

Transcript of Dean R. Wheeler, Ph.D.
Conducted on January 28, 2026

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5 1 REFERENCED EXHIBITS 2 NUMBER PAGE 3 EXHIBIT 1003 52 4 EXHIBIT 1006 43 5 EXHIBIT 1010 68 6 EXHIBIT 1014 121 7 EXHIBIT 1043 25 8 EXHIBIT 2015 61 9 EXHIBIT 2016 15 10 EXHIBIT 2047 83 11 12 13 14 15 16 17 18 19 20 21 22	7 1 represent the petitioner in this proceeding. 2 MR. COX: Brady Cox, from -- I'm 3 sorry. 4 MR. PHILBIN: Yeah, I was going to 5 say, I'm not Mike, but Steve Philbin with Lee 6 & Hayes, representing the petitioner. 7 MR. COX: Brady Cox with Alston & 8 Bird on behalf of Ningde Amperex Technology 9 Limited and representing the witness, Dean 10 Wheeler. 11 THE VIDEOGRAPHER: The court reporter 12 today is Debbie Dibble, representing Planet 13 Depos. The witness will now be sworn. 14 ----- 15 DEAN R. WHEELER, Ph.D., 16 having been duly sworn, 17 testified as follows: 18 ----- 19 EXAMINATION 20 ----- 21 BY MR. STEIN: 22 Q. Good morning, Dr. Wheeler.
6 1 ----- 2 PROCEEDINGS 3 January 28, 2026, 9:17 a.m. MST 4 ----- 5 THE VIDEOGRAPHER: Here begins media 6 number one in the videotaped deposition of 7 Dean R. Wheeler, Ph.D., in the matter of 8 Zhuhai CosMX Battery Co., LTD, v. Ningde 9 Amperex Technology LTD, in the United States 10 patent and trademark office before the Patent 11 Trial and Appeal Board. Case No. IPR 12 2025-00431. 13 Today's date is January 28, 2026. 14 The time on the video monitor is 09:18 15 Mountain Time. The videographer today is 16 Kieran Morrison, representing Planet Depos. 17 This video deposition is taking place at 180 18 North University Avenue, Suite 270 in Provo, 19 Utah. Would counsel please voice identify 20 themselves and state whom they represent. 21 MR. STEIN: I'm James Stein. I'm 22 with the law firm of Lee & Hayes, and I	8 1 A. Good morning. 2 Q. So you understand that you're here today 3 to give testimony in an inter partes review 4 proceeding before the U.S. Patent and Trademark 5 Office? 6 A. Yes. 7 Q. And that proceeding is Zhuhai CosMX 8 Battery Co. Limited versus Ningde Amperex Technology 9 Limited. Correct? 10 A. Yes. 11 Q. And the reference number for that is IPR 12 2025-00431. 13 Right? 14 A. Yes. 15 Q. Is it okay if I call the petitioner CosMX 16 in this proceeding and the Patent Owner ATL? 17 A. Yes. 18 Q. And this proceeding relates to U.S. 19 Patent number 11799131, correct? 20 A. Correct. 21 Q. Is it okay if I call that the '131 22 patent?

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9 1 A. Yes. 2 Q. And you've submitted testimony in this 3 IPR proceeding on behalf of ATL, correct? 4 A. Correct. 5 Q. You submitted a first declaration in 6 support of ATL's preliminary response, which is 7 Exhibit 2015 in this proceeding? 8 A. Yes. Let me verify the exhibit number. 9 [Document review.] 10 A. Yes. 11 BY MR. STEIN: 12 Q. And you also submitted a second 13 supplemental declaration in this proceeding, which 14 is Exhibit 2047, right? 15 A. Correct. 16 Q. And in general, your testimony in this 17 case is about the '131 patent and prior art 18 references raised by CosMX in its petition for 19 inter partes review, right? 20 A. Correct. 21 Q. Have you ever been deposed before? 22 A. No.	11 1 Q. And the court reporter will be 2 transcribing my verbal questions and your verbal 3 answers. Do you understand that? 4 A. Yes. 5 Q. And so it's important that you answer 6 verbally and not with head nods or gestures. Okay? 7 A. Understood. 8 Q. And then we should both try to speak 9 slowly and try not to interrupt each other so the 10 record is clear. Okay? 11 A. Okay. 12 Q. So let me finish my question before 13 answering and I'll let you finish your answer before 14 asking another question. Okay? 15 A. Okay. 16 Q. And then we'll aim to take a break 17 periodically. Maybe every hour or so. But if you 18 need a break sooner than that, just let me know and 19 we can take a break after you finish answering a 20 pending question. 21 Does that sound fair? 22 A. So I need – if a break happens, it needs
10 1 Q. Is it okay if I go over a few ground 2 rules that will allow the deposition to proceed 3 smoothly? 4 A. Please. 5 Q. So it's pretty simple. I'll ask 6 questions and you'll answer them. Is that fair? 7 A. Yes. 8 Q. And if you understand the question, 9 please answer it. Okay? 10 A. Yes. 11 Q. If you don't understand a question, 12 please say so and I'll try to clarify the question 13 for you. Do you understand? 14 A. Yes. 15 Q. Otherwise, I'll assume you understood the 16 question if you answer it. Do you understand? 17 A. Yes. 18 Q. And Mr. Cox may object to questions from 19 time to time. Even if he does, you must still 20 answer the question unless he instructs you not to 21 answer it. Okay? 22 A. Understood.	12 1 to be after a question has been completed? 2 Q. If we're in the middle of a question that 3 you haven't answered, we prefer to finish it. 4 A. Got it. 5 Q. And so you understand that you'll be 6 testifying under oath during today's deposition, 7 just as though you were testifying in court before a 8 judge? 9 A. Yes. 10 Q. Is there any reason that you can't fully 11 and truthfully answer questions today? For example, 12 are you taking any medication that might affect your 13 memory? 14 A. No. 15 Q. And I understand that you have electronic 16 copies of the papers and exhibits that are already 17 of record in this proceeding? 18 A. Correct. 19 MR. COX: He has the exhibits, not 20 all the papers. 21 MR. STEIN: Okay. 22

13 1 BY MR. STEIN: 2 Q. Are they -- 3 A. Should I amend my response? 4 Q. If you'd like to. 5 A. Yeah, I have all the exhibits, but not 6 all the papers. 7 Q. Are they free of any notes or any 8 highlighting or any comments? 9 A. Correct. 10 Q. And do you have any lines of 11 communication open on your computer like e-mail or a 12 messaging application? 13 A. No. 14 Q. So who retained you for this proceeding? 15 A. Alston & Bird. 16 Q. And when were you first contacted about 17 it? 18 A. I don't remember the exact date, but it 19 was early in 2025. 20 Q. What did you do to prepare for today's 21 deposition? 22 A. In addition to forming opinions	15 1 Q. Let's pull up your CV, which is 2 Exhibit 2016. 3 (Clarification by reporter.) 4 BY MR. STEIN: 5 Q. Just let me know when you have that open. 6 A. It's open. 7 Q. So do you see on the first page there's a 8 section called Work Experience? 9 A. Correct. I've found that. 10 Q. And the second bullet says: Expert 11 Witness and Consultant. 12 And it lists various law firms and 13 companies? 14 A. Yes, I see that. 15 Q. Can you tell me about each of those 16 engagements? 17 A. Some of them are long enough ago I may 18 not remember all of the details, but I will state 19 what I can. 20 Alston & Bird is the first listed 21 engagement, which is obviously this proceeding as 22 well as a previous case two years ago, also
14 1 previously that are in my declarations, I met with 2 Brady and another lawyer from Alston & Bird LLP, 3 Miranda Sooter. 4 And she was remote, but... 5 For the last two days we had discussions. 6 Q. Anyone else? 7 A. No. 8 Q. Did you review any documents in preparing 9 for today's disposition? 10 A. Yes. 11 Q. Which documents? 12 A. Many of the exhibits, and my own 13 declarations. 14 Q. Any documents that are not part of this 15 proceeding already? 16 A. Occasionally using an internet search to 17 identify molecular structures, but nothing else. 18 Q. Does any part of your compensation in 19 this -- for work done in this proceeding depend on 20 the outcome or on how you testify today in the 21 deposition? 22 A. No.	16 1 involving the same parties. 2 Safety Management Services is a firm in 3 Utah that does testing of devices to -- basically to 4 try to blow them up and see what happens. And so 5 that was -- they needed some advice about 6 battery-related -- no. About seat belt -- a seat 7 belt device in a car. 8 Hall Labs is a local company that does 9 research in a range of fields, and they wanted 10 advice about batteries. 11 Fish & Richardson is a law firm, and I 12 believe I was assisting them kind of indirectly. 13 One of their expert witnesses needed assistance on 14 the battery issue and so I was helping that expert 15 witness do some testing. 16 That's my memory about that one. 17 Caldera is a local engineering company 18 that needed assistance about thermodynamics and 19 chemical engineering, and so I was helping them with 20 a project. 21 SpectraPower is a company in California 22 that makes batteries, and they -- I consulted with

17 1 them informally. 2 Thorpe North & Western is a law firm. My 3 memory is that that was a consumer products case 4 dealing with batteries in flashlights that I was an 5 expert witness for one of the parties. 6 Novatek is also a local engineering firm. 7 I was consulting with them about battery issues. 8 Airgyro Aviation is a local firm that at 9 the time makes a -- or was marketing a product 10 called Airgyros that are similar to helicopters. 11 And I was consulting with them about how their 12 helicopters would work better. 13 Parr Waddoups. That's a law firm, but I 14 honestly can't remember what I was doing for them. 15 Phoenix Systems is a maker of additives 16 for brake fluid, and they wanted some expert advice 17 on corrosion issues. 18 And vSpring Capital was a venture capital 19 firm that was considering whether to invest in a 20 battery technology, and they wanted my expert advice 21 on whether that would be a good -- if it was a good 22 technology.	19 1 Q. And when was that, do you remember? 2 A. That was in approximately the summer of 3 2023. 4 Q. What did you do on that case? 5 A. Similar to what I'm doing now. I formed 6 opinions about prior art and wrote a declaration. 7 Q. Was the declaration used in the 8 proceeding? 9 MR. COX: Objection, vague. 10 A. I understand it was, yes. 11 BY MR. STEIN: 12 Q. Were you deposed in that previous case? 13 A. No. I don't -- I was not deposed. 14 Q. And did you testify at the trial in that 15 previous case? 16 A. No, I did not. 17 Q. Regarding the Fish & Richardson work, do 18 you remember what you did for them? 19 A. Beyond what I already said, nothing of 20 note. 21 Q. Okay. So you have a BS degree in 22 chemical engineering from Brigham Young University,
18 1 Q. And so going back to the Alston & Bird 2 work, it sounds like you're working on the current 3 pending district court litigation between CosMX and 4 ATL and obviously you're working on some of the IPRs 5 related to that. 6 A. Mm-hmm. 7 Q. Correct? 8 A. Yes. I have to be honest, I don't always 9 keep track of which forum the expert advice is being 10 used in, whether it's the district court or the 11 patent stuff. 12 So I will say yes, in the sense that yes, 13 I'm their expert witness on a range of cases. 14 Q. So you're involved in the current -- 15 currently pending district court case, let's say? 16 MR. COX: Objection, form. 17 A. I believe so. 18 BY MR. STEIN: 19 Q. And it sounded like you worked on a -- 20 you said you worked on a past litigation between ATL 21 and CosMX as well? 22 A. Yes.	20 1 right? 2 A. Correct. 3 Q. Did any of your undergraduate work focus 4 on electrolytes for lithium-ion batteries, 5 specifically? 6 A. No. 7 Q. And you have a Ph.D. in chemical 8 engineering from UC Berkeley, right? 9 A. Correct. 10 Q. Did any of your graduate work focus on 11 electrolytes for lithium-ion batteries specifically? 12 A. Yes. That was the entirety of my Ph.D. 13 project. 14 Q. What was your Ph.D. project about? 15 A. It was to perform computer simulations of 16 electrolytes for lithium batteries, and other 17 systems. But the ultimate goal was to apply the 18 technique to lithium battery electrolytes. 19 Q. And when was that? What year would that 20 have been? 21 A. Well, it was a range of years. I 22 completed my degree in 2002. Started in 1997.

21 1 Q. And you mentioned that you did 2 simulations of lithium-ion batteries in your 3 graduate work? 4 A. Of -- specifically of electrolytes, yes. 5 Q. And then what did you use to simulate? 6 Was it a computer tool? 7 A. Yes, a computer code. 8 Q. And then is there a name for it or 9 it's -- what would something like that be called? 10 A. The term of art is molecular dynamics 11 simulations. And I had my own code that I inherited 12 and then modified to perform the research. 13 Q. Okay. So your CV also lists some recent 14 peer-reviewed archival publications. Do you see 15 that? 16 A. Yes, I do. 17 Q. And based on the titles of these, it 18 looks like they're focused on electrode composition; 19 is that right? 20 A. Well, on my CV, as -- that we are looking 21 at, only shows the most recent five at the time that 22 the CV was written, which was some months ago. Of	23 1 electrolytes in multiple papers, understanding how 2 the electrolytes function on the molecular level. 3 So yes, electrolytes are used in my prior 4 work. 5 Q. I didn't see any papers that, for 6 example, had electrolyte in the title such that it 7 was really kind of zooming in on the electrolyte 8 itself; is that correct? 9 MR. COX: Objection, form. 10 A. I believe that's correct. I would have 11 to look through a complete list of my publications 12 to verify that, which I don't have available to me 13 right now. 14 BY MR. STEIN: 15 Q. Would you say your expertise is in 16 electro construction? 17 A. My expertise is in many areas of 18 electrochemistry, electrochemical engineering. 19 Lithium-ion batteries have been a topic -- a 20 recurring topic of most of my career. 21 My interests are broad, so they change 22 over time, and -- but they kind of center on how
22 1 those five, the first one is a set of computer 2 simulations of silicon anodes, which are being 3 considered for use in lithium-ion batteries. 4 The next one discusses the use of 5 polymeric binder for silicon anodes, and how that 6 can be improved. 7 The next one talks about measuring ionic 8 transport behavior inside of cathodes and or anodes. 9 The next one is talking about using 10 multilayer electrodes for specific engineering 11 purposes. 12 And then the last one that's listed here 13 is a computer modeling and experimental study on 14 what happens when you're manufacturing electrodes, 15 including the drying and calendaring steps. 16 Q. Do you have any published papers about 17 electrolytes specifically? 18 A. Certainly in any published work, 19 electrolytes are integral, especially for when 20 you're constructing cells, you have to pay attention 21 to what electrolyte you're using. 22 I've focused on computer simulations of	24 1 electrodes can be organized or formed for maximum 2 benefit. 3 How the electrolyte goes into other 4 materials in batteries, such as separators, and 5 electrodes. 6 More recently there's unpublished work 7 that we're working on where we do a lot of 8 electrolyte development. So even though I didn't 9 point to any published papers on electrolyte 10 development, it's an active part of my current 11 research. 12 Q. And you're currently a professor of 13 chemical engineering at BYU, right? 14 A. Correct. The name of the department 15 recently changed, after this was submitted, so it's 16 now chemical and biological engineering. 17 Q. Do you teach any undergraduate classes 18 about electrolytes for lithium-ion batteries? 19 A. I do not currently teach 20 undergraduate-level class on electrolytes. 21 Q. What about graduate classes? 22 A. In the past I have taught an

25 1 electrochemical engineering class. And there's a -- 2 I'm not currently teaching an electrochemical 3 engineering class, but I've been invited as a guest 4 lecturer this semester to come in and talk about 5 lithium battery issues, including electrolytes. 6 Q. Did that electrochemical engineering 7 class have a unit on electrolytes? 8 A. A great deal of that class -- again, it's 9 being taught by another professor, but a great deal 10 of that class deals with electrolytes. 11 Q. Okay. Let's go to -- this is the new 12 Exhibit, 1043. 13 A. I have that now. 14 Q. Do you recognize this? 15 A. I do. 16 Q. It's a web page about research done by 17 the Wheeler Group. 18 A. Correct. 19 Q. And that's your research group? 20 A. Yes. 21 Q. Is this research group currently active? 22 A. Yes. I currently perform research.	27 1 inside electrodes and separators. 2 The second topic on this page says 3 particle simulation tools. And this is emphasizing 4 that we commonly use computers to imitate or make a 5 digital twin of real systems so that we can better 6 understand how they function. And these happen at 7 different length scales so it can include molecular 8 things or larger things like that you would see 9 inside a battery-material-like particles that are on 10 the order of five microns. 11 And so it's -- this is -- this page is 12 meant to -- as a -- effectively as an advertisement 13 for students who might consider joining my group to 14 get an idea what they would be doing if they joined 15 my research group. 16 Q. And this page says your research seeks 17 improved electrode morphologies? 18 Can you explain what that means? 19 A. Let me find where you said that. 20 Q. It's in the first section you discussed, 21 high-powered lithium-ion batteries about halfway 22 through.
26 1 Although I will say that this is a portion of the 2 website for my group or for the department that has 3 not been updated in some time. 4 Q. Roughly when do you think this website 5 was posted in this current form? 6 A. If I had to speculate, I would say 7 probably ten years ago, but I couldn't tell you the 8 exact time. It's not that this is -- would be 9 incorrect now, it's just an incomplete description 10 of what I do. 11 Q. So can you tell me about this research? 12 A. That's listed on this page? 13 Q. Mm-hmm. 14 Yes. 15 A. So the first topic on this page says 16 high-power lithium-ion batteries. And it's stating 17 that we -- my research group seeks to improve 18 batteries so that they can work at higher rates of 19 power, which effectively means you need to pay 20 attention to how ions move through the electrolyte 21 and electrons move through the solids. And so you 22 have to understand how those materials are organized	28 1 A. It says: Our work in this area is to 2 engineer improved electrode morphologies. 3 And your question is -- 4 Q. Yeah, what's an electrode morphology? 5 A. That's just another fancy word to say 6 microstructure or structure or how the particles are 7 organized and how the electrolyte fits in between 8 those particles. 9 In the case of separators, they aren't 10 necessarily particles, but there are polymeric 11 materials typically that again have a certain 12 arrangement and then you have pores that are filled 13 with electrolyte. 14 Q. Does morphology refer to the structure 15 and composition of the electrode or how it behaves? 16 MR. COX: Objection, form. 17 A. It can mean lots of things, but in this 18 context, this web page is trying to express that we 19 pay attention to how solids are arranged and how 20 liquids are arranged with those solids to accomplish 21 function that makes -- that's necessary for the 22 battery to be competitive.

29 1 BY MR. STEIN: 2 Q. And this page, it also says you work with 3 simulation tools, which we started touching on a bit 4 earlier, right? 5 A. Correct. 6 Q. And so can you tell me about these 7 simulation tools? 8 A. As I said, there's multiple tools. Most 9 of them we develop within our own research group, 10 making computer codes that can imitate real systems. 11 One of the difficulties in battery work is that you 12 can't see inside the battery typically, so you don't 13 always know what's going on in terms of the 14 electrical currents, the concentrations. And so a 15 computer tool like this can be very helpful to 16 indicate what is going -- what is likely to be 17 occurring inside that battery as you operate it 18 under different conditions, and that allows 19 engineers to make informed decisions about how to 20 improve the battery function. 21 Q. And then are there commercial software 22 tools that do this?	31 1 simulations estimate or predict the molecular 2 behavior of the materials in the battery system, 3 right? 4 A. That's one tool that can do that, mm-hmm. 5 Q. And they can estimate or predict the 6 thermal dynamic transport properties of the 7 material, correct? 8 A. Yes. 9 Q. Does that refer to the electrolyte till? 10 A. Yes. 11 Q. So how do these tools do that? How do 12 they predict or estimate the behavior? 13 A. You hypothesize how molecules will -- in 14 this case, you hypothesize how molecules will 15 interact, including ions, in terms of the forces 16 between them. You program that into a computer code 17 and you basically turn it loose and let it -- it's 18 similar to, like, a box filled with molecules that 19 are bouncing around, including ions. And you 20 basically watch what they do, and you can relate 21 that to the more dynamic and transport properties. 22 That's the essence of the tool called
30 1 A. There are some. But as an academic, I'm 2 always trying to improve the tools, so we commonly 3 go well beyond what the commercially available tools 4 can do. 5 Q. Do you recall any names of the commercial 6 tools? 7 A. To be honest, I'm not keeping track of 8 all of the latest iterations of those tools, but 9 many companies that make fluid mechanics tools, like 10 fluent, try to add battery things on to them. Or 11 there's a tool that we have used and others have 12 used -- I'm sorry, my -- give me a moment. 13 It's COMSOL Multiphysics. It's used in 14 lots of different engineering areas, but they have a 15 battery module that you can purchase to do battery 16 simulations. So that's a tool that we have looked 17 at, and I believe have improved on. 18 Q. And how long have these types of 19 commercial tools been available? 20 A. Generally speaking, decades. 21 Q. And so the page in the particle 22 simulation tools section. It says that the	32 1 Molecular Dynamics. 2 Q. And so what are the types of inputs that 3 you would provide to the tool? 4 A. Again, you have to make educated guesses 5 about how the molecules interact in terms of their 6 forces. And then you also have to tell the tool how 7 many molecules you want to put in the box, what 8 temperature; what pressure; what ratios, because 9 you'll have a mixture of things. And then you turn 10 it loose. 11 Q. So would one of the inputs be the 12 composition of the cathode? 13 A. In the case that we're talking about 14 right now, it would not be on a cathode scale, it 15 would just be -- you could think of it as on a 16 molecular scale inside one of the pores of the 17 cathode. 18 So it wouldn't capture the whole cathode. 19 That would be a different computer model. 20 Q. Well how do you know if the simulation is 21 useful if it doesn't account for the cathode 22 composition at a detailed level?

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33 1 MR. COX: Object to form. 2 A. Computer simulations are designed to 3 answer a specific question for a specific system on 4 specific time scales and length scales. So it's -- 5 it would be ridiculous to say why doesn't your tool 6 answer this other question it was never designed to 7 answer. 8 BY MR. STEIN: 9 Q. Is one of the inputs the inert 10 composition also? 11 MR. COX: Object to form. 12 A. Again, if -- are we still talking about 13 my molecular scale simulations? 14 BY MR. STEIN: 15 Q. Yeah, about the -- I'm asking about these 16 types of commercial tools. 17 A. Well, I misunderstood. I thought we were 18 talking about my computer codes. 19 Q. Okay. Let's finish talking about yours 20 first, and then we can go back. 21 A. Okay. 22 Q. Yeah, so in your tools, would you input	35 1 properties that it used for the simulation? 2 A. Not everything is integrated, as you are 3 suggesting with your question. So sometimes you 4 have to do some work on the side. If you say -- if 5 you say I'm interested in a particular electrolyte, 6 then you would do an in-depth investigation of the 7 properties of that electrolyte. Once those are 8 determined, then you could put those into the 9 computer simulation to answer other questions. 10 Q. Okay. And what about, as far as you are 11 aware of, these commercial simulation tools? What 12 are the types of inputs you would put in for those 13 tools? 14 A. It would be difficult for me to 15 generalize that. 16 Q. Can you input a composition of, like, a 17 battery system and simulate that? 18 MR. COX: Object to form. 19 A. Again, your question is so broad, I can't 20 -- couldn't possibly answer that. 21 BY MR. STEIN: 22 Q. So why don't you explain it, as best you
34 1 the anode composition? 2 A. Again, if we are talking about one of the 3 mesoscale simulations that I do, yes. 4 Q. And what about the composition of the 5 electrolyte? 6 A. That is factored in, yes. 7 Q. So you would input -- what would you 8 input for the electrolyte composition to the tool? 9 A. You would -- 10 MR. COX: Objection, form. 11 A. It depends on what you're trying to do 12 with the code, but in a typical scenario, you would 13 need to know properties of that electrolyte such as 14 its conductivity, diffusivity, and other properties. 15 And you would program -- the code is designed to 16 input those properties of that electrolyte so that 17 you -- it will imitate what happens in the real 18 system. 19 BY MR. STEIN: 20 Q. But could you, like, select the specific 21 compounds to put into the simulation and then the 22 tool would have the properties for it? Or have some	36 1 can, how a commercial tool, a typical commercial 2 tool would work? 3 MR. COX: Object to form. 4 A. There is no typical. 5 BY MR. STEIN: 6 Q. Well, which one are you aware of? Which 7 commercial tool are you aware of? 8 A. So if we were to pick one tool, like the 9 one I mentioned, COMSOL Multiphysics, it would be 10 designed as a mesoscale computer simulation of a 11 battery. We'd call it a sandwich, which includes 12 both electrodes and a separator. And you would 13 input similar properties as I already specified for 14 my own computer codes, including the properties of 15 the electrolyte, the fraction of pores in the 16 electrodes, the exact chemical nature of those 17 electrodes, and you would, again, attempt to imitate 18 the real system to see how it would behave under 19 different scenarios. 20 Q. Okay. On page 2, I guess bridging 21 between pages 1 and 2. 22 A. So of this same document?

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37 1 Q. Yes, of the web page document. 2 A. Mm-hmm. 3 That page 2? Okay. I've got it. 4 Q. And the web page says that this is a: 5 Snapshot from a molecular dynamics simulation of 1 6 molar LiPF₆ and propylene carbonate solvent, an 7 electrolyte used in lithium-ion batteries. 8 Do you see that, just above the snapshot? 9 A. I do. 10 Q. Why did you choose that electrolyte 11 composition for the simulation? 12 A. It is meant as illustrative. This is 13 also quite old. I probably made this picture during 14 my Ph.D. or shortly after, and so it's meant to 15 illustrate in a simple way what the electrolyte 16 looks like at a molecular level. 17 Q. Is that a typical electrolyte 18 composition, one more LiPF₆ and propylene carbonate? 19 A. No. 20 Q. Why not? 21 A. Because in the last 25 years or longer, 22 other electrolyte compositions have been shown to be	39 1 Q. Would 5 molar LiPF₆ be conventional? 2 A. No. 3 Q. What about 0.3 molar LiPF₆? Would that 4 be conventional for a lithium-ion battery 5 electrolyte? 6 A. I don't actually know what concentrations 7 are used in commercially available batteries. Many 8 of those are proprietary. 9 But any time you design an electrolyte 10 for a specific use in a battery, you're trying to 11 design it to fulfill a certain criteria, and you 12 design it with a certain concentration that you 13 think will meet those needs. In some cases, maybe 14 .3 molar would meet those specifications, and that 15 would be used. It would certainly be a lower cost 16 electrolyte, because the salt is an expensive 17 component. So there might be some motivation for 18 someone to use a lower concentration. 19 On the other hand, you might decide that 20 you want to use a different concentration for other 21 purposes. 22 Q. Have you ever used a 0.3 molar
38 1 better. 2 Q. But at the time you made this web page it 3 was typical? 4 A. No, I wouldn't even say that. 5 Q. So why did you use it in this simulation? 6 A. Because it was easy to illustrate 7 principles of electrolytes. 8 Q. What makes it easy to illustrate? 9 A. Because it only has one solvent as 10 opposed to a mixture of solvents. 11 Q. Is 1 molar LiPF₆ a typical concentration 12 used in lithium-ion battery electrolytes? 13 A. I don't think I could say that. 14 Q. They usually range between .8 and 1.2, 15 right? 16 MR. COX: Objection, form. 17 A. As you said, some people use that range. 18 But I – 19 BY MR. STEIN: 20 Q. Is it a common range? 21 A. It is used by people who want to make an 22 electrolyte.	40 1 concentration of LiPF₆ in an electrolyte before? 2 A. I couldn't state that I've specifically 3 used that concentration. 4 Q. What about 5 molar? 5 A. I couldn't state that I've used that 6 either. 7 Q. Well, 1 molar is commonly used in 8 lithium-ion batteries commercially, right? 9 MR. COX: Objection, asked and 10 answered. 11 A. As I said, I don't know what everybody is 12 using in their battery electrolytes when they make 13 them and sell them. 14 BY MR. STEIN: 15 Q. And would you be surprised to learn that 16 a commercial battery has a 1 molar LiPF₆ 17 concentration in its electrolyte? 18 A. If I were to learn that someone was using 19 1 molar, I would not be surprised. 20 Q. Okay. Can we go to the snapshot on 21 page 2 of the simulation? 22 A. The graphic that's on that?

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41 1 Q. The graphic that's on page 2 of the PDF. 2 A. Yes. 3 Q. Can you just explain a little bit about 4 what's going on in this snapshot? 5 A. Again, it's meant to illustrate so that 6 someone viewing it can visually interpret what 7 they're seeing. So it has artificial lighting, 8 shadows, things like that, just to make it easier 9 to – for someone to interpret. 10 It's showing the identity of lithium-ions 11 in red, and the PF6 anions in blue. And then the 12 propylene carbonate solvent in green. 13 And so someone looking at this can 14 observe how close the lithium-ions approach to the 15 other species, how close they approach to other 16 lithium-ions, and have a better understanding of 17 what is happening on a molecular level in these – 18 in electrolytes such as this. 19 Q. But this is a snapshot, so if you're to 20 be viewing this in the real world, it would be like 21 a movie? Like a video, where things are moving 22 around in the image?	43 1 endeavor to try to study each of those components 2 and understand them well enough that you could put 3 them into the simulation with the appropriate 4 parameters. 5 Q. Okay. Okay. Let's go to the Zeng 6 reference, which is Exhibit 1006. 7 A. I have that reference. 8 Q. Do you recognize this reference? 9 A. Yes. 10 Q. Are you familiar with it? 11 A. Yes. 12 Q. And so this is one of the prior art 13 references that you opine on in your declarations, 14 right? 15 A. Yes. 16 Q. And you agree that Zeng discloses 17 electrolytes used in lithium-ion batteries? 18 A. Yes. 19 Q. Let's go to examples 4 and 6 of Zeng. 20 He calls them embodiments. 21 A. Can you point me to a paragraph? 22 Q. Yeah. Let's go to paragraph 45.
42 1 A. Correct. You can make movies. I've made 2 movies of these simulations. They're very 3 entertaining. 4 Q. Okay. Could you have done the simulation 5 with a different electrolyte than the one that's 6 mentioned above the snapshot? 7 A. Yes, you could – yes, I could. 8 Q. Could you have done it with an 9 electrolyte that included propyl propionate in it? 10 A. I could if I was interested in that 11 system, yes. 12 Q. And could you have done it with an 13 electrolyte that has two solvent components? 14 A. Yes, I could. 15 Q. Or three? 16 A. Yes. 17 Q. Four? 18 A. Yes. 19 Q. Is there any limit to how many solvents 20 you could put into the mixture for the simulation? 21 A. In principle there is no limit. In 22 practical application, it would be an expensive	44 1 There's a Table 1 that spans further 2 paragraphs, so paragraphs 45 and 46. 3 A. I see it. 4 Q. Are you familiar with embodiments 4 and 6 5 of Zeng? 6 A. Reasonably so. 7 Q. Now, example 4 and 6 are lithium-ion 8 battery electrolytes, right? 9 A. Correct. 10 Q. So you would agree that both examples 4 11 and 6 have a solvent mixture of ethylene carbonate, 12 propylene carbonate, diethyl carbonate, 13 fluorobenzene, ethyl propionate, and propyl 14 propionate, right? 15 A. Zeng discloses a mixture of those species 16 that you just listed as part of a solvent 17 composition, yes. 18 Q. But they're in both of those two 19 examples, examples 4 and 6, right? 20 A. Yes. 21 Q. Okay. Let's go to paragraph 37. 22 A. I'm there.

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45 1 Q. In the first sentence of paragraph 37 2 states that those solvent components that we just 3 discussed are mixed in a mass ratio, right? 4 MR. COX: Objection, form. 5 A. Paragraph 37 -- 6 Can you restate your question? 7 BY MR. STEIN: 8 Q. First, just maybe could you read the 9 first sentence of paragraph 37? Up to -- just the 10 first three lines of it. 11 A. Yes. 12 Q. Let me know when you've read it. 13 A. Sorry, the first three lines? 14 Q. Yeah. Actually, could you just read it 15 into the record, please? 16 A. The entire paragraph? 17 Q. No, just the part of the first sentence 18 that goes up to the semicolon in the third line. 19 A. Okay. 20 Electrolyte solution preparation steps: 21 In a glove box filled with argon gas, ethylene 22 carbonate, propylene carbonate, diethyl carbonate,	47 1 A. Well, I don't understand your question. 2 Q. You agree that propyl propionate is 20 3 parts out of 100 of the solvent mixture by mass, 4 right? 5 A. Sorry, I misheard you. I thought you 6 said solid mixture. 7 Q. Solvent. 8 A. Solvent. Yes, I agree with that. 9 Q. So it's 20% by mass of the solvent 10 mixture and then LiPF₆ is added after that, right? 11 MR. COX: Objection, form. 12 A. The Zeng specification after the 13 semicolon says "then," which implies that, yes, 14 after this mixture has been formed, then other 15 components are added. 16 BY MR. STEIN: 17 Q. Okay. So is it okay if I refer to a 18 person of ordinary skill in the art as a POSITA? 19 Just easier to say. 20 A. Yes. 21 Q. Okay. Thanks. 22 So in your opinion, a POSITA would
46 1 fluorobenzene, ethyl propionate, and propyl 2 propionate are mixed at a mass ratio of 3 EC:PC:DEC:FB:EP:PP equals 25:10:30:5:10:20. 4 Q. So it's saying that the solvent 5 components are mixed at a mass ratio, right? 6 A. That's correct. 7 Q. And that's before adding LiPF₆, which 8 comes after the semicolon. 9 A. That's correct. 10 Q. So would you agree that the mass ratio, 11 or the mass fraction of propyl propionate is 20 12 parts out of 100 in the solvent mixture before 13 adding LiPF₆? 14 A. Yes, I would agree that that's what Zeng 15 specifies. 16 Q. And 20 parts out of 100 is 20%, right? 17 A. Correct. 18 Q. So you would agree that propyl propionate 19 is 20% by mass of that solvent mixture before adding 20 LiPF₆, correct? 21 A. Did you say solid mixture? 22 Q. Either way.	48 1 understand Zeng as disclosing adding to Zeng's 2 specified solvent mixture -- a further solvent 3 mixture having 1 molar concentration of LiPF₆, 4 right? 5 A. I wouldn't characterize it as a further 6 solvent mixture, because it contains lithium 7 hexafluorophosphate. 8 If I understand what you're asking. 9 Q. Well, if there's no solvent, it would 10 just be solid LiPF₆, right? 11 A. I don't understand your question. 12 Q. It's your opinion that Zeng adds a 1 13 molar concentration solution of LiPF₆ to the 14 specified solvent mixture in Zeng that we just 15 discussed, right? 16 A. Yes, that's my opinion. 17 Q. It's also your opinion that Zeng does not 18 disclose what volume of that further solvent 19 solution containing LiPF₆ is added, right? 20 A. Correct. I don't see any specification 21 there. 22 Q. And this makes the weight percentage of

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49 1 propyl propionate (Z) in the total electrolyte 2 unknown in your opinion, right? 3 A. Correct. 4 Q. And Zeng, in your opinion, doesn't 5 disclose what that solvent is that LiPF₆ is 6 dissolved in, right? 7 A. Correct. I don't see any disclosure of 8 that. 9 Q. You would agree that adding an unknown 10 solution of LiPF₆ to Zeng's other mixture of solvent 11 would have an unpredictable effect on Zeng's 12 electrolytes, right? 13 A. It would be unpredictable to a POSITA, 14 yes, but not to Zeng. 15 Q. Because in your opinion it would have 16 unpredictable effects on the existing solvent 17 composition that Zeng already specifies, right? 18 A. If we're establishing the principle that 19 any modification to the electrolyte mixture will 20 have an effect, yes. 21 Q. Is that your opinion that any 22 modification to an electrolyte will have an	51 1 way Zeng describes it, right? In your opinion? 2 A. I believe I've answered that already. 3 Q. Is the answer yes? 4 A. The answer is it would be unpredictable 5 if you hadn't yet experimented on that mixture, and 6 it would be predicted -- once you've experimented, 7 you would know what it would do. 8 Q. But you can't experiment with a solvent 9 solution if you don't know what the solvent is, 10 right? 11 A. That's right. Zeng knew -- it appears 12 that Zeng knows what they did, but a POSITA doesn't 13 have as much information as Zeng had. 14 Q. But Zeng doesn't say what it is, right? 15 In your opinion? 16 A. Correct. 17 Q. Okay. 18 So you're aware that CosMX expert, 19 Dr. Lucht, opines that a POSITA would have added 20 LiPF₆ salt as a solid until it reaches a 1 molar 21 concentration in that solvent mixture that Zeng 22 already specifies, right?
50 1 unpredictable effect? 2 A. Again, it's unpredictable until you've 3 done the experiment. Once you've done the 4 experiment, you know what it will do. But until 5 that point, it's fairly unpredictable. 6 Q. But using one of these tools we just 7 discussed, you could simulate it, right? 8 A. You mean a computer simulation tool of 9 electrolytes? In principle, you could simulate 10 electrolytes like this. 11 Q. And then that unknown solution of LiPF₆ 12 could have an unpredictable effect on the additives 13 in Zeng's embodiments 4 and 6, right? 14 A. Again, it's not unpredictable to Zeng. 15 Zeng made an electrolyte and achieved a result that 16 they were satisfied with. But it would be 17 unpredictable to someone who hadn't yet done the 18 experiment. 19 Q. But the solvent that LiPF₆ is in is not 20 even known, in your opinion. 21 A. There are uncertainties in that solvent. 22 Q. So it would be unpredictable, even in the	52 1 A. I'm aware that's his opinion. 2 Q. But that's your understanding, that he, 3 in his opinion, a POSITA would have added a LiPF₆ as 4 a solid salt until it reaches that concentration? 5 A. Yes, I understand that's his opinion. 6 Q. And Dr. Lucht says that's typically how 7 you would add lithium salt when the solvent mixture 8 is already specified, right? 9 A. I would have to find where you're looking 10 for that opinion of his. 11 Do you want to point me to something? 12 Q. Yeah. It's Exhibit 1003, paragraph 80, 13 and there's a footnote 6. 14 A. Okay. 15 I've found paragraph 80. Will you 16 restate? 17 Q. And then, I guess if you just read 18 paragraph 80 and then the footnote 6 that's in that 19 paragraph? 20 A. You would like me to read his statement? 21 Q. If you -- yeah. If you want to see what 22 he says about this.

53 1 MR. COX: I think the question is out 2 loud or not. 3 MR. STEIN: Oh. No, you don't have 4 to read it out loud. 5 [Document review.] 6 A. I see where he gives his opinion that it 7 would be standard practice to mix LiPF6 to achieve 8 the 1 molar concentration. 9 BY MR. STEIN: 10 Q. Do you disagree with him that that's 11 typically what a -- what you would do when a recipe 12 for the solvent is already specified? 13 A. I do disagree. 14 Q. Why? 15 A. Because you use the word "typical." And 16 there's no typical in such recipes. Everybody has 17 their idiosyncratic way of expressing how they want 18 their composition to be achieved. So Zeng has their 19 own way of expressing it. Someone else might have a 20 different way of expressing how they want their 21 composition to be achieved. 22 Q. So you don't disagree with his opinion,	55 1 a premixed electrolyte containing LiPF6, and you put 2 additives in that? 3 A. Yes. 4 Q. And I asked, have you ever poured that 5 premixed solution of LiPF6 onto another recipe for a 6 solvent? 7 A. I don't believe I have done that in my 8 laboratory, but it's -- it's one way that you could 9 get a composition that you want. 10 Q. Are you aware of anyone else who has done 11 that? 12 A. I don't keep track of what -- how other 13 people produce their mixtures, so I couldn't 14 specify, or I couldn't speculate, I should say. 15 Q. Have you ever seen another reference or 16 paper that teaches doing that? 17 A. Most papers that I would be aware of in 18 the academic literature don't give that level of 19 detail. 20 Q. Well, how does a POSITA learn how to make 21 an electrolyte? 22 MR. COX: Objection, form.
54 1 then? 2 A. I stated that I did disagree with it. 3 Q. Well, you said -- it sounds like you're 4 saying it depends, right? It depends on how you 5 want to do it. 6 A. I stated that it was typical, and he -- 7 Lucht stated that it was standard practice. And I 8 disagreed with both of those terms. 9 Q. Have you ever seen a solvent solution 10 prepared the way that Dr. Lucht is describing? 11 A. That is one way to prepare an 12 electrolyte. 13 Q. Have you ever done that before? 14 A. More typically we purchase our 15 electrolytes premixed. And then we add additives 16 that we like into that premixed electrolyte. 17 Q. Would you pour the premixed electrolyte 18 into another solvent that's already there? 19 A. I don't know the specifics of what you're 20 talking -- of your question. Could you be more 21 specific? 22 Q. You just said that you typically purchase	56 1 A. A POSITA typically would work in a 2 laboratory environment, and every lab has their own 3 practices and procedures for how to mix 4 electrolytes. I can't say how other people do it. 5 BY MR. STEIN: 6 Q. Have you or any of your research 7 students, the ones doing research in your group, 8 done that before? Adding a premixed LiPF solution 9 onto an already specified recipe of a solvent 10 mixture? 11 A. I'm not aware of that. 12 Q. Are there any textbooks on electrolytes 13 and how to make them? 14 A. There may be. 15 Q. Well, you said you taught a class in 16 electrochemical engineering that dealt with 17 electrolytes, so... 18 A. So that mixing electrolytes is more of a 19 laboratory skill that's typically not the topic of a 20 lecture class. 21 Q. So is it like magic to make one of these 22 things? How would a person learn how to make an

57 1 electrolyte? 2 MR. COX: Objection, form. 3 A. Again, as I said, you work in a 4 laboratory that has its own set of practices and 5 procedures. There are different ways to make a 6 mixture. You can add A to B or B to A. 7 BY MR. STEIN: 8 Q. So what are the standard practices and 9 procedures in your laboratory? 10 A. As I said, the most common scenario that 11 we do is buy a premixed electrolyte and add other 12 components to it that we think will be of benefit. 13 Q. Okay. So you understand, there's like -- 14 there's two worlds here. Either you're correct that 15 a POSITA would add another unspecified 1 molar LiPF 16 solvent solution to Zeng's solvent recipe, or 17 Dr. Lucht is correct that a POSITA would add a solid 18 LiPF6 to Zeng's already specified solvent mixture 19 until it reaches the 1 molar concentration, correct? 20 MR. COX: Objection, form. 21 A. I think you're misstating, or you're 22 stating a false dichotomy. The important thing is	59 1 understand that there's two different opinions on 2 how LiPF6 is added in Zeng. That's all I'm asking. 3 A. I understand that Dr. Lucht and I 4 disagree about this. 5 Q. So do you offer an opinion in Dr. Lucht's 6 world, like under the assumption that he's correct 7 about how a POSITA would add LiPF6 to Zeng's solvent 8 mixture? 9 A. Are you asking a hypothetical? 10 Q. No, I'm just asking if you offered an 11 opinion that assumes -- 12 A. You said Dr. Lucht's world. I need you 13 to specify what you mean by that. 14 Q. Have you offered an opinion -- have you 15 offered an opinion under the assumption that 16 Dr. Lucht is correct about how LiPF6 is added to 17 Zeng's mixture? 18 For example, like you don't opine that 19 Dr. Lucht is wrong about the amount of propyl 20 propionate in examples 4 and 6 of Zeng, even 21 assuming LiPF6 were added as a solid, as he 22 believes. Right?
58 1 what does Zeng say, not what does -- what do I say 2 or what do I do in my lab or what does Dr. Lucht say 3 or do in his lab. It's what does Zeng say in their 4 specification of how to make their electrolyte. 5 That's the important thing. 6 BY MR. STEIN: 7 Q. You realize that the grounds that are 8 presented in this case are obviousness, right? 9 So the question is what would a POSITA 10 find obvious from Zeng. And Dr. Lucht's opinion is 11 different from yours. You understand that, right? 12 A. I understand those are opinions about how 13 someone might interpret Zeng. 14 Q. Okay. 15 A. But when I look at Zeng and read the 16 plain English, there's only one interpretation. 17 Dr. Lucht's interpretation is basically coloring his 18 own practices or preferences on to what Zeng is 19 plainly saying, and in effect changing Zeng's 20 language for Zeng, which I believe is not an 21 appropriate way for a POSITA to read a reference. 22 Q. I'm just trying to make sure you	60 1 A. If one were to assume that Dr. Lucht was 2 correct about his interpretation, I have not 3 disputed how he calculated the fraction of propyl 4 propionate in the solvent mixture that the fleuro 5 lithium was added. 6 Q. Okay. 7 A. I think he made speculations. 8 Q. But you don't offer an opinion under the 9 assumption that he's correct about LiPF6. 10 MR. COX: Objection to form. 11 A. I'm not sure what you're asking. 12 MR. STEIN: Just scratch that 13 question. 14 Do you want to take a break? We've 15 been going about an hour. 16 THE VIDEOGRAPHER: We're going off 17 the record at 10:30. 18 (Recess taken, 10:30 a.m. to 10:39 19 a.m. MST) 20 THE VIDEOGRAPHER: We are back on 21 record at 10:39. 22

61 1 BY MR. STEIN: 2 Q. Okay, Dr. Wheeler. Your opinion is that 3 a POSITA would not have implemented Zeng's 4 embodiments 4 and 6, correct? 5 MR. COX: Objection, form. 6 A. I guess I need more context. What do you 7 mean by a POSITA would not have implemented? 8 BY MR. STEIN: 9 Q. Maybe go to paragraph 74 of your first 10 declaration, Exhibit 2015. 11 A. Okay. 12 I'm at paragraph 74. 13 Q. And even just the heading above that 14 says: Petitioner Fails to Show that a POSITA Would 15 Have Selected or Implemented Embodiments 4 or 6 of 16 Zeng. 17 Right? 18 A. Correct. 19 Q. Okay. 20 And why is that your opinion? 21 MR. COX: Objection, form. 22 A. My opinion is based on the idea that Dr.	63 1 comparative examples in capacity retention, right? 2 A. Yes, it does. 3 Q. And example 4 also outperformed -- Or 4 embodiment 4 also outperformed embodiment 3, right? 5 A. I would not consider that statistically 6 significant, but numerically it is slightly greater 7 than embodiment 3. In the context of uncertainties, 8 I would say they're indistinguishable. 9 Q. And the same is true for examples -- for 10 example nine, right? 11 A. Embodiment 9? 12 Q. Embodiment 9. 13 A. It's numerically slightly greater than 14 embodiment 9, yes. 15 Q. And I think I skipped embodiment 7. 16 Embodiment 4 also outperformed embodiment 7 in 17 capacity retention, right? 18 A. That's correct. Again, I don't consider 19 that a very significant discrepancy between those 20 two. 21 Q. And then you would agree that table -- 22 that the table shows that embodiment 6 outperformed
62 1 Lucht cherry-picks embodiments 4 and 6, and puts 2 them forward as what a POSITA would want to do as 3 opposed to all other possibilities, and I disagree 4 with that. 5 BY MR. STEIN: 6 Q. So let's go to Zeng paragraph 45, which 7 has Table 1, I think. 8 A. Zeng paragraph 45, you said? 9 Q. Mm-hmm. Yes. 10 A. Okay. 11 Q. So you see the second-to-last column in 12 the table lists the capacity -- retention rate after 13 500 cycles for each of the embodiments, right? 14 A. I see that. 15 Q. And you would agree that this table shows 16 that embodiment 4 outperformed embodiments 3, 7, 9, 17 in the comparative examples in capacity retention, 18 right? 19 A. Can you restate which ones you were 20 comparing it to? 21 Q. Well, let's take them in turn. 22 So embodiment 4 outperformed all of the	64 1 the comparative examples also? 2 A. Yes, by the measure indicated on this 3 table, it does. 4 Q. And the same is true of -- that 5 embodiment 6 outperforms embodiments 1, 3, and 7 6 through 9, right? 7 A. Similar to my previous testimony, I would 8 state that they are -- it's numerically greater, but 9 in many cases not of a high significance. 10 Q. And the highest capacity retention of any 11 embodiment is embodiment 5, right? 12 A. Correct. 13 Q. But that -- you would still characterize 14 that as only nominally better than examples -- 15 embodiments 4 or 6, right? 16 MR. COX: Objection, vague. 17 A. I would characterize embodiment 5 as 18 having a higher numerical number than 4 and 6, and 19 all other embodiments. 20 It's -- the significance is starting to 21 get a little separation from the other results. 22

65 1 BY MR. STEIN: 2 Q. Can you turn to paragraph 76 of your 3 first declaration, Exhibit 2015? 4 A. Yes. 5 Q. So at the end of that paragraph you say: 6 Each of Embodiments 1-9 reflecting a similar 7 capacity retention rate within a nominal 2% range, 8 (i.e., between 90.3-92.2%) and no precipitation of 9 crystals after low-temperature storage for ten days. 10 A. That's what I said. 11 Q. So you're saying essentially that they're 12 comparable, right? 13 Embodiments 1 through 9 are all 14 comparable in terms of capacity retention and no 15 precipitation? 16 A. Yes. 17 Q. And so it would have been obvious to 18 implement any of Zeng's embodiments, right? Based 19 on that? 20 MR. COX: Objection to form. 21 A. So in what we're talking about, we're -- 22 embodiments 1 through 9 are indicating different	67 1 Q. But you would agree that Zeng doesn't 2 teach away from using embodiments 4 and 6, right? 3 MR. COX: Object to form. 4 A. A POSITA -- obviously a reference that 5 labels -- a reference like Zeng that labels a set of 6 experiments as embodiments is implying that there's 7 something beneficial about those formulations. 8 In the context of what we're talking 9 about now, we're -- the question is why we would 10 pick the specific embodiments 4 and 6 that Dr. Lucht 11 identified, and I don't see any rationale for that. 12 BY MR. STEIN: 13 Q. Well, what I'm asking you is something 14 different. Is there anything in Zeng that teaches 15 away from selecting embodiments 4 and 6? 16 A. So can you restate your question? 17 Q. Is there any disclosure in Zeng that 18 teaches away from using embodiments 4 and 6? 19 A. In the context of Zeng itself, Zeng 20 doesn't teach that. But in the context of combining 21 Zeng with something else, then a POSITA needs to 22 look in more detail in the formulations.
66 1 approaches, and Dr. Lucht said that 4 and 6 are 2 somehow superior, and that they should be chosen 3 over all other embodiments. 4 And I'm disagreeing with -- that a POSITA 5 would not be able to distinguish effectively between 6 those embodiments and choose 4 and 6 over any other 7 embodiment, based on the data in that table. 8 BY MR. STEIN: 9 Q. Well, he never said they were the best, 10 he just said it would have been obvious to use them. 11 Or -- and obvious to try them. 12 Do you disagree with that? 13 A. He stated that they significantly 14 outperformed the comparative examples, and that 15 outside of embodiments 2 and 5, embodiment 6 had the 16 best capacity retention at 91.6%. 17 And then he uses the word superlative 18 result -- the expression superlative results to 19 motivate someone to implement embodiments 4 and 6. 20 I disagree that a POSITA would have seen 21 those two as superlative or exemplary among other 22 embodiments.	68 1 Q. So Zeng doesn't -- there's nothing in 2 Zeng that's like -- where he says don't use the 3 embodiments 4 and 6, and then gives some reason why 4 it's bad, right? 5 A. Zeng -- no, Zeng does not teach against 6 using 4 and 6. 7 Q. Okay. Let's go to Sunose Exhibit 1010. 8 A. I have it. 9 Q. Are you familiar with this reference? 10 A. Yes. 11 Q. And this is one of the prior art 12 references that you've opined on in your 13 declarations, right? 14 A. Yes. 15 Q. So Sunose discloses using lithium cobalt 16 oxide, LCO, as part of a cathode active material, 17 right? 18 A. Yes, it does. 19 Q. Okay. In your opinion, some of the 20 compaction densities reported by Sunose are greater 21 than the theoretical crystalline density of LCO, 22 right?

69 1 A. Yes. 2 Q. And that is part of forming this opinion 3 you determined the density of crystalline density of 4 LCO to be 5.1 grams per cubic centimeter, right? 5 A. I didn't determine that, I relied on 6 other sources, or at least one cited source at 7 least. 8 Q. You cited to some references in your 9 declaration for this, right? 10 A. Correct. 11 Q. Did you know offhand the exact 12 crystalline density of LCO the first time you read 13 Sunose or did you have to look it up? 14 A. I don't recall, but I certainly know it 15 now. 16 Q. Would you expect a POSITA to know offhand 17 the crystalline density of LCO off the top of their 18 head or do you think they would have to look it up 19 as well? 20 MR. COX: Object to form. 21 A. A POSITA needs to do their own due 22 diligence. If a POSITA is to understand a	71 1 their head without looking it up? 2 MR. COX: Objection to the form. 3 A. Some might; some might not. I don't 4 know. 5 BY MR. STEIN: 6 Q. Okay. Let's go to paragraph 41 of 7 Sunose, which has Table 1. 8 A. Okay. 9 Q. So for example 2, you would agree that 10 the active material densities reported are less than 11 what you found to be the maximum -- or the 12 theoretical crystalline density of LCO, right? 13 MR. COX: Objection, vague. 14 A. You said example 2? 15 MR. COX: Do you mean embodiment or 16 example? 17 MR. STEIN: Scratch it. Let me ask 18 it again. 19 BY MR. STEIN: 20 Q. So looking at embodiment 2 in Table 1 of 21 Sunose, you would agree that the two active material 22 density values in that table are below the
70 1 reference, they need to use the tools that they 2 learned in their education and training to 3 investigate what the reference is saying. And if 4 it's believable or not, that's part of their 5 judgment. 6 In the context of densities, it's about a 7 three second online search to find that density, so 8 I would say a POSITA could do that quite readily. 9 BY MR. STEIN: 10 Q. I was just asking if you would expect a 11 POSITA to know offhand what that number was off the 12 top of her head. 13 MR. COX: Object to form. 14 A. I think that's immaterial. 15 BY MR. STEIN: 16 Q. Well, I'm just -- that's the question I'm 17 asking. 18 A. The question is could they identify that 19 value if they wanted to know it, and the answer is 20 yes, they could identify that. 21 Q. That's an answer to a different question. 22 I'm just asking would they know it off the top of	72 1 theoretical crystalline density of LCO, right? 2 A. Yes, that's true, but it's not a fair 3 comparison to compare it to the crystalline density 4 of LCO. 5 Q. I'm just asking whether you agree that 6 those densities are below the theoretical 7 crystalline density of LCO. 8 A. Yes, I agree with the statement you made. 9 Q. And the same with embodiment 3? 10 A. No, I would -- I'm sorry, I need to -- I 11 need to amend my prior statement. You asked if -- 12 is it below the crystalline density of LCO, which is 13 4.51. So the column N would be below that. 14 You're looking at embodiment 2, right? 15 The prior question. 16 Q. You said that the crystalline density of 17 LCO is 5.1 grams per cubic centimeter, right? 18 A. Right. 19 Q. Embodiment 2 reports -- of Sunose reports 20 two densities? 21 A. Right. 22 Q. And they're both below 5.1, correct?

73 1 A. Correct. 2 Q. And the same is true of embodiment 3? 3 A. That's correct. 4 Q. And the same is true of embodiment 4, 5 correct? 6 A. That's correct. 7 As I said before, I don't think that's 8 the appropriate comparison to be made. 9 Q. Well, that's the question I'm asking, for 10 now. 11 And so you also opine that the maximum 12 possible density of the composite material for 13 Sunose's cathode is 4.5 grams per cubic centimeter, 14 right? 15 A. That's correct, based on the composition 16 that was given in Sunose. I calculated that value. 17 Q. And that's -- the calculation is at -- 18 starts around paragraph 137 of your first 19 declaration, Exhibit 2015, right? 20 [Document review.] 21 A. Yes, that's correct. 22	75 1 Q. But you at least needed to calculate 2 those mass fractions in order to determine the 3 density, right? 4 A. Right. 5 Q. And then you had to research the 6 crystalline densities of the various components. 7 And that's in paragraph 138, right? 8 A. Right. 9 I would say that that research took a few 10 minutes of my time, yes. 11 Q. But you don't know it offhand when you 12 were reading Sunose, what they were. 13 MR. COX: Objection, form. 14 A. I actually do know the densities of -- 15 these are approximate densities, by the way, of -- 16 when it comes to the binder, and the carbon black. 17 So there's a small error bar on those, but I do know 18 them approximately. 19 BY MR. STEIN: 20 Q. Well, then that means your density 21 calculation of 4.5 is also approximate and has an 22 error bar in it, right?
74 1 BY MR. STEIN: 2 Q. Did you know that number 4.5 grams per 3 cubic centimeter off the top of your head or did you 4 have to calculate it? 5 MR. COX: Objection, form. 6 A. I did not know that number off the top of 7 my head, but I did know that it would be less than 8 the 5.1 value of the pure crystalline LCO, and I -- 9 again, it was a fairly easy calculation to do. 10 BY MR. STEIN: 11 Q. But it's not something you could do in 12 your head, right? 13 A. I wouldn't ordinarily do this in my head, 14 no. 15 Q. Because, for example, you calculated the 16 mass fractions for making up the dry powder, right? 17 In paragraph 137? 18 A. I included those to be complete to 19 show -- illustrate where those values came from in 20 Sunose so that it -- no one could question the 21 veracity of that calculation, but it's a trivial 22 calculation to perform.	76 1 A. It has an error bar that's extremely 2 small. 3 Q. Okay. So going back to the table in 4 Sunose, you agree that example three -- embodiment 3 5 reports densities that are below what you calculated 6 as the maximum composite density, right? 7 MR. COX: Objection, form. 8 Do you mean the compaction density? 9 A. So you asked if embodiment 4 has a value 10 of density that's less than the maximum theoretical 11 compaction density of that composite, and I agree 12 that that value is below. But that still doesn't 13 get it out of the woods, because the theoretical 14 maximum doesn't mean that you can achieve that in a 15 routine battery context. 16 The theoretical maximum is like what you 17 could achieve if you were just trying to put that 18 material in a press and press as much as it can be 19 pressed. But in an actual battery context, you 20 couldn't even get as high as that theoretical 21 maximum. Meaning that 4.5 is not realistically 22 achievable in any battery context. You would have

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77 1 to have a value less than 4.5 by some significant 2 amount. 3 So that's why I say embodiment 4 is not 4 necessarily realistic. 5 BY MR. STEIN: 6 Q. I was just asking about embodiments 2 and 7 3, which you agree have -- report active material 8 densities below the 4.5 that you calculated, right? 9 A. Yes, that's correct, the values shown in 10 that table are below 4.5. 11 Q. Do you agree that Sunose uses the terms 12 packing density and active material density 13 interchangeably? 14 MR. COX: Objection, form. 15 A. I don't like the way that Sunose uses the 16 term active material density, because that's 17 imprecise, because it implies something about the 18 active material itself. But insofar as it uses the 19 term to mean active material layer, then I 20 understand that they mean the same thing by that. 21 BY MR. STEIN: 22 Q. Okay. But in your opinion, neither of	79 1 electrode. So whatever they reported, it's 2 something else. 3 Q. Would you agree that the description in 4 Sunose about how it obtains the active material 5 density is describing a compaction process? 6 MR. COX: Objection, form of. 7 A. Your question is confusing. Could you 8 restate it? 9 BY MR. STEIN: 10 Q. Do you agree that Sunose's description 11 about how they obtain the active material density 12 involves compacting the active material? 13 MR. COX: Objection, form. 14 A. I agree that they compacted material in a 15 device. I don't know how they obtained the density 16 values that they reported. 17 BY MR. STEIN: 18 Q. So go to paragraph 16 of Sunose. 19 A. Okay. 20 Q. Just read that paragraph into the record, 21 I guess. 22 MR. COX: And just.
78 1 those terms, packing density or active material 2 density is the same as the -- as compaction density, 3 right? 4 A. I don't think those are the same because 5 of fatal flaws in Sunose's procedure. 6 Q. Do you offer an opinion on what else they 7 could mean? 8 A. I wouldn't want to speculate about what 9 Sunose means or what they thought they meant, I just 10 know that it's wrong because it cannot be physically 11 possible for those values to be compaction density 12 values. 13 Q. Well, what else could it be? 14 A. As I said, I'm reluctant to speculate. 15 All I can say is they're mistaken. 16 Q. But you don't have an opinion on what 17 else they could mean, right? 18 A. Well, I know what they thought they 19 meant, because they use the term density, and they 20 use the terms that have units of density, grams per 21 centimeter cubed. But I also know that what they 22 report is not a compaction density of an actual	80 1 A. And just to clarify, it's the para below 2 16? 3 BY MR. STEIN: 4 Q. Yes. 5 A. Therefore, by varying the thickness of 6 the single-sided active material portion and the 7 thickness of the two-sided active material portion 8 during the application of the active material, and 9 performing a fixed-size press using a rolling 10 machine, the prescribed active material density 11 ratio is obtained. 12 Q. So you'd agree that description is 13 describing a compaction, right? 14 A. Correct, they did -- it appears they 15 compacted their materials using a rolling press 16 machine. 17 Q. And then go to paragraph 28. 18 A. Okay. 19 Q. And just maybe read the paragraph and let 20 me know when you're finished. 21 A. You want me to read it out loud? 22 Q. No, you can read it to yourself.

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81 1 A. Okay. 2 [Document review.] 3 A. Okay. 4 BY MR. STEIN: 5 Q. So it's describing roll pressing from 6 both sides using a press roller, right? 7 A. Yes. 8 Q. So that's -- you would agree that's 9 compaction also, right? 10 A. Well, it depends on how thick the 11 material was that went into the device and how wide 12 they place the rollers apart from each other. But 13 if they place them narrower a distance than the 14 original thickness, then, yes, it will cause some 15 compaction. 16 Q. So you're saying that makes the 17 single-sided coating thicker than the double-sided 18 coating, and then rolls it through a fixed gap roll 19 press. So that's to compress it from both sides, 20 right? 21 A. Well, the compressing from both sides is 22 intrinsic to the device they're using.	83 1 A. Okay. 2 [Document review.] 3 A. Do you have a question? 4 BY MR. STEIN: 5 Q. You agree that it's at least describing a 6 compaction of the active material layers, right? 7 A. It's relying on the earlier description 8 that -- it appears to me. It says rolling was 9 performed. Using a roll press machine. So yes, 10 they are attempting to perform a compaction. 11 Q. So go to paragraph 55 of your second 12 declaration, Exhibit 2047. 13 A. Okay, paragraph 55 of the second 14 declaration. 15 Q. So here, there's a passage in this 16 paragraph where you state: Compaction density of an 17 electrode is calculated after the electrode has been 18 constructed and involves measurement of various 19 values to include weight and thickness. 20 A. Yes, I said that. 21 Q. You would agree that just -- density is 22 just mass divided by volume, right?
82 1 Q. But it's a compaction process, right? 2 A. That's correct. 3 Q. Okay. 4 A. But again, it -- it's possible that in 5 some instances it doesn't compact like they think, 6 if they don't have the thicknesses all worked out. 7 Q. Like if you didn't put enough material -- 8 if the thickness of the material that you coated on 9 the electroplate was smaller than the gap on the 10 roll press, then there would be no compaction, 11 right? 12 A. Very likely not. 13 Q. Yeah. 14 But if the thickness was too much -- 15 scratch that. 16 So go to paragraph 31. 17 A. Okay. 18 Q. And this was also describing the 19 compaction process, right? 20 A. Would you like me to read it? 21 Q. No, I just want to see if you agree with 22 it.	84 1 A. In the general sense, density is mass 2 divided by volume, yes. 3 Q. So you're not opining that density is 4 something other than mass divided by volume, right? 5 A. Correct. 6 What I'm opining is that someone may 7 think that they're measuring a density, but they 8 might not actually be measuring a density. 9 Q. So the density of an electrode active 10 material is just the mass of the material divided by 11 the volume to which it was compacted, right? 12 A. It can be somewhat complicated in battery 13 work, because, for instance, in Sunose, they -- and 14 this is common. You don't want to include the 15 current collector in the density value. So you have 16 to find a way to subtract out the current collector, 17 which is an integral part of that finished 18 electrode. And so it gets a little more complicated 19 than just saying mass over volume. 20 Q. But it's the mass of the material divided 21 by the volume to which it's compacted? 22 A. If you correctly measure those

85 1 properties, yeah. 2 Q. Okay. 3 So if you know the mass of the material 4 and the volume to which it's being compacted, you 5 can calculate the compaction density, right? 6 A. If you correctly know those properties, 7 yes. 8 Q. And Sunose is just compacting a known 9 mass of active material to a known volume using a 10 fixed gap roll press, right? 11 A. Correct, which, in my mind, makes it all 12 the more egregious that they made such fundamental 13 errors in their reported densities, because as you 14 state, it's a fairly simple thing to do, or it 15 should be, and yet they reported completely 16 impossible values. Dr. Lucht didn't even notice 17 those completely impossible values. So to me that 18 indicates someone's not being careful like you 19 should be when you're trying to do a fairly simple 20 procedure. 21 Q. And coat weight tells you the mass of the 22 material over a given area of the electrode plate,	87 1 electrode plate through the fixed gap roll press, 2 right? 3 A. No, not necessarily. 4 Q. Why not? 5 A. Because when you roll between two rollers 6 and there's a huge amount of force applied, you -- 7 yes, the material must fit between that gap, but it 8 typically will relax in some fashion after it's 9 moved through the gap. And so you can't be entirely 10 sure what the thickness of the material is after 11 it's moved through the gap. 12 Q. But you'd agree that the fixed -- the 13 volume is dictated by the fixed gap of the roll 14 press, right? 15 MR. COX: Object to form. 16 A. I would agree that it's related, but I 17 wouldn't say that it's exactly determined from that. 18 BY MR. STEIN: 19 Q. The fixed gap of the roll press dictates 20 a volume that the machine compresses the material 21 to, whether or not it may be adjusted later after 22 you take it out of the machine, right?
86 1 right? 2 A. That's a common way of expressing that, 3 yes. 4 Q. That's how Sunose expresses it, right? 5 As a mass of material over an area? 6 A. Yes. 7 Q. And the area of the electrode plate is 8 known or knowable, right? 9 A. Again, as I said before, it's not rocket 10 science. So when someone makes an egregious error, 11 it indicates to me that they're not a reliable 12 source. 13 Q. But you'd agree that you either know the 14 area of the electrode plate or you could -- it's 15 knowable, right? 16 A. Yes. 17 Q. And the height of the fixed gap role 18 press is known or knowable, right? 19 A. You mean the gap between the rollers? 20 Yes, that's knowable. 21 Q. And that's all you need to get a density, 22 assuming it's physically possible to get the coated	88 1 A. Again, the gap between the rollers 2 determines a volume through which the material must 3 pass. And it does pass when you do that. And then 4 it may have other mechanical interactions after it's 5 passed through that roller that affect the final 6 volume. 7 Q. But the roll press with its fixed gap 8 defines a compaction volume, right? 9 A. If you were to -- if you were to be 10 interested in the density exactly as it's -- in the 11 passing through the rollers? Yes, that might work. 12 But we're talking about the density of the material 13 after. 14 Q. Do you know how much the material would 15 change after? 16 A. I don't. 17 Q. You don't have an opinion in this case to 18 narrow that, right? 19 A. I haven't done that analysis. 20 Q. And so if you have the mass of the active 21 material, and you know the area and the height of 22 the compacted volume, that gives you a density,

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89 1 right? 2 MR. COX: Objection, form. 3 A. Again, as I've previously described, if 4 you know -- if you properly know a volume and a 5 mass, yes, you can get a density. The question is, 6 did you properly get that information? 7 I see no evidence in Sunose that they 8 properly got the thing that they reported, or think 9 that they got. 10 I don't know what went wrong. I don't 11 know how it -- but it's a fairly egregious case that 12 jumped out at me immediately, even without doing any 13 calculations. When I see a value of a density of -- 14 a reported density of 8, it's like, that's -- that's 15 not just impossible, that's ridiculous. And so I -- 16 I'm astonished that this got through any kind of 17 quality control process before it was turned into a 18 patent. 19 BY MR. STEIN: 20 Q. But this mechanism that Sunose uses to 21 define the compaction volume could actually explain 22 these values reported above the crystalline density	91 1 that a POSITA cannot rely on any of these reported 2 or purported density values. 3 Q. For example, this could explain why 4 comparative example 3 broke during compaction. 5 Sunose attempted to run too much active material 6 through the roll press and the electro plate broke. 7 So the volume that they were trying to 8 compact to was too small for the amount -- for the 9 mass of material that they coated on to the electro 10 plate and so it broke. 11 A. Well, they reported that the electrode 12 material -- let me find that. 13 Just a minute. 14 [Document review.] 15 A. Sunose states in paragraph 40 that the 16 positive electrode plate in comparative example 3 17 could not undergo a bending test due to breakage of 18 the active material layer occurring on the 19 single-side active material portion when rolling 20 using a roll press machine. 21 BY MR. STEIN: 22 Q. Sorry, which paragraph?
90 1 of LCO, right? 2 A. No. 3 Q. If you attempted to compact a greater 4 mass of active material than can physically fit 5 through the -- in the volume that's dictated by the 6 fixed-gap roll press, those parameters would give 7 you a compaction density that's physically 8 impossible, right? 9 You'd be trying to put too much mass into 10 too little volume, which gives you an impossible 11 density value? 12 A. I don't understand your question. 13 Q. My question is that the way that Sunose 14 dictates density could actually explain these 15 reported values above the crystalline density of 16 LCO -- 17 MR. COX: Objection to form. 18 BY MR. STEIN: 19 Q. -- right? 20 A. As I said previously, I have no idea why 21 they made such egregious errors in their procedure 22 or in the way they reported, but I do know that I --	92 1 A. 40. 2 And you can also see in Table 1, they 3 report that same result in the final column of the 4 table for comparative example 3. 5 Q. Yes. So -- 6 A. So they're indicating -- sorry, I'm still 7 responding. 8 Q. That's fine. 9 A. So they're indicating that this was a 10 failed experiment in -- when it came to the crack 11 rate. That's what the Sunose says. 12 Q. Yeah, what that says is that they 13 couldn't move on to do the bending test after 14 compaction because the electro plate broke when they 15 tried to roll it. 16 A. Yeah. It was so brittle. 17 Q. So they couldn't -- 18 A. My interpretation is that it was brittle 19 and it fractured when they tried to do that test. 20 Q. It says -- that's not what it says. It 21 says: Comparative example 3 could not undergo a 22 bending test due to breakage of the active material

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93 1 layer occurring on the single-side active material 2 portion when rolling using a roll press machine. 3 So it broke when they tried to roll it. 4 And so they couldn't even do the bending test. They 5 couldn't even attempt the bending test because it 6 broke. 7 MR. COX: Objection, form. 8 BY MR. STEIN: 9 Q. Right? 10 A. Do you have a question? 11 Q. Yeah, I'm asking if you agree with how I 12 characterized it? 13 A. With your interpretation? 14 Q. Yeah. 15 MR. COX: Same objection. 16 BY MR. STEIN: 17 Q. I can ask a different question, if you 18 want. 19 A. I agree that the language here appears to 20 state that the breakage occurred during the rolling 21 process, and so they aborted the experiment that 22 would normally follow that rolling process.	95 1 The roll press has a setting. You set 2 it. Is that distance between the rollers known? 3 They don't say. They don't specify -- they don't 4 give a value anywhere in the Sunose description. 5 They don't tell us how thick the layers were that 6 they put through. So it's hard to say what happened 7 in their experiment, but they clearly have a failure 8 of some kind, and it seems systematic because it's 9 occurring in multiple experiments. 10 A POSITA can't have any confidence in the 11 way they're performing their experiments here, and 12 has inadequate information to diagnose what went 13 wrong, so the only thing a POSITA can do is throw up 14 their hands and say this is unreliable information, 15 I'm not going to base anything that I want to do off 16 of this. 17 Q. But you said earlier that the height of 18 the fixed gap is knowable -- it's either known or 19 knowable. And that -- 20 A. I acknowledged that it's knowable, but I 21 don't -- sorry. 22 I acknowledge that it's knowable, but
94 1 Q. And that could be because they put 2 weight -- they coated way too much material on the 3 single-sided coating, and it just couldn't fit 4 through the machine and so it broke. Right? 5 MR. COX: Objection, form. 6 A. I don't know what they did. 7 In fact, they do a terrible job of giving 8 us information that we could use to determine that. 9 They don't give us thickness values for any of the 10 embodiments beyond -- 11 I mean, they say something about 12 embodiment 1, and then they tried -- attempt to use 13 all of the other embodiments to just say, you know, 14 we modified embodiment 1, but they don't give us any 15 detail that would allow us to diagnose in the way 16 that you're attempting to do right now. 17 BY MR. STEIN: 18 Q. But you agree that the roll press 19 dictates this fixed volume, right? 20 Fixed compaction volume. 21 A. I think I've answered that question more 22 than once.	96 1 that's not the same thing as Sunose actually knowing 2 it or reporting it so that a POSITA could rely on 3 this disclosure, or purported disclosure. 4 Q. So Sunose teaches an electrode compaction 5 density ratio of N over M. That's between 0.7 and 6 1, correct? 7 MR. COX: Object to form. 8 A. Sunose reports that formula that you just 9 described, yes. 10 BY MR. STEIN: 11 Q. And is the compaction density of the 12 double-sided coating? 13 MR. COX: Object to form. 14 A. N is the value that they give in their 15 table. I don't know what they measured, to be 16 honest. It's something other than compaction 17 density. 18 BY MR. STEIN: 19 Q. But Sunose literally states that that's 20 what N is, right? In the text. 21 MR. COX: Object to form. 22 A. They state in Table 1, active material

97 1 density N of two-sided coating – coated portion 2 grams per CC. 3 BY MR. STEIN: 4 Q. Mm-hmm. And then M, is a compaction 5 density of the single-sided portion, right? 6 A. You continue to use the word "compaction 7 density," which I reject. 8 Q. You agreed earlier that Sunose's process 9 is compacting the active material. 10 A. Yes. 11 Q. And so that's why I'm calling it 12 compaction density. 13 A. Well, that's a term of art that's used in 14 other sources, and so I don't want to confuse those 15 two – that term with what Sunose did. 16 Q. So you'd agree that the M is the active 17 material density of the single-sided coated portion, 18 right? 19 A. I agree that's what Sunose purports it 20 as, but I don't agree that it's anything that a 21 POSITA could rely on. 22 Q. And earlier we discussed that Sunose uses	99 1 Sunose N over M ratio would be 1, right? 2 MR. COX: Object to form. 3 A. I don't know that that would happen that 4 way. 5 BY MR. STEIN: 6 Q. Well, you would just be compacting the 7 same mass of material to the same volume. That's 8 the same density, right? 9 A. Is that a question? 10 Q. Yeah. 11 A. Not necessarily. 12 Q. So you don't agree that if you compact 13 the same amount of mass to the same density -- to 14 the same volume, you'd have equal densities? 15 A. Your question has built in assumptions. 16 You said that it compacted to the same volume, and I 17 don't agree that it would necessarily compact to the 18 same volume. 19 Q. The volume under the roll press is the 20 same for both -- for both -- for both portions as it 21 goes through, right? 22 MR. COX: Object to form.
98 1 a fixed-gap roll press to compact the electrode 2 active material, right? 3 A. That appears to be what they -- the 4 method they used, yes. 5 Q. If a POSITA wanted to make an electrode 6 plate where the N over M ratio is equal to 1, they 7 would just set the coat weights for both the 8 single-sided and double-sided portions to be equal, 9 right? 10 MR. COX: Object to form. 11 A. That's a very complicated process to 12 engineer, because as I previously stated, you have 13 to factor in the thicknesses of the layers or if 14 there's just one layer, the thickness of the 15 separator -- sorry, the current collector. And so 16 it's not just something you just set without doing 17 some analysis before you would attempt that. 18 BY MR. STEIN: 19 Q. But you'd agree that if you put the same 20 total amount of material on both the single-sided 21 portion and the double-sided portion, and put those 22 same amounts through the same fixed-gap roll press,	100 1 A. As previously stated, the distance 2 between the rollers is one factor, but not the only 3 factor in determining the final volume of the 4 material after it's passed through the rollers. 5 BY MR. STEIN: 6 Q. And that's because the -- you're saying 7 the material might change density after you're 8 finished with the compaction process, right? 9 A. Right. Because it's a -- there's a 10 partial elastic response. Materials are not simple 11 in the way that you might think, so it's difficult 12 to say what will happen between the time when it's 13 in -- between the rollers and when it's passed 14 through the rollers and has had a chance to relax. 15 Q. I'm not asking what happens after it goes 16 through the roll press, I'm asking what happens when 17 it's inside the roll press. 18 If you have the same amount of material 19 on both portions and you compact it to the same 20 volume, that will give you the same density, right? 21 A. Again, you're assuming that you compacted 22 it to the same volume, which is not necessarily the

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101 1 case. 2 Q. Well, the gap is fixed, right? 3 A. But the gap is not the only determining 4 factor. 5 Q. What's the -- what are the other 6 determining factors? 7 A. The mechanical response of the material 8 that's passing through the rollers is very 9 consequential. 10 Q. It's the same material on both portions, 11 though. So it would have the same response? 12 A. It's not the same material. In one case 13 you -- and again, this is your hypothetical example, 14 because we don't actually know what thicknesses they 15 used. But in the hypothetical example that one 16 layer has exactly twice the thickness of the two -- 17 of the double-sided layers, the mechanical response 18 of that single layer isn't necessarily the same as 19 the two layers that have the same total thickness. 20 Q. So I'm asking if the single-sided coating 21 and the double-sided coating both have the same 22 total thickness.	103 1 current collector, both having the same total 2 thickness, and the answer is no, you wouldn't 3 necessarily get to the same density if you put them 4 between the same roll press distance. And the 5 reason for that is because the mechanical response 6 of those layers is not necessarily equivalent. 7 Q. But they're both the same cathode active 8 material, right? On both the single- and 9 double-sided coating portions. 10 A. Yes, they are. 11 Q. So -- 12 A. In this hypothetical example. 13 Q. So why would the same material have 14 different mechanical responses? 15 A. Because the mechanical response of the 16 material depends on many factors such as the size of 17 the particles, the viscosity of the -- or 18 viscoelastic, I should say, response of the polymer, 19 and the -- so there's -- it's a complicated 20 interaction between all of those factors that 21 determine how it responds. 22 So --
102 1 And you compact it through a fixed gap. 2 You would be compressing the same amount of material 3 into the same volume, which gives you the same 4 density, right? 5 MR. COX: Object to form. 6 A. I feel like I've answered this question 7 already, and the answer is no. 8 BY MR. STEIN: 9 Q. The question was different. I said the 10 same thickness, the same total thickness on both 11 sides. On both the single-sided coating and the 12 double-sided coating? 13 MR. COX: Same objection. 14 A. Are you referring to a specific case here 15 that I should be -- in Sunose? 16 BY MR. STEIN: 17 Q. No, this is a hypothetical. 18 A. This is a hypothetical? 19 Q. Yeah. If you -- 20 A. So in this hypothetical example, if I 21 understand you correctly, you have a single-sided 22 coating and a double-sided coating, both on the same	104 1 Q. My hypothetical is saying that the 2 materials are identical. So identical material. 3 A. Right. But they are not identical 4 because they are different thicknesses, and that 5 thickness relative to, for instance, the size of the 6 particles can have an effect. 7 Q. My hypothetical assumes that they are the 8 same total thickness. 9 A. Right, but they're not the same thickness 10 relative to the distance between the outer surface 11 and the current collector. 12 Q. The outer surface of what? 13 A. So when you have a single layer -- here, 14 I'll make it concrete. Let's say you have a single 15 layer and the distance between the current collector 16 and its outer surface is 100 microns. And then you 17 have a double-sided coating that has a distance 18 between the current collector and the outer surface 19 of 50 microns for each of the two layers. 20 Yes, those, in that hypothetical example 21 they both have the same total thickness, but 22 distance between the current collector and the outer

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105 1 surface is not the same in the two cases, and so I 2 can see a scenario where the mechanical response is 3 not identical. 4 And as I previously said, we don't even 5 know the thicknesses here. So we can't even make 6 that kind of analysis have any effect on our -- on 7 how we would interpret Sunose. 8 Q. I was asking what you mean by the "outer 9 surface." You still didn't tell me what that was in 10 that answer. 11 A. So when you make a coating of a material 12 on the current collector, the interface between that 13 coating and the surrounding is the outer surface. 14 Q. What's the surrounding? 15 A. Well, in a typical manufacturing 16 environment, that would be the air. 17 Q. So if the surrounding is the air, and 18 both the single- and double-sided portions have the 19 same surrounding, I don't think -- your answer 20 doesn't make sense to me. 21 Can you try to explain it a different 22 way?	107 1 thickness was the same before it got to the roller, 2 not after. 3 Q. It's the same in both, because they start 4 off the same and then they go through the same gap, 5 so they have to be the same. 6 MR. COX: Object to form. 7 BY MR. STEIN: 8 Q. They have to be the same on both sides. 9 MR. COX: Object to form. 10 A. So the answer is no, they don't. 11 BY MR. STEIN: 12 Q. So when the electrode is completely 13 inside the roll press, the two sides will have 14 different thicknesses? Is that what you're saying? 15 A. No, that's not what I'm saying. 16 Q. When the electrode is inside the roll 17 press and being compacted, both sides are forced to 18 have the same thickness, right? 19 MR. COX: Object to form. 20 A. At the location of the roll press, when 21 the material is in between the two rollers, it's -- 22 yes, the rollers -- whatever distance they are --
106 1 A. Yes. What part doesn't make sense? 2 Q. All of it, basically. 3 A. Would you like me to draw a picture? 4 Q. Oh, I think I understand what you mean. 5 So you're saying because the distance 6 between the current collector and the air on one 7 side will be different than the distance between the 8 current collector and the air on the other side 9 because one side has a double-sided coating and the 10 other is a single-sided coating? 11 MR. COX: Object to form. 12 A. Yes. 13 BY MR. STEIN: 14 Q. But the total thickness on the 15 double-sided coating from the outer surface of the 16 bottom coating through the outer surface of the top 17 coating will be the same as the total thickness of 18 the current collector to the outer surface of the 19 single-sided coating. Because it's going through 20 the same gap. 21 A. No. And secondly, in this hypothetical 22 example, I understood you to mean the total	108 1 have between them, that's going to determine what 2 material -- the thickness of the material is at the 3 point that it's passing through, but that doesn't 4 determine all of the effects that happen afterward. 5 And so the material after it's passed through that 6 narrow gap may not have the same properties that it 7 had while it was in the gap. 8 BY MR. STEIN: 9 Q. I'm just asking about while it's inside 10 the roll press. 11 A. Right. Because you don't seem to like my 12 answer, but I am not changing -- 13 Q. Well, you haven't offered an opinion on 14 what -- on what exactly would happen after you take 15 it out, so I'm just -- 16 A. My opinion -- 17 Q. I'm just asking a certain question and 18 I'm trying to get an opinion on it. 19 A. -- is you can't know what would happen 20 afterward without doing extensive experimentation 21 and measurement, which would require you to make 22 measurements of thickness and mass after it's gone

109 1 through the roller. 2 MR. COX: And when you get to a good 3 stopping point, it's probably close to time 4 for another break. 5 MR. STEIN: Yeah, this is actually a 6 decent time to stop. 7 THE VIDEOGRAPHER: Stand by, please. 8 We're going off record at 11:51. 9 (Recess taken, 11:51 a.m. to 10 12:53 p.m. MST) 11 THE VIDEOGRAPHER: We are back on the 12 record at 12:53. 13 BY MR. STEIN: 14 Q. Dr. Wheeler, can you go to Claim 2 of 15 Sunose? 16 It's on page 2 of the PDF. 17 A. Okay. 18 Q. Did you read Claim 2? 19 A. I will. 20 [Document review.] 21 A. Okay. 22	111 1 and not flake off or have other problems. 2 Q. Anything else? 3 A. That's the main gist of it. 4 Q. How does Sunose try to solve that 5 problem? 6 A. Well, it's interesting, because they have 7 a -- it appears that they have a roller press that 8 can only function with a fixed gap distance, so 9 they -- for that particular piece of equipment, they 10 come up with a method of having the single-sided be 11 thicker than you would expect, or at least compared 12 to the double-sided coating, so that fixed gap 13 distance can have some ability to compress that 14 single-sided coating enough that it won't flake off. 15 That's my interpretation. 16 Q. So would you agree that Sunose is solving 17 a problem where it's difficult to get the right 18 compaction on an electrode that has both a 19 single-sided coating and a double-sided coating 20 because of the thickness difference between the two 21 sides, right? 22 MR. COX: Object to form.
110 1 BY MR. STEIN: 2 Q. So Claim 2 recites a method of 3 manufacturing an electrode plate, correct? 4 A. Yes. 5 Q. And it's where the ratio -- Sunose's 6 ratio N over M is between 0.7 and 1, right? 7 A. Yes. That is their claimed range. 8 Q. And you'd agree an electrode plate can be 9 a cathode or an anode electrode plate, correct? 10 A. Electrode could be interpreted as a 11 cathode or an anode. 12 Q. Yet Claim 2 doesn't specify about the 13 electrode plate as a cathode, right? 14 A. No, it does not. 15 Q. Do you know what the problem is that 16 Sunose addresses? 17 A. Yes. 18 Q. What is your understanding of the 19 problem? 20 A. They want to be able to have a 21 single-sided coating on a portion of their electrode 22 plate, and they want that coating to function well	112 1 A. I would agree that they are solving a 2 problem similar to what you said, but in addition, 3 they have a piece of equipment that is not capable 4 of dynamically changing the gap distance between the 5 rollers, and therefore, subject to the limitations 6 of their piece of equipment, they've come up with a 7 proposed solution to that. 8 BY MR. STEIN: 9 Q. Are you aware of a roll press that 10 changes thickness as you roll? 11 A. They cite that that's a possibility. 12 Q. Where do they cite that? 13 A. They say, in paragraph 7 -- I'll read 14 from paragraph 7. 15 In relation to the rolling method, there 16 is a sized rolling method wherein the electrode 17 passes through a fixed gap, or a fixed pressure 18 rolling method wherein the electrode passes under a 19 certain pressure. 20 And then I'll stop there, but the only 21 way you can have a fixed rolling pressure method 22 would be if the rollers dynamically adjust the gap

113 1 distance to maintain a fixed pressure. 2 Sounds like a great idea, but they don't 3 have that option, it appears because they're 4 coming -- if they had that option, that would be a 5 very simple solution to their problem that they 6 enumerate. 7 Q. Are you aware of any commercial machines 8 that do that? That change the gap mid roll? 9 A. I couldn't cite to you a specific 10 machine, but I can only assume that based on this 11 description, that is an option. 12 Q. You didn't identify any such machines in 13 your declarations, right? 14 A. I don't recall doing that. Let me look. 15 [Document review.] 16 A. I don't believe I did that analysis. 17 BY MR. STEIN: 18 Q. So getting back to the problem that 19 Sunose attempts to solve. Is it fair to say that 20 Sunose teaches that the right compaction setting for 21 the double-sided coating doesn't provide enough 22 compaction for the single-sided coating leading to	115 1 see what Sunose is stating. Give me a minute. 2 [Document review.] 3 A. Sunose uses the term "electrode," but 4 when you get to the actual embodiments, they're all 5 cathodes. So if you believe in what they're doing 6 with their embodiments, they seem to not care about 7 the anode, and they don't have any evidence to 8 suggest that there's a benefit to their method for 9 anodes. 10 BY MR. STEIN: 11 Q. But that geometric problem that Sunose is 12 trying to solve using a fixed-gap roll press, it 13 doesn't matter the type of cathode, right? 14 MR. COX: Object to form. 15 A. If your objective is to have something 16 that has one layer or two layers on the same 17 coating, in the same current collector, it might 18 seem that that's a common problem to both, but they 19 don't have any evidence here that -- to teach a 20 POSITA that is a problem that anodes regularly 21 experience. 22 In other words, we don't know if anodes
114 1 peeling; and vice versa, the right compaction 2 setting for the single-sided coating will provide 3 excess active compaction for the double-sided 4 coating because of the thickness difference. And so 5 Sunose is trying to find a solution for that 6 problem, right? 7 MR. COX: Object to form. 8 A. So they are trying to find a solution to 9 a problem where they can't get both layers to be -- 10 to have an appropriate adhesion. So yes, they came 11 up with a solution that works for their piece of 12 equipment. 13 Or at least purports to work. I can't 14 say that it actually accomplished the purpose that 15 they set, because their data is so unreliable. 16 Q. And that problem doesn't depend on 17 whether the electrode is a cathode or an anode, 18 right? 19 MR. COX: Object to form. 20 A. The problem of having single layers or 21 double layers could occur for either electrode, if 22 that's what someone wants to do, but I would have to	116 1 are as likely to flake off. I can, for instance, 2 conceive of anodes having a different mechanical 3 behavior than a cathode, so that it -- that problem 4 doesn't really exist for anodes. They adhere just 5 fine to the current collector without any special 6 changes to the process. 7 So it's hard to generalize that their 8 solution is applicable to anodes or would have some 9 beneficial effect. 10 BY MR. STEIN: 11 Q. In my question, I accidentally said the 12 type of cathode. I meant the type of electrode. 13 That's just a comment for the record. 14 But it sounds like that's what you 15 understood my question to say anyway? 16 A. I did understand it that way. 17 Q. Okay. So let's go to Zeng. 18 MR. COX: Exhibit 1006? 19 MR. STEIN: Yes. 20 BY MR. STEIN: 21 Q. So do you agree that Zeng is focused on 22 electrolyte compositions?

117 1 A. That seems to be the topic of Zeng. 2 Q. Zeng doesn't disclose any specific 3 details on different electrode structures, does it? 4 A. In looking through Zeng, I see one 5 reference to battery thickness, in paragraph 5. And 6 so that implies some reference to understanding that 7 this is going to be applied in an expected -- within 8 battery geometry. 9 Q. Do you know what a spirally-wound 10 electrode configuration is? 11 A. I do. 12 Q. Is that a common configuration that's 13 used commercially? 14 A. It's one of several designs for 15 batteries, yes. 16 Q. How about a AA battery, for example, it's 17 that type of configuration, right? 18 MR. COX: Object to form. 19 A. No. 20 A AA battery is a form factor that just 21 tells you the outside dimensions. It doesn't really 22 say what -- how it's arranged inside. So I couldn't	119 1 electrode, an anode and a cathode, and you also have 2 a flexible separator. They're all quite thin. You 3 press them together and roll them up. And place 4 that roll inside of a metal can, and then inject the 5 electrolyte and go from there. 6 Q. Zeng doesn't teach away from using its 7 electrolytes in its spirally-wound batteries, 8 correct? 9 A. I'm sorry, I couldn't hear the whole 10 question. 11 Q. Zeng doesn't teach away from using its 12 electrolytes in batteries having a spirally-wound 13 electrode structure, right? 14 MR. COX: Object to form. 15 [Document review.] 16 A. So I'm looking at Zeng's embodiments. In 17 paragraph 40, Zeng refers to a polymer battery. It 18 doesn't state what geometry that is, although I'm 19 familiar with polymer batteries that are more 20 rectangular in shape. So that's one possibility. 21 [Document review.] 22 A. I don't see any teaching that would say
118 1 say whether a AA is spiral-wound or not. 2 BY MR. STEIN: 3 Q. But a AA battery is cylindrical, right? 4 A. It is cylindrically in shape, yes. But, 5 for instance, a common alkaline AA battery that's 6 not based on lithium chemistry is not a 7 spirally-wound geometry. 8 Q. Sunose is an example of a spirally-wound 9 electrode structure, right? 10 [Document review.] 11 A. In Sunose paragraph 21, it does refer to 12 the two electrode plates being wound in a spiral. I 13 would have to do additional looking to see if 14 there's any other reference that would pertain to 15 your question. 16 BY MR. STEIN: 17 Q. And could you just describe what a 18 spirally-wound electrode configuration is? 19 A. So in a spirally-wound configuration, you 20 have -- Sunose uses the word plate, but more 21 commonly we would think of it as a flexible film. 22 And you have a flexible film for each type of	120 1 you cannot use their electrolyte composition in a 2 spirally-wound geometry. 3 BY MR. STEIN: 4 Q. And then going back to Sunose, Sunose 5 states that its electrolytes are for use in 6 non-aqueous -- for use with non-aqueous 7 electrolytes, but otherwise provides no details on 8 the electrolytes, right? 9 [Document review.] 10 A. Although Sunose states non-aqueous, it 11 seems they have lithium batteries in mind, which 12 would narrow that down based on their choice of 13 embodiments. 14 BY MR. STEIN: 15 Q. But Sunose doesn't provide, like, a 16 specific electrolyte composition in the way that 17 Zeng does, right? 18 [Document review.] 19 A. It doesn't appear that Sunose has any 20 instruction about which electrolyte to use. 21 Interestingly, they do not even do an 22 electrochemical test for their embodiments, so

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121 1 there's no intention of narrowing it down. In my 2 interpretation of what they're doing, they're trying 3 to develop a technology that could apply to any 4 number of possible electrolytes. 5 BY MR. STEIN: 6 Q. And there's nothing in Sunose that 7 teaches away from using Zeng's electrolytes, right? 8 MR. COX: Object to form. 9 A. I don't see any teachings that would say 10 that someone could not use Zeng's electrolytes. 11 BY MR. STEIN: 12 Q. Okay. Let's go to the Zhou reference, 13 Exhibit 1014. 14 A. Give me a minute. 15 Q. Sure. 16 A. Okay. 17 Q. Are you familiar with this reference? 18 A. Yes. 19 Q. It's another prior art reference that 20 CosMX relies on in its IPR petition in this 21 proceeding, right? 22 A. Yes.	123 1 Q. This figure shows cycle discharge 2 capacity test results for examples 3 through 8 and 3 comparative example 3. Right? 4 A. Yes. 5 Q. And you agree that this Figure 1 shows 6 that example 8 maintain the highest discharge 7 capacity except for example 7, right? 8 MR. COX: Object to form. 9 A. So it's not the highest. 7 is the 10 highest. 11 BY MR. STEIN: 12 Q. Yes, except for example 7. 13 A. But it's also not showing examples 1 and 14 14 2, and comparative examples 1 and 2. 15 So it's -- 16 And is there a comparative example 4? 17 Let's see. 18 Yeah. 19 So it's omitting key data which is never 20 explained. 21 Q. Right. Because I don't think all the 22 examples were tested in this test. But of the
122 1 Q. You would agree that Zhou is directed to 2 a fast charging lithium-ion battery electrolyte, 3 correct? 4 A. That's the name of their invention, yes. 5 Q. That's the title. 6 A. Yes. 7 Q. So let's go to Zhou's examples. 8 A. Okay. 9 Q. So you'd agree that Zhou describes 10 several example electrolytes, right? 11 [Document review.] 12 A. Yes. 13 BY MR. STEIN: 14 Q. There's examples 1 through 8 and some 15 comparative examples, right? 16 A. Yes. 17 Q. And you understand that CosMX relies on 18 example 8 to its challenge to the '131 patent 19 claims, right? 20 A. Yes. 21 Q. Can you go to Figure 1 of Zhou? 22 A. Okay.	124 1 examples that were tested, you agree that example 8 2 performed the second best in retaining its discharge 3 capacity, correct? 4 A. Yes, I agree that by the end of the test, 5 example 8 was second best of those that were tested 6 in this test and reported. 7 Q. Let's go to Figure 4. 8 A. Okay. 9 Q. So Figure 4 shows the AC 10 impedance spectrum of the electrolytes of examples 11 1, 2, 4, 6, and 8, and the comparative examples 1 12 through 3, right? 13 A. Yes, that's correct. 14 Q. And you agree that -- and I believe 15 you've opined that Zeng teaches that the smaller the 16 radius of the arc of the semicircle on the AC 17 spectrum curve, the better the kinetic performance 18 of the battery, right? 19 A. Zhou states that, or something close to 20 that. And that would also be understood by a POSITA 21 as being a way of determining or recognizing how 22 much resistance there is at the interface.

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125 1 And so a smaller radius indicates less 2 resistance. 3 The problem is that, you know, these are 4 not perfect semicircles, so you have to think about 5 it a little more broadly than just what's the 6 radius. So one way you do that is by looking at 7 where the elbow is on the horizontal access. 8 MR. COX: And I'm just going to 9 retroactively object because I think you said 10 Zeng and you meant Zhou. He caught it. 11 MR. STEIN: Zhou. 12 BY MR. STEIN: 13 Q. But you understood my question as 14 pertaining to Zhou, right? 15 A. Yes, I did. 16 Q. And that's discussed in paragraph 58 of 17 Zhou, about halfway through. 18 [Document review.] 19 MR. COX: Object to form. 20 MR. STEIN: I'll look it up. 21 BY MR. STEIN: 22 Q. So going back to Figure 4, you'd agree	127 1 BY MR. STEIN: 2 Q. So in example 8, the solvent components 3 are mixed in that specified mass ratio, correct? 4 A. Yes. 5 Q. Those numbers add up to 90, right? 6 A. Yes. 7 Q. But a mass ratio doesn't necessarily have 8 to add to 100, right? 9 A. No. 10 Q. Do you agree that the electrolytes of 11 Zhou's invention require a solvent that includes a 12 linear carboxylic acid ester? 13 A. Can you restate the question? 14 Q. Do you agree that the electrolytes of 15 Zhou's invention require a solvent that includes a 16 linear carboxylic acid ester? 17 A. Have I opined on that? 18 Q. I'm just asking what Zhou teaches. 19 [Document review.] 20 BY MR. STEIN: 21 Q. Maybe you could go to the abstract of 22 Zhou and read that.
126 1 that example 8 performed better than the comparative 2 examples, right? 3 A. On this measure, yes. 4 Q. And it also appears that example 8 5 performed better than example 4; is that right? 6 A. Yes. 7 Q. And then it appears that example 8 8 performed better than example 6 as well. 9 A. Yes, but it did not perform better than 10 examples 1 and 2. 11 Q. Okay. Can you go to paragraphs 46 and 47 12 of Zhou? 13 A. Okay. 14 Q. Paragraph 47 states that the solvent 15 components: Ethylene carbonate, dimethyl carbonate, 16 ethyl methyl carbonate, acetal acetate and 17 fluorobenzene are mixed uniformly in a mass ratio of 18 25:30:10:20:5. Correct? 19 MR. COX: Object to form. Ethyl 20 acetate? 21 A. Yes, that's what it says in paragraph 47. 22	128 1 A. Okay. 2 [Document review.] 3 A. Based on the abstract, it's hard for me 4 to say if it requires a linear carboxylic acid 5 ester. 6 The language says: Wherein the solvent 7 includes a mixture of two or more of, and then it 8 proceeds to give a long list. 9 So that doesn't appear to require it. 10 BY MR. STEIN: 11 Q. Is it okay if I just call it an ester? 12 A. Yes. 13 Q. Okay. Thanks. 14 A. We use carboxylic acid ester, carboxylic 15 ester and ester, kind of, interchangeably. 16 Q. Okay. It's much easier to say. 17 So going to example 8 of Zhou. 18 A. Do you mean paragraph 46? 19 Q. Yes. 20 [Document review.] 21 BY MR. STEIN: 22 Q. So the description of example 8 says that

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129 1 the composition includes ethyl acetate, correct? 2 A. Yes, that description for example 8 3 includes ethyl acetate. 4 Q. And ethyl acetate is an ester, right? 5 A. Yes. 6 Q. Let's go to paragraph 11 of Zhou. 7 A. Okay. 8 Q. Could you read that into the record? 9 A. The linear carboxylic acid ester is at 10 least one of propyl propionate, ethyl propionate, 11 propyl acetate, butyl propionate, ethyl acetate, 12 isopropyl propionate, ethyl butyrate, and methyl 13 acetate. 14 Q. So do you agree that Zhou is teaching 15 that any of these eight esters can be used in its 16 electrolytes? 17 MR. COX: Object to form. 18 A. So in order to understand what it's 19 teaching, you have to look at the whole thing 20 including what -- how they implement their 21 embodiments. 22 In this paragraph, they seem to be giving	131 1 BY MR. STEIN: 2 Q. So do you recall that CosMX's position is 3 that it would have been obvious to substitute ethyl 4 acetate to propyl propionate in example 8 of Zhou? 5 MR. COX: Object to form. 6 A. So I understand that CosMX's position 7 that -- yes, as you stated. 8 BY MR. STEIN: 9 Q. And it's your opinion that it would be 10 impossible to predict the effect of that 11 substitution in example 8 because chemical 12 interactions are complex and unpredictable, right? 13 A. So you can make some predictions, but you 14 can't make all of the relevant predictions without 15 doing the experiment. 16 Q. So you dispute that it would be obvious 17 to substitute ethyl acetate for propyl propionate in 18 example 8? 19 A. Yes. 20 Q. Why? 21 A. If you make that substitution, and you're 22 changing one molecule for another molecule, that
130 1 an option to have any from among this list be part 2 of your carboxylic acid ester. 3 BY MR. STEIN: 4 Q. Go to your first declaration, 5 paragraph 267. 6 A. Okay. 7 Q. So here, are you saying that it would -- 8 well, here you do say that is impossible to predict 9 the effect of propyl propionate in Zhou's example 8 10 because chemical interactions are complex and 11 unpredictable, right? 12 A. So Zhou doesn't use propyl propionate in 13 this example 8. 14 Q. Right. But you understand that CosMX 15 position is obvious to substitute -- 16 A. I understand that's causing -- 17 Q. -- ethyl acetate for propyl propionate. 18 A. I understand that's -- 19 Q. So I think you're responding to that 20 here. 21 (Clarification by reporter.) 22	132 1 molecule will interact with every other molecule 2 that's present and every ion that's present, and 3 that interaction is not easily predicted because you 4 have complex molecular interactions that are not 5 linear, not -- 6 So when you make that exchange, you don't 7 know what's going to happen. 8 If you were to change the other 9 components in the remainder of the electrolyte and 10 make the exact same exchange, you'd get a different 11 answer. 12 In other words, the ethyl acetate and the 13 propyl propionate are interacting with everything 14 else present, and so you don't know what's going to 15 happen when you make that exchange. 16 Q. But you agree that Zhou teaches that any 17 of those esters can be used in its electrolytes, 18 right? 19 MR. COX: Object to form. 20 A. In the paragraph that we just looked at, 21 Zhou makes a list of possible linear esters, but 22 again, you have to look at the entirety of Zhou's

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133 1 examples and results in order to determine what Zhou 2 is teaching. 3 When a POSITA sees that Zhou's results 4 are not conclusive, that one combination is better 5 than all the others, then they don't -- the POSITA 6 has to conclude that it's not an easy answer of what 7 combination is the best. 8 BY MR. STEIN: 9 Q. So is it your opinion that it's 10 impossible to predict what change -- what any change 11 to an electrolyte's composition would do? 12 A. Impossible is a very strong word, but 13 under our -- and again, in my previous answer I 14 stated that some -- some properties might be able to 15 be predicted or anticipated, but there are many 16 others that would be difficult to anticipate or 17 predict. 18 Q. Is any new electrolyte composition -- 19 would any new -- 20 Scratch that. 21 Would any new electrolyte composition 22 exhibit unpredictable results?	135 1 components, that has a well-known change in the 2 melting point and boiling point. 3 Q. How did you predict that? 4 That the change would have that effect? 5 A. That's not a prediction, that's based on 6 experiment. 7 Q. You did an experiment? 8 A. No, those are pure components. 9 Again, in my previous answer I noted that 10 we're talking about pure components, not part of an 11 electrolyte mixture. 12 So when you have a pure component, it's 13 quite easy to go look up properties of that pure 14 component, in many cases, you know, a simple search 15 will find it, and then you know its boiling point or 16 its melting point. 17 And that's based on an experiment that 18 someone did on that pure component. So that's not a 19 matter of conjecture or prediction, that's a matter 20 of experiment. 21 Q. This paragraph is talking about example 8 22 of Zhou, right?
134 1 A. That's a very broad question. I don't 2 know how to answer that. It's too broad. 3 Q. Is it your opinion that even small 4 changes to lithium-ion battery electrolytes will 5 have unpredictable effects? 6 A. What do you mean by "small changes"? 7 Q. Like, for example, substituting one ester 8 for another? 9 A. Yes, I believe that substituting one 10 ester for another could lead to unpredictable 11 effects. 12 Q. Can you go to paragraph 273 of your first 13 declaration? 14 A. Okay. 15 Q. So in this paragraph, you state that 16 substituting propyl propionate for ethyl acetate 17 would increase both the melting and boiling point of 18 the example 8 electrolyte, right? 19 A. No, that's not what I said. 20 Q. It's the last sentence of paragraph 273. 21 A. What I meant in that statement is that 22 propyl propionate compared to ethyl acetate, as pure	136 1 A. It does reference example 8, yes. 2 Q. Can you read the last two sentences of 3 paragraph 273 into the record? 4 MR. COX: Do you mean the paragraph? 5 MR. STEIN: The entire paragraph. 6 A. I will read paragraph 273. 7 BY MR. STEIN: 8 Q. Yes. 9 A. Accordingly, a POSITA seeking higher 10 electrolyte conductivity as Zhou is, would not have 11 had a reasonable expectation of success in replacing 12 propyl propionate for ethyl acetate in Example 8 of 13 Zhou nor would the POSITA obtain predictable results 14 in such a substitution. For example, propyl 15 propionate is a larger molecule and such 16 substitution would both increase both the melting 17 point and boiling point relative to the smaller 18 ethyl acetate molecule, which defeats Zhou's 19 identified purpose of using this solvent component. 20 Q. So in this paragraph, you're making a 21 prediction that substituting ethyl acetate for 22 propyl propionate would increase both the melting

137 1 point and the boiling point of example 8. 2 MR. COX: Object to form. 3 A. So I'm noting that we know the melting 4 point and boiling point of those two molecules when 5 they are in their pure state. That will tend to 6 have an effect on the mixture. It's not entirely 7 predictable what effect that will be. 8 I could go into greater detail, but 9 basically when you have a mixture, there is no 10 single melting point and no single boiling point, so 11 it's not quite correct to talk in terms of a single 12 melting point, single boiling point of the mixture, 13 but it can -- as a component of the mixture, it's 14 going to have an effect based on those single 15 component properties of the pure component. 16 BY MR. STEIN: 17 Q. And it's an effect that you were able to 18 predict. 19 A. You can have some predictions about that, 20 yes. 21 MR. STEIN: Okay. Can we take a 22 short break?	139 1 at paragraph 77 and 78. 2 Do you recall discussing some values -- 3 A. Hold on. 4 Q. Sorry, yeah. 5 A. Go ahead. 6 Q. Do you recall discussing different values 7 for capacity retention rates that were measured by 8 Zeng for the different embodiments? 9 A. Yes. 10 Q. And the embodiments 2 and 5, you 11 previously opined, have better capacity retention 12 rates than embodiments 4 and 6? 13 A. Yes. 14 Q. Do you recall whether those embodiments 15 do or do not contain trinitrile compounds? 16 That is embodiments 2 and 5? 17 A. Give me a minute. 18 [Document review.] 19 A. Yes, I recall -- sorry, can you ask the 20 question again? 21 BY MR. COX: 22 Q. Do you recall whether embodiments 2 and 5
138 1 THE VIDEOGRAPHER: Stand by. We are 2 going off the record at 1:49 p.m. 3 (Recess taken, 1:49 p.m. to 4 1:56 p.m. MST) 5 THE VIDEOGRAPHER: We're back on 6 record at 1:57. 7 BY MR. COX: 8 Q. Dr. Wheeler, thanks for being here today. 9 Do you recall some questions earlier -- 10 (Clarification by reporter.) 11 MR. STEIN: We have no further 12 questions. We will pass the witness. 13 ----- 14 EXAMINATION 15 ----- 16 BY MR. COX: 17 Q. Dr. Wheeler, do you recall earlier some 18 questions from Mr. Stein about whether Zeng teaches 19 away from using embodiments 4 and 6? 20 A. Yes. 21 Q. And I'd like to direct your attention to 22 Exhibit 2015, your original declaration, and looking	140 1 do or do not contain trinitrile compounds? 2 A. They do not. 3 Q. And if those embodiments have better 4 capacity retention rates, in your opinion what would 5 that lead a POSITA to believe with respect to the 6 decision to choosing embodiments 2 and 5 or 7 embodiments 4 and 6? 8 A. 2 and 5 would be preferred, if they have 9 better performance, in this case on this measure -- 10 retention -- capacity retention rates. 11 Q. Do you recall a discussion earlier about 12 your maximum calculated theoretical compaction 13 density that you calculated? 14 A. Do I recall making that calculation? 15 Q. Yes. 16 A. Yes. 17 Q. And do you recall a discussion that you 18 had with Mr. Stein about the possibility of error 19 bars on that calculation? 20 A. Yes. 21 Q. And that was due to some variability 22 between the density of carbon black and the density

141 1 of PVDF as reported? 2 A. Right. 3 Q. In your calculation that you performed at 4 paragraph 140, which density values for carbon black 5 and PVDF did you use? 6 [Document review.] 7 A. Sorry, paragraph 40? 8 BY MR. COX: 9 Q. 140. 10 A. Oh, sorry. 140. 11 Q. Of Exhibit 2015. 12 A. The value I used for carbon black was 13 2.1 grams per cubic centimeter, and for the binder, 14 I used 1.8 grams per cubic centimeter. 15 Q. And within the respective ranges of 16 values that you saw reported for carbon black and 17 for PVDF, where in those ranges did you get these 18 values from? 19 A. So the range for carbon black gave -- the 20 source that I found gave 1.8 to 2.1. So I selected 21 2.1, which was a conservative choice. 22 And for the PVDF, I think I only found	143 1 A. The error would trend to the lower 2 values. So the value I produced of 4.5 would be the 3 upper end of the range of possible values. 4 Q. And at what level of porosity would that 5 4.5 be? 6 A. 4.5 corresponds to 0 porosity, meaning 7 you've compressed the electrode materials so much 8 that there are no pores left. And as I previously 9 stated, that does not make for a practical or 10 workable battery electrode, so a realistic upper 11 bound for density would necessarily be lower than 12 4.5. 13 Q. Do you recall some questions from 14 Mr. Stein about the substitution of propyl 15 propionate for ethyl acetate? 16 A. Yes. 17 Q. Do you believe that a similar weight of a 18 given linear carboxylic acid ester will lead to the 19 same effects of adding a similar weight of a 20 different linear carboxylic acid ester to an 21 electrolyte solution? 22 A. So even if one believed that the two
142 1 1.8. Hold on. Let me... 2 [Document review.] 3 A. I'm not seeing if I had a range of values 4 for PVDF. 5 BY MR. COX: 6 Q. You can go to paragraph 138 of that 7 exhibit. 8 A. Okay. 9 [Document review.] 10 A. Okay. I had a range -- in paragraph 138, 11 I gave a range of 1.7 to 1.8. I was looking at the 12 footnotes and didn't see it in the footnote. 13 And so again, I picked a conservative 14 value, meaning the upper end of the range, so that 15 my calculation would be conservative in favor of a 16 higher overall value -- density value that would be 17 considered the limit of possibilities. 18 BY MR. COX: 19 Q. So to the extent that there were any 20 error bars surrounding your calculation of 4.5 grams 21 per cubic centimeter, in what direction would that 22 error trend?	144 1 materials had -- would have similar behavior or 2 predictable behavior, mass is not necessarily the 3 best way to compare two different molecules. 4 Another common way in chemistry is by 5 moles, or another common way is by volume. And it 6 depends on the property that you are thinking about 7 or targeting. Some are more sensitive to molar 8 ratios, some are more sensitive to mass ratios, some 9 are more sensitive to volume ratios. 10 So there's no clean answer for whether -- 11 should you substitute by weight or some other 12 method. If you substitute by some other method, 13 then you would obviously have to account for the 14 property of the molecule, in this case like its 15 molecular weight or its density, when you make the 16 substitution. 17 But again, that's assuming you have good 18 reason for the substitution. As I previously 19 testified, I wouldn't necessarily expect that to be 20 a predictable outcome, even if you were careful 21 about whether you were using mass or volume or 22 moles.

145 1 Q. And in paragraph 130 of your second 2 declaration, Exhibit 2047, is it correct that you 3 include some of the physical properties of those 4 different esters? 5 A. Yes. I see that. 6 Q. And what do the differences in these 7 physical properties tell you about the substitution 8 or proposed substitution of propyl propionate for 9 ethyl acetate? 10 A. So this is a limited picture. It's -- 11 this table is looking -- lists molar mass, melting 12 point, and boiling point. 13 Those are convenient and easy to measure 14 for pure components. 15 In just those measures, there's a 16 significant difference between ethyl acetate and 17 propyl propionate. For instance, the boiling point 18 is -- for ethyl acetate it's 77.1 degrees Celsius, 19 and the boiling point for propyl propionate it's 20 122.5 degrees Celsius. And so there's a fairly 21 noticeable difference there. 22 And there's a -- but again, that's --	147 1 A. No, there would be no expectation that an 2 equal weight of those two molecules would be a 3 substitution that you could predict the outcome of 4 the electrolyte behavior. 5 MR. COX: I'll pass the witness. 6 MR. STEIN: We have no further 7 questions. 8 THE VIDEOGRAPHER: This marks the end 9 of the deposition of Dean R. Wheeler, Ph.D. 10 MR. COX: We are going off the video 11 at 2:12. 12 (Time noted: 2:12 p.m. MST) 13 --o0o-- 14 15 16 17 18 19 20 21 22
146 1 that's not a complete picture. Even -- and I do 2 cite from Dr. Lucht's own writings on the topic of 3 electrolytes, that there are many properties you 4 need to look at for electrolytes, and melting point, 5 boiling point wouldn't be the only ones you would 6 consider. 7 Furthermore, even when you know all of 8 these single-molecule properties, it's not 9 predictable what will happen when you mix them 10 altogether with some bunch of other molecules with 11 their own sets of properties and how they're all 12 going to interact. 13 Some things you can know better than 14 others. You know, there's lots of science over the 15 years on these things, but ultimately you have to do 16 experiments to find out what a mixture -- how a 17 mixture is going to behave. 18 Q. Do you believe that a POSITA reviewing 19 Zhou would assume that propyl propionate could be 20 substituted for an equal weight amount of ethyl 21 acetate without impacting the performance of the 22 resulting battery?	148 1 CERTIFICATE 2 I, DEBRA A. DIBBLE, RDR, CRR, CRC, Notary 3 Public, do hereby certify: 4 That DEAN R. WHEELER, Ph.D., the witness 5 whose deposition is hereinbefore set forth, was duly 6 sworn by me before the commencement of such deposition, 7 and that such deposition was taken before me and is a 8 true record of the testimony given by such witness, 9 that said testimony was taken by me stenographically 10 and thereafter reduced to typewriting under my direction. 11 I further certify that the adverse party, the 12 Patent Owner was represented by counsel at the 13 deposition. 14 I further certify that the deposition of 15 DEAN R. WHEELER, Ph.D., occurred remotely on the 28th 16 of January, 2026, commencing at 9:17 a.m. to 2:12 p.m. 17 I further certify that I am not related to any 18 of the parties to this action by blood or marriage, 19 I am not employed by or an attorney to any of the 20 parties to this action, and that I am in no way 21 interested, financially or otherwise, in the outcome 22 of this matter. 23 IN WITNESS WHEREOF, I have hereunto set my 24 hand on this 1st day of February, 2026. 25 26  27 DEBRA A. DIBBLE, RDR, CRR, CRC 28 29 30 31 32

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Conducted on January 28, 2026

38 (149 to 152)

149 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 10 X _____ 11 DEAN R. WHEELER, Ph.D. 12 13 14 15 16 17 18 19 20 21 22	150 1 ERRATA SHEET FOR THE TRANSCRIPT OF: 2 CASE NAME: Zhuhai v. Ningde 3 DEP DATE: January 28, 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 X _____ 21 DEAN R. WHEELER, Ph.D. 22
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Re: Deposition of **Dean R. Wheeler, Ph.D.**

Date: 1/28/2026

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

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Page	Line	Correction/Change and Reason
27	12	-- as a --" to "act" - misspoke/clarification
31	4	"mm-hmm" to "yes" - clarification
37	2	"Mm-hmm" to "Yes" - clarification
39	11	Strike "a" - misspoke
54	6	"I" to "You" - misspoke/clarification
60	4-5	"fleuro lithium" to "lithium hexafluorophosphate" - misspoke/transcription error
72	13	"4.51" to "5.1" - misspoke/clarification
92	11	Strike "the" - misspoke/clarification
114	15	"is" to "are" - misspoke
118	4	"cylindrically" to "cylindrical" - clarification/transcription error
125	7	"access" to "axis" - transcription error
130	16	"causing" to "CosMX's position" - clarification/transcription error
131	6	"that -- yes" to "is that, yes" - transcription error
133	4	"conclusive, that" to "conclusive that" - clarification/transcription error
146	8	"single-moleduled" to "single-molecule" - transcription error
146	10	"altogether" to "all together" - transcription error

February 18, 2026

(Date)



(Signature)

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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)



(Signature)