would be using it readily, but instead, 14 people have to adjust formulations, adjust 15 processing conditions, and experimentally find out 16 what happens to get to a certain pore size. 17 BY MR. PHILBIN: 18 Q. Well, what sort of processing conditions 19 could you adjust in order to adjust the pore size? 20 A. As I discuss in my declaration, among the 21 many factors there are particle sizes, if you're 22 using an inorganic filler; proportion of binder to

121 1 particles; the nature of the binder, its chemical 2 composition; the amount that it likes to wet the 3 particles; the particle -- the distribution of 4 particle sizes; whether you're using NIPS or some 5 other kind of method for forming the final solid 6 materials. 7 Those are all examples of factors that 8 would need to be considered. 9 Q. And are those the same factors that would 10 affect pore size distribution coefficient? 11 A. Yes. 12 Q. Are there any additional factors for pore 13 size distribution coefficient as compared to just 14 controlling pore size itself? 15 MR. COX: Object to form. 16 A. I would think that any factor that would 17 affect pore size would also affect pore size 18 distribution. 19 BY MR. PHILBIN: 20 Q. If you can go to paragraph 172 of your 21 declaration. You refer to -- 22 A. Hold on.	123 1 BY MR. PHILBIN: 2 Q. Paragraph 173. 3 A. Yes. 4 Q. You state that a POSITA could not 5 successfully imitate Tanaka's pore sizes without 6 altering the particle sizes and particle size 7 distribution of Murakami. 8 Are you -- when you say particle -- or 9 when you say pore sizes, did you mean pore size 10 distribution coefficient? 11 A. Sorry, give me a minute to read this 12 paragraph. 13 [Document review.] 14 A. Can you restate your question? 15 BY MR. PHILBIN: 16 Q. Yeah. In your last sentence of 17 paragraph 173, you say: A POSITA could not 18 successfully imitate Tanaka's pore sizes without 19 altering the particle sizes and particle size 20 distribution of Murakami. 21 And I'm just wondering when you wrote 22 pore sizes, did you mean pore sizes or did you mean
122 1 Q. Oh, sure. Sorry. 2 This is your second declaration. 3 A. Mm-hmm. 4 Go ahead. 5 Q. You refer to Tanaka using a centered 6 method? 7 A. Yes. 8 Q. Does the '148 patent use the centered 9 method? 10 A. Not as Tanaka uses it. 11 Q. Is it possible to achieve the pore size 12 distribution coefficient in Tanaka without relying 13 on the centered method? 14 MR. COX: Object to form. 15 A. So that's a very general statement. But 16 if Tanaka gives a pore size distribution coefficient 17 in principle, someone can make that happen. The 18 question is whether you can make that happen while 19 producing all of the other characteristics that are 20 desired at the same time. That's a very difficult 21 question -- problem to solve. 22	124 1 pore size distribution coefficient? 2 MR. COX: Object to form. 3 A. When I say it stated pore sizes, I meant 4 the general -- by saying sizes, I meant the 5 distribution of pores in Tanaka. Okay. So you did 6 mean pore size distribution coefficient. 7 MR. COX: Object to form. 8 A. Not the coefficient, but the 9 distribution. 10 BY MR. PHILBIN: 11 Q. Well, what is the pore size distribution 12 coefficient? What is that? 13 And I'm asking generally, not for Tanaka. 14 A. Okay. It's generally understood as some 15 ratio between like a D90 -- I believe it's D90 to 16 D10. 17 Let me look at that. 18 Q. In the '148 patent, column 5, it says the 19 pore size distribution coefficient, D, is equal to 20 R90 over R10? 21 Does that help you with your answer? 22 A. Yeah, that seems like a reasonable

125 1 definition. But it's not -- I wouldn't say that 2 it's so widely used that everyone would recognize 3 that as the only possible definition. 4 Q. Okay. So then when you say pore size 5 distribution, you're talking about not that 6 coefficient? 7 When you say pore size distribution, what 8 do you mean? 9 A. In paragraph -- in my paragraph 173, when 10 I said: A POSITA could not successfully imitate 11 Tanaka's pore sizes. 12 I meant the entirety of Tanaka's pores. 13 And it would be fair to say that I meant the pore 14 size distribution. The problem with distribution 15 coefficient is it's a ratio. So it doesn't say 16 whether everything's 100 microns big or 1 micron 17 big. 18 So the way I wrote that was opining on 19 Tanaka's pore sizes, not a ratio. 20 Q. So is it necessary to imitate Tanaka's 21 pore sizes in order to imitate Tanaka's pore size 22 distribution coefficient?	127 1 not want a -- well, in the context of a lithium-ion 2 battery, does that change your answer? 3 A. So generally with a lithium-ion battery, 4 greater mechanical strength would be desired, and 5 durability would be desired. 6 Q. And in paragraph 10, Tanaka says that 7 they achieve that excellent mechanical strength and 8 durability by controlling the pore size 9 distribution, right? 10 A. Tanaka says: As a result of diligent 11 research to solve the problems described above, the 12 present inventors discovered that by controlling 13 pore size distribution, it is possible to obtain a 14 polyolefin porous sintered compact that can ensure 15 air permeability and water absorption performance 16 even with a little film -- a thin film, has little 17 pressure loss, and has excellent mechanical strength 18 and durability, thereby arriving at the present 19 invention. 20 In this paragraph, as they set their 21 objective here, they include high air permeability 22 and water absorption performance, which isn't what
126 1 MR. COX: Object to form. 2 A. Can you restate the question? 3 BY MR. PHILBIN: 4 Q. Yeah. Do you need to imitate Tanaka's 5 pore sizes, or pore size distribution as you've been 6 talking about, in order to imitate Tanaka's pore 7 size distribution coefficient? 8 MR. COX: Object to form. 9 A. No. 10 BY MR. PHILBIN: 11 Q. Okay. If you'll go to Exhibit 1009. 12 A. Is this -- sorry, which exhibit? 13 Q. 1009. 14 If you go to paragraph 10. 15 A. Okay. 16 Q. Do you agree that excellent mechanical 17 strength and durability would be a desirable 18 property in a porous film? 19 A. The way you've worded that question is 20 very general, so I would say it depends on the 21 application. 22 Q. Are there applications where you would	128 1 you would want in a -- necessarily in a lithium 2 battery separator. In fact, water is considered a 3 dangerous contaminant in lithium batteries, so water 4 absorption would be considered a harmful 5 characteristic. 6 As for the -- they described little 7 pressure loss. Again, that has no bearing on a 8 lithium battery. 9 And so it's hard for me to see how this 10 applies to a lithium battery context. 11 Q. Okay. Well, I just asked if the pore 12 size distribution -- if Tanaka claims that 13 controlling the pore size distribution results in 14 the excellent mechanical strength and durability. 15 A. That's what they claim. 16 Q. Okay. That's all I need. 17 Let's move on to the next section. 18 If you can look at paragraph 184 of your 19 second declaration. 20 And actually, do people want to take a 21 five-minute break? Because this is a switching of 22 topics.

129 1 MR. COX: Sure. 2 (Recess taken, 2:00 p.m. to 3 2:08 p.m. MST) 4 MR. COX: I'll just say on the 5 record, for the Sugino web page exhibits, I 6 will stipulate to substituting those later 7 with a version that has the URL on the 8 exhibit. That's fine. 9 BY MR. PHILBIN: 10 Q. Paragraph 184 of your second declaration. 11 A. Yes. 12 Q. You state that: In Beard the pores are 13 the empty spaces between pore walls, and the pore 14 walls are made of binder on the outside. 15 So then is it your opinion that Beard 16 discloses pores formed by binder? 17 A. Yes, insofar as it has binder -- 18 particles encapsulated in binder. 19 Q. But it's -- you're done with your answer, 20 right? 21 A. Yes. 22 Q. But it's your opinion that Beard's pores	131 1 to teach? 2 And the principle is that you have pore 3 walls, you have particles within those pore walls 4 that are encapsulated by binder. 5 I think that's about as far as you can 6 interpret the figure. Trying to make nuanced 7 judgments about does a particle protrude into the 8 pore wall -- I mean, sorry, into the pore, I don't 9 think it's fair to make that judgment from this 10 figure. 11 Q. But do you agree that, at least looking 12 at this figure, some of the particles extend into 13 the pore as drawn? 14 MR. COX: Object to form. 15 A. Well, as drawn, some particle circles -- 16 not -- they're not particles, they're circles, 17 crossover the line that's also drawn as a boundary. 18 However, a POSITA has -- can't take that as the 19 definitive answer to what Beard is doing, because 20 the POSITA has -- would know that Beard specifically 21 teaches that you want to encapsulate the particles 22 in binder.
130 1 don't at least comprise part of inorganic particles, 2 right? 3 A. Correct. 4 Q. And that's because the -- it's your 5 opinion that the inorganic particles do not contact 6 or extend into the pores themselves, right? 7 A. Right. 8 Q. If you'll look at Figure 1 of Beard, 9 which -- you have it here in paragraph 184. 10 A. I'll refer to that. 11 Q. Is it your opinion that none of those 12 particles extend into or contact any of the pores 13 themselves? 14 MR. COX: Object to form. 15 A. So a POSITA sees -- would see this 16 diagram, first of all as a cartoon. So it's not -- 17 doesn't carry the same weight as an SEM or actual 18 image of the material. 19 Secondly, as a cartoon, it's intended to 20 teach certain principles. Because it's a 21 simplification of reality, you have to, as a POSITA, 22 ask yourself what principle is this cartoon trying	132 1 So, for instance, one of these purported 2 particles protruding past the pore wall would be 3 encapsulated in binder, and so therefore wouldn't 4 necessarily be meeting the requirements of the '148 5 claims. 6 BY MR. PHILBIN: 7 Q. Is there anything in Figure 1 that leads 8 you to believe the particles are fully encapsulated 9 by binder? 10 MR. COX: Object to form. 11 A. As I previously opined, this figure is 12 not trying to teach every aspect of -- and nor can 13 it teach every aspect of Beard's teachings, so I 14 don't believe that it has much to say on where every 15 little bit of binder is present. 16 What it does teach is that the pore walls 17 are made of small particles. Multiple particles are 18 enclosed within those walls. There's a high degree 19 of binder present in these pore walls, and that's 20 holding all of those particles together. That's 21 what a POSITA would see in this figure. 22

133 1 BY MR. PHILBIN: 2 Q. In paragraph 191 of your second 3 deposition -- or second declaration, you state that 4 the binder by volume in Beard is between 33 to 67%. 5 So is it your opinion that if the binder 6 by volume percentage is 33, that every particle in 7 Beard would be fully encapsulated by binder? 8 [Document review.] 9 A. So I would cite that according to Beard's 10 teachings, binder could be 33 to 67% by volume of 11 the solids. 12 And you asked, is it possible for, if 13 we're at the lower end of that range, 33% binder by 14 volume for all the particles to be encapsulated, and 15 the answer is yes, it's possible. 16 BY MR. PHILBIN: 17 Q. But is it also possible that they would 18 not all be encapsulated? 19 A. Yes, just from the number, but you have 20 to look at all of the teachings of Beard. 21 Q. If you'll go to your first declaration, 22 paragraph 89.	135 1 BY MR. PHILBIN: 2 Q. If you'll open up Exhibit 1010. 3 And this is the Beard reference. 4 And go to paragraph 36. 5 A. Okay. 6 Q. It states that: A portion of the 7 titanium dioxide particles are visible as 8 unincorporated filler particles. 9 Do you see that sentence? 10 A. Yes, I see that sentence. 11 Q. What is an unincorporated filler 12 particle? 13 A. Let me refer to Figure 2. 14 Figure 2 has an annotation that says: 15 Unincorporated filler particles 206. 16 Q. Well, when it says it's "unincorporated," 17 would you understand that to mean that the particle 18 is not incorporated in the binder? 19 A. I'm not sure what they mean, since they 20 don't define what they mean by unincorporated. 21 That's why I want to look at the SEM for additional 22 guidance on what they could mean.
134 1 And what I'm going to ask you about is -- 2 it's on page 40. 3 A. Okay. 4 Q. You state that the solid volume percent 5 of binder in the porous layer disclosed in the '148 6 patent is between 25 to 83%, right? 7 A. Yes. 8 Q. So is it your opinion that you could have 9 83% volume of binder and the part -- and not every 10 particle will be fully encapsulated by binder? 11 A. Can you state the question again? 12 Q. Yeah. If you have 83% binder by volume, 13 would every particle be encapsulated by binder? 14 MR. COX: Object to form. 15 A. Again, just based on a percent like that, 16 you can't determine that. It would certainly be 17 more likely for particles to be encapsulated, 18 because you have to put that volume somewhere, that 19 volume of binder. But that number by itself doesn't 20 tell you everything you need to know to determine if 21 things are encapsulated or not encapsulated. 22	136 1 When I look at the SEM and what they've 2 labeled as unincorporated, it appears that there's a 3 segment of particles that was not well mixed with 4 the remainder of the materials, and so they're just 5 kind of sticking out there. And it seems like they 6 mean for it not to be the regular occurrence, like 7 it's an anomaly. 8 They've only labeled one area that 9 they're calling unincorporated, and I don't see any 10 other areas that would match that. So it seems like 11 it's sort of an outlier or nonstandard situation. 12 They don't define what they mean by 13 unincorporated. 14 Q. Well, paragraph 36, the sentence right 15 after says: The polymer matrix has incorporated 16 most of the titanium dioxide particles. 17 A. Mm-hmm. 18 Q. Does that help you understand what 19 unincorporated means? 20 A. It seems that they mean that it's been 21 well mixed and encapsulated. 22 Q. That most of the titanium dioxide

Conducted on January 30, 2026

1 particles have been encapsulated? 2 A. Yes. 3 Q. Which means that some, the portion that 4 are unincorporated, are not encapsulated? 5 A. That would seem what they mean. 6 We don't -- we can't be sure how much 7 that is, but I stand by my statement that it seems 8 to be the exception to the rule, not the standard 9 configuration of particles and binder. 10 Q. So the unincorporated filler particles, 11 like those shown in Figure 2, are those a part of 12 the pore that they touch? 13 MR. COX: Object to form, lacks 14 foundation. 15 A. So what do you mean by are they "a part 16 of the pore that they touch"? 17 BY MR. PHILBIN: 18 Q. Let me reword that. 19 In Figure 2, where there's the 20 unincorporated filler particles, there's also a 21 pore, right? 22 MR. COX: Object to form.	137 1 are near by to a -- to pores, but it's difficult for 2 me to say how they are oriented relative to a pore 3 wall or pore. 4 It's interesting that this is a -- this 5 is on the outer surface, it appears, of the 6 material. In other words, this SEM is taken from 7 just top-down view. So you don't always get the 8 best -- the best picture when there's a lot of 9 irregularity in a material. So it's hard for me to 10 interpret it. 11 Q. If you'd go to paragraph 21 of 12 Exhibit 1010. 13 A. Yes. 14 Q. Beard states that the wall thickness can 15 vary from .01 to .05 microns, or it can also vary 16 from approximate .001 to .1 microns, and that it 17 depends on the pore size. 18 So is Beard saying that by changing the 19 pore size, the pore wall thickness would change too? 20 A. In reading this paragraph, when Beard 21 says depending on pore size, it's not clear whether 22 they mean that you use the first range, or the
138 1 A. You are asking, is there also a pore 2 where? 3 BY MR. PHILBIN: 4 Q. Well, is there a pore where the 5 unincorporated filler particles are? 6 A. I'm looking at the SEM trying to 7 interpret it in light of your question. It's hard 8 to say where there are pores or not pores in this 9 image, due to the lack of contrast. 10 It would be reasonable to assume that 11 those particles are nearby a pore. 12 They say that they're unincorporated. 13 That's their terminology. Frankly, I think that's a 14 little bit going further than I would, meaning that 15 I would be more cautious as to stating whether 16 something is covered by binder or not. 17 So I guess I would put on the record that 18 just because they call it unincorporated doesn't 19 mean they're right about that. Meaning it doesn't 20 mean they're right that it is not encapsulated in 21 binder. 22 They -- those unincorporated particles	139 1 second range depending on pore size, or you use 2 different values within each range depending on pore 3 size. 4 So the language is a little unclear to me 5 what they mean. 6 Q. Well, in general, if you adjust the pore 7 size, will there be -- will that cause a change in 8 the pore wall size too? 9 A. So, as I've explained, you don't have a 10 knob that you just turn that says, here's the pore 11 size I want. There's multiple physical properties 12 and mixture properties that you can change in the 13 hope that you get some pore size that you want. But 14 there's no guarantee. You have to do the experiment 15 and empirically determine how to get the pore size 16 you want. 17 Similarly, you can vary the -- these 18 things and try to get a wall thickness that you 19 want. 20 But in either case, you don't have 21 something that you can just directly control. So it 22 would be incorrect to say that, oh, if you just make 140

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Zhuhai CosMX Battery Co. v. Ningde Ampere Tech. Ltd.

IPR2025-00432 - Page 35 of 81

141 1 this pore size you'll get this wall thickness. 2 They're both consequences of other things that you 3 do have more control over, but I wouldn't 4 necessarily say there's a direct causation from one 5 to the other, as you stated. 6 Q. If you'll go to paragraph 211 of your 7 second declaration. 8 You state that Murakami and Beard use 9 incompatible mixing and disbursing procedures. 10 A. Yes. 11 Q. Does Beard disclose how it disperses its 12 filler particles? 13 A. I think my point was that Beard does not 14 teach to use a high pressure dispersion device like 15 the Sugino device that we've been -- that we've 16 talked about. And that is a distinction between the 17 embodiments that Dr. Gido relied upon in Murakami, 18 and what Beard is doing. 19 Q. But you would agree that Beard doesn't 20 teach any dispersion method, right? 21 A. I haven't done that analysis completely 22 as to whether it doesn't teach a dispersion method.	143 1 voidage is? 2 A. Well, Murakami would be the best source 3 to explain that, since that's their objective. But 4 in general, variability is a statistical principle 5 of -- you have a mean and then you have variations 6 from that mean. And the higher degree of -- that 7 the samples depart from the mean, the higher the 8 variability. 9 Q. And the variability, it's not based on a 10 comparison of individual pores, right? 11 A. Right. Murakami takes larger areas and 12 determine -- treats that as a sample from which to 13 determine a void value, and then works from that to 14 determine a variability. 15 Q. Well, you would take multiple samples, 16 right? Like cross-sections of the separator, and 17 you would compare the voidage in one area with 18 another. Right? 19 A. Right. I can't recall how they measure 20 the voidage, so I would need to look that up, as far 21 as doing cross-section, but yes, the principle is 22 correct that you make a -- you choose a volume or an
142 1 If you want an opinion, I would need to 2 spend more time looking at Beard. 3 My main point is that it does not teach 4 the methods used in Murakami Examples 1 and 2. 5 Q. Does Beard state that you cannot use high 6 pressure dispersion? 7 A. I don't recall Beard stating that. 8 Q. In paragraph 211 of your second 9 declaration, you also state that Murakami and Beard 10 also use different methods of solidification. 11 Beard uses solve and substitution, right? 12 A. I would have to refresh my mind on that. 13 If you want to draw my attention to something, I 14 would look at it. 15 Q. We can skip that. 16 A. Okay. 17 Q. If you go to paragraph 212 of your 18 declaration. 19 A. Yes. 20 Q. You state that the purpose of Murakami is 21 to decrease variability in voidage. 22 Can you explain what variability in	144 1 area, you make a measurement on that, and then you 2 repeat that for other areas and then you compare 3 them to each other. 4 Q. So then you'd agree that looking at 5 Figure 2 alone, of Beard, you cannot determine the 6 variability in voidage. 7 A. Sorry, I'm trying to get back to Figure 2 8 of Beard. 9 [Document review.] 10 A. Can you ask your question again? 11 BY MR. PHILBIN: 12 Q. Sure. So Figure 2 is just a snapshot of 13 one section of the separator, right? 14 A. Right. I need to refer again to Beard's 15 specification of how they did their statistics to 16 know what they consider to be one sample size. 17 Q. Do you agree you need more than one 18 sample in order to determine the variability in 19 voidage? 20 A. Sorry, I need to restate. Beard -- I 21 momentarily confused Beard and Murakami. Beard is 22 not determining of voidage variability like Murakami

145 1 is. So it would be difficult to do the analysis of 2 Murakami on Beard's material without additional 3 information. 4 Q. Why would you not be able to determine 5 the variability in voidage in Beard without more 6 information? 7 A. If you were motivated to do it exactly as 8 Murakami did, which I don't know why you would do 9 that, but if you were, you would need to carefully 10 read Murakami's description of how they determined 11 variability and voidage, and then you would need 12 that same procedure to be applied to Beard's 13 material. 14 So it's very unlikely you could do that 15 analysis just on what happens to be present in the 16 Beard patent. 17 Q. All right. Can we go to paragraph 228 of 18 your second declaration? 19 A. Okay. 20 Q. Actually, let's pull up Akiike. That's 21 Exhibit 1011. 22 MR. COX: That's A-K-I-I-K-E?	147 1 And then it says: Further, the 2 accumulated particle size distribution of the 3 non-conductive particles in the porous membrane may 4 be measured by a laser diffraction method. 5 So from this paragraph, they give laser 6 diffraction as a possible way to get the D10, D50, 7 D90 values. 8 BY MR. PHILBIN: 9 Q. Right. So it's permissible but it is not 10 required, right? 11 MR. COX: Object to form. 12 A. So the teachings of just this paragraph 13 seem to indicate that, but a POSITA would need to 14 look at all of the other teachings, including how 15 Akiike performs their experiments and embodiments 16 and also what -- which tool or instrument would make 17 the most sense to make a particular measurement. 18 For instance, if you have a slurry or a -- particles 19 dissolved in a -- or dispersed in a liquid, then 20 laser diffraction would be a convenient way to do 21 particle size distribution in that environment. 22 BY MR. PHILBIN:
146 1 BY MR. PHILBIN: 2 Q. Akiike does not require that the particle 3 size distribution be determined via laser 4 diffraction, right? 5 A. I would have to look more carefully to 6 see if they make that stipulation. 7 Q. Go to paragraph 36 of Akiike. 8 A. 36? 9 Q. Yeah. 10 It's on PDF page 4. 11 A. Yeah. I have it. 12 Q. If you want to just read that to 13 yourself. 14 A. The D10 -- oh, sorry. I want to read it 15 to myself. 16 Q. You can read it out loud, if you want, 17 but... 18 [Document review.] 19 A. It says that you can obtain the D10, D50, 20 D90 values for the nonconductive particles by 21 measuring the accumulated particle size 22 distribution.	148 1 Q. Well, you could just buy the particles at 2 the D10, D50, and D90, right? 3 MR. COX: Object to form. 4 A. Again, as I indicated earlier, you might 5 find a vendor that advertises certain values for 6 those properties, but you don't necessarily get what 7 you want. 8 MR. COX: As the Stones say. 9 MR. PHILBIN: Pass the witness. 10 MR. COX: I have some brief redirect. 11 MR. PHILBIN: Can we take a break 12 first? Or a few minutes? 13 MR. COX: We can, if you guys want. 14 MR. PHILBIN: I'd rather not. 15 THE WITNESS: Let's go. 16 ----- 17 EXAMINATION 18 ----- 19 BY MR. COX: 20 Q. Dr. Wheeler, have you ever dug a hole in 21 the dirt? 22 A. Yes. Many times.

149 1 Q. And when you dig a hole in the dirt, what 2 is the hole or the void? 3 A. It's the volume that is defined by the 4 walls of the hole where the dirt stops and the air 5 starts. 6 Q. Fair to say that the hole is where the 7 air is and the dirt is not, correct? 8 MR. PHILBIN: Objection, leading. Or 9 to form. 10 MR. COX: I think you can say 11 leading. 12 MR. PHILBIN: Okay. 13 A. I would agree that that is a correct 14 statement of what I said. 15 BY MR. COX: 16 Q. If one were to take a rock and put it in 17 the hole, would a person understand that the rock is 18 in the hole? 19 A. Yes. 20 Q. Even though the space that the rock 21 occupies is not air and is not void, correct? 22 A. Correct.	151 1 Example 1 that's shown in column 12? 2 A. I recall that discussion, yes. 3 Q. And do you see where -- at the discussion 4 of the preparation of the separator, it says: The 5 inorganic particles (boehmite) are mixed with the 6 binder (PVDF) a volume ratio of 1.2, and then 7 N-methylpyrrolidone (first solvent) is added and 8 uniformly stirred to obtain a coating solution? 9 Do you see that section? 10 A. Yes, I see that. 11 Q. Is it your understanding that this mixing 12 or stirring would have a material effect on the 13 particle size distribution of boehmite in that 14 coating? 15 A. The plain and ordinary meaning of 16 uniformly stirred would mean you mix it with some 17 device that's convenient to you in a laboratory, 18 which would commonly be like a stir rod or an 19 implement, or you could have a magnetic stirrer bar 20 and place it in a beaker, and then you would perform 21 that stirring until it appeared that it was 22 uniformly mixed.
150 1 Q. Does that relate to, at all, what it 2 means for a pore to comprise a part of a particle? 3 A. It's an analogy that would -- that could 4 correspond to what we are -- have been talking about 5 with pores and particles. 6 When you have a pore that's been formed 7 by the binder, as you understand that pore to have a 8 certain geometry, a certain boundary, and then you 9 observe a particle on occasion protruding into that 10 pore, partially or even nearly completely, you think 11 of that like a rock in a hole, as still being bound 12 by the previous boundaries of the pore, but having 13 an effect on the overall structure that can lead to 14 unexpected benefits in the '148 patent. 15 Q. Do you recall a discussion you had 16 earlier about the '148 patent Example 1 and the 17 creation of the step -- separator in Example 1 18 that's at column 12 of Exhibit 1001? 19 A. Can you restate the question? 20 Q. So do you recall a discussion that you 21 had earlier with Mr. Philbin about the '148 patent 22 Example 1 and the creation of the separator in	152 1 And so that's not able or likely to have 2 any kind of effect on the boehmite, because that's 3 very -- that's a very rigid material. You would 4 have to be more aggressive to have an impact on the 5 particle sizes. 6 Q. Is there any indication that high 7 pressures are used in any of the mixing or stirring? 8 A. There's no indication of that. And that 9 would be something you would normally need to call 10 out, because people would not necessarily have that 11 equipment in their laboratory. 12 Q. Is the size distribution of boehmite 13 provided at the beginning of the instructions or at 14 the end when the separator is completed? 15 MR. PHILBIN: Objection, form. 16 A. In this paragraph, in column 12, it 17 recites a series of mixing and coating steps, 18 coagulation, drying, and then at the end of the 19 paragraph it recites the particle size distribution 20 of the inorganic particles. 21 So that implies that it's the effective 22 distribution at the conclusion of these steps.

153 1 BY MR. COX: 2 Q. Would you open Exhibit 1032 that you 3 discussed with Mr. Philbin earlier? 4 A. Yes. 5 Q. Do you see the first sentence under the 6 heading: Super fine particles, minimal 7 contamination? 8 A. Can you point me -- 9 Q. It's on the first page. 10 A. Okay. 11 Yes, I see that. 12 Q. Would you read that sentence out loud? 13 A. Star Burst is a wet-type pulverizing, or 14 wet jet milling, device to disperse, emulsify, 15 pulverize, and reform surfaces of raw materials by 16 obliquely colliding the particles pressurized up to 17 245 megapascals at the relative velocity of Mach 4. 18 Q. Do you have an understanding of what it 19 means to obliquely collide the particles? 20 A. Based on the pictures that they 21 provided -- let's see. I think it would be in the 22 other exhibit. But oblique implies that they're --	155 1 multiple times down the length of the pipe. 2 Q. And if the particles were pressurized at 3 100 megapascals, with what would they collide as 4 they proceeded down this pipe? 5 MR. PHILBIN: Objection, form, lack 6 of foundation. 7 A. So the pressure that's indicated is going 8 to relate to the velocity at which the fluid moves 9 through this device. Higher pressure means you will 10 have a higher velocity moving through. 11 And then the velocity, as you move 12 through, is going to affect how energetic the 13 impacts are of the particles with other particles or 14 with the walls. So at extremely high pressures, 15 you'll have very energetic collisions which will 16 lead to reduction of particle sizes. 17 BY MR. COX: 18 Q. And briefly going back to Exhibit 1032, 19 do you see on page 3 a paragraph that is under: 20 Solves problems that commonly occur when 21 homogenizing particles? 22 PDF page 3. Right at the top.
154 1 they're at an angle to each other. They're 2 colliding, and causing them to impact in a way that 3 will change their particle sizes. 4 Q. Would obliquely colliding at pressures of 5 100 megapascals affect particle sizes of alumina? 6 A. Based on the information that Sugino 7 provided on their website, yes, they show evidence 8 that that would occur. 9 Q. And when you were referring to "the other 10 exhibit," were you referring to Exhibit 1034? That 11 had some images, the different types of chambers? 12 A. Yes. The one that we looked at in this 13 deposition. 14 Q. Would you look at the image of the single 15 nozzle chamber that's on PDF page 3? 16 A. Yes, I'm looking at it. 17 Q. Do you see the blue arrows that go 18 through that chamber? 19 A. Yes. 20 Q. And is it correct that they intersect or 21 cross each other? 22 A. Yes. It illustrates that occurring	156 1 A. Oh, yes. That's the heading of the -- 2 this section. 3 Q. And what does Sugino teach that 4 homogenization of particles refers to? 5 A. It says, under that section heading: 6 Homogenization of particles refers to the process of 7 reducing the average diameter of a particles -- of a 8 material's particles uniformity -- uniformly. 9 Sorry, let me restate that. 10 Homogenization of particles refers to the 11 process of reducing the average diameter of a 12 material's particles uniformly. 13 Q. Is that consistent with your 14 understanding of what the Star Burst machine is used 15 to do? 16 A. Yes. 17 Q. What are Murakami's pores formed by? 18 A. Murakami teaches a structure that -- 19 where the pores are formed by the filler particles 20 and not by the binder. The binder is incidental 21 in -- it's a -- is there to just hold the particles 22 together at points of contact. And the particles

157 1 are making the primary effect on the shape of the 2 pore because the pore is basically the interstitial 3 space between those particles. 4 Q. What are Honda's pores formed by? 5 A. Honda's pores are formed by the binder. 6 They specifically teach this honeycomb structure 7 that requires a careful combination of factors, 8 including use of a surfactant that enables them to 9 get a pore that looks like honeycomb, and allows 10 them to have a well-defined wall thickness. A 11 POSITA looking at that would see pores formed by the 12 binder. 13 Q. What does this tell you about whether a 14 POSITA would be able to combine the structures of 15 Murakami with the structures of Honda? 16 A. Those two structures are fundamentally 17 different, and so combining them is not possible. 18 You have to pick one or the other approach, and then 19 you -- you might make minor modifications to that 20 approach, but you can't magically combine the two. 21 For instance, you have to pick, are you 22 going to use a surfactant or not? Are you going	159 1 them in one location on their SEM Figure 2 and not 2 throughout the material like you would expect if 3 that's a desired property of the material. 4 Q. In Figure 3, are there any filler 5 particles that are not fully encapsulated by binder? 6 A. That would be hard -- it would be hard to 7 identify it just from a figure. It does appear that 8 the particles are -- have soft edges. There's a lot 9 of binder present. Again, just looking at the SEM, 10 there's a hybrid portion of binder. It's filling in 11 the gaps between particles. I can't say if 12 occasionally a particle is not fully encapsulated, 13 but it does appear like there's a lot of 14 encapsulation happening in that structure. 15 Q. And if you look at paragraph 50, 16 discussing Figure 3, what does this teach you about 17 Beard's structure shown in Figure 3? 18 A. Beard's interpretation of that figure 19 says, in paragraph 50, that: Small bumps and 20 protrusions of the filler material fully 21 encapsulated by the polymer. The polymer has fully 22 wet the TiO2 filler, yet the microporous structure
158 1 to -- what size particles are you going to use? 2 What size -- if you want to have Honda's structure, 3 you can't have big particles that are poking -- that 4 would be larger than the size of the walls. 5 And so you -- you can't obtain a 6 combination without picking one or the other. The 7 combination just doesn't make sense. 8 Q. Do you recall discussing Figure 2 of 9 Beard with Mr. Philbin? 10 A. Yes. 11 Q. And you discussed some unincorporated 12 filler particles that are pictured in Figure 2? 13 A. Yes. 14 Q. Does Beard teach that the presence of 15 unincorporated filler particles is desirable or 16 preferable? 17 A. I don't see any teaching of that. 18 Obviously they call them out and notice them on 19 their figure, but they don't seem to be promoting 20 that. 21 And as evidence of that, I -- you only 22 see the unincorporated particles as they've labeled	160 1 remains. 2 So Beard's interpretation of that SEM 3 states that it's fully wet, and that the bumps and 4 protrusions are fully encapsulated. 5 I gave a more cautious view when I looked 6 at that SEM, but that's something that Beard is 7 stating, they have confidence in that level of 8 encapsulation. 9 Q. Does Beard teach that it is desirable for 10 particles to extend into the pore without being 11 encapsulated by binder? 12 MR. PHILBIN: Objection, form. 13 A. Can you refer me to a specific part of 14 Beard? 15 BY MR. COX: 16 Q. No. 17 A. My understanding is that Beard teaches 18 that encapsulation is desirable. It's what you 19 want. You want the wetting. It's -- that would be 20 consistent with all of the figures of Beard and the 21 other teachings of Beard. 22 MR. COX: I'll pass the witness.

Transcript of Dean R. Wheeler, Ph.D.
Conducted on January 30, 2026

41 (161 to 164)

161 1 MR. PHILBIN: No further questions. 2 That's the words you used. 3 MR. COX: We'll reserve the right for 4 the witness to review and sign and have 5 30 days to review his deposition transcript. 6 (Time noted: 3:10 p.m. MST) 7 --o0o-- 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22	163 1 I HEREBY CERTIFY that I have read 2 this transcript of my deposition, and that 3 this transcript accurately states the testimony 4 given by me, with the changes or corrections, if 5 any, as noted. 6 7 8 9 X _____ 10 DEAN R. WHEELER, Ph.D. 11 12 13 14 15 16 17 18 19 20 21 22
162 1 CERTIFICATE 2 I, DEBRA A. DIBBLE, RDR, CRR, CRC, Notary Public, do hereby certify: 3 That DEAN R. WHEELER, Ph.D., the witness whose deposition is hereinbefore set forth, was duly 4 sworn by me and that such deposition is a true record of the testimony given by such witness. 5 I further certify that the adverse party, the Patent Owner NINGDE AMPEREX TECHNOLOGY LIMITED, 6 was represented by counsel at the deposition. I further certify that the deposition of 7 DEAN R. WHEELER, Ph.D., occurred at the offices of Regus - Downtown Provo 180 N. University Avenue Suite 8 270 Provo, Utah 84601 on Friday, January 30, 2026 commencing at 9:18 a.m. to 3:10 p.m. 9 I further certify that I am not related to any of the parties to this action by blood or marriage, 10 and that I am in no way interested in the outcome of this matter. 11 IN WITNESS WHEREOF, I have hereunto set my hand on this 13th day of February, 2026. 12  13 _____ 14 DEBRA A. DIBBLE, RDR, CRR, CRC 15 16 17 18 19 20 21 22	164 1 ERRATA SHEET FOR THE TRANSCRIPT OF: 2 CASE NAME: Zhuhai v. Ningde 3 DEP DATE: January 30, 2026 4 DEPONENT: DEAN R. WHEELER, Ph.D. 5 Pg. Ln. Now Reads Should Read Reason 6 _____ 7 _____ 8 _____ 9 _____ 10 _____ 11 _____ 12 _____ 13 _____ 14 _____ 15 _____ 16 _____ 17 _____ 18 _____ 19 _____ 20 21 X _____ 22 DEAN R. WHEELER, Ph.D.

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A			
a-k-i-i-k-e	128:4	additional	agree
145:22	academy	13:22, 39:10,	7:8, 18:19,
able	2:7	47:7, 47:10,	42:3, 44:3,
67:14, 68:1,	accept	121:12, 135:21,	44:5, 49:15,
72:3, 145:4,	98:2, 103:4,	145:2	51:2, 91:12,
152:1, 157:14	105:8, 111:4	adjust	104:4, 126:16,
about	accepting	120:14, 120:19,	131:11, 141:19,
9:22, 13:15,	104:15	140:6	144:4, 144:17,
23:4, 24:18,	according	advance	149:13
25:18, 29:12,	69:7, 74:15,	60:2	agreeing
29:13, 35:4,	111:1, 133:9	adverse	31:13
39:8, 39:17,	accordingly	162:9	ahead
40:1, 40:3,	49:14	advertises	37:20, 49:8,
41:17, 44:8,	accumulated	148:5	112:2, 122:4
49:19, 50:1,	146:21, 147:2	affect	air
50:17, 53:3,	accurate	7:6, 44:2,	127:15, 127:21,
53:22, 58:3,	8:14	121:10, 121:17,	149:4, 149:7,
63:19, 65:7,	accurately	154:5, 155:12	149:21
65:11, 70:20,	163:3	after	akiike
71:3, 72:18,	achieve	65:16, 86:3,	145:20, 146:2,
73:16, 73:17,	28:10, 120:2,	136:15	146:7, 147:15
73:19, 76:7,	122:11, 127:7	again	all
77:21, 89:20,	across	6:20, 7:9,	9:10, 15:8,
92:1, 92:2,	82:6, 82:11,	14:21, 16:7,	32:9, 35:8,
92:16, 93:19,	84:6, 85:2,	19:22, 27:19,	36:9, 36:15,
97:16, 99:21,	96:12	29:20, 31:22,	36:18, 52:1,
100:11, 101:19,	action	37:12, 39:8,	58:2, 66:17,
105:19, 113:10,	9:20, 162:18	41:10, 43:3,	72:5, 75:16,
125:5, 126:6,	actual	43:13, 47:17,	77:3, 79:6,
131:5, 131:7,	89:11, 118:7,	48:17, 51:15,	81:17, 85:1,
134:1, 138:19,	130:17	52:7, 56:12,	89:6, 90:3,
141:16, 150:4,	actually	64:4, 64:18,	100:10, 105:3,
150:16, 150:21,	58:5, 84:16,	88:9, 99:14,	111:4, 113:3,
157:13, 159:16	94:16, 95:1,	104:15, 107:9,	115:16, 119:20,
above	112:21, 117:5,	108:13, 113:17,	121:7, 122:19,
35:14, 83:6,	128:20, 145:20	116:18, 117:3,	128:16, 130:16,
127:11	add	118:4, 120:9,	132:20, 133:14,
above-described	21:5, 26:13,	128:7, 134:11,	133:18, 133:20,
33:8	31:19, 100:19,	134:15, 144:10,	145:17, 147:14,
above-referenced	108:13, 113:5	144:14, 148:4,	150:1, 160:20
2:5	added	159:9	allow
above-styled	23:15, 65:17,	agglomerated	120:6
2:4	88:20, 115:16,	103:10, 103:17,	allows
absence	151:7	104:19, 105:1	95:3, 96:1,
16:15	adding	aggressive	96:3, 157:9
absorption	65:19	152:4	alluding
127:15, 127:22,	addition	ago	32:10, 39:7
	100:19	6:13	alone
			68:2, 85:13,

Transcript of Dean R. Wheeler, Ph.D.
Conducted on January 30, 2026

43

144:5 alpha 101:12 already 47:5, 111:5, 111:6 also 17:4, 26:19, 46:16, 46:20, 67:22, 72:9, 73:17, 78:22, 83:7, 84:19, 85:13, 85:22, 86:18, 99:19, 121:17, 131:17, 133:17, 137:20, 138:1, 139:15, 142:9, 142:10, 147:16 alston 3:13 alteration 112:19 altering 62:12, 123:6, 123:19 alternative 86:15, 86:16, 115:21 alternatively 86:2 although 20:17, 21:5, 60:13 altogether 69:22 alumina 101:12, 154:5 always 139:7 amalgamation 35:20 among 25:8, 120:20 amount 15:6, 29:13, 29:18, 30:20, 54:10, 54:21,	60:17, 70:6, 70:9, 70:18, 70:19, 72:4, 75:21, 121:2 amperex 1:9, 162:10 analogy 57:11, 150:3 analysis 117:16, 118:6, 119:11, 141:21, 145:1, 145:15 angle 154:1 annotated 20:16, 88:22, 90:11 annotation 135:14 annotations 88:18, 88:20 anomaly 136:7 another 21:22, 31:2, 85:7, 86:5, 88:5, 96:17, 143:18 answer 12:19, 37:7, 44:13, 52:22, 72:13, 73:3, 81:21, 107:16, 120:1, 124:21, 127:2, 129:19, 131:19, 133:15 answered 42:16 any 7:1, 7:3, 7:5, 8:10, 9:8, 11:6, 14:20, 26:4, 27:5, 39:3, 39:6, 53:22, 54:1, 60:21, 64:10, 64:19, 67:8, 67:20, 67:22, 76:3,	94:5, 97:19, 114:2, 116:4, 119:13, 121:12, 121:16, 130:12, 136:9, 141:20, 152:2, 152:6, 152:7, 158:17, 159:4, 162:17, 163:5 anything 6:22, 7:11, 26:11, 132:7 anytime 26:15 anyway 68:20 apparent 95:6 apparently 101:15 appeal 1:4 appear 109:12, 113:1, 159:7, 159:13 appearances 4:3 appeared 151:21 appears 10:6, 20:9, 21:4, 21:9, 35:22, 93:15, 136:2, 139:5 applicability 16:13 application 107:1, 107:21, 108:1, 108:9, 126:21 applications 106:18, 108:11, 126:22 applied 9:9, 107:7, 145:12 applies 128:10	apply 53:20 approach 157:18, 157:20 approximate 139:16 area 96:4, 97:3, 136:8, 143:17, 144:1 areas 136:10, 143:11, 144:2 argued 26:17 argument 46:14 arguments 9:21 around 20:5, 25:15, 25:20, 36:22, 66:13 arranged 13:19, 14:5, 89:21 arriving 127:18 arrows 154:17 aside 57:14 asked 90:4, 128:11, 133:12 asking 52:16, 56:8, 74:9, 85:19, 124:13, 138:1 aspect 132:12, 132:13 assume 65:6, 99:10, 138:10 assumes 104:21 assuming 84:20
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Transcript of Dean R. Wheeler, Ph.D.
Conducted on January 30, 2026

44

assumption 74:6, 74:10, 78:8, 84:22	B	130:8, 131:19, 131:20, 133:4, 133:7, 133:20, 135:3, 139:14, 139:18, 139:20, 141:8, 141:11, 141:13, 141:18, 141:19, 142:2, 142:5, 142:7, 142:9, 142:11, 144:5, 144:8, 144:20, 144:21, 145:5, 145:16, 158:9, 158:14, 160:6, 160:9, 160:14, 160:17, 160:20, 160:21	becomes 37:9, 40:9, 57:11, 97:1
atlanta 3:9	b3 114:3		been 6:6, 32:10, 50:16, 101:19, 102:8, 126:5, 136:20, 137:1, 141:15, 150:4, 150:6
attempt 28:20, 29:2, 93:16	b5 114:3		before 1:4, 2:6, 32:11, 63:9
attempting 69:17, 109:18, 109:19	b6 114:3		begin 113:17
attention 8:3, 142:13	back 22:12, 29:9, 39:7, 44:16, 62:6, 62:17, 80:3, 81:20, 85:9, 87:8, 94:8, 95:8, 108:3, 108:18, 144:7, 155:18		beginning 96:11, 152:13
authentic 8:14	background 7:9, 7:12, 90:3	beard's 129:22, 132:13, 133:9, 144:14, 145:2, 145:12, 159:17, 159:18, 160:2	behaves 28:2
authenticating 8:6, 8:12	bar 151:19		behavior 89:18, 90:2
available 58:15, 59:10, 60:11, 61:15, 101:13, 101:15	barely 93:15		behind 37:3
avenue 2:10, 162:14	based 21:7, 39:14, 106:4, 117:22, 119:11, 134:15, 143:9, 153:20, 154:6	bearing 128:7	being 11:22, 12:16, 20:3, 36:11, 66:13, 105:19, 106:5, 150:11, 160:10
average 33:12, 39:15, 40:16, 41:4, 41:18, 42:3, 42:18, 43:4, 43:7, 82:19, 83:19, 85:5, 89:18, 94:12, 101:4, 110:17, 111:1, 114:8, 114:10, 114:14, 114:19, 115:8, 115:10, 115:12, 115:15, 115:18, 115:19, 116:1, 116:3, 116:4, 156:7, 156:11	basically 17:17, 40:10, 46:11, 110:6, 157:2	because 10:5, 13:6, 21:19, 23:6, 25:19, 31:19, 36:9, 40:10, 43:22, 44:7, 46:9, 50:2, 52:8, 64:4, 64:19, 73:15, 80:7, 84:12, 84:17, 87:18, 88:22, 90:11, 91:16, 92:3, 97:14, 104:14, 104:18, 109:17, 112:22, 118:6, 119:4, 128:21, 130:4, 130:20, 131:19, 134:18, 138:18, 152:2, 152:10, 157:2	believe 16:2, 24:3, 39:17, 61:4, 78:11, 119:10, 124:15, 132:8, 132:14
averaged 40:18	basis 97:19, 113:13, 113:18, 118:3, 118:5		below 83:6
averaging 84:17	batteries 128:3		beneficial 97:8
avoid 96:11	battery 1:6, 33:14, 119:13, 127:2, 127:3, 128:2, 128:8, 128:10		benefit 97:17, 98:2
away 94:19	beaker 151:20		benefits 96:9, 96:22, 150:14
	beard 129:12, 129:15,	become 95:22	best 14:2, 21:8, 37:1, 51:14, 51:21, 83:1,

PLANET DEPOS
888.433.3767 | WWW.PLANETDEPOS.COM

139:8, 143:2 bet 82:16 better 13:13 between 14:16, 16:9, 19:14, 20:1, 21:7, 39:15, 39:21, 40:8, 40:17, 41:11, 43:3, 46:12, 50:14, 64:2, 75:14, 76:11, 77:4, 77:11, 78:5, 79:16, 81:3, 82:14, 88:3, 95:20, 104:14, 111:2, 116:14, 117:9, 124:15, 129:13, 133:4, 134:6, 141:16, 157:3, 159:11 beyond 113:7 big 81:18, 92:9, 125:16, 125:17, 158:3 bigger 43:6 bind 70:8 binders 35:13, 37:14 bird 3:13 bit 25:15, 80:2, 104:13, 132:15, 138:14 blob-like 31:21 blocked 75:10 blood 162:18	blue 154:17 board 1:4 boehmite 59:6, 59:9, 59:20, 62:19, 151:5, 151:13, 152:2, 152:12 both 18:4, 41:17, 68:15, 69:2, 76:5, 85:4, 117:22, 141:2 bottom 69:5, 71:14, 95:4, 95:6 bought 101:15, 101:17, 101:18 bound 17:11, 72:8, 150:11 boundaries 10:19, 11:22, 12:2, 12:5, 12:16, 13:9, 17:7, 17:9, 18:17, 57:21, 150:12 boundary 11:16, 11:19, 12:7, 12:9, 12:17, 12:21, 13:1, 13:4, 13:14, 14:10, 47:21, 48:5, 48:8, 87:22, 92:13, 92:17, 131:17, 150:8 brady 3:14, 3:15 break 19:20, 44:19, 44:21, 63:5, 101:21, 128:21, 148:11 brief 113:9, 148:10	briefly 155:18 broaden 64:5 broader 11:14 broadly 59:17, 103:14 bumps 159:19, 160:3 burst 100:7, 102:8, 106:4, 106:9, 108:16, 153:13, 156:14 buy 59:12, 59:19, 107:12, 148:1 C calculation 54:2 call 7:21, 44:11, 63:22, 64:1, 138:18, 152:9, 158:18 calling 22:14, 84:9, 119:19, 136:9 came 20:17, 51:14 can't 7:3, 21:13, 21:16, 46:19, 59:15, 60:1, 74:6, 75:2, 76:6, 83:4, 83:5, 97:14, 97:19, 101:14, 107:14, 109:15, 116:10, 131:18, 134:16, 137:6, 143:19, 157:20, 158:3, 158:5, 159:11 cannot 45:19, 46:5,	142:5, 144:5 capabilities 104:11 capable 79:2 caption 106:20, 107:9, 108:10 careful 80:6, 92:16, 157:7 carefully 145:9, 146:5 cares 62:2, 62:3 carolina 3:18 carry 86:3, 130:17 cartoon 104:17, 130:16, 130:19, 130:22 cartoons 105:3 case 1:12, 13:15, 16:12, 26:7, 35:22, 76:1, 76:2, 76:10, 78:12, 84:8, 140:20, 164:2 cases 80:17, 91:4 causation 141:4 cause 2:4, 140:7 causes 99:16 causing 100:16, 154:2 cautious 138:15, 160:5 caveats 81:12, 88:9 cavitation 107:3 cavities 39:21, 40:8
---	--	---	--

ccr 2:6 centered 122:5, 122:8, 122:13 ceramic 30:21 certain 8:6, 10:9, 16:13, 21:14, 21:16, 28:2, 28:12, 44:4, 54:16, 79:21, 90:1, 97:17, 97:22, 120:2, 120:5, 120:12, 120:16, 130:20, 148:5, 150:8 certainly 134:16 certificate 4:10 certify 162:4, 162:9, 162:12, 162:17, 163:1 cetera 29:4, 89:21, 118:2 challenging 73:14 chamber 106:10, 106:12, 106:16, 106:19, 107:1, 107:21, 108:5, 108:8, 154:15, 154:18 chambers 154:11 change 37:7, 100:21, 120:10, 127:2, 139:19, 140:7, 140:12, 154:3 changed 7:11, 7:16, 12:12, 55:13 changes 120:11, 163:4	changing 139:18 characteristic 128:5 characteristics 122:19 charlotte 3:18 chemical 121:1 chemistry 66:3 choose 143:22 circles 131:15, 131:16 cite 71:1, 133:9 claim 9:8, 9:10, 9:15, 13:20, 38:15, 38:17, 38:22, 39:3, 39:14, 39:17, 40:4, 40:15, 42:21, 42:22, 44:15, 47:4, 48:9, 48:20, 49:10, 50:5, 51:7, 51:22, 52:1, 52:15, 52:20, 53:2, 53:21, 56:7, 56:10, 69:18, 69:19, 110:11, 110:19, 110:22, 111:1, 111:5, 128:15 claimed 37:22, 38:9, 38:12 claiming 96:7 claims 26:4, 26:11, 27:5, 38:1, 38:12, 39:10, 39:13, 41:17,	42:11, 90:16, 92:19, 94:2, 118:16, 119:2, 119:9, 128:12, 132:5 clarify 7:11, 28:16, 52:21, 55:20, 56:4, 70:17 clarity 19:6 classified 18:9 clear 86:18, 99:15, 101:6, 104:21, 105:19, 139:21 cleaving 107:5 client's 106:5 closer 94:20 coag 26:17 coagulate 25:11, 25:16 coagulated 26:1 coagulating 26:22, 36:21 coagulation 23:4, 23:6, 24:19, 25:2, 26:5, 26:12, 26:13, 26:17, 27:9, 152:18 coating 20:4, 20:8, 21:10, 65:18, 86:4, 151:8, 151:14, 152:17 coefficient 121:10, 121:13, 122:12, 122:16, 123:10, 124:1, 124:6, 124:8, 124:12, 124:19,	125:6, 125:15, 125:22, 126:7 coefficients 119:8 collide 153:19, 155:3 colliding 153:16, 154:2, 154:4 collision 108:5, 108:8 collisions 155:15 colloquially 38:13 column 32:20, 32:21, 58:6, 59:2, 59:13, 62:18, 65:16, 69:4, 69:10, 71:14, 124:18, 150:18, 151:1, 152:16 columns 83:11 com 3:4, 3:6, 3:15 combination 26:22, 68:5, 109:20, 119:12, 157:7, 158:6, 158:7 combinations 28:2 combine 109:6, 109:14, 113:6, 119:5, 157:14, 157:20 combining 157:17 come 85:9 comes 61:16, 64:14 commencing 162:16 commercially 58:15, 59:9,
---	--	---	--

61:15, 101:13 common 95:16 commonly 151:18, 155:20 compact 127:14 companies 98:20 comparable 100:8 comparative 69:21, 114:3 compare 110:13, 143:17, 144:2 compared 29:1, 121:13 comparison 143:10 complete 20:4, 21:10 completed 152:14 completely 20:8, 141:21, 150:10 complex 44:8, 51:18, 52:9, 54:15, 89:7, 91:1 complicated 14:22, 119:20 component 10:20, 55:6, 56:5, 57:2, 57:4 components 11:1, 34:19, 34:22, 35:1, 35:16, 35:18, 35:21 composition 67:8, 121:2 compound 27:12 comprise 12:10, 47:8, 49:21, 94:3,	94:4, 130:1, 150:2 comprised 12:10 comprises 45:15, 48:13, 89:4, 89:5, 90:7, 91:13 comprising 46:17, 46:20, 46:22, 48:2, 53:5 conceivable 28:6, 28:20, 37:9 conceive 36:12 concept 31:13, 56:2 conception 93:6 concerned 61:20 conclude 72:19 conclusion 152:22 conditions 120:15, 120:18 conducted 42:13 confidence 160:7 configuration 28:11, 28:13, 37:2, 137:9 confused 144:21 connected 81:18 consequences 141:2 consider 86:7, 107:13, 115:22, 144:16 considered 87:2, 121:8, 128:2, 128:4	considering 53:14, 74:21 consistent 156:13, 160:20 construction 9:8 contact 18:15, 19:2, 76:7, 77:5, 82:7, 82:8, 100:15, 130:5, 130:12, 156:22 contacting 78:4 contacts 75:9, 75:13, 75:18, 79:12 contain 55:11, 114:2 contained 86:4 containing 30:21, 72:12 contains 73:8, 76:5 contaminant 128:3 contamination 153:7 contend 118:6 content 71:7, 71:22, 73:8, 73:10, 74:1, 74:12, 74:16 contention 112:16, 115:2 context 16:13, 39:10, 39:13, 42:11, 43:13, 47:3, 47:6, 47:9, 47:18, 47:20, 48:9, 48:17, 51:7, 51:15, 52:1, 52:15, 52:19, 53:2,	53:21, 56:7, 56:9, 57:8, 57:10, 63:18, 64:4, 64:6, 64:18, 71:3, 90:16, 91:1, 92:18, 92:22, 94:1, 100:4, 104:7, 109:5, 127:1, 128:10 contexts 26:14 continue 46:1, 63:8 continues 76:22 contrast 21:7, 73:15, 85:6, 89:13, 138:9 contribute 30:2 contributed 30:1 control 119:15, 140:21, 141:3 controlling 121:14, 127:8, 127:12, 128:13 convenient 147:20, 151:17 conventionally 98:10 convert 41:22 copy 88:16, 88:21 correct 6:15, 8:2, 8:17, 8:18, 9:8, 9:16, 10:11, 11:11, 12:18, 16:18, 16:19, 17:9, 17:10, 17:15, 17:16, 17:21, 19:4, 19:13, 20:16,
---	--	---	--

Transcript of Dean R. Wheeler, Ph.D.
Conducted on January 30, 2026

48

20:17, 20:22, 21:3, 21:20, 21:21, 22:1, 22:2, 23:8, 24:5, 25:5, 27:6, 27:7, 28:18, 33:18, 34:7, 42:19, 43:1, 44:4, 51:3, 62:15, 65:14, 68:11, 69:3, 69:15, 74:13, 74:20, 75:1, 87:14, 87:17, 87:20, 90:13, 91:18, 109:7, 130:3, 143:22, 149:7, 149:13, 149:21, 149:22, 154:20 corrections 163:4 correspond 150:4 cosmx 1:6 could 7:6, 11:5, 12:4, 12:9, 12:11, 13:19, 18:14, 26:17, 27:3, 28:7, 28:20, 29:2, 34:17, 35:5, 36:16, 42:9, 43:6, 46:14, 52:13, 55:10, 64:4, 64:11, 66:4, 79:10, 80:7, 80:12, 80:17, 82:5, 82:14, 87:2, 93:22, 94:17, 98:20, 103:16, 103:22, 120:19, 123:4, 123:17, 125:10, 133:10, 134:8, 135:22,	145:14, 148:1, 150:3, 151:19 couldn't 29:20, 79:18 counsel 3:11, 3:20, 44:18, 85:16, 162:11 counsel's 102:22 counter 64:6 counterexample 79:14 couple 6:12, 63:4 course 34:16, 105:2 court 9:20 covered 7:10, 138:16 covering 36:15, 36:19 cox 3:14, 4:8, 11:4, 15:17, 17:22, 19:6, 19:19, 23:9, 23:13, 24:7, 25:6, 27:12, 27:18, 31:10, 32:7, 33:19, 35:7, 39:5, 41:9, 42:7, 43:2, 43:12, 44:18, 44:21, 45:2, 46:1, 47:16, 48:6, 49:17, 50:20, 51:4, 53:18, 55:9, 57:6, 57:13, 61:18, 65:2, 66:22, 67:16, 69:14, 71:16, 74:3, 74:18, 78:7, 78:19, 85:16,	86:21, 88:12, 92:15, 97:4, 97:13, 99:1, 101:22, 102:5, 102:19, 103:4, 105:18, 107:17, 110:9, 110:21, 111:12, 111:22, 117:15, 118:18, 118:20, 119:17, 120:8, 121:15, 122:14, 124:2, 124:7, 126:1, 126:8, 129:1, 129:4, 130:14, 131:14, 132:10, 134:14, 137:13, 137:22, 145:22, 147:11, 148:3, 148:8, 148:10, 148:13, 148:19, 149:10, 149:15, 153:1, 155:17, 160:15, 160:22, 161:3 cox@alston 3:15 crack 107:7 crc 1:25, 162:3, 162:25 create 27:10, 27:16, 28:3, 60:19, 78:16, 79:10, 92:7 created 80:22, 88:5 creates 28:5, 92:9 creating 28:8, 78:3 creation 150:17, 150:22 cross 82:12, 154:21 cross-section 83:3, 83:4,	94:15, 143:21 cross-sections 143:16 crossover 131:17 crr 1:25, 2:6, 162:3, 162:25 crush 104:20 crystal 103:1 csr 2:6 ctrl 111:18 custom 60:14 customers 104:11, 105:7, 107:10 customization 106:11 customize 106:9 customized 106:4 cutoff 18:12 D dangerous 128:3 dark 21:8 data 89:12 date 2:5, 164:3 day 162:22 days 6:13, 7:12, 7:15, 161:5 dean 1:19, 2:1, 4:6, 6:5, 162:5, 162:13, 163:10,
--	---	--	--

PLANET DEPOS
888.433.3767 | WWW.PLANETDEPOS.COM

164:4, 164:22 debra 1:25, 2:6, 162:3, 162:25 decide 73:18 declaration 8:5, 8:9, 9:3, 9:7, 9:13, 9:14, 12:13, 15:17, 15:20, 20:14, 22:13, 22:15, 22:16, 24:13, 29:10, 37:17, 44:16, 45:11, 50:8, 53:8, 55:2, 58:4, 62:7, 67:4, 67:20, 70:2, 71:1, 72:6, 75:6, 80:19, 87:8, 87:9, 88:2, 108:18, 111:16, 113:16, 118:9, 119:19, 120:20, 121:21, 122:2, 128:19, 129:10, 133:3, 133:21, 141:7, 142:9, 142:18, 145:18 declarations 8:2 decrease 120:7, 142:21 decreased 33:13, 34:22 define 10:8, 12:15, 13:2, 16:2, 16:3, 22:7, 40:9, 41:13, 44:11, 50:13, 53:10, 80:11, 80:13, 81:21, 90:14, 94:10, 110:11, 135:20, 136:12	defined 10:18, 11:22, 12:16, 17:7, 17:10, 23:7, 25:4, 32:6, 36:5, 40:12, 51:8, 51:11, 53:4, 56:15, 90:19, 91:2, 92:19, 92:21, 149:3 definer 92:3 defines 14:6, 16:5, 16:17, 16:21, 16:22, 17:4, 17:15, 22:4, 24:4, 33:4, 50:18, 51:2, 87:21, 104:5, 114:21, 114:22, 115:11 defining 32:15 definition 16:14, 18:12, 103:21, 104:16, 115:9, 116:4, 125:1, 125:3 definitions 105:9 definitive 31:12, 131:19 degree 95:21, 96:22, 132:18, 143:6 deliberately 28:10 delineated 18:18 delineating 107:14 denominator 53:13, 53:17 dep 164:3 depart 143:7	dependant 39:13 dependent 39:9, 97:10, 110:19 depending 80:13, 139:21, 140:1, 140:2 depends 126:20, 139:17 deponent 164:4 deposed 6:13 deposition 1:17, 2:1, 6:16, 7:10, 133:3, 154:13, 161:5, 162:6, 162:7, 162:11, 162:12, 163:2 depth 95:3 describe 15:2, 35:12, 41:15, 48:20, 49:11, 51:14, 51:19, 51:21, 52:8, 52:9, 60:18, 91:1, 113:20 described 66:6, 78:3, 98:21, 116:5, 127:11, 128:6 describes 24:19, 69:5, 95:11, 103:10, 116:22 describing 14:1, 34:8, 84:5, 105:2, 105:4 description 42:14, 80:1, 80:7, 145:10 desirable 126:17, 158:15,	160:9, 160:18 desired 101:1, 122:20, 127:4, 127:5, 159:3 details 35:9, 116:10 detect 47:22 deteriorated 33:15 determine 21:6, 27:20, 67:7, 68:2, 68:17, 72:3, 73:18, 99:12, 99:22, 134:16, 134:20, 140:15, 143:12, 143:13, 143:14, 144:5, 144:18, 145:4 determined 91:3, 145:10, 146:3 determining 13:9, 14:18, 22:11, 56:17, 56:19, 56:22, 57:20, 144:22 device 98:10, 98:12, 98:13, 99:11, 99:13, 99:16, 99:19, 99:21, 99:22, 100:3, 100:5, 100:15, 107:15, 112:18, 141:14, 141:15, 151:17, 153:14, 155:9 devices 98:20, 101:9, 104:12, 105:4, 105:8 diagram 130:16 diameter 41:3, 41:5,
--	--	---	--

41:6, 41:7, 41:14, 80:4, 80:14, 83:14, 83:15, 101:4, 156:7, 156:11 diameters 41:2, 80:16 dibble 1:25, 2:6, 162:3, 162:25 dictate 43:18 difference 64:2, 117:8 different 9:15, 16:11, 26:14, 27:9, 28:7, 30:19, 35:13, 35:20, 52:14, 63:17, 79:21, 82:18, 96:13, 96:15, 106:10, 106:12, 140:2, 142:10, 154:11, 157:17 difficult 13:6, 15:1, 21:6, 40:9, 40:13, 41:12, 51:20, 68:7, 79:15, 81:22, 82:20, 122:20, 139:1, 145:1 diffraction 146:4, 147:4, 147:6, 147:20 dig 149:1 diligent 127:10 dimensional 84:3 dioxide 135:7, 136:16, 136:22 direct 10:1, 141:4 direction 83:15, 83:16,	84:9, 84:10, 84:12 directions 84:1, 84:15, 85:5 directly 140:21 dirt 148:21, 149:1, 149:4, 149:7 disbursing 63:17, 64:1, 64:3, 141:9 disclose 119:8, 141:11 disclosed 58:19, 70:9, 134:5 discloses 75:19, 109:9, 111:10, 129:16 disclosure 67:21, 68:6 disclosures 110:10 discovered 127:12 discuss 85:20, 85:22, 89:1, 120:20 discussed 89:6, 94:9, 111:6, 153:3, 158:11 discusses 40:16 discussing 119:20, 158:8, 159:16 discussion 68:20, 104:16, 150:15, 150:20, 151:2, 151:3 dispensing 98:10 disperse 153:14 dispersed 72:10, 98:9,	147:19 disperses 141:11 dispersing 64:17, 98:12, 99:13, 100:3 dispersion 64:22, 65:21, 86:4, 86:12, 98:9, 99:17, 103:9, 103:10, 103:13, 103:14, 103:21, 104:2, 104:5, 104:16, 104:17, 107:2, 108:11, 112:17, 141:14, 141:20, 141:22, 142:6 dispute 10:6, 57:22 disrupt 109:17, 109:18 dissolved 147:19 distance 85:4 distances 84:7, 85:3 distinct 55:22, 56:1, 81:19, 87:19 distinction 141:16 distinguish 19:14, 20:1, 43:3 distributing 103:16 distribution 59:13, 60:2, 60:19, 61:1, 61:17, 62:12, 66:8, 79:19, 95:12, 95:16, 95:17, 96:8, 101:2, 116:13, 117:1, 117:3, 117:4, 117:21,	118:1, 119:8, 119:12, 120:2, 121:3, 121:10, 121:13, 121:18, 122:12, 122:16, 123:7, 123:10, 123:20, 124:1, 124:5, 124:6, 124:9, 124:11, 124:19, 125:5, 125:7, 125:14, 125:22, 126:5, 126:7, 127:9, 127:13, 128:12, 128:13, 146:3, 146:22, 147:2, 147:21, 151:13, 152:12, 152:19, 152:22 distributions 59:21, 60:7, 60:10, 60:15 distributors 95:16 district 9:19 divided 83:18, 115:17 document 23:21, 26:10, 30:17, 38:5, 58:11, 58:22, 65:5, 67:18, 70:14, 77:19, 105:15, 105:16, 107:14, 108:14, 112:12, 123:13, 133:8, 144:9, 146:18 doing 14:18, 15:11, 51:21, 56:20, 87:5, 105:6, 131:19, 141:18, 143:21 done 51:21, 60:16, 64:8, 66:19,
---	--	--	---

97:14, 107:11, 107:15, 117:16, 129:19, 141:21 down 50:10, 155:1, 155:4 downtown 2:9, 162:14 dr 6:12, 30:4, 30:19, 31:8, 70:12, 71:4, 141:17, 148:20 drafted 49:10 drastically 33:15 draw 8:3, 142:13 drawn 131:13, 131:15, 131:17 drew 90:10 drying 85:13, 85:15, 85:20, 86:3, 86:12, 86:19, 152:18 due 138:9 dug 148:20 duly 2:3, 6:6, 162:6 durability 126:17, 127:5, 127:8, 127:18, 128:14 dv 41:1, 58:3	140:2, 144:3, 154:1, 154:21 earlier 25:8, 72:7, 148:4, 150:16, 150:21, 153:3 easier 55:1, 63:14, 89:1 easily 54:17, 54:20, 80:8, 109:10 easy 22:20, 120:12 edge 14:15 edges 14:14, 15:12, 159:8 educate 105:7 educating 104:10 effect 12:7, 13:1, 13:4, 13:11, 13:13, 14:10, 22:9, 22:10, 22:11, 90:22, 91:19, 91:22, 92:5, 92:12, 93:20, 150:13, 151:12, 152:2, 157:1 effective 41:5, 82:19, 107:5, 152:21 effectively 52:12, 54:6, 54:12 efficient 36:16 effort 64:11, 64:15, 66:10 either 31:12, 52:6, 140:20	electrode 65:12 electrolyte 65:13 electron 84:4 else 11:19, 47:4, 94:21, 104:7, 120:11 elsewhere 61:3 embodiments 100:6, 114:1, 141:17, 147:15 emphasis 26:21 empirically 140:15 empty 129:13 emulsification 108:12 emulsify 153:14 enable 79:21 enables 157:8 encapsulate 13:21, 131:21 encapsulated 20:3, 21:3, 21:5, 21:15, 22:1, 49:3, 56:16, 57:19, 129:18, 131:4, 132:3, 132:8, 133:7, 133:14, 133:18, 134:10, 134:13, 134:17, 134:21, 136:21, 137:1, 137:4, 138:20, 159:5, 159:12, 159:21, 160:4, 160:11 encapsulating 32:14	encapsulation 159:14, 160:8, 160:18 enclosed 132:18 encompass 11:6 end 3:16, 31:1, 31:3, 31:5, 39:1, 63:9, 104:17, 118:8, 133:13, 152:14, 152:18 energetic 100:16, 155:12, 155:15 english 14:3, 51:20, 52:10 enlargement 68:18 enough 70:8, 113:2 ensure 127:14 entire 52:15, 61:10, 80:8, 95:15, 105:15, 105:16 entirety 27:1, 76:2, 76:9, 89:17, 94:9, 94:16, 125:12 entropy 66:11 environment 147:21 envision 40:13 equal 83:18, 124:19 equipment 152:11 errata 164:1 error 97:19
E			
each 78:4, 80:4, 80:9, 80:18, 83:16, 84:15, 100:15, 109:20,			

especially 79:19 esquire 3:3, 3:5, 3:14 essentially 76:4, 95:4 established 47:5 et 29:4, 89:21, 118:2 etc 107:6 evaporate 37:2 even 21:13, 36:3, 37:4, 68:7, 72:15, 127:16, 149:20, 150:10 eventual 115:4 ever 108:16, 148:20 every 33:22, 48:16, 49:2, 78:9, 78:10, 79:1, 79:2, 89:8, 89:15, 89:16, 94:13, 105:22, 132:12, 132:13, 132:14, 133:6, 134:9, 134:13 everyone 125:2 everything 47:4, 66:18, 90:2, 103:22, 104:7, 109:17, 109:19, 134:20 everything's 125:16 evidence 19:1, 20:9, 76:3, 154:7, 158:21 exact 13:7, 29:20,	59:16, 105:9 exactly 145:7 examination 4:6, 6:9, 148:17 example 7:5, 18:5, 37:5, 41:1, 58:20, 60:20, 60:21, 64:22, 65:4, 65:15, 66:7, 68:10, 69:3, 69:7, 71:2, 73:21, 90:18, 91:7, 94:7, 112:13, 114:3, 114:20, 117:11, 150:16, 150:17, 150:22, 151:1 examples 58:15, 64:6, 69:8, 69:11, 69:13, 69:21, 70:11, 70:21, 71:5, 72:1, 93:11, 93:13, 114:3, 121:7, 142:4 excellent 126:16, 127:7, 127:17, 128:14 exception 137:8 exchanging 29:4 exclude 73:22, 86:17, 86:20 excludes 74:10 excluding 73:19 exclusive 14:12 exclusively 11:17, 11:18,	12:5, 18:2, 18:21, 28:4 excuse 19:18 exfoliation 107:2 exhibit 5:3, 5:4, 5:5, 5:6, 5:7, 5:8, 5:9, 5:10, 5:11, 5:12, 5:13, 8:20, 8:22, 9:4, 9:14, 19:7, 19:9, 20:13, 22:17, 32:20, 38:19, 40:3, 58:6, 70:4, 71:14, 75:6, 76:13, 88:11, 102:4, 102:11, 102:20, 105:10, 105:19, 105:22, 111:21, 111:22, 114:5, 114:22, 116:20, 117:12, 126:11, 126:12, 129:8, 135:2, 139:12, 145:21, 150:18, 153:2, 153:22, 154:10, 155:18 exhibits 5:1, 8:7, 8:13, 129:5 expand 57:11 expect 64:16, 94:13, 159:2 expected 89:15 expensive 60:14 experiment 36:10, 97:15, 140:14 experimentally 120:15	experiments 97:16, 147:15 explain 13:12, 142:22, 143:3 explained 140:9 explaining 22:22, 24:2, 24:13, 56:2, 93:9 explanation 57:11 explicit 55:5, 68:6 exposed 20:7 express 111:6 expressed 9:18, 9:20, 113:5 expresses 86:18 extend 48:15, 130:6, 130:12, 131:12, 160:10 extends 21:19, 22:4, 47:13, 50:17, 53:15, 90:12, 91:17 extreme 76:6, 93:14 extremely 43:7, 155:14 F fabrication 36:20 fact 94:17, 128:2 factor 13:9, 14:5, 25:7, 27:2, 30:1, 31:16, 31:18, 54:18,
--	--	--	--

56:22, 113:7, 121:16 factors 15:8, 15:14, 27:19, 32:9, 37:12, 120:9, 120:21, 121:7, 121:9, 121:12, 157:7 faculties 7:6 fair 48:12, 57:1, 93:21, 94:1, 125:13, 131:9, 149:6 fairly 53:19, 66:1, 109:11, 119:18 fapr 1:25 far 99:15, 104:9, 131:5, 143:20 farther 95:18 fashion 47:12 favorable 37:2 favours 66:12 february 162:22 fellow 2:7 few 50:10, 52:10, 148:12 field 82:17, 95:3 figure 18:20, 19:4, 20:15, 68:15, 80:15, 80:22, 81:5, 81:9, 83:2, 88:5, 88:17, 88:19,	130:8, 131:6, 131:10, 131:12, 132:7, 132:11, 132:21, 135:13, 135:14, 137:11, 137:19, 144:5, 144:7, 144:12, 158:8, 158:12, 158:19, 159:1, 159:4, 159:7, 159:16, 159:17, 159:18 figures 18:16, 19:12, 20:9, 69:5, 103:9, 160:20 file 20:18 filler 11:2, 11:9, 27:11, 70:8, 71:7, 71:22, 72:8, 72:10, 72:12, 72:19, 72:22, 73:8, 73:10, 74:1, 74:12, 74:16, 75:9, 75:15, 76:12, 95:19, 98:8, 101:12, 113:20, 113:22, 114:2, 114:4, 114:9, 114:11, 114:13, 114:14, 115:1, 116:13, 117:1, 120:22, 135:8, 135:11, 135:15, 137:10, 137:20, 138:5, 141:12, 156:19, 158:12, 158:15, 159:4, 159:20, 159:22 filler-type 36:4 filling 159:10 film 24:21, 26:15,	27:10, 30:6, 33:9, 33:10, 33:12, 34:9, 36:2, 36:15, 37:8, 62:1, 69:7, 76:20, 80:4, 80:9, 110:22, 126:18, 127:16 final 25:22, 28:11, 121:5 find 14:16, 62:1, 64:5, 71:11, 93:11, 111:16, 120:15, 148:5 fine 129:8, 153:6 finish 49:7, 93:3 finished 97:11, 98:4, 115:6 first 8:19, 9:3, 9:7, 10:12, 36:9, 38:8, 63:16, 65:17, 65:19, 67:4, 67:19, 68:18, 70:2, 70:22, 72:5, 73:21, 75:5, 85:14, 89:6, 105:14, 130:16, 133:21, 139:22, 148:12, 151:7, 153:5, 153:9 fit 110:5, 110:7, 112:11, 113:2, 115:6, 116:6, 116:9 fits 114:14, 117:13 five 42:10 five-minute 19:20, 44:19,	101:20, 128:21 fix 103:1 fluid 155:8 fluoride 59:7 following 97:17 follows 6:7 force 107:7 form 11:4, 17:22, 19:12, 23:9, 24:7, 24:20, 25:6, 25:22, 26:15, 27:12, 27:18, 28:21, 29:19, 31:10, 32:7, 33:19, 35:7, 39:5, 41:9, 42:7, 43:2, 43:12, 47:16, 48:4, 48:6, 49:3, 49:17, 50:20, 51:4, 53:18, 55:9, 57:6, 57:13, 61:18, 65:2, 67:16, 69:14, 74:3, 74:18, 78:7, 78:19, 86:21, 92:15, 97:4, 97:13, 99:1, 107:17, 110:9, 110:21, 111:12, 117:15, 118:18, 119:17, 120:8, 121:15, 122:14, 124:2, 124:7, 126:1, 126:8, 130:14, 131:14, 132:10, 134:14, 137:13, 137:22, 147:11, 148:3,
--	---	--	---

149:9, 152:15, 155:5, 160:12 formation 67:21 formed 10:13, 10:17, 11:16, 17:20, 18:9, 24:3, 24:14, 25:3, 25:10, 25:19, 26:2, 27:3, 27:11, 27:16, 27:21, 28:5, 28:17, 29:6, 29:14, 29:15, 29:19, 29:21, 30:3, 30:7, 31:9, 31:16, 32:2, 32:17, 37:3, 37:14, 39:20, 40:1, 40:5, 40:19, 47:6, 50:4, 67:15, 68:3, 68:8, 75:9, 75:12, 75:17, 77:4, 79:11, 90:17, 92:2, 119:10, 129:16, 150:6, 156:17, 156:19, 157:4, 157:5, 157:11 forming 25:9, 27:22, 28:14, 48:7, 78:5, 121:5 forms 36:14 formulations 120:14 forth 162:6 found 85:3, 96:18 foundation 74:4, 74:19, 137:14, 155:6 four 102:15	fourth 62:9 fraction 29:1, 37:4, 37:13, 53:11, 75:20 fracture 100:16 frankly 119:13, 138:13 friday 1:21, 162:15 fulfilling 49:20 full 7:4, 117:3 fully 20:1, 21:4, 21:6, 21:14, 26:1, 132:8, 133:7, 134:10, 159:5, 159:12, 159:20, 159:21, 160:3, 160:4 functional 109:20 functions 106:13 fundamentally 157:16 further 94:19, 138:14, 147:1, 161:1, 162:9, 162:12, 162:17 G gap 16:9, 82:9 gaps 75:8, 75:11, 75:14, 75:17, 76:11, 77:4, 78:5, 82:14, 159:11 gave 8:6, 160:5 general 11:5, 54:21,	59:19, 71:3, 98:18, 100:13, 101:7, 102:20, 122:15, 124:4, 126:20, 140:6, 143:4 generalize 64:19 generally 6:16, 31:2, 86:12, 124:13, 124:14, 127:3 generate 30:10, 31:4 geometric 82:2, 92:13, 92:17 geometries 36:5 geometry 10:18, 12:15, 14:11, 17:1, 17:7, 17:15, 22:5, 22:7, 22:11, 24:4, 44:9, 90:15, 90:22, 91:20, 119:21, 150:8 georgia 3:9 getting 17:8 gido 31:8, 70:12, 141:17 gido's 30:4, 30:19, 71:4 give 7:3, 26:8, 29:20, 38:3, 41:2, 41:20, 45:14, 57:10, 58:21, 67:17, 76:22, 77:13, 79:14, 108:20, 115:18, 117:5, 123:11, 147:5	given 10:4, 72:14, 81:13, 85:1, 88:10, 112:14, 116:8, 162:8, 163:4 gives 40:4, 71:6, 71:22, 72:14, 114:8, 117:2, 117:6, 117:8, 122:16 giving 39:10, 81:22, 95:14, 106:20, 112:15 glass 66:2 go 6:19, 7:9, 9:6, 10:7, 20:12, 22:12, 28:3, 32:19, 37:20, 44:16, 45:10, 49:8, 50:7, 53:7, 62:6, 62:17, 65:3, 67:4, 69:4, 70:2, 75:5, 76:13, 80:19, 83:10, 87:8, 95:8, 101:10, 102:13, 106:14, 108:3, 108:18, 112:2, 118:9, 118:11, 121:20, 122:4, 126:11, 126:14, 133:21, 135:4, 139:11, 141:6, 142:17, 145:17, 146:7, 148:15, 154:17 goal 66:17 goes 94:8 going 21:12, 26:18,
---	--	--	--

29:3, 39:7, 44:10, 44:21, 54:17, 57:14, 63:6, 65:6, 80:2, 82:12, 99:12, 101:19, 109:14, 113:10, 134:1, 138:14, 155:7, 155:12, 155:18, 157:22, 158:1 good 7:2, 44:19, 45:4, 66:21 greater 30:1, 30:22, 42:5, 42:19, 54:21, 54:22, 91:19, 91:22, 92:12, 127:4 grinding 100:11, 100:12, 100:13, 100:18, 100:20, 101:1 ground 118:13, 118:14 guarantee 28:17, 66:7, 80:17, 140:14 guess 13:12, 17:8, 44:18, 88:3, 115:21, 138:17 guidance 135:22 guys 113:9, 148:13	83:6, 159:14 happens 120:16, 145:15 hard 18:12, 53:20, 89:16, 104:14, 128:9, 138:7, 139:9, 159:6 harmful 128:4 hayes 3:2 head 61:7 heading 153:6, 156:1, 156:5 heavy 26:20 hello 6:12 help 15:10, 82:22, 124:21, 136:18 helped 48:20 helps 32:11, 83:11 here 7:18, 20:20, 36:11, 50:1, 66:21, 73:7, 75:12, 81:17, 104:9, 105:9, 106:1, 109:1, 127:21, 130:9 here's 107:11, 140:10 hereby 162:4, 163:1 hereinbefore 162:6 hereunto 162:21 hidden 78:8 high 31:13, 42:4,	95:2, 112:17, 112:18, 127:21, 132:18, 141:14, 142:5, 152:6, 155:14 higher 20:18, 37:13, 71:8, 143:6, 143:7, 155:9, 155:10 highly 87:3 history 20:18 hold 37:18, 88:13, 121:22, 156:21 holding 132:20 hole 148:20, 149:1, 149:2, 149:4, 149:6, 149:17, 149:18, 150:11 homogenization 156:4, 156:6, 156:10 homogenizer 98:11, 98:17, 98:18, 98:19, 98:22, 99:3, 99:7, 99:20 homogenizers 98:21 homogenizing 155:21 homogenous 64:9, 64:13, 99:4 honda 109:6, 109:9, 109:15, 109:18, 110:5, 110:13, 111:10, 111:17, 111:18, 111:20, 111:21, 112:4, 113:4, 113:6, 113:14, 113:19,	113:20, 113:22, 114:1, 114:4, 114:5, 115:7, 115:8, 116:12, 116:19, 117:14, 157:15 honda's 109:3, 109:16, 157:4, 157:5, 158:2 honeycomb 109:10, 157:6, 157:9 hope 140:13 hour 101:20 hours 45:3 however 13:7, 28:8, 31:18, 87:3, 118:4, 131:18 hybrid 159:10 hypothetical 36:10, 37:5, 94:18 hypothetically 43:5
I			
half 110:18 hand 162:22 happen 26:18, 54:17, 99:12, 100:1, 122:17, 122:18 happening 15:12, 25:15,			idea 14:4, 104:22 identified 21:18, 59:5, 109:10 identify 20:21, 159:7 illustrate 88:7, 89:9, 89:13, 93:6, 93:16, 107:10 illustrated 94:5 illustrates 69:17, 154:22 illustration 81:10, 89:8,

90:18, 93:5, 93:7, 102:14, 102:18 image 15:10, 20:19, 21:6, 21:13, 32:11, 48:18, 49:12, 56:12, 68:6, 68:14, 69:16, 82:3, 82:12, 84:3, 84:6, 84:13, 84:20, 85:2, 94:22, 95:2, 105:13, 106:21, 130:18, 138:9, 154:14 images 18:22, 67:22, 68:11, 68:15, 69:1, 69:2, 69:6, 83:17, 106:1, 154:11 imaging 67:6, 67:7, 67:13, 69:12 imitate 123:5, 123:18, 125:10, 125:20, 125:21, 126:4, 126:6 impact 83:7, 152:4, 154:2 impacts 155:13 imperfect 14:1, 51:13, 52:7 implement 66:3, 151:19 implication 40:17 implied 84:13 implies 40:19, 42:18, 152:21, 153:22	important 12:7, 13:1, 13:4, 13:8, 19:14, 19:22, 54:10, 61:21, 89:9 imprecise 55:19 improve 100:20 incidental 156:20 include 11:9, 16:4, 16:17, 17:12, 17:16, 50:12, 58:19, 67:6, 103:22, 106:11, 127:21 included 11:6, 11:13, 35:6, 64:22 including 34:16, 68:3, 73:20, 147:14, 157:8 incompatible 141:9 incorporated 135:18, 136:15 incorrect 140:22 increase 34:19, 96:1, 97:1, 120:6 incurs 29:22 indent 92:7, 92:9 independent 68:14 index 4:1 indicate 25:9, 31:22, 38:14, 51:17, 147:13 indicated 25:8, 148:4,	155:7 indicates 14:17 indicating 31:16 indication 152:6, 152:8 indicative 54:6, 54:18 indicator 14:12, 14:13 indicators 14:20 individual 42:9, 43:4, 143:10 information 13:22, 21:9, 77:1, 117:4, 145:3, 145:6, 154:6 inherently 26:22 initial 112:14 injected 107:3 innately 44:4 inorganic 11:10, 11:13, 12:10, 15:5, 18:5, 18:14, 19:1, 19:3, 25:14, 29:1, 33:5, 33:9, 33:22, 34:5, 34:10, 34:12, 36:3, 37:8, 40:10, 40:20, 41:2, 41:4, 41:11, 45:16, 45:18, 46:5, 46:10, 46:12, 46:15, 46:19, 47:8, 48:13, 48:14, 49:22, 51:10, 55:5,	55:7, 55:11, 55:16, 55:22, 56:5, 57:3, 58:19, 59:6, 59:19, 61:16, 62:19, 62:22, 63:19, 76:5, 87:12, 87:15, 89:5, 90:8, 91:13, 94:4, 109:2, 114:2, 120:22, 130:1, 130:5, 151:5, 152:20 inside 56:13, 58:1, 110:2 insofar 40:16, 129:17 instance 2:2, 28:22, 36:12, 49:18, 55:21, 64:20, 82:2, 96:13, 108:10, 132:1, 147:18, 157:21 instances 48:8 instead 12:22, 27:17, 93:19, 95:2, 100:9, 120:13 instructions 152:13 instrument 118:2, 147:16 intended 32:17, 101:4, 101:7, 130:19 intention 73:13, 90:9 interactions 119:21 interested 162:19 interesting 139:4 interface 14:16, 75:21
--	---	---	---

interior 55:11	irregularity 139:9	54:19, 55:21, 64:11, 66:15, 67:14, 74:5, 76:7, 82:7, 89:16, 94:19, 98:2, 98:17, 99:21, 100:2, 101:16, 104:18, 112:21, 131:20, 134:20, 144:16, 145:8	65:4, 65:15, 69:18, 69:20, 99:14, 140:4
interpret 47:3, 47:17, 49:14, 52:20, 69:21, 73:15, 80:7, 84:2, 99:16, 99:18, 100:5, 103:14, 104:10, 107:9, 109:13, 131:6, 138:7, 139:10	isotopic 84:21	known 98:10	large 78:17, 79:15, 80:8, 80:13, 93:20
interpretation 56:11, 159:18, 160:2	itself 10:18, 30:11, 31:4, 87:16, 121:14, 134:19		larger 110:1, 143:11, 158:4
interpreted 48:1, 69:19	J	L	largest 12:6, 12:22, 13:3, 13:9, 13:11, 13:13
interruption 19:17	james 3:3, 3:4	l1 83:14, 83:19	laser 146:3, 147:4, 147:5, 147:20
intersect 154:20	january 1:21, 6:3, 162:15, 164:3	l1+l2 83:18	last 7:12, 123:16
interstitial 16:4, 16:6, 16:8, 16:10, 39:20, 40:7, 41:11, 46:12, 157:2	jet 153:14	l2 83:16, 83:19	later 103:2, 129:6
intrudes 51:5	job 1:26, 36:17	label 93:21	lay 82:6, 82:11, 84:6, 85:1
intruding 50:3	judge 68:7	labeled 90:12, 136:2, 136:8, 158:22	layer 10:20, 11:2, 11:7, 14:8, 28:12, 30:22, 34:17, 54:7, 54:11, 62:4, 67:21, 68:1, 72:10, 72:11, 72:17, 72:18, 73:7, 74:11, 75:17, 76:5, 76:17, 77:2, 83:6, 94:19, 95:22, 96:2, 96:12, 96:14, 97:2, 97:12, 115:6, 134:5
invalidates 90:2	judgment 21:7, 21:8, 76:6, 131:9	labelled 81:1	layers 13:17, 36:18, 115:4
invention 61:22, 127:19	judgments 89:20, 131:7	laboratory 151:17, 152:11	lead 27:3, 29:5, 96:19, 119:21, 150:13, 155:16
inventors 127:12	K	labs 66:3	
involves 62:11	keep 22:14, 22:21, 33:16, 63:6	lack 138:9, 155:5	
ion 96:4	kept 11:5	lacks 74:3, 74:18, 137:13	
ions 54:6, 54:12, 54:14, 54:20, 55:1	key 29:8	language 13:20, 14:3, 34:3, 38:15, 38:17, 42:21, 47:4, 48:9, 48:20, 49:10, 49:12, 50:5, 51:8, 51:13, 52:1, 52:15, 52:20, 53:2, 53:21, 65:3,	
ipr 1:12, 30:19	kind 25:21, 36:22, 66:3, 82:19, 92:6, 93:3, 114:2, 121:5, 136:5, 152:2		
irregular 40:11, 44:9	knob 140:10		
	know 6:16, 14:9, 32:4, 32:10, 32:16, 36:8, 43:5, 45:12,		

leading 149:8, 149:11 leads 132:7 least 35:15, 40:12, 41:4, 45:15, 47:8, 49:21, 54:12, 89:4, 90:7, 91:8, 91:12, 94:3, 109:2, 130:1, 131:11 leave 60:5 led 98:1 lee 3:2 left 37:3, 81:6 left-hand 71:14 length 80:9, 80:13, 155:1 lengthy 119:18 less 37:9, 42:19, 75:10, 77:8, 78:15, 80:5, 80:10, 80:18 let's 39:14, 43:4, 44:15, 53:7, 56:9, 58:5, 59:17, 67:4, 73:5, 73:21, 75:5, 83:10, 90:4, 91:10, 108:18, 110:16, 128:17, 145:20, 148:15, 153:21 level 67:8, 160:7 levers 120:5	light 21:8, 69:19, 138:7 likely 31:14, 32:1, 37:10, 37:14, 59:22, 75:10, 116:9, 134:17, 152:1 likes 36:13, 121:2 limit 14:6, 17:11, 42:22, 86:9 limitation 47:7, 47:10 limitations 47:18, 110:11, 111:5 limited 1:9, 162:10 limits 16:5, 16:17, 16:21, 17:5, 50:13, 50:19 line 35:15, 38:8, 58:7, 59:13, 62:10, 62:18, 63:7, 104:14, 131:17 lines 32:20, 32:21, 35:3, 35:14, 35:18, 50:10, 58:7, 62:18 liquid 64:15, 65:20, 86:4, 100:19, 107:4, 147:19 list 106:22, 107:20, 107:22 listed 59:13 lists 35:16, 106:18 literally 64:11	lithium 128:1, 128:3, 128:8, 128:10 lithium-ion 33:14, 127:1, 127:3 little 59:17, 73:14, 80:2, 92:7, 104:13, 104:18, 127:16, 128:6, 132:15, 138:14, 140:4 ln 164:5 locally 107:8 located 56:17, 57:21 location 82:12, 96:17, 159:1 long 12:6, 30:15 longitudinal 83:16, 83:22, 84:10, 84:14 look 13:22, 15:3, 15:8, 15:13, 18:22, 25:9, 27:20, 32:9, 32:13, 35:8, 37:13, 38:19, 38:22, 39:14, 42:12, 43:14, 51:15, 52:13, 52:14, 58:5, 58:6, 61:4, 65:4, 69:20, 73:5, 76:2, 76:9, 81:11, 82:3, 88:1, 88:16, 89:3, 89:17, 89:18, 90:4, 91:10, 94:9, 94:11, 95:9, 96:13,	98:6, 103:8, 105:3, 114:5, 124:17, 128:18, 130:8, 133:20, 135:21, 136:1, 142:14, 143:20, 146:5, 147:14, 154:14, 159:15 looked 154:12, 160:5 looking 30:16, 48:21, 56:12, 83:5, 112:13, 131:11, 138:6, 142:2, 144:4, 154:16, 157:11, 159:9 looks 81:1, 88:19, 157:9 loosen 103:10, 104:19 loss 127:17, 128:7 lot 15:13, 60:1, 120:1, 139:8, 159:8, 159:13 loud 146:16, 153:12 low 29:14 lower 33:11, 72:16, 133:13 M mach 153:17 machine 106:9, 108:16, 156:14 made 11:20, 12:21, 17:21, 18:2, 18:4, 18:8, 19:2, 32:12, 32:13, 35:17,
---	---	---	---

36:3, 37:8, 37:22, 38:9, 39:18, 46:15, 48:18, 49:11, 49:13, 51:15, 51:22, 60:3, 79:22, 88:17, 109:12, 116:8, 129:14, 132:17 magically 157:20 magnetic 151:19 main 96:10, 142:3 make 21:7, 21:8, 30:9, 39:3, 42:14, 44:10, 44:12, 46:14, 46:16, 49:9, 61:5, 64:7, 66:9, 66:17, 74:6, 74:9, 76:6, 79:15, 81:5, 84:11, 89:19, 96:16, 104:8, 122:17, 122:18, 131:6, 131:9, 140:22, 143:22, 144:1, 146:6, 147:16, 147:17, 157:19, 158:7 makes 18:15, 39:17, 68:7 making 22:20, 30:2, 31:12, 40:1, 54:15, 60:22, 62:4, 104:13, 112:20, 157:1 manipulate 28:12 manipulated 97:22 manipulating 28:1	manner 25:12, 44:1, 49:13 manufacturing 62:11, 62:13, 65:1 many 13:18, 25:8, 27:19, 49:2, 64:5, 120:21, 148:22 marriage 162:18 mass 70:13, 71:8, 72:1, 72:13, 72:15, 72:16, 73:16 match 136:10 material 14:14, 14:22, 15:10, 16:15, 17:17, 35:10, 44:6, 51:10, 54:15, 76:7, 84:21, 107:4, 118:8, 119:14, 130:18, 139:6, 139:9, 145:2, 145:13, 151:12, 152:3, 159:2, 159:3, 159:20 material's 156:8, 156:12 materials 11:6, 14:7, 15:7, 16:9, 25:13, 28:3, 34:17, 34:18, 58:14, 89:12, 105:12, 106:5, 106:13, 107:7, 119:22, 121:6, 136:4, 153:15 math 34:11 matrix 136:15	matter 84:16, 84:19, 84:20, 162:20 max 110:18 maximum 83:14, 83:15, 112:21 maybe 73:4 mean 13:13, 22:16, 23:10, 23:12, 26:13, 35:3, 55:20, 57:8, 76:4, 80:8, 83:22, 87:4, 91:22, 98:15, 99:15, 99:16, 99:18, 100:5, 101:6, 104:10, 104:19, 111:17, 115:10, 115:12, 123:9, 123:22, 124:6, 125:8, 131:8, 135:17, 135:19, 135:20, 135:22, 136:6, 136:12, 136:20, 137:5, 137:15, 138:19, 138:20, 139:22, 140:5, 143:5, 143:6, 143:7, 151:16 meaning 9:10, 9:22, 10:5, 10:7, 10:9, 10:17, 14:14, 16:8, 16:13, 25:4, 50:11, 53:20, 99:3, 105:13, 115:12, 120:10, 138:14, 138:19, 151:15 meanings 116:2 means 2:9, 16:3,	17:17, 24:4, 24:14, 33:17, 42:4, 45:16, 46:4, 47:10, 48:14, 75:3, 75:20, 92:22, 100:13, 136:19, 137:3, 150:2, 153:19, 155:9 meant 39:11, 83:3, 87:1, 88:7, 89:8, 89:9, 89:12, 93:5, 93:8, 100:9, 110:12, 124:3, 124:4, 125:12, 125:13 measure 40:13, 40:20, 41:3, 47:21, 80:16, 82:14, 82:17, 82:20, 83:8, 84:7, 85:4, 143:19 measured 40:18, 83:17, 147:4 measurement 40:22, 42:13, 42:15, 43:15, 43:22, 44:1, 44:10, 55:22, 56:1, 82:10, 115:22, 144:1, 147:17 measurements 44:12, 60:4 measures 43:17 measuring 53:17, 82:1, 82:18, 85:3, 118:1, 146:21 mechanical 126:16, 127:4, 127:7, 127:17, 128:14
--	--	---	---

Transcript of Dean R. Wheeler, Ph.D.
Conducted on January 30, 2026

60

medication 7:5 medium 86:4, 86:12, 98:9, 98:11, 99:13 meeting 91:5, 132:4 megapascals 153:17, 154:5, 155:3 membrane 147:3 memory 7:6, 70:11 mental 7:6 mention 26:19, 65:19, 83:2, 86:22 met 6:12 meters 80:9 method 36:20, 61:2, 80:16, 82:1, 82:3, 82:22, 85:7, 85:13, 85:15, 85:20, 86:6, 86:13, 87:4, 101:1, 121:5, 122:6, 122:9, 122:13, 141:20, 141:22, 147:4 methods 80:17, 82:16, 86:8, 142:4, 142:10 mica 107:6 micrometers 77:21, 77:22, 111:8, 114:12 micron 43:11, 77:12, 78:15, 80:5,	110:19, 112:5, 112:6, 116:15, 125:16 microns 41:22, 42:4, 42:6, 42:10, 77:8, 78:4, 78:17, 79:11, 80:10, 80:18, 111:7, 111:11, 112:11, 116:7, 116:15, 125:16, 139:15, 139:16 microporous 159:22 microscope 84:4 might 13:22, 60:3, 94:20, 94:21, 95:5, 107:11, 148:4, 157:19 milling 153:14 million 43:6 mind 32:9, 98:19, 142:12 minerals 107:6 minimal 70:7, 70:20, 153:6 minimum 29:18, 36:17 minor 22:9, 157:19 minus 73:1, 116:14, 117:7, 117:12, 117:13 minute 37:18, 38:3, 58:21, 67:17, 123:11 minutes 148:12	mix 62:22, 63:11, 64:12, 66:4, 66:12, 66:14, 151:16 mixed 59:6, 62:19, 63:20, 65:16, 66:13, 136:3, 136:21, 151:5, 151:22 mixing 63:16, 64:3, 64:6, 64:14, 141:9, 151:11, 152:7, 152:17 mixture 99:4, 140:12 mm-hmm 38:21, 63:21, 87:10, 100:8, 100:9, 108:4, 108:6, 118:15, 122:3, 136:17 mobile 25:13, 36:21 moderate 96:4 modification 100:18, 108:12 modifications 157:19 modify 101:8 moment 26:8, 71:11, 77:13 momentarily 144:21 money 60:1, 60:17 montmorillonite 107:6 more 16:13, 24:10, 30:5, 30:9, 30:22, 31:8, 31:14, 36:3,	37:14, 38:13, 49:7, 59:17, 63:4, 64:15, 64:16, 68:7, 71:2, 71:8, 73:14, 85:20, 93:14, 99:4, 99:9, 103:14, 116:10, 134:17, 138:15, 141:3, 142:2, 144:17, 145:5, 146:5, 152:4, 160:5 most 12:7, 13:1, 13:3, 13:8, 22:10, 37:1, 46:13, 59:22, 80:17, 84:11, 136:16, 136:22, 147:17 mostly 56:16, 57:19 motivated 109:6, 145:7 motivation 96:10, 96:18, 119:5 motor 98:11, 98:14, 98:16 move 25:14, 44:15, 54:14, 54:20, 55:1, 58:2, 66:13, 128:17, 155:11 moves 155:8 moving 25:20, 25:21, 37:1, 155:10 mst 2:6, 6:3, 45:8, 67:2, 102:2, 129:3, 161:6 much 18:7, 32:1,
--	---	---	--

PLANET DEPOS
888.433.3767 | WWW.PLANETDEPOS.COM

32:4, 64:5, 66:10, 71:9, 93:13, 132:14, 137:6 multiple 35:16, 35:17, 69:20, 81:19, 82:13, 110:10, 120:9, 132:17, 140:11, 143:15, 155:1 multitude 119:20 murakami 45:18, 46:10, 46:11, 67:11, 67:20, 67:22, 68:5, 70:7, 70:10, 70:21, 71:1, 71:4, 73:5, 73:18, 75:3, 75:8, 75:12, 75:19, 76:1, 76:10, 76:13, 78:3, 78:21, 80:3, 85:6, 85:9, 85:10, 85:12, 86:9, 87:12, 95:8, 95:11, 96:7, 97:15, 98:6, 100:4, 100:11, 101:10, 109:6, 109:15, 109:19, 110:5, 110:13, 111:16, 112:10, 112:13, 113:7, 114:14, 116:6, 117:11, 118:5, 118:8, 118:14, 119:3, 119:4, 119:13, 123:7, 123:20, 141:8, 141:17, 142:4, 142:9, 142:20, 143:2, 143:11, 144:21, 144:22, 145:2,	145:8, 156:18, 157:15 murakami's 67:15, 68:4, 68:8, 75:17, 76:16, 80:1, 81:10, 89:14, 96:10, 109:16, 113:1, 113:13, 113:19, 114:13, 114:17, 145:10, 156:17 murky 104:18 must 23:7, 25:3, 28:17 myself 23:19, 146:15 N n-methylpyrrolid- one 65:17, 151:7 name 164:2 nanometers 39:16, 39:17, 41:21, 111:3, 111:6 nature 66:12, 121:1 ne 3:7 near 139:1 nearby 138:11 nearly 150:10 necessarily 18:1, 29:5, 29:16, 29:17, 75:20, 79:1, 99:10, 115:14, 128:1, 132:4, 141:4, 148:6, 152:10	necessary 30:10, 31:3, 125:20 need 6:19, 6:22, 7:9, 30:7, 43:14, 54:14, 54:19, 61:10, 66:13, 68:12, 82:21, 99:20, 107:11, 121:8, 126:4, 128:16, 134:20, 142:1, 143:20, 144:14, 144:17, 144:20, 145:9, 145:11, 147:13, 152:9 needs 13:8, 48:14 negative 65:12 never 60:16, 89:15 new 88:12, 102:5 next 44:15, 46:1, 128:17 ningde 1:9, 162:10, 164:2 nips 26:21, 27:4, 27:7, 27:8, 27:15, 28:1, 28:3, 28:4, 28:7, 28:9, 28:16, 28:20, 29:2, 29:14, 36:20, 86:6, 86:7, 86:20, 86:22, 87:2, 87:3, 87:5, 121:4 nods 108:6 non-conductive 147:3	nonconductive 146:20 none 130:11 nonlinear 120:10 nonprimary 57:4, 57:7 nonstandard 136:11 normally 115:15, 152:9 north 3:18 notary 1:25, 2:8, 162:3 noted 161:6, 163:5 nothing 7:16, 29:3, 42:21, 62:10, 98:3 notice 158:18 noticing 63:3 nozzle 106:16, 106:19, 107:1, 107:21, 154:15 nuanced 131:6 number 5:2, 7:19, 94:17, 115:17, 133:19, 134:19 number-based 115:19 numbered 2:4 numerator 53:12, 53:16, 54:2 O obeys 89:16
--	--	--	---

Transcript of Dean R. Wheeler, Ph.D.
Conducted on January 30, 2026

62

object 17:22, 25:6, 31:10, 32:7, 33:19, 35:7, 39:5, 41:9, 42:7, 43:2, 43:12, 47:16, 48:6, 49:17, 50:20, 51:4, 53:18, 55:9, 57:6, 57:13, 61:18, 65:2, 67:16, 69:14, 74:3, 74:18, 78:7, 78:19, 86:21, 92:15, 97:4, 97:13, 99:1, 102:19, 107:17, 110:9, 110:21, 111:12, 117:15, 118:4, 118:18, 119:17, 120:8, 121:15, 122:14, 124:2, 124:7, 126:1, 126:8, 130:14, 131:14, 132:10, 134:14, 137:13, 137:22, 147:11, 148:3 objection 11:4, 23:9, 24:7, 27:12, 27:18, 105:18, 149:8, 152:15, 155:5, 160:12 objective 127:21, 143:3 oblique 108:5, 108:8, 153:22 obliquely 153:16, 153:19, 154:4 observe 150:9 observed 56:13	obtain 65:18, 101:1, 120:12, 127:13, 146:19, 151:8, 158:5 obvious 63:14, 97:18, 118:17, 119:3 obviously 13:17, 51:6, 75:19, 158:18 occasion 150:9 occasional 51:10, 52:2 occasionally 159:12 occupies 149:21 occupy 73:17 occur 29:22, 154:8, 155:20 occurred 162:13 occurrence 136:6 occurring 154:22 offer 9:8, 9:15 offered 12:13 office 1:1 offices 162:13 oh 8:8, 37:19, 105:16, 122:1, 140:22, 146:14, 156:1 okay 7:8, 7:17, 7:21, 8:8, 9:12, 10:1, 12:3, 12:20, 15:22,	17:14, 19:21, 20:12, 21:17, 22:19, 23:3, 23:13, 26:4, 29:7, 29:11, 29:17, 32:16, 33:2, 34:4, 36:1, 37:11, 38:16, 40:3, 45:6, 46:3, 46:4, 53:7, 53:9, 56:4, 57:1, 58:8, 58:12, 60:6, 61:6, 61:12, 63:5, 64:2, 66:20, 66:22, 68:10, 68:22, 71:19, 73:6, 75:7, 77:20, 78:14, 79:7, 88:1, 88:16, 91:10, 91:11, 93:2, 95:10, 95:18, 98:2, 98:7, 101:11, 102:6, 105:10, 108:22, 109:9, 110:16, 115:15, 116:21, 118:12, 124:5, 124:14, 125:4, 126:11, 126:15, 128:11, 128:16, 134:3, 135:5, 142:16, 145:19, 149:12, 153:10 one 8:4, 8:5, 8:22, 10:12, 14:7, 14:12, 14:13, 15:2, 20:22, 21:12, 24:9, 25:7, 28:20, 29:22, 31:2, 33:22, 34:5, 34:12, 34:13, 35:15, 36:11,	37:12, 37:18, 43:11, 49:7, 51:19, 54:7, 54:18, 68:12, 68:13, 68:18, 68:19, 73:10, 81:6, 81:18, 82:10, 84:10, 84:11, 84:17, 88:7, 88:12, 89:22, 90:1, 93:22, 96:17, 101:8, 102:5, 103:9, 106:8, 113:6, 116:2, 116:10, 118:3, 120:10, 132:1, 136:8, 141:4, 143:17, 144:13, 144:16, 144:17, 149:16, 154:12, 157:18, 158:6, 159:1 ones 88:12, 102:5 only 12:2, 31:18, 34:16, 54:19, 65:3, 72:20, 74:20, 74:21, 93:14, 97:15, 114:1, 125:3, 136:8, 158:21 open 53:12, 54:11, 88:11, 102:4, 105:10, 135:2, 153:2 operate 87:12 opined 132:11 opining 125:18 opinion 8:19, 9:18, 9:20, 10:8, 10:21, 10:22,
---	--	---	---

PLANET DEPOS
888.433.3767 | WWW.PLANETDEPOS.COM

11:15, 12:8, 12:12, 17:19, 21:2, 21:18, 22:3, 22:6, 24:13, 25:1, 28:19, 40:4, 45:14, 46:9, 47:1, 48:13, 48:19, 52:2, 55:13, 57:2, 57:12, 57:17, 67:13, 67:19, 75:11, 75:16, 87:15, 87:18, 89:4, 108:15, 118:16, 119:2, 119:7, 119:10, 129:15, 129:22, 130:5, 130:11, 133:5, 134:8, 142:1 opinions 8:10, 8:17, 9:8, 9:15, 113:6 optical 15:10 option 107:12 options 106:11 oral 1:17 order 18:9, 24:20, 29:18, 32:5, 60:14, 99:11, 99:22, 120:19, 125:21, 126:6, 144:18 ordinarily 20:4, 87:4 ordinary 9:10, 10:5, 10:7, 10:9, 10:16, 16:8, 50:11, 99:3, 151:15 organized 25:17	oriented 139:2 orthogonal 84:14 other 9:21, 10:20, 11:1, 13:7, 14:7, 14:20, 15:6, 15:9, 16:9, 17:17, 17:18, 18:8, 27:21, 30:8, 34:17, 34:18, 34:19, 34:22, 35:1, 36:4, 50:11, 54:8, 69:13, 76:22, 78:4, 79:3, 82:8, 84:12, 84:15, 89:12, 100:15, 118:4, 119:22, 121:5, 122:19, 136:10, 139:6, 141:2, 141:5, 144:2, 144:3, 147:14, 153:22, 154:1, 154:9, 154:21, 155:13, 157:18, 158:6, 160:21 otherwise 15:21, 45:2, 50:4, 58:16 out 23:5, 24:20, 25:2, 26:6, 27:9, 47:22, 48:10, 80:15, 86:3, 95:5, 120:15, 136:5, 146:16, 152:10, 153:12, 158:18 outcome 29:5, 61:21, 96:19, 162:19 outcomes 87:6, 97:8, 97:10	outer 16:5, 16:17, 16:21, 17:5, 50:13, 50:19, 87:21, 139:5 outlier 136:11 outliers 94:11 outside 129:14 over 6:19, 7:9, 82:13, 94:12, 105:2, 124:20, 141:3 overall 150:13 own 60:3, 60:22 owner 1:10, 3:20, 162:10 P pack 79:20 packed 39:22 page 5:2, 30:14, 46:2, 71:13, 71:16, 71:18, 76:14, 77:18, 85:10, 102:13, 104:1, 104:7, 105:14, 106:3, 106:14, 106:18, 108:3, 129:5, 134:2, 146:10, 153:9, 154:15, 155:19, 155:22 part 17:13, 19:12, 21:18, 22:8, 33:22, 34:6, 34:13, 45:15, 45:19, 46:6, 46:13, 46:17, 46:20, 46:22, 47:1, 47:8, 47:14, 48:4, 48:7, 48:13, 49:3, 49:15, 49:18, 49:21, 49:22, 50:18, 52:3, 52:5, 52:12, 52:16, 52:22, 53:16, 54:1, 55:8, 55:17, 58:19, 59:20, 60:14, 72:7, 81:2, 87:15, 87:22, 89:5, 90:8, 90:14, 91:13, 94:4, 130:1, 134:9, 137:11, 137:15, 150:2, 160:13 partially 91:9, 93:12, 150:10 particular 89:9, 119:21, 147:17 particularly 71:4 particulate 31:21 parties 7:8, 10:6, 162:18 partition 112:5 parts 33:21, 34:5, 34:12 party 162:9 pass 148:9, 160:22 passes 112:18 past 132:2
---	--	--

paste 88:17 pasted 88:22 patent 1:1, 1:4, 1:10, 1:13, 3:20, 6:14, 7:19, 7:21, 10:4, 11:11, 13:20, 18:17, 18:20, 19:8, 19:12, 20:10, 20:16, 20:19, 20:20, 24:18, 25:12, 26:5, 26:12, 26:20, 27:2, 27:6, 32:19, 34:8, 35:12, 38:1, 38:2, 38:12, 38:20, 39:1, 40:15, 43:14, 45:20, 46:7, 56:10, 58:6, 60:18, 61:2, 61:10, 61:14, 61:20, 62:17, 66:7, 68:11, 69:8, 69:17, 83:8, 95:1, 110:7, 110:8, 110:10, 110:17, 110:18, 122:8, 124:18, 134:6, 145:16, 150:14, 150:16, 150:21, 162:10 patent's 62:11, 88:8 pathway 55:1 pay 60:1 pdf 71:16, 71:18, 76:14, 77:18, 85:10, 106:3, 106:14, 108:3,	146:10, 154:15, 155:22 people 82:17, 87:4, 120:13, 120:14, 128:20, 152:10 percent 72:15, 72:22, 73:2, 73:9, 73:11, 76:20, 76:21, 134:4, 134:15 percentage 12:17, 13:7, 29:21, 32:8, 34:21, 73:11, 74:17, 74:22, 133:6 percentages 72:1, 72:14, 72:21 perform 44:1, 106:12, 151:20 performance 33:14, 127:15, 127:22 performed 107:3 performs 147:15 perhaps 30:9, 30:22, 31:11 period 86:13 permeability 96:5, 127:15, 127:21 permissible 147:9 person 83:5, 149:17 perspective 9:11 petitioner 1:7, 2:3, 3:11 pg 164:5	ph 1:19, 2:2, 4:6, 6:5, 162:5, 162:13, 163:10, 164:4, 164:22 phenomenon 93:16 philbin@leehayes 3:6 phrase 10:17 physical 50:12, 50:18, 140:11 pick 89:22, 157:18, 157:21 picking 84:8, 158:6 picture 139:8 pictured 158:12 pictures 153:20 pipe 155:1, 155:4 place 91:5, 151:20 placing 100:14 plain 9:9, 10:5, 10:7, 10:8, 10:16, 16:7, 50:11, 99:3, 151:15 please 23:17, 63:8, 71:19 point 26:18, 39:19, 40:1, 44:10, 105:6, 111:13, 115:11, 116:17, 141:13, 142:3, 153:8 points 113:11, 156:22	poke 48:15 poking 50:1, 52:11, 93:12, 94:14, 94:18, 158:3 polymer 30:10, 30:21, 31:4, 136:15, 159:21 polymeric 26:16 polyolefin 127:14 polyvinylidene 59:7 popping 95:5 pores 10:12, 14:6, 14:21, 15:11, 15:12, 18:18, 20:22, 23:16, 24:3, 24:14, 25:3, 25:4, 25:10, 25:18, 26:2, 27:3, 27:10, 27:16, 27:22, 28:5, 28:8, 28:14, 28:17, 28:21, 29:6, 29:15, 29:19, 29:21, 30:3, 30:7, 31:9, 31:16, 32:1, 32:5, 32:17, 37:3, 37:14, 39:16, 39:20, 40:1, 40:5, 40:7, 40:17, 40:19, 45:15, 45:19, 46:6, 46:11, 47:6, 47:8, 49:1, 49:21, 53:6, 67:15, 68:8, 73:17, 73:19, 73:20,
--	--	---	--

73:22, 74:10, 74:12, 75:13, 75:15, 75:17, 76:8, 76:12, 77:2, 77:3, 77:8, 78:3, 78:16, 79:10, 79:16, 80:2, 80:4, 80:10, 81:19, 82:13, 89:19, 91:4, 91:6, 92:2, 111:2, 119:22, 124:5, 125:12, 129:12, 129:16, 129:22, 130:6, 130:12, 138:8, 139:1, 143:10, 150:5, 156:17, 156:19, 157:4, 157:5, 157:11 porosity 30:10, 31:4, 33:13, 53:10, 53:11, 53:17, 53:19, 54:2, 54:6, 54:16, 54:22 porous 10:20, 11:2, 11:7, 13:16, 14:8, 14:22, 24:21, 27:10, 28:11, 30:6, 32:14, 33:8, 33:10, 33:12, 34:9, 34:17, 36:2, 54:15, 62:3, 67:21, 68:1, 69:7, 72:9, 72:11, 72:16, 72:18, 73:7, 75:17, 76:5, 76:17, 76:19, 77:2, 80:4, 95:22, 96:2, 96:12, 96:14, 97:2,	97:11, 110:22, 115:4, 126:18, 127:14, 134:5, 147:3 portion 12:4, 12:9, 21:22, 30:2, 135:6, 137:3, 159:10 posita 9:11, 10:16, 32:4, 32:8, 37:13, 42:12, 49:11, 61:14, 61:19, 64:1, 67:14, 68:1, 69:19, 69:20, 76:2, 76:11, 80:7, 89:20, 93:10, 99:2, 99:6, 99:9, 99:15, 99:18, 109:1, 109:6, 112:16, 123:4, 123:17, 125:10, 130:15, 130:21, 131:18, 131:20, 132:21, 147:13, 157:11, 157:14 position 11:21, 11:22 positive 65:11 possibilities 13:19 possible 15:9, 27:8, 36:7, 36:12, 37:6, 43:11, 43:18, 60:8, 60:13, 77:3, 77:6, 78:9, 78:10, 79:7, 79:8, 79:13, 86:3, 86:8, 86:15, 114:1, 114:4, 116:2, 122:11, 125:3,	127:13, 133:12, 133:15, 133:17, 147:6, 157:17 possibly 36:3 potential 104:11, 105:7, 107:10 potentially 60:14, 80:9, 82:13 powders 64:7, 64:12, 65:16, 66:17 precisely 38:18 preferable 158:16 preferably 71:7, 71:8, 73:9, 76:20, 77:8, 77:21, 80:5, 114:11, 116:14 preference 86:19, 117:8 preferred 78:9, 78:11, 78:15, 78:21, 78:22, 79:9, 97:7 preparation 59:3, 65:7, 151:4 prescribed 115:7 presence 158:14 present 14:8, 15:6, 15:7, 17:18, 20:19, 25:13, 56:18, 56:21, 57:18, 71:10, 111:5, 127:12, 127:18, 132:15, 132:19, 145:15, 159:9	presented 76:3 preset 60:6, 60:10 pressure 98:12, 100:2, 107:5, 112:17, 112:18, 127:17, 128:7, 141:14, 142:6, 155:7, 155:9 pressures 152:7, 154:4, 155:14 pressurized 153:16, 155:2 presume 15:20 pretty 51:20, 80:8, 92:9, 93:20 previous 47:18, 81:20, 150:12 previously 18:11, 28:9, 44:7, 50:5, 51:12, 53:4, 55:14, 74:11, 84:5, 89:6, 94:9, 132:11 primarily 25:4, 27:11, 27:16, 27:17, 32:5, 36:5, 40:7, 56:15 primary 14:5, 14:10, 22:10, 57:2, 92:3, 103:11, 103:17, 104:20, 104:22, 157:1 principal 14:13 principally 22:6 principle 69:16, 80:12,
---	---	--	--

94:8, 122:17, 130:22, 131:2, 143:4, 143:21 principles 89:10, 102:17, 130:20 probably 63:22 problem 9:21, 110:3, 122:21, 125:14 problems 127:11, 155:20 procedure 44:12, 97:16, 97:18, 99:11, 99:21, 145:12 procedures 141:9 proceed 71:19, 116:21 proceeded 155:4 proceeding 7:17, 8:1, 8:13, 30:19 proceedings 4:4 process 23:4, 23:6, 25:2, 26:21, 27:5, 27:8, 27:9, 27:15, 28:4, 28:16, 29:14, 62:11, 65:1, 156:6, 156:11 processed 106:6 processing 106:13, 120:15, 120:18 produce 78:10 produced 2:2, 84:3, 85:7 producing 79:2, 122:19	product 98:4 professional 2:7 promote 25:17, 37:14 promoting 158:19 properties 140:11, 140:12, 148:6 property 44:6, 126:18, 159:3 proportion 31:14, 120:22 protrude 20:6, 131:7 protruding 47:11, 47:22, 48:10, 48:22, 49:5, 49:19, 51:11, 52:2, 53:4, 90:21, 91:6, 91:8, 92:20, 94:6, 132:2, 150:9 protrusions 159:20, 160:4 provide 8:10, 8:16, 67:20, 67:22 provided 8:1, 8:13, 70:7, 93:6, 152:13, 153:21, 154:7 provo 2:9, 2:10, 162:14, 162:15 public 1:25, 2:8, 162:4 published 20:19 pull 120:5, 145:20 pulling 36:22	pulverization 99:12, 104:2, 104:17, 106:22, 107:20, 108:2, 108:9, 108:11 pulverize 99:7, 99:19, 153:15 pulverizing 153:13 purchase 59:15 purported 132:1 purpose 66:9, 142:20 purposefully 13:5 purposes 54:12, 68:20, 104:15 push 45:2 pushing 25:19 put 55:14, 134:18, 138:17, 149:16 puts 42:22 putting 35:9 pvsdf 151:6	78:8, 82:5, 90:6, 97:20, 107:16, 122:18, 122:21, 123:14, 126:2, 126:19, 134:11, 138:7, 144:10, 150:19 questions 7:1, 21:13, 63:4, 161:1 quickly 23:20 quite 25:13, 42:16, 109:12 quote 30:4, 30:18, 30:20, 31:1, 31:3, 31:5, 75:8, 95:21
R			
random 82:12 range 15:3, 33:10, 39:16, 41:20, 78:9, 78:10, 79:2, 79:3, 79:10, 95:20, 111:2, 114:8, 114:15, 115:6, 116:6, 116:10, 117:13, 118:4, 133:13, 139:22, 140:1, 140:2			
ranges 95:14 rate 33:13 rather 10:19, 14:7, 148:14 ratio 29:21, 33:4, 33:7, 33:9, 33:11, 33:17, 33:18, 34:4,			
Q			
quality 20:18 quantify 13:2, 13:5 quantity 13:7 question 17:2, 23:17, 24:9, 27:4, 27:13, 33:17, 38:6, 42:17, 72:13, 73:3,			

Transcript of Dean R. Wheeler, Ph.D.
Conducted on January 30, 2026

67

34:19, 59:7, 62:20, 124:15, 125:15, 125:19, 151:6 raw 106:13, 107:4, 107:6, 153:15 rdr 1:25, 2:6, 162:3, 162:25 read 45:21, 58:9, 61:10, 63:19, 99:6, 123:11, 145:10, 146:12, 146:14, 146:16, 153:12, 163:1, 164:5 readily 120:13 reading 24:8, 33:16, 73:12, 99:2, 139:20 reads 164:5 ready 63:9 real 64:10 reality 130:21 really 36:13, 40:11, 79:15, 79:16, 103:8 realtime 2:8 reason 7:3, 7:7, 24:2, 24:6, 164:5 reasonable 61:13, 84:22, 124:22, 138:10 recall 26:7, 90:5, 102:12, 102:16, 104:6, 105:21,	106:1, 142:7, 143:19, 150:15, 150:20, 151:2, 158:8 recess 45:7, 67:1, 102:1, 129:2 recipe 29:4 recited 71:12, 72:5, 72:21, 112:7, 113:4 recites 86:14, 110:22, 152:17, 152:19 reciting 72:6 recognize 102:11, 102:14, 105:12, 112:17, 125:2 record 19:7, 22:14, 66:22, 129:5, 138:17, 162:8 red 88:18 redirect 148:10 reduce 96:3, 100:17, 109:2 reduced 33:12 reducing 100:14, 156:7, 156:11 reduction 97:2, 155:16 refer 35:19, 42:14, 77:13, 121:21, 122:5, 130:10, 135:13, 144:14, 160:13 reference 39:3, 39:6,	67:10, 135:3 referenced 5:1 references 109:21 referred 9:18, 54:3 referring 19:7, 23:10, 38:1, 38:12, 39:9, 40:22, 64:17, 75:12, 114:16, 154:9, 154:10 refers 11:2, 156:4, 156:6, 156:10 reform 153:15 refresh 142:12 regarding 6:13, 7:12, 7:18, 67:21 regards 118:13 region 96:16 regions 96:14 regular 109:9, 136:6 regus 2:9, 162:14 reiterate 10:3 relate 150:1, 155:8 related 54:18, 162:17 relation 55:14 relative 15:4, 15:5, 72:16, 139:2, 153:17 relatively 39:21, 39:22	relevance 119:12 reliability 67:9 reliance 71:5 relied 141:17 relies 70:12 reluctant 110:12 rely 97:15 relying 71:2, 122:12 remainder 61:5, 136:4 remains 160:1 remember 8:8, 61:7, 61:8 reminder 6:22 removed 85:13, 86:12 rendered 118:17, 119:3 repeat 24:9, 27:13, 90:6, 107:18, 144:2 replace 93:8 reported 1:24, 2:8 reporters 2:7 represent 88:21, 103:3, 118:7 representation 102:22, 103:5 represented 162:11 reproduced 20:15, 20:20 require 10:18, 12:1,
---	---	--	---

PLANET DEPOS
888.433.3767 | WWW.PLANETDEPOS.COM

18:13, 26:5, 26:12, 64:10, 64:15, 146:2 required 29:18, 32:5, 67:7, 147:10 requirement 18:7 requirements 106:5, 132:4 requires 17:20, 28:2, 157:7 reread 23:19 research 127:11 reserve 161:3 resin 70:7, 70:9, 70:19, 72:8, 72:10, 72:11, 72:12, 75:10, 109:13 responding 71:4 response 9:19 restate 17:2, 23:17, 38:6, 123:14, 126:2, 144:20, 150:19, 156:9 restating 16:12 result 96:21, 127:10 results 128:13 retaining 96:4 review 23:21, 26:10, 30:17, 38:5, 58:11, 58:22, 65:5, 67:18, 70:14, 77:19,	112:12, 123:13, 133:8, 144:9, 146:18, 161:4, 161:5 reword 137:18 rigid 152:3 rock 149:16, 149:17, 149:20, 150:11 rod 66:2, 151:18 rotate 84:20 routine 66:1 rule 89:16, 137:8 ruler 82:6, 82:9, 82:11, 84:6, 85:2 rules 6:19 S s 3:1 said 12:20, 14:21, 23:1, 24:9, 29:16, 32:11, 32:21, 38:18, 39:8, 50:15, 55:7, 57:14, 62:16, 66:4, 77:15, 78:20, 79:6, 85:17, 87:2, 90:5, 92:5, 101:3, 125:10, 149:14 sales 108:14 salivants 27:1 same 16:22, 27:4,	46:17, 54:5, 77:7, 91:14, 105:18, 117:21, 118:1, 118:2, 121:9, 122:20, 130:17, 145:12 sample 43:4, 143:12, 144:16, 144:18 samples 143:7, 143:15 say 15:21, 16:16, 16:20, 17:6, 22:16, 28:4, 35:14, 38:9, 38:18, 41:13, 43:4, 43:10, 46:16, 48:12, 54:5, 57:1, 57:7, 57:8, 60:4, 62:22, 69:18, 70:18, 70:19, 80:1, 81:2, 81:22, 82:6, 82:15, 87:5, 90:1, 90:3, 90:9, 91:2, 93:18, 93:22, 94:1, 96:14, 96:21, 97:5, 97:14, 97:17, 97:21, 109:16, 113:12, 118:19, 123:8, 123:9, 123:17, 124:3, 125:1, 125:4, 125:7, 125:13, 125:15, 126:20, 129:4, 132:14, 138:8, 138:12, 139:2, 140:22, 141:4, 148:8, 149:6, 149:10, 159:11 saying 16:22, 31:8, 35:5, 52:11,	52:19, 52:22, 53:1, 55:16, 67:10, 78:14, 86:11, 92:17, 93:2, 96:18, 96:20, 110:4, 118:3, 124:4, 139:18 says 33:8, 65:16, 65:20, 66:15, 69:6, 71:7, 71:22, 72:7, 72:9, 73:7, 76:19, 77:7, 80:3, 83:14, 83:21, 86:2, 98:3, 101:3, 106:4, 106:7, 107:2, 108:10, 111:13, 113:22, 114:10, 115:8, 116:12, 124:18, 127:6, 127:10, 135:14, 135:16, 136:15, 139:21, 140:10, 146:19, 147:1, 151:4, 156:5, 159:19 scanning 84:3 scenario 25:17, 28:7, 36:13 scientific 97:19 scientist 85:8 scratch 119:5 second 8:22, 9:13, 9:14, 12:13, 15:17, 15:20, 20:13, 22:13, 22:15, 22:16, 24:6, 29:9, 29:10, 35:5,
---	---	---	---

Transcript of Dean R. Wheeler, Ph.D.
Conducted on January 30, 2026

69

37:16, 44:16, 45:10, 50:8, 53:8, 55:2, 58:4, 62:6, 68:13, 68:18, 80:19, 87:9, 88:2, 108:18, 108:20, 113:16, 118:9, 119:19, 122:2, 128:19, 129:10, 133:2, 133:3, 140:1, 141:7, 142:8, 145:18 secondly 83:2, 94:15, 130:19 section 24:12, 45:14, 119:18, 128:17, 144:13, 151:9, 156:2, 156:5 see 18:22, 19:11, 23:13, 26:11, 30:12, 32:12, 33:3, 33:4, 36:11, 39:6, 47:22, 48:19, 48:22, 49:4, 49:12, 51:16, 58:17, 59:4, 60:21, 61:19, 64:18, 65:21, 65:22, 71:21, 73:12, 76:18, 76:19, 77:7, 77:9, 83:4, 83:5, 88:14, 90:17, 93:10, 94:12, 94:21, 95:1, 95:3, 95:5, 95:11, 95:14, 95:18, 96:6, 97:18, 103:22, 105:6, 106:3, 106:7, 106:16, 106:17,	108:5, 116:16, 116:22, 128:9, 130:15, 132:21, 135:9, 135:10, 136:9, 146:6, 151:3, 151:9, 151:10, 153:5, 153:11, 153:21, 154:17, 155:19, 157:11, 158:17, 158:22 seeing 45:22, 61:8, 94:16, 102:16, 104:6, 105:22, 106:1, 115:9 seem 137:5, 147:13, 158:19 seems 12:17, 30:6, 124:22, 136:5, 136:10, 136:20, 137:7 seen 48:7, 93:17 sees 130:15 segment 136:3 selective 117:4 sell 98:20 selling 60:3, 60:5 sem 15:9, 21:6, 21:13, 36:12, 48:18, 49:12, 56:12, 67:7, 68:11, 68:15, 69:1, 69:12, 82:3, 89:11, 93:6, 93:8, 93:11, 93:17, 94:22, 95:2, 130:17, 135:21,	136:1, 138:6, 139:6, 159:1, 159:9, 160:2, 160:6 sense 26:15, 36:16, 46:16, 84:11, 147:17, 158:7 sentence 58:10, 63:18, 123:16, 135:9, 135:10, 136:14, 153:5, 153:12 sentences 51:20, 52:10 separate 9:19, 55:6, 109:21 separated 31:2 separating 23:5, 24:20, 25:2, 26:5, 27:9 separator 59:3, 62:14, 65:8, 119:13, 119:16, 119:22, 128:2, 143:16, 144:13, 150:17, 150:22, 151:4, 152:14 separators 30:20 series 98:1, 152:17 serving 41:7 set 57:14, 127:20, 162:6, 162:21 settle 25:22 several 35:14, 106:12 shape 14:18, 14:19, 31:21, 41:10, 56:20, 90:18,	92:4, 93:20, 157:1 shaped 14:6 sheet 164:1 shelf 60:7, 60:11 shorthand 38:14, 39:8 should 10:4, 17:16, 93:8, 164:5 show 18:17, 114:16, 154:7 showing 82:4 shown 36:11, 105:13, 137:11, 151:1, 159:17 side 54:7, 66:11, 82:8 side's 9:21 side-by-side 102:15 sign 161:4 signature-lapgj 162:23 significant 112:19 significantly 30:22, 62:12, 109:22 similar 66:3 similarly 140:17 simple 66:6, 120:1 simplification 130:21 since 12:12, 117:22,
--	--	---	--

PLANET DEPOS
888.433.3767 | WWW.PLANETDEPOS.COM

135:19, 143:3 single 44:13, 58:10, 106:16, 106:19, 107:1, 107:21, 113:7, 154:14 sintered 127:14 situation 136:11 sizes 59:16, 61:21, 62:12, 62:13, 79:20, 79:21, 82:18, 83:1, 96:21, 97:7, 101:8, 109:3, 110:4, 112:14, 112:20, 113:13, 113:19, 113:21, 115:3, 115:5, 115:16, 118:7, 119:15, 120:3, 120:21, 121:4, 123:5, 123:6, 123:9, 123:18, 123:19, 123:22, 124:3, 124:4, 125:11, 125:19, 125:21, 126:5, 152:5, 154:3, 154:5, 155:16 skip 142:15 slice 95:1, 95:7 sloppy 80:2 slurry 147:18 small 12:9, 28:22, 75:21, 79:16, 95:22, 97:1, 113:2, 132:17, 159:19 smaller 112:20	smooth 109:12 snapshot 144:12 soft 159:8 solely 65:7, 77:4, 119:4 solid 50:3, 51:7, 74:22, 121:5, 134:4 solidification 142:10 solids 37:5, 65:20, 72:20, 74:21, 133:11 solution 24:20, 25:3, 26:6, 65:18, 151:8 solve 122:21, 127:11, 142:11 solvent 25:12, 26:16, 37:3, 65:17, 85:12, 85:14, 86:1, 86:3, 86:5, 86:6, 86:8, 86:10, 86:11, 86:16, 86:17, 87:1, 87:2, 98:9, 151:7 solvents 29:4 solves 155:20 some 10:19, 12:4, 12:8, 12:17, 17:17, 18:14, 19:1, 22:9, 26:18, 27:21, 44:10, 47:12,	47:21, 48:8, 49:4, 60:6, 60:17, 66:3, 68:11, 75:19, 75:21, 82:12, 82:19, 85:3, 88:18, 89:9, 89:16, 91:4, 91:5, 91:6, 93:13, 97:18, 99:4, 100:19, 100:21, 101:16, 104:11, 113:1, 113:2, 117:3, 121:4, 124:14, 131:12, 131:15, 137:3, 140:13, 148:10, 151:16, 154:11, 158:11 someone 28:6, 35:9, 60:17, 68:7, 82:22, 122:17 something 27:21, 28:9, 32:22, 40:18, 47:20, 82:4, 92:5, 94:21, 96:19, 100:8, 115:10, 120:11, 138:16, 140:21, 142:13, 152:9, 160:6 somewhere 134:18 sorry 15:19, 24:8, 27:13, 49:7, 52:21, 71:11, 85:16, 90:6, 111:8, 111:18, 111:21, 112:2, 113:15, 116:17, 118:21, 122:1, 123:11, 126:12, 131:8, 144:7, 144:20, 146:14, 156:9	sort 7:5, 89:18, 120:18, 136:11 sorts 106:20 sounds 65:22, 66:16, 101:17 source 101:16, 143:2 south 3:16, 3:17 space 16:6, 16:8, 16:10, 41:11, 50:14, 51:3, 51:11, 52:5, 53:4, 53:12, 54:11, 54:22, 81:15, 81:17, 93:19, 93:20, 149:20, 157:3 spaces 16:4, 40:8, 46:12, 129:13 speak 59:15, 101:14 specific 71:2, 87:3, 87:5, 99:11, 102:21, 105:22, 113:10, 160:13 specifically 45:18, 70:20, 102:12, 131:20, 157:6 specification 13:21, 24:19, 26:20, 42:12, 48:21, 48:22, 51:16, 55:4, 56:13, 60:22, 94:2, 144:15 specifications 92:18 specifics 99:9, 99:21 specified 58:16, 59:12,
---	--	---	---

59:20, 60:19, 61:16, 95:20 specify 27:7, 60:1, 61:2, 82:22 spend 142:2 spoon 66:4 stand 137:7 standard 63:11, 63:13, 137:8 star 100:7, 102:8, 106:4, 106:9, 108:16, 153:13, 156:14 start 48:19, 56:9, 85:2, 104:18 started 26:16, 97:21 starting 44:16, 58:7, 62:18 starts 9:17, 17:12, 58:4, 59:2, 69:10, 86:11, 149:5 state 10:15, 13:8, 17:3, 18:16, 23:5, 25:7, 29:7, 37:17, 37:21, 45:17, 46:4, 50:10, 55:4, 57:17, 62:9, 67:6, 70:6, 87:11, 96:11, 109:1, 111:15, 113:18, 123:4, 129:12, 133:3, 134:4, 134:11, 141:8, 142:5, 142:9,	142:20 stated 9:9, 18:11, 28:9, 51:5, 53:1, 55:10, 67:19, 74:11, 124:3, 141:5 statement 31:12, 49:7, 49:20, 101:7, 104:8, 122:15, 137:7, 149:14 states 1:1, 30:8, 39:15, 58:14, 59:5, 62:18, 62:21, 76:16, 77:10, 95:19, 97:15, 98:8, 106:11, 112:4, 135:6, 139:14, 160:3, 163:3 stating 30:7, 74:6, 138:15, 142:7, 160:7 statistical 143:4 statistics 144:15 stein 3:3 stein@leehayes 3:4 stenographic 2:8 step 150:17 steps 29:3, 98:1, 152:17, 152:22 steve 3:5 steven 3:6 sticking 47:11, 136:5 sticks 47:13	still 15:18, 24:8, 25:12, 36:5, 47:14, 100:10, 110:2, 150:11 stipulate 49:20, 129:6 stipulated 50:5 stipulation 146:6 stipulations 116:8 stir 151:18 stirred 65:18, 65:21, 65:22, 66:16, 66:19, 151:8, 151:16 stirrer 151:19 stirring 66:2, 66:6, 151:12, 151:21, 152:7 stones 148:8 stop 60:8, 66:21, 78:6 stops 29:3, 149:4 street 3:7, 3:17 strength 126:17, 127:4, 127:7, 127:17, 128:14 strictly 107:14 strong 31:16, 36:14 strongly 28:13 structure 13:18, 14:2, 15:2, 32:12,	32:14, 48:18, 49:13, 51:19, 52:9, 67:8, 68:2, 81:10, 88:8, 89:7, 89:14, 89:17, 91:2, 94:10, 109:10, 150:13, 156:18, 157:6, 158:2, 159:14, 159:17, 159:22 structures 13:16, 157:14, 157:15, 157:16 subject 11:11 subset 68:13, 86:7, 87:2, 104:3 substantial 22:10 substantive 8:16, 9:14, 20:13 substitute 89:11 substituted 86:5 substituting 129:6 substitution 85:14, 86:1, 86:6, 86:8, 86:10, 86:16, 86:18, 87:1, 87:3, 142:11 subsumed 19:15, 20:1 successfully 123:5, 123:18, 125:10 suggest 28:13, 114:4 suggests 100:22 sugino 102:8, 104:5, 112:18, 129:5,
---	---	--	--

Transcript of Dean R. Wheeler, Ph.D.
Conducted on January 30, 2026

72

141:15, 154:6, 156:3 suitable 72:11 suite 2:10, 3:8, 3:17, 162:14 summarize 57:5, 91:16 super 153:6 suppose 60:16 supposed 81:9 sure 17:3, 23:19, 24:12, 26:9, 27:15, 37:19, 38:4, 43:10, 45:1, 49:10, 57:16, 61:5, 66:9, 66:17, 68:19, 71:13, 71:20, 75:2, 77:14, 81:14, 89:2, 90:7, 91:16, 93:4, 96:16, 98:15, 98:19, 101:5, 101:22, 107:20, 108:21, 113:9, 113:18, 114:18, 116:11, 122:1, 129:1, 135:19, 137:6, 144:12 surface 108:12, 139:5 surfaces 153:15 surfactant 157:8, 157:22 surrounded 31:2, 31:15 switching 128:21 sworn 2:3, 6:6, 162:7	T take 15:1, 19:19, 57:10, 60:5, 64:7, 64:11, 64:12, 66:1, 66:10, 73:21, 99:2, 101:20, 102:21, 110:16, 114:20, 117:10, 128:20, 131:18, 143:15, 148:11, 149:16 taken 2:3, 27:1, 45:7, 67:1, 102:1, 129:2, 139:6 takes 15:13, 99:3, 143:11 taking 100:13 talk 20:2, 23:4, 41:17, 59:17, 93:18 talked 92:1, 92:2, 141:16 talking 13:15, 24:18, 25:18, 29:12, 29:13, 44:8, 49:19, 50:1, 50:16, 53:3, 53:22, 58:3, 65:7, 65:11, 70:20, 71:3, 72:18, 73:16, 73:19, 125:5, 126:6, 150:4 talks 35:4, 77:20, 100:11 tanaka 118:14, 119:3,	119:4, 119:7, 122:5, 122:10, 122:12, 122:16, 124:5, 124:13, 127:6, 127:10, 128:12 tanaka's 123:5, 123:18, 125:11, 125:12, 125:19, 125:20, 125:21, 126:4, 126:6 teach 104:8, 130:20, 131:1, 132:12, 132:13, 132:16, 141:14, 141:20, 141:22, 142:3, 156:3, 157:6, 158:14, 159:16, 160:9 teaches 85:12, 85:14, 109:21, 131:21, 156:18, 160:17 teaching 27:2, 61:15, 76:11, 104:9, 158:17 teachings 76:3, 76:10, 132:13, 133:10, 133:20, 147:12, 147:14, 160:21 teaspoon 64:12 technical 107:13, 108:14 technically 22:15 technology 1:9, 162:10 tell 33:7, 54:16, 71:9, 112:22, 134:20, 157:13 tend 66:14	tendency 26:1 tends 95:22 term 11:5, 11:14, 16:3, 26:13, 31:11, 35:19, 44:15, 50:12, 53:19, 98:18 terminology 138:13 terms 9:10, 9:16, 9:22, 10:4, 10:9, 20:2, 56:20, 94:11, 110:12 testified 6:7, 44:7 testify 7:18 testifying 30:19 testimony 7:4, 30:4, 70:12, 162:8, 163:3 text 81:13, 88:10 th 3:7, 162:22 thank 7:2, 22:20, 83:13 themselves 46:5, 87:12, 130:6, 130:13 thereby 127:18 therefore 56:18, 87:14, 90:2, 132:3 thick 43:10, 112:11 thicker 42:9 thickness 39:15, 40:9,
--	--	--	--

40:12, 41:8, 41:13, 41:18, 42:4, 42:5, 43:1, 44:4, 44:11, 44:14, 56:1, 56:20, 109:11, 111:2, 111:7, 112:5, 139:14, 139:19, 140:18, 141:1, 157:10 thicknesses 40:16, 42:19, 43:18, 43:19 thin 36:15, 127:16 thing 15:2, 40:13, 54:19, 66:1 things 13:19, 15:3, 25:15, 25:16, 25:20, 25:21, 25:22, 26:14, 36:22, 37:1, 63:14, 66:12, 87:19, 89:13, 89:20, 104:14, 134:21, 140:18, 141:2 think 22:15, 23:15, 35:4, 38:14, 42:16, 55:19, 58:2, 62:2, 64:1, 66:20, 66:21, 69:16, 80:6, 83:11, 85:3, 89:22, 96:18, 104:13, 121:16, 131:5, 131:9, 138:13, 141:13, 149:10, 150:10, 153:21 thinking 47:19 third 8:4, 22:16	thought 89:1 three 8:2, 9:15, 34:4, 34:5, 34:12, 77:8, 78:4, 78:16, 79:11, 94:17, 112:18, 118:13 three-dimensional 13:16, 13:17, 14:2, 14:22, 15:1, 44:8, 51:18 three-one 98:11, 98:14, 98:15 through 28:3, 29:3, 32:20, 33:1, 35:3, 35:18, 54:14, 61:5, 98:1, 154:18, 155:9, 155:10, 155:12 throughout 55:5, 159:2 tight 39:21 tightly 39:22 time 24:10, 44:19, 45:5, 122:20, 142:2, 161:6 times 43:6, 148:22, 155:1 tio2 159:22 titanium 135:7, 136:16, 136:22 today 7:4, 7:18, 55:7 together 35:9, 70:8, 79:20, 103:18,	132:20, 156:22 took 79:9 tool 147:16 top 61:6, 71:18, 155:22 top-down 139:7 topics 128:22 total 53:13, 72:16 totally 19:15 touch 137:12, 137:16 touching 93:15 toward 30:2 trademark 1:1 transcript 161:5, 163:2, 163:3, 164:1 transferred 54:7, 54:13 transparently 102:21 transverse 83:15, 84:1, 84:9, 84:14 treats 143:12 trial 1:4 true 79:1, 89:8, 162:7 truthful 7:4 try 13:12, 19:22, 46:14, 52:13, 110:13, 140:18 trying 13:20, 28:10,	48:20, 49:11, 51:16, 51:19, 52:9, 66:12, 68:17, 91:1, 105:7, 107:10, 110:1, 130:22, 131:6, 132:12, 138:6, 144:7 tryon 3:17 turbulence 107:3 turn 140:10 two 7:12, 7:15, 8:16, 15:2, 34:16, 35:13, 45:3, 51:19, 64:6, 64:7, 64:12, 69:1, 72:20, 84:3, 87:19, 157:16, 157:20 two-dimensional 84:13 type 86:10, 98:11, 98:12, 99:13, 100:2, 108:14, 109:13 types 106:10, 106:12, 154:11 typical 89:18 typically 64:10, 64:16 U ultra-high 107:5 unambiguously 82:21 unclear 86:22, 140:4 under 116:4, 153:5,
---	---	--	--

Transcript of Dean R. Wheeler, Ph.D.
Conducted on January 30, 2026

74

155:19, 156:5 understand 7:18, 22:18, 61:14, 63:16, 76:4, 83:1, 102:17, 135:17, 136:18, 149:17, 150:7 understanding 12:18, 15:11, 31:7, 34:2, 35:19, 58:18, 64:21, 93:9, 99:7, 103:12, 106:8, 151:11, 153:18, 156:14, 160:17 understood 10:16, 124:14 unexpected 150:14 unexpectedly 120:11 unfair 89:22 uniform 66:5, 66:8, 66:10, 66:14, 109:11 uniformity 156:8 uniformly 65:18, 65:20, 65:22, 66:16, 66:19, 151:8, 151:16, 151:22, 156:8, 156:12 unincorporated 135:8, 135:11, 135:15, 135:16, 135:20, 136:2, 136:9, 136:13, 136:19, 137:4, 137:10, 137:20, 138:5, 138:12, 138:18, 138:22, 158:11, 158:15, 158:22	unit 96:4, 97:2 united 1:1 university 2:10, 162:14 unless 15:21, 35:1, 58:15, 59:22, 97:18 unlikely 43:8, 145:14 unrealistic 94:13 until 37:1, 66:4, 151:21 upper 42:22 url 102:21, 129:7 use 16:7, 24:19, 26:5, 27:8, 27:15, 28:7, 28:20, 29:2, 38:11, 54:17, 61:15, 80:16, 85:14, 86:15, 98:10, 108:1, 109:16, 113:13, 113:19, 113:22, 122:8, 139:22, 140:1, 141:8, 141:14, 142:5, 142:10, 157:8, 157:22, 158:1 user 83:4 uses 30:8, 31:11, 122:10, 142:11 using 18:13, 25:1, 26:21, 35:12, 38:13, 82:22, 85:22, 95:19, 96:21, 99:22,	100:22, 106:10, 112:17, 117:21, 117:22, 118:5, 120:13, 120:22, 121:4, 122:5 utah 2:10, 162:15 V vague 120:8 value 44:2, 117:6, 117:13, 117:18, 143:13 values 112:14, 112:15, 116:14, 117:2, 117:10, 140:2, 146:20, 147:7, 148:5 vantage 3:16 variability 95:21, 96:11, 96:22, 142:21, 142:22, 143:4, 143:8, 143:9, 143:14, 144:6, 144:18, 144:22, 145:5, 145:11 variable 29:8 variables 13:18 variations 143:5 vary 96:17, 139:15, 140:17 velocity 153:17, 155:8, 155:10, 155:11 vendor 60:2, 148:5 verify 26:8, 68:12, 70:13, 70:16	version 129:7 versus 18:8, 27:21, 64:3, 104:20 via 146:3 video-recorded 1:17, 2:1 view 80:2, 93:9, 139:7, 160:5 viewer 94:20 virtual 84:6, 85:2 visible 19:4, 20:22, 21:19, 135:7 void 16:9, 16:11, 16:14, 17:18, 23:16, 47:14, 48:15, 49:16, 50:2, 50:17, 51:3, 51:6, 52:5, 52:17, 52:22, 53:2, 53:5, 53:12, 54:11, 54:22, 93:19, 93:20, 143:13, 149:2, 149:21 voidage 76:16, 76:19, 95:21, 96:2, 96:12, 96:15, 97:1, 142:21, 143:1, 143:17, 143:20, 144:6, 144:19, 144:22, 145:5, 145:11 voids 16:3, 23:7, 23:13, 36:4 volume 33:4, 33:9, 33:11, 34:9,
--	---	---	---

PLANET DEPOS
888.433.3767 | WWW.PLANETDEPOS.COM

34:15, 36:17, 53:11, 53:13, 59:7, 62:20, 73:9, 73:10, 73:11, 73:17, 73:19, 73:20, 73:22, 74:1, 74:2, 74:10, 74:16, 74:17, 76:17, 76:20, 77:3, 117:22, 133:4, 133:6, 133:10, 133:14, 134:4, 134:9, 134:12, 134:18, 134:19, 143:22, 149:3, 151:6	110:18, 111:1, 112:5, 131:8, 132:2, 139:3, 139:14, 139:19, 140:8, 140:18, 141:1, 157:10 walls 15:4, 17:9, 17:21, 18:19, 32:16, 37:22, 38:9, 39:18, 40:4, 44:3, 46:10, 46:15, 47:19, 49:4, 50:12, 50:14, 51:9, 55:6, 55:8, 55:10, 56:14, 57:3, 57:4, 57:19, 57:21, 58:1, 87:13, 100:15, 109:3, 109:11, 109:12, 109:17, 110:5, 110:8, 110:17, 111:10, 112:11, 113:3, 129:13, 129:14, 131:3, 132:16, 132:18, 132:19, 149:4, 155:14, 158:4 want 19:19, 22:21, 58:9, 62:6, 63:9, 64:19, 81:21, 87:4, 96:16, 101:20, 103:8, 104:8, 107:12, 115:11, 127:1, 128:1, 128:20, 131:21, 135:21, 140:11, 140:13, 140:16, 140:19, 142:1, 142:13, 146:12, 146:14, 146:16, 148:7, 148:13, 158:2, 160:19	water 127:15, 127:22, 128:2, 128:3 way 14:1, 14:4, 25:17, 27:22, 28:1, 43:17, 52:7, 52:14, 52:20, 55:19, 62:1, 63:11, 63:13, 82:18, 87:5, 91:14, 93:8, 100:16, 100:21, 105:2, 105:4, 110:14, 110:16, 125:18, 126:19, 147:6, 147:20, 154:2, 162:19 ways 13:19, 63:14, 79:21, 106:9 we'll 45:2, 81:2, 102:21, 108:3, 161:3 we're 13:15, 24:12, 25:18, 44:8, 44:21, 47:19, 49:19, 50:1, 53:3, 53:22, 54:15, 60:5, 65:6, 65:11, 66:21, 74:20, 74:21, 94:16, 119:19, 133:13 we've 47:5, 50:16, 92:1, 101:19, 141:15 web 104:6, 129:5 website 102:9, 102:17, 154:7 wednesday 7:14	weight 96:3, 97:2, 130:17 well-accepted 53:20 well-defined 85:7, 157:10 well-known 82:17, 115:12 weren't 103:17 wet 31:19, 31:21, 36:14, 100:11, 100:18, 101:1, 121:2, 153:14, 159:22, 160:3 wet-type 153:13 wetted 66:18, 66:19 wetting 160:19 whatever 14:17, 82:9 wheeler 1:19, 2:1, 4:6, 6:5, 6:12, 148:20, 162:5, 162:13, 163:10, 164:4, 164:22 wherein 111:1 whereof 162:21 whether 13:3, 21:14, 27:20, 59:15, 68:3, 101:14, 119:11, 121:4, 122:18, 125:16, 138:15, 139:21, 141:22, 157:13 white 81:15, 81:17 whole 94:12 widely 125:2
W			
wall 16:4, 16:17, 16:18, 16:20, 16:21, 16:22, 17:4, 17:12, 17:13, 17:14, 17:17, 18:1, 18:4, 18:8, 19:13, 19:16, 20:2, 20:6, 22:1, 37:17, 39:4, 39:15, 40:9, 40:10, 40:12, 40:16, 41:7, 41:8, 41:13, 41:18, 42:3, 42:5, 42:9, 42:18, 43:1, 43:6, 43:10, 43:18, 44:11, 44:13, 46:20, 47:15, 50:18, 52:3, 55:17, 55:18, 56:1, 56:6, 56:19, 57:20, 87:19, 87:21, 93:12, 93:15, 110:1, 110:2,			

Transcript of Dean R. Wheeler, Ph.D.
Conducted on January 30, 2026

76

willing 59:22 within 11:14, 19:15, 20:2, 20:5, 60:21, 79:1, 79:3, 95:20, 110:8, 113:2, 114:14, 115:6, 116:6, 116:9, 117:13, 118:3, 131:3, 132:18, 140:2 without 67:13, 81:22, 99:9, 116:10, 122:12, 123:5, 123:18, 145:2, 145:5, 158:6, 160:10 witness 2:2, 45:6, 63:6, 63:8, 88:13, 108:6, 148:9, 148:15, 160:22, 161:4, 162:5, 162:8, 162:21 wondering 38:11, 123:21 word 23:16, 38:11, 54:18, 64:16, 65:21, 108:1, 108:2 worded 55:19, 126:19 words 30:8, 50:11, 139:6, 161:2 working 32:16, 111:19 works 6:17, 7:1, 143:13 wouldn't 28:4, 29:5, 32:8, 35:6,	41:6, 41:13, 41:14, 46:16, 50:17, 52:20, 74:17, 84:16, 84:19, 84:20, 93:22, 95:6, 97:12, 99:9, 104:8, 110:5, 112:10, 116:5, 125:1, 132:3, 141:3 wrap 63:7 wrote 11:1, 123:21, 125:18 y yeah 7:15, 8:5, 15:19, 22:21, 23:7, 23:15, 30:14, 30:16, 33:1, 33:16, 35:2, 38:8, 44:20, 59:9, 71:13, 71:18, 79:13, 81:3, 81:4, 81:6, 81:7, 91:14, 92:16, 103:3, 103:6, 105:21, 111:15, 111:18, 111:20, 112:1, 113:16, 114:10, 116:19, 117:16, 118:19, 118:21, 123:16, 124:22, 126:4, 134:12, 146:9, 146:11 yesterday 7:10, 7:13 yourself 32:13, 58:9, 130:22, 146:13 z zhuhai 1:6, 164:2	' 's 90:16, 92:18 . .001 139:16 .01 77:11, 77:21, 116:7, 139:15 .02 42:1 .05 139:15 .1 116:14, 139:16 .2 33:10, 33:11, 33:17, 33:18, 33:21 .22 117:19 .5 42:1, 42:4, 42:6, 42:10, 111:8 0 0.01 114:11 0.1 112:5 00 44:22, 63:4, 129:2 00432 1:12 03 67:2 05 102:1 08 67:1, 129:3 1 102:1, 102:2	1.0 77:21, 117:20 1.03 117:18 1.2 59:8, 62:20, 151:6 10 2:5, 41:1, 45:7, 45:8, 58:3, 95:15, 95:20, 102:2, 112:15, 114:12, 114:22, 116:7, 116:14, 117:2, 117:6, 117:7, 117:9, 117:10, 117:12, 117:13, 117:18, 124:16, 124:20, 126:14, 127:6, 146:14, 146:19, 147:6, 148:2, 161:6, 162:16 100 12:21, 18:13, 21:14, 21:16, 73:1, 116:11, 125:16, 154:5, 155:3 100.00 12:1 1001 5:3, 19:7, 19:9, 32:20, 38:19, 58:6, 150:18 1005 5:4, 71:14, 76:13, 114:22, 117:12 1007 5:5, 111:22, 114:5, 116:20 1009 5:6, 126:11, 126:13 1010 5:7, 135:2,
---	--	---	---

PLANET DEPOS
888.433.3767 | WWW.PLANETDEPOS.COM

Transcript of Dean R. Wheeler, Ph.D.
Conducted on January 30, 2026

77

139:12 1011 5:8, 145:21 102 5:9 1032 5:9, 102:4, 153:2, 155:18 1034 5:10, 105:10, 154:10 1035 5:11, 88:11 104 88:1, 88:3, 88:17 105 5:10, 88:3 11 44:22, 58:6, 63:4, 67:1, 69:10 11,575,148 1:13, 7:19 111 5:5 1119 3:19 1120 3:17 117 87:11 12 39:10, 39:14, 41:17, 42:22, 59:2, 59:13, 62:18, 65:16, 67:2, 110:20, 150:18, 151:1, 152:16 126 5:6 13 118:18, 119:2, 119:9, 162:22 131 6:13, 7:10 135 5:7	14 3:7 140 101:10, 114:21, 116:6, 117:12, 118:5 145 5:8 148 4:8, 7:21, 10:4, 11:11, 18:17, 18:20, 19:8, 19:12, 20:10, 20:16, 24:18, 25:12, 26:4, 26:12, 26:20, 27:2, 27:5, 32:19, 34:8, 35:12, 38:2, 38:19, 40:15, 42:11, 43:13, 43:17, 45:20, 46:6, 47:20, 48:9, 49:9, 51:7, 53:21, 56:7, 56:10, 56:12, 58:5, 60:18, 61:2, 61:14, 61:20, 62:2, 62:10, 62:17, 66:7, 68:10, 69:8, 69:17, 76:2, 83:8, 88:8, 89:12, 90:16, 91:1, 92:18, 93:7, 94:1, 94:22, 110:7, 110:8, 110:10, 110:17, 110:18, 122:8, 124:18, 132:4, 134:5, 150:14, 150:16, 150:21 15 59:2, 62:18 153 108:19, 111:15,	112:8 162 4:10 163 113:12, 113:15 169 118:11 172 121:20 173 123:2, 123:17, 125:9 18 2:5, 6:3, 162:16 180 2:9, 162:14 184 128:18, 129:10, 130:9 19 5:3, 69:13 191 133:2 1918 3:10 2 2 129:2, 129:3 20 39:16, 41:20, 45:7, 69:8, 69:11, 76:20, 111:2 2015 5:12, 8:20, 9:4, 70:4, 75:6 2025 1:12 2026 1:21, 6:3, 162:15, 162:22, 164:3 2034 5:13, 8:22, 9:14, 20:13, 22:17	206 135:15 21 83:11, 139:11 211 141:6, 142:8 212 142:17 22 83:12 228 145:17 245 153:17 25 37:5, 134:6 2500 3:8 270 2:10, 162:15 28203 3:18 29 30:14, 45:8 3 3 2:5, 161:6, 162:16 3.0 33:11 30 1:21, 6:3, 161:5, 162:15, 164:3 30309 3:9 33 133:4, 133:6, 133:10, 133:13 3300 3:17 34 59:14 35 59:14 36 135:4, 136:14,
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Transcript of Dean R. Wheeler, Ph.D.
Conducted on January 30, 2026

78

146:7, 146:8 37 76:14, 80:3 3d 89:7 4 40 134:2 404 3:10 42 9:17, 9:19 43 10:2, 10:3, 35:15 444 3:19 45 111:20, 112:4 47 10:15, 17:6 48 15:15, 16:2, 17:3 49 58:7 5 50 18:16, 30:5, 30:9, 31:1, 31:8, 32:20, 32:21, 33:1, 35:3, 35:18, 41:1, 58:3, 77:11, 77:21, 95:15, 95:20, 112:15, 114:22, 115:21, 146:19, 147:6, 148:2, 159:15, 159:19 500 39:16, 41:20, 111:3, 111:8 52 23:10, 32:20, 33:1, 35:3,	35:18 53 22:12, 23:2, 23:3, 23:11, 23:12, 23:14, 23:19, 24:2, 24:17 54 23:1, 29:7, 29:11, 30:13, 30:14, 30:18 55 37:16, 37:21, 38:8, 39:7, 39:19 57 44:17, 45:11, 45:17 58 114:6, 115:7 59 116:12, 116:19, 117:14 6 60 71:7, 72:14 61 50:7 614339 1:26 65 53:7 66 77:10, 77:16, 77:17, 78:3, 79:10, 95:9, 95:10, 96:20 67 55:2, 55:14, 133:4, 133:10 69 20:12, 73:5, 73:16 7 70 9:6, 71:1,	71:6, 71:7, 71:8, 72:6, 72:7, 72:15, 73:15, 74:15 704 3:19 71 5:4 73 98:6, 100:10, 100:22 736 3:10 75 3:7, 34:9, 34:15, 36:2, 58:4 8 80 62:7, 72:15, 76:17, 76:20, 77:2 83 134:6, 134:9, 134:12 84 67:5 84601 162:15 87 70:6, 70:19, 70:22, 85:9, 85:17, 86:9 88 5:11, 75:5 89 133:22 9 9 2:5, 6:3, 162:16 90 37:7, 41:1, 58:3, 72:15, 95:15, 95:20, 112:15, 112:22,	114:22, 116:14, 117:2, 117:6, 117:7, 117:9, 117:10, 117:12, 117:13, 117:18, 124:15, 124:20, 146:20, 147:7, 148:2 91 80:20, 81:2, 81:3 92 81:3 99 72:15, 73:9, 74:17
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Re: Deposition of **Dean R. Wheeler, Ph.D.**

Date: 1/30/2026

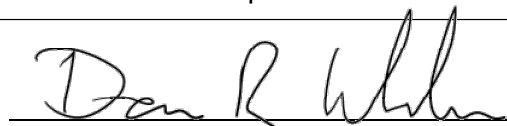
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Page	Line	Correction/Change and Reason
14	3	"with English" to "with the English" - transcription error
14	7	Strike "and" - clarification
27	1	"salivants" to "solvents" - transcription error
27	2	"that would" to "that coagulation would" - clarification
29	22	"incurs" to "occurs" - transcription error
30	1	"contributed" to "contributes" - clarification
37	14	"binders" to "binder is" - transcription error
38	21	"Mm-hmm" to "Yes" - clarification
53	21	". The" to ", the" - clarification / transcription error
53	22	", that any" to ". Any" - clarification / transcription error
59	16	"it that" to "it at that" - transcription error
69	22	"altogether" to "all together" - transcription error
76	4	"no" to "a" - clarification / transcription error
83	4	"see or the user -- or" to "see, or the user or" - transcription error
83	5	"see what's" to "see, what's" - transcription error
84	21	"isotopic" to "isotropic" - transcription error
85	7	"produced" to "reproduced" - clarification / transcription error
95	16	"distributors" to "descriptors" - clarification / transcription error
99	3	"takes" to "makes" - clarification / transcription error
108	4	"Mm-hmm" to "Yes" - clarification
112	16	"that POSITA" to "that a POSITA" - transcription error

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(Date)



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No. 614339

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Date: 1/30/2026

Case: Zhuhai CosMX Battery Co., LTD. -v- Ningde Amperex Technology LTD. (PTAB)

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117	22	"since" to "if" - clarification
120	2	"size" to "sizes" - transcription error
120	3	"pore sizes" to "of pore sizes" - transcription error
124	5-6	Add "Q." before "Okay. So you did mean pore size distribution coefficient."
		- transcription error [this text is a follow-up question by Mr. Philbin]
129	17	Strike "binder --" - clarification / misspoke
131	17	"crossover" to "cross over" - transcription error
136	17	"Mm-hmm" to "Yes" - clarification
140	11	"There's" to "There are" - clarification / misspoke
144	22	Strike "of" - clarification
159	10	"hybrid" to "high" - clarification / transcription error

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Date: 1/30/2026

Case: Zhuhai CosMX Battery Co., LTD. -v- Ningde Amperex Technology LTD. (PTAB)

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ACKNOWLEDGMENT OF DEPONENT

I, Dean R. Wheeler, Ph.D., do hereby
acknowledge that I have read and examined the
foregoing testimony, and the same is a true, correct
and complete transcription of the testimony given by
me and any corrections appear on the attached Errata
sheet signed by me.

February 18, 2026

(Date)

Dean R Wheeler

(Signature)