

Transcript of Brett Lucht, Ph.D.
Conducted on October 22, 2025

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1 PROCEEDINGS 2 BRETT LUCHT, Ph.D., 3 having been first duly sworn testified as follows: 4 EXAMINATION 5 BY MR. COX: 6 Q Good morning, Dr. Lucht. 7 A Good morning. 8 Q My name is Brady Cox. I'm with the law 9 firm of Alston & Bird and I will be asking you 10 some questions today on behalf of Ningde Amperex 11 Technology Limited; is that okay? 12 A Yes. 13 Q And I may refer to the patent owner as 14 Amperex or ATL, will you understand what I mean if 15 I use either of those? 16 A Yes. 17 Q And you were retained on behalf of 18 petitioner in this IPR, correct? 19 A Yes. 20 Q And how do you pronounce the petitioner's 21 name? 22 A I pronounce it CosMX.	7 1 A Yes. The paper versions are copies of the 2 exhibits in the IPR. 3 Q And none of those binders have any notes 4 or highlighting or other kind of annotations for 5 yourself? 6 A Not to my knowledge. I haven't -- well, I 7 haven't flipped through all of them, but I haven't 8 made any marks in any of them. 9 Q Perfect. And other than your two counsel 10 who are in the room with you, do you have any 11 other lines of communication open on your laptop 12 or otherwise like a messaging platform or email or 13 anything? 14 A Well, I just opened my email -- 15 Q Sure. 16 A -- to get the download, but I can close 17 the email. 18 Q Yeah, would you mind just closing the 19 email. And if have you Teams or Slack or whatever 20 your university uses, close that down for the 21 remainder? 22 A The only thing that I have open on the
6 1 Q CosMX, okay. We will do it that -- I've 2 heard it also CoxMX, but CoxMX works for me. 3 Where do you live, Dr. Lucht? 4 A I live in Kingston, Rhode Island. 5 Q And today you are physically located in 6 Atlanta; is that correct? 7 A Yes. 8 Q And you are at counsels' offices? 9 A Yes. 10 Q And your counsel are sitting on two sides 11 of you in this deposition proceeding? 12 A Yes. 13 Q Is there anyone else in the room with you 14 that I can't see off camera? 15 A No. 16 Q And are there any white boards, easels or 17 other notes around the room to -- 18 A No. The only thing in the room are the 19 binders with all of the materials. 20 Q And by all of the materials, you are 21 referring to the papers in this IPR proceeding and 22 the exhibits in this IPR proceeding?	8 1 laptop is the Planet Depos. 2 Q Okay. 3 A Whatever you want to call it, the screen. 4 Q Got it. And today's deposition relates to 5 the IPR2025-00431; is that your understanding? 6 A That is what I see here on the exhibit, 7 the papers that I have, yes. 8 Q And that is the IPR declaration that 9 you're prepared to discuss today? 10 A Yes. 11 Q And that relates to U.S. Patent Number 12 11,799,131, which I will refer to as the '131 13 patent if that is all right? 14 A Yes, that is fine. And yes, that is the 15 patent. 16 Q And you prepared declarations for other 17 IPR proceedings involving Amperex patents that are 18 asserted against CoxMX, correct? 19 A Yes, I have. 20 Q About how many of those other declarations 21 did you prepare, if you recall? 22 A Is the question specifically related to

9 1 CosMX? 2 Q Just to CosMX for now, yeah. 3 A Well, there were these two, this '131 and 4 then what -- was it '910 that just got -- that was 5 last week it was supposed to be what I was 6 supposed to be deposed on yesterday? 7 Q Right. 8 A And then I believe there were three other 9 declarations that -- well, actually no, in terms 10 of IPRs? 11 Q In terms of IPRs? 12 A I don't recall if there was another one, 13 because I was not the person -- the expert for the 14 IPRs for the other three patents most recently, so 15 I'm not sure. 16 Q Okay. 17 A I was an expert at trial in the -- in the 18 Court, the -- 19 Q Sure. 20 A -- federal district court case. 21 Q In the prior go round you are referring 22 to --	11 1 proceedings, if you -- if you recall? 2 MR. STEIN: Objection to the extent it 3 asks for privileged communications. 4 A I don't recall which one I was asked to do 5 first on this case. I'm not sure. 6 Q Do you recall -- I'm sorry, go ahead. 7 A I would have to look back at the emails 8 from when I was asked to do this and when I signed 9 the contracts. I don't recall exactly. 10 Q Do you recall what you started working on 11 first, if you started working on the district 12 court proceeding or started working on these IPR 13 proceedings first? 14 A I believe that I started working on the 15 IPR proceedings first, but I'm not positive. 16 There may have been some small amount of work that 17 I did with the district court case. Once again, I 18 would have to look back at my records. 19 Q About how many times have you been deposed 20 before, Dr. Lucht? 21 A I think on the order of 10 or 12 times, 22 maybe as much as 14 or 15.
10 1 A Yes. 2 Q -- the first district court case? 3 A Yes, but I was not the expert for those 4 IPRs. 5 Q You referred in your answer just now to 6 the '910 patent and the declaration that you 7 prepared in connection with that? 8 A Yes. 9 Q You are referring to patent 11,769,910 10 that was in an IPR proceeding that was denied 11 institution last week or so? 12 A I believe that is the correct number. I 13 would have to look to make sure. 14 Q But you do recall that it is the '910 15 patent? 16 A Yes, yes. 17 Q I will represent that that is the patent 18 number 11,769,910. 19 Did you -- when you prepared these 20 declarations, let me step back. 21 Were you hired initially to assist with 22 the district court litigation or the IPR	12 1 Q And about how many of those were remote? 2 A Small percentage, maybe three or four, two 3 or three, because those ones primarily were just 4 during Covid. I definitely had at least two 5 depositions that were remote, might have been 6 three. 7 Q Okay. Do you understand that in these 8 proceedings because the court reporter is writing 9 down everything we say verbatim, we need to kind 10 of take turns in the back and forth with questions 11 and answers? 12 A Yes. 13 Q And so I will ask you just to be sure that 14 when you give an answer even though you are on 15 video to be sure to give a audible response 16 instead of a nod or a shake of the head; is that 17 all right? 18 A Yes. 19 Q And if -- if you are still giving an 20 answer, I will do my level best to not interrupt 21 you and let you finish your answer. I will also 22 ask if I'm asking a question, you do your level

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13 1 best to let me finish the question before you 2 begin your answer. Is that all right? 3 A I will try my best. 4 Q And that is all we can do. 5 And have all of your depositions been 6 related to either patent district court cases or 7 IPR proceedings? 8 A Yes, I think so. 9 Q You have not had a deposition, you know, 10 like a product liability case, a battery exploded 11 or an automobile case or something like that? 12 A There was one other case that I was 13 involved with, which was a fraud case where a 14 group of investors had filed a fraud case against 15 a company, but I don't think I was ever deposed 16 for that. I think I was just a expert providing 17 information. 18 Q And what type of information did you 19 provide in that case? 20 A Well -- 21 MR. STEIN: Objection to the scope. 22 A They were -- as I said, it was a group of	15 1 trial, Dr. Lucht? 2 A Just the one time. 3 Q And that is in the initial trial between 4 Amperex and CosMX? 5 A Yes. 6 Q And you're aware in the second district 7 court case that there is ongoing litigation 8 related to the '131 patent? 9 A Yes, that is my understanding. 10 Q And that litigation also involves the '910 11 patent? 12 A Yes, that is my understanding. 13 Q And you're serving as an expert for CosMX 14 in that district court litigation? 15 A Yes. 16 Q Have you submitted to date any 17 declarations in the second district court 18 litigation? 19 A No, I do not believe so. 20 Q Do you anticipate preparing declarations 21 or expert reports in that litigation? 22 MR. STEIN: Objection to the extent it
14 1 investors. And you know, this is confidential 2 what the company was that I was working with, but 3 they had two -- at least two different expert 4 witnesses. And so I sat in on various depositions 5 of people from the company and then provided 6 technical feedback to the lawyers. 7 Q And about when was that? 8 MR. STEIN: Same objection. 9 A I think that was in 2023, but it could 10 have been 2022 or 2024. I mean, it was a year or 11 two ago, something like that. It stretched over a 12 fairly long period of time. 13 Q And do you know if that case is still 14 ongoing or if it is resolved or if it settled? 15 A It settled. 16 Q Okay. And where was that case? In what 17 state or was it in federal court or state court? 18 MR. STEIN: Objection to the scope and 19 relevance. 20 A I don't -- I don't -- I think it might 21 have been in California, but I don't recall. 22 Q About how many times have you testified at	16 1 calls for privileged communications. 2 A I don't know. I haven't been told. I 3 haven't been asked, but you know, having done this 4 before, I would assume that they would probably 5 want a declaration from me, but nobody has told me 6 anything specifically. 7 Q Outside of the work related to these IPR 8 proceedings in the district court litigation, have 9 you done any other kind of work for CosMX, any 10 consulting or technical or other work for that 11 company? 12 A No, the only work that I have done for 13 them has been related to the patent litigation and 14 the IPR proceedings. 15 Q And they're not otherwise, you know, 16 funding or providing grants for your research at 17 the university or anything like that? 18 A No, they are not. 19 Q Have you ever worked as an expert adverse 20 to CosMX? 21 A I do not believe so. 22 Q Have you previously worked as an expert

17 1 adverse to Amperex for any client other than 2 CosMX? 3 A Yes, I believe so. 4 Q And in what circumstances or cases was 5 that? 6 A I would have to go back and look at all 7 the different cases. It has been a while, but I 8 believe I was with Maxel against ATL. And I don't 9 recall now if that was the Court case that I was 10 on or the IPR or both. I don't -- I don't recall, 11 it has been a while. 12 Q Okay. And do you understand that CosMX 13 was a co-petitioner to those IPRs? 14 A I'm sorry, can you say that again? 15 Q Do you understand that CosMX was joined as 16 a co-petitioner to those IPRs against the Maxel 17 patents? 18 MR. STEIN: Objection to the form of the 19 question. 20 A I'm not -- I was not aware. I mean, I 21 don't recall that. I don't know -- I don't know. 22 Q Have you also done work for Semiconductor	19 1 I used to develop my declaration. 2 Q Is there any documents that you reviewed 3 in preparation for your deposition that were not 4 part of the record in this IPR proceeding? 5 A Not that I recall. 6 Q And when you referred to the declaration 7 of Amperex's expert, you are referring to the 8 declaration of Dr. Dean Wheeler? 9 A Yes. 10 Q And are you familiar with Dr. Wheeler 11 professionally in any other setting? 12 A No. 13 Q Do you know if you have cited any papers 14 or co-written any papers with him or anything like 15 that? 16 A I haven't co-authored a paper with him. 17 I've published a lot of papers. It is possible 18 that I cited a paper of his in one of my papers, 19 but I don't know. 20 Q If you go to Exhibit 1003, that is I 21 believe your declaration. 22 (Exhibit 1003 discussed.)
18 1 Energy Laboratories adverse to Amperex? 2 A Yes. 3 Q And do you recall the outcome of those 4 IPRs? 5 A With the SEL one, my recollection is that 6 the patent was invalidated, I think. 7 Q Do you recall the outcome with respect to 8 the IPRs against Maxel patents that you defended? 9 MR. STEIN: Objection, relevance, scope. 10 A Once again, I think that the patents got 11 rejected or whatever, was invalidated, is that 12 what the term is? 13 Q How did you prepare for your deposition 14 today? I don't want to know the content of any 15 communication you have had with your attorneys. 16 A I'm sorry, can you ask that again? 17 Q I'm not asking for the content of any of 18 the communication you had with your attorneys. 19 A I reviewed my declaration, I reviewed the 20 declaration of the expert witness from ATL. I 21 reviewed the Patent Office's response, and I 22 reviewed several of the patents and prior art that	20 1 A Yes. 2 Q You see page 17 lists the references you 3 relied on in preparing your declaration? 4 A Hold on. Exhibit 1003, okay, my 5 declaration, yes. 6 Q On page 17 does that list the references 7 you relied on in preparing your opinions? 8 A Page 17 of my declaration? 9 Q I believe that -- 10 A Electro -- 11 Q Sorry, let me make sure I have the right 12 pages here. I may be looking at the PDF 13 pagination, one second. 14 A I believe it is on page 5 and page 6 and 15 then goes on to page 7. 16 Q Sorry. So you see at the bottom 17 right-hand side there is pagination saying page X 18 of 131? 19 A Oh, yes, I see there is page 17 of 131, 20 yes. 21 Q Sorry. 22 A Sorry.

21 1 Q That is ambiguous, because there is some 2 Roman Numeral pagination at the beginning of your 3 declaration. I'm referring to essentially what is 4 the PDF pagination, if that makes sense. 5 A Okay, yes. 6 Q And so beginning on page 17 of 131, these 7 are the materials that you considered in preparing 8 your opinions? 9 A Yes. 10 Q And are there any other exhibits that 11 aren't listed in this table that you considered in 12 preparing your opinions? 13 A Not that I recall. 14 Q Did you review Amperex's preliminary 15 response that was filed in this IPR proceeding? 16 A I think -- I reviewed the declaration of 17 Dr. Wheeler. I don't recall if I reviewed the 18 actual response. 19 Q You reviewed -- you called it the Patent 20 Office's response. Are you referring to the 21 Institution Decision that was issued in this IPR 22 proceeding?	23 1 many people were online. 2 Q Do you know the names of the other people 3 that were present? 4 MR. STEIN: Objection, relevance. 5 A I don't recall. That is -- there were 6 several people there and I'm not sure. 7 Q And about how long did you spend 8 preparing? 9 A All total probably on the order of 20 10 hours or something like that, 15, 20. 11 Q So is that over the course of about three 12 days or two days? 13 A I would say, I mean, over the course of 14 the whole month. I mean, I first would say I 15 started preparing when -- when I was sent the 16 Institution decision and the expert report from 17 Dr. Wheeler. 18 Q So you are referring to all of your 19 preparation, not necessarily kind of your 20 immediate preparation for the deposition? 21 A Yes, I was talking about all the 22 preparation, which that -- reading that -- yes. I
22 1 A Yes, I'm referring to the Institution 2 Decision. 3 Q Have you reviewed the Institution 4 Decisions in all of the IPRs where there has been 5 an institution decision, to your knowledge? 6 A I don't recall. I think those were 7 probably provided to me, but I don't recall. 8 Q Have you reviewed any of the directors' 9 decisions in any of the other CosMX IPRs? 10 MR. STEIN: Objection, scope, relevance. 11 A I don't know, I don't recall. 12 Q You said in preparing for this deposition 13 you reviewed certain documents. Did you also meet 14 with counsel? 15 A Yes, I did. 16 Q Is it the two counsel who are in the room 17 with you today? 18 A Yes, there were also some people that were 19 present online. 20 Q And were those also attorneys? 21 A I think at least one of them was an 22 attorney. I'm not sure about -- I'm not sure how	24 1 am talking about all the preparation. 2 Q Were you aware of the '131 patent before 3 you were retained by CosMX? 4 MR. STEIN: Objection, relevance. 5 A No. 6 Q Exhibit 1004 is your CV that was submitted 7 in this proceeding; is that correct? 8 (Exhibit 1004 discussed.) 9 A Yes. 10 Q And was this CV accurate as of January 11 28th, 2025 when it was submitted in this 12 proceeding? 13 A Yes. 14 Q Have there been any changes or updates to 15 your CV since then? 16 A I think I've published a couple more 17 research articles. 18 Q Your -- otherwise your position at the 19 university has not changed? 20 A My position at the university has not 21 changed. 22 Q Have you began any other consulting

25 1 relationships? 2 A No. This is the only -- the only current 3 consulting relationship that I have right now is 4 related to these patents. 5 Q And that is, you know, including other 6 technical consulting not legal consulting? 7 A I mean, I have a position as the chief 8 scientific officer at eFlion, which isn't really 9 consulting, but I don't think I've got any other 10 consulting going on at this time. I am an editor 11 of a journal. 12 Q What is that journal? 13 A The Journal of the Electrochemical 14 Society. 15 Q And what is your role as chief science 16 officer? 17 A My role is advising the company how to 18 optimize the performance of their batteries. 19 Q And what kinds of batteries are those? 20 A They're lithium-ion batteries. 21 Q What is their intended application? 22 A The primary intended application for	27 1 Q And why? 2 A Well, you are going to have the VTOL 3 takeoff and then fly. The mass of the battery is 4 critical to how far can you fly the VTOL, but the 5 power requirement, which is really important for 6 takeoff and landing, is -- is the bigger issue for 7 those batteries. 8 Q Are there other lithium-ion battery 9 applications for which mass is less of a factor or 10 focus or concern? 11 MR. STEIN: Objection, scope. 12 A Well, that is not really exactly what I 13 said. Mass is important for sure. I'm just 14 saying the more importance is high power. And 15 yes, there are various other applications where 16 high power is the more important component such as 17 drones, they are also typically more high power. 18 Some power tools are related to more high power. 19 Those I would say are the -- oh, racing cars. I 20 don't know if there is -- there is E Formula 1 and 21 that is more of a high power application. 22 Q Are there other lithium-ion battery
26 1 eFlion is VTOLs, which is vertical takeoffs and 2 landings. They're effectively flying taxis. 3 Q And these are of the sort that Uber is 4 investigating and researching? 5 MR. STEIN: Objection, relevance. 6 A I'm not aware of if Uber's investigating 7 that. They are -- there are other companies that 8 we have been working with which are more 9 traditional aerospace companies. 10 Q What is different about the intended 11 applications for VTOL batteries? 12 MR. STEIN: Objection to the form. 13 A For the application of the VTOLs, the most 14 important thing for the battery or one of the most 15 important things for the battery is high power as 16 opposed to high energy. They still want to have 17 high energy, but they are batteries that are 18 really focused on delivering high power, which is 19 required for the VTOLs. 20 Q What about weight or energy density, is 21 that a consideration? 22 A It also is, yes.	28 1 applications that don't require the battery to be 2 mobile at all? 3 MR. STEIN: Objection, relevance. 4 A Yes. I mean, there has been a fair amount 5 of recent interest in using lithium-ion batteries 6 for grid scale storage where they're not moving 7 around. 8 Q Any others? 9 MR. STEIN: Same objection. 10 A I mean, not -- I guess, you know, some 11 people have battery backups in their house, that 12 is another one that would be that way, too. There 13 are probably others, but I'm just not thinking of 14 it at the moment. 15 Q Do you have a Ph.D., a master's degree and 16 a bachelor's degree; is that correct? 17 A Yes, I do. 18 Q All in chemistry? 19 A Yes. 20 Q And was the focus of your master's and 21 Ph.D. program battery chemistry? 22 A No.

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29 1 Q What was the focus? 2 A So at Cornell they give you a master's 3 degree on your way to getting a Ph.D., it's just 4 part of the process, not all schools do that. URI 5 doesn't, they just give Ph.D.s. But my research, 6 all of my Ph.D. research was on lithium 7 dialkylamides, in particular lithium 8 hexamethyldisilazide. And I looked at the 9 solution structure and reactivity of lithium 10 hexamethyldisilazide. 11 Q And what were the applications for that? 12 MR. STEIN: Objection, relevance. 13 A Lithium hexamethyldisilazide is a strong 14 base. It is used in a lot of organic reactions to 15 dipropionate species to make lithium analytes, for 16 example. 17 Q Did you study electrolyte solutions in 18 your Ph.D. program? 19 A They were lithium salts dissolved in 20 solvents, so I guess you could say that they were 21 electrolyte solvents, but that is not typically 22 what they were considered at the time. They were	31 1 electrolyte solution -- battery electrolyte 2 solutions in your education? 3 A In terms of my bachelor's and master's and 4 Ph.D. research activities, I did not study lithium 5 battery electrolytes. 6 Q I want to be clear. I'm not asking just 7 about your research activities. I'm about -- I'm 8 also asking about any of your coursework or 9 education. 10 A In the coursework or education that I had 11 for my bachelor's, master's and Ph.D., no, I did 12 not. 13 Q Any of your postdoctoral fellow work, did 14 you -- 15 A No, I did not. 16 Q So did you study batteries as a 17 bachelor's, master's or Ph.D. or as a postdoctoral 18 fellow? 19 MR. STEIN: Objection to the form. 20 A I did not study batteries as a bachelor's 21 student, master's student, Ph.D. or as a postdoc. 22 Q Same question for battery cathodes?
30 1 more so organic solutions. 2 Q Sorry, I didn't ask about electrolyte 3 solvents, I said about electrolyte solutions. Did 4 you study electrolyte solutions in your -- 5 A I studied solution structures of 6 organolithium species. So technically speaking, 7 the solution was an electrolyte, but, you know, it 8 is -- that is not typically the way that organic 9 chemists would think about those solutions. 10 Q Did you study at all in your Ph.D., 11 master's or bachelor's program battery cathodes or 12 cathode active materials? 13 A No. As a Ph.D. student or bachelor's 14 student, no, I did not. 15 Q Or as a master's student. Through your 16 university education, did you study battery 17 cathodes? 18 A No, I did not. 19 Q Did you study battery anodes in any of 20 your education? 21 A No, I did not. 22 Q And it sounds to me that you did not study	32 1 MR. STEIN: Same objection. 2 A No, I did not. 3 Q Same question for battery anodes? 4 MR. STEIN: Same objection. 5 A No, I did not. 6 Q And same for battery separators? 7 MR. STEIN: Same objection. 8 A No, I did not. 9 Q And same for battery electrolytes? 10 A No, I did not study battery electrolytes 11 as an undergraduate student, a graduate student or 12 a postdoc. 13 Q When did you gain knowledge or 14 understanding, if at all, regarding lithium-ion 15 batteries and their operation? 16 A I started my research into lithium-ion 17 batteries around 2000 as an assistant professor. 18 Q What led you to begin studying lithium-ion 19 batteries at that time? 20 A I had a friend of mine from graduate 21 school who was working at a lithium-ion battery 22 manufacturing company named Yardney Technical

33 1 Products, which was in Poquetanuck, Connecticut 2 about a 30 minute drive from the University of 3 Rhode Island. And he asked me if I would be 4 interested in doing research collaboratively with 5 them as part of a federal, I think it was an Air 6 Force/NASA contract on lithium-ion batteries. 7 Q Have you been doing work in lithium-ion 8 batteries ever since that time? 9 A Yes. 10 Q Exclusively or as part of other research? 11 A From 2000 until about 2010, in addition to 12 studying lithium-ion batteries I was also studying 13 thermochromic polymers. And then around 2008, 14 2010, something around there, I discontinued the 15 research on the thermochromic polymers and 16 basically exclusively started -- was doing 17 research on lithium-ion batteries from 2010 until 18 now. 19 Q What aspects of the lithium-ion batteries 20 has that research been in? 21 A I'm sorry, you were kind of warped there, 22 could you restate that?	35 1 latter? 2 Q Sorry, the latter, the interaction with 3 carbon? 4 A The interaction with the conductive 5 carbon? 6 Q Right. 7 A I mean, most of the focus is on the 8 electrode -- the electrolyte itself or the 9 electrolyte reacting with the surface of the 10 electrode materials, but as I said we have done 11 some work also looking at reactions with things 12 like conductive carbon. 13 Q And do you do work with electrolyte 14 additives as part of your research? 15 A Yes, I do. 16 Q And what is an electrolyte additive in the 17 context of a lithium-ion battery? 18 MR. STEIN: Objection, relevance. 19 A So typically additives are something that 20 is added to the primary electrolyte formulation. 21 So you typically have an electrolyte formulation, 22 which is some mixture of solvents in a lithium
34 1 Q I'm sorry, I said what aspects of 2 lithium-ion batteries has your research been in or 3 focused on? 4 A Most of my research is focused on 5 lithium-ion battery electrolytes, and the 6 reactions of the lithium-ion battery electrolytes 7 with the surface of the electrode materials which 8 is both the anode and the cathode, although I have 9 had some research in the area of separators, also. 10 Q When you are referring to the electrode 11 materials, are you referring to the electrode's 12 active materials? 13 A In terms of the reactivity of the 14 electrolyte, it is primarily with the electrode 15 active materials both the anode active materials 16 and the cathode active materials, although there 17 is also some -- potentially some reaction at times 18 of the electrolyte with the conductive carbon 19 dilutant that is used in electrodes. 20 Q I assume the latter is less of the focus 21 of your research? 22 A Could you define what you mean by the	36 1 salt, most frequently lithium hexafluorophosphate. 2 And then at times you will add relatively low 3 concentrations, half a percent, 1 percent, 2 4 percent of one or more additives to the 5 electrolyte formulation. And the electrolyte 6 additives are designed to improve some property 7 aspect of the electrolyte. 8 Q Can you provide some examples of common 9 electrolyte additives in the context of a 10 lithium-ion battery? 11 A Yes. 12 Q And what are those? 13 A One of the most widely used utilized 14 additives is VC, vinylene carbonate. Another 15 common one is FEC, fluoroethylene carbonate. 16 Propane sultone is another common one. And then 17 as described in these patents, some nitriles are 18 frequently used as additives. 19 Q You mentioned some nitriles. What is a 20 dinitrile compound? 21 A A dinitrile compound is a compound, which 22 has two carbon nitrogen triple bonds or two

37 1 nitriles. 2 Q And what is a trinitile compound? 3 A A trinitile compound is a compound which 4 would contain three carbon nitrogen triple bonds 5 or three nitriles. 6 Q Is a trinitile compound also a dinitrile 7 compound? 8 A From the nomenclature aspect of organic 9 chemistry, a trinitile would be a trinitile. It 10 does have two, but you wouldn't typically call it 11 a dinitrile if it has three. 12 Q Would you go ahead and open up Exhibit 13 2044? 14 (Exhibit 2044 discussed.) 15 A 2044. That is not in this binder. 16 Q It is not in the binder. That is one of 17 the ones we provided you electronically. 18 A Let me, while he's grabbing the paper 19 version -- which one is it again? 20 Q 2044. 21 A 2044, okay. 22 Q Have you seen this document before and	39 1 a dinitrile compound and a trinitile compound. 2 Do you agree or disagree with a 3 preliminary construction that says a dinitrile 4 compound is a compound with two cyano groups? 5 A Yes. 6 Q And do you agree or disagree with the 7 construction that a trinitile compound is a 8 compound with three cyano groups? 9 MR. STEIN: Objection, relevance and calls 10 for a legal conclusion. 11 A I agree with that. 12 Q Did you apply these constructions in 13 rendering your opinions in this IPR? 14 A I would say in terms of rendering my 15 opinions in the IPR, I utilized the plain and 16 simple meaning of the terms. 17 Q And is the plain and simple meaning of a 18 dinitrile compound a compound with two cyano 19 groups? 20 MR. STEIN: Objection, calls for a legal 21 conclusion. 22 A I believe I already answered that
38 1 take a second to look at it? 2 A (Reviewing document.) 3 MR. STEIN: Object to the relevance of the 4 document. 5 A Is there a date on this document 6 somewhere? 7 Q Down at page 14 there is a date September 8 30th. 9 A September 30th of this year? 10 Q Of this year, yes? 11 A I do not believe that I actually saw this 12 document. I did have some conversations with 13 counsel regarding the claim construction. 14 Q And I don't want to get into those 15 conversations. 16 Do you see at page 7 there is a table that 17 lists CosMX's proposed constructions for claim 18 terms in the '131 patent? 19 A I see the U.S. Patent Number 11,799,131 20 and I see claim terms and then preliminary 21 constructions. 22 Q I guess looking for now at the two lines,	40 1 question. 2 Q I'm not sure that you did, Dr. Lucht. 3 When you prepared your declaration as you applied 4 your plain and ordinary meaning or understanding 5 of the term a dinitrile compound, did you 6 understand it to mean a compound with two cyano 7 groups when you rendered your opinion? 8 A I believe that is -- yes, a dinitrile 9 compound is a compound with two cyano groups, two 10 carbon nitrogen triple bonds, as I just said a few 11 minutes ago. 12 Q And same question for trinitile compound? 13 MR. STEIN: Objection, asked and answered. 14 A As I said, the trinitile compound is a 15 compound with three carbon nitrogen triple bonds 16 or three cyano groups. 17 Q And that is the understanding that you 18 applied in rendering your declaration? 19 A Yes, I believe so. 20 Q Okay. This further states that a weight 21 percentage of the dinitrile compound is X. Do you 22 see that line?

41 1 A Yes, I see the line that says the weight 2 percentage of the dinitrile compound is X. 3 Q And do you agree or disagree that this 4 term means a weight percentage of all dinitrile 5 compounds present in the electrolyte is X? 6 MR. STEIN: Objection, calls for a legal 7 conclusion. 8 A Could you restate the question again? I'm 9 just reading this. 10 Q Do you agree or disagree that this term 11 means a weight percentage of all dinitrile 12 compounds present in the electrolyte is X? 13 MR. STEIN: Objection to the form, calls 14 for a legal conclusion. 15 A The way that I would read a weight 16 percentage of the dinitrile compound is X would be 17 the weight percentage of all dinitrile compounds 18 present in electrolytes is X as is stated. 19 Q And why, Dr. Lucht? 20 MR. STEIN: Same objections. 21 A Excuse me? 22 Q Why would you read it that way?	43 1 Q Okay. I'm sorry, it just felt like you 2 hadn't finished your sentence. 3 A I'm sorry, I just trailed off. I believe 4 that I've been told that before. 5 Q And I understand you're not a lawyer nor 6 are you a grammarian, right, Dr. Lucht? 7 A I am not a lawyer and I am not a grammar 8 teacher. 9 Q Are you familiar with what the definite 10 article "the" refers to? 11 MR. STEIN: Objection, calls for a legal 12 conclusion, relevance. 13 A Once again, I believe I've been told what 14 "the" means in terms of the legal aspects of it, 15 but you can tell me again. 16 Q Do you understand that the dinitrile 17 compound in a patent claim refers to a dinitrile 18 compound referred to earlier in the patent claim? 19 MR. STEIN: Objection, calls for a legal 20 conclusion. 21 A I mean, once again, I read it. I'm not a 22 lawyer. It says the dinitrile.
42 1 A Well, from my recollection of reading 2 through the patent, that was what my perception of 3 the intent was and that is what it appears to 4 state. 5 Q Are you familiar with what the word "a" 6 means in patent claims, Dr. Lucht? 7 MR. STEIN: Objection, calls for a legal 8 conclusion. 9 A This is something that has been pointed 10 out to me before, but I would, you know, 11 appreciate further guidance again. 12 Q Sure. Do you understand the word "a" in a 13 patent claim to mean one or more? 14 A I believe -- 15 MR. STEIN: Objection, calls for a legal 16 conclusion. 17 A Once again, I believe that has been 18 something that I've been told before, but I'm not 19 a lawyer, so that is -- 20 Q So that is? 21 A So I'm not a lawyer, that is what I've 22 been told.	44 1 Q The dinitrile? 2 A That is what it says in the claim. The 3 claim term, which is quoted there, says a weight 4 percentage of dinitrile compound is X. 5 Q So the question is, does the dinitrile 6 compound refer to the earlier one or more 7 dinitrile compounds? 8 MR. STEIN: Objection, asked and answered, 9 calls for a legal conclusion. 10 A My reading of that claim term is 11 consistent with what the preliminary construction 12 is as described in this document. 13 Q And is that the interpretation that you 14 applied in your declaration? 15 MR. STEIN: Same objections. 16 A I believe it is, yes. 17 Q So in your interpretation, when you were 18 calculating a weight percentage of the dinitrile 19 compound is X, you in every instance interpreted 20 it in the prior art as a weight percentage of all 21 dinitrile compounds present in the electrolyte in 22 the prior art?

45 1 MR. STEIN: Objection to the form. 2 A I believe that is what I would -- did, but 3 I would have to look back at the calculations 4 again to confirm that, but if you can direct me to 5 where that is in my declaration, I certainly can 6 confirm that for you. 7 Q If the claim term means instead a weight 8 percentage of the one or more dinitrile compounds 9 is X, would that mean that your calculations would 10 not accurately represent the correct calculation 11 of the weight percentage? 12 MR. STEIN: Objection to the form and 13 calls for information not in the record. 14 A So I guess -- I mean, I would have to -- 15 could you -- could you show me what the specific 16 thing -- you are -- you are asking me a specific 17 question that doesn't -- out of context, so I'm 18 not really understanding what you are trying to 19 ask. 20 Q I'm asking more in general which -- which 21 understanding of a weight percentage you apply in 22 forming all of your opinions. So when you were	47 1 speculation. 2 A I mean, all liquid electrolytes that are 3 used in lithium-ion batteries allow the 4 lithium-ions to go back and forth between the 5 cathode and the anode. Is that -- I'm not -- I 6 don't quite understand what your question was. 7 Q Are all electrolytes interchangeable for 8 that purpose? 9 MR. STEIN: Objection, calls for 10 speculation. 11 A Well, as a person that has been studying 12 liquid electrolytes for over 20 years, different 13 electrolyte formulations are optimized for 14 different applications. 15 Q And different applications includes the 16 different potential uses or goals of the 17 lithium-ion battery? 18 A Yes, the goals or -- it is related to the 19 goals, it is related to the specifications of the 20 battery. The electrolyte could be optimized for 21 low temperature performance, the electrolyte could 22 be optimized for high temperature performance. It
46 1 calculating weight percentage of the dinitrile 2 compound, were you looking at the weight 3 percentage of a single dinitrile compound or did 4 you in every event calculate the weight percentage 5 of all dinitrile compounds in the electrolyte? 6 MR. STEIN: Objection to the form, asked 7 and answered. 8 A So once again, I would have to look back 9 at all the specific calculations that I did. I 10 don't -- I don't recall exactly right now which -- 11 which electrolyte formulations had one dinitrile 12 in them or two dinitriles in there, you know, but 13 I can certainly, if you direct me to that page of 14 my declaration, I can clarify. 15 Q Okay. What role does the electrolyte 16 provide in the lithium-ion battery? 17 A The electrolyte provides a medium for the 18 lithium-ions to be transported back and forth from 19 the cathode to the anode and vice versa. 20 Q And do all electrolytes do that in the 21 same way? 22 MR. STEIN: Objection, calls for	48 1 could be optimized for silicon anodes, graphite 2 anodes, it could be optimized for high voltage 3 cathodes. There are different factors that affect 4 what -- the choice of electrolyte. 5 Q And do you use aqueous or non-aqueous 6 electrolytes in connection with lithium-ion 7 secondary batteries? 8 A One must use non-aqueous electrolytes. 9 Q And why is that? 10 A Because lithium metal or lithiated 11 graphite react with water. 12 Q Which is an undesirable outcome in a 13 lithium-ion battery? 14 A You want to minimize the reactivity -- 15 typically you want to minimize the reactivity of 16 the electrolyte with lithium metal or lithiated 17 graphite. So yes, the water would be bad for a 18 lithium-ion battery. 19 Q And is it correct that the main components 20 of an electrolyte formulation in a lithium-ion 21 secondary battery include a solvent or solvents, 22 electrolyte salt or salts and additive or

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49 1 additives? 2 A Yes, the electrolyte formulation is 3 typically made up of polar aprotic solvents, one 4 or more. So a lithium salt, which is required to 5 allow for the ion conducts lithium-ion conduction 6 and then frequently additives, but you wouldn't 7 have to necessarily have additives. 8 Q And what is a solvent in the context of an 9 electrolyte? 10 MR. STEIN: Objection, relevance. 11 A A solvent is typically considered a liquid 12 that can dissolve the lithium salt. 13 Q And why do you say typically considered a 14 liquid? 15 A Well, there are polymer electrolytes in 16 lithium-ion batteries that are solid state 17 lithium-ion batteries. 18 Q Would you call those polymers a solvent if 19 they were not liquid? 20 MR. STEIN: Objection, calls for 21 speculation. 22 A I'm not sure exactly what the terminology	51 1 liquid, correct? 2 MR. STEIN: Objection, calls for 3 speculation. 4 A That would be my general way of looking at 5 it, yeah. 6 Q A solute could be a liquid or solid or 7 gas, correct? 8 MR. STEIN: Objection, relevance. 9 A A solute is something that you would 10 dissolve into a liquid, which it could be a solid, 11 it could be a liquid, or as you said it could be a 12 gas. 13 Q Probably not a plasma? 14 A I don't know, I don't know. 15 Q And what is an additive in the context of 16 an electrolyte? 17 MR. STEIN: Objection, asked and answered, 18 relevance. 19 A Additives are – in terms of lithium 20 battery electrolytes, additives are typically 21 something that is added to the base electrolyte. 22 It is usually in relatively small percentages. As
50 1 would be there, but in all solid ceramic, solid 2 electrolyte, those would not be considered 3 solvents. The polymer electrolytes are frequently 4 polymer gel electrolytes, which contain some 5 liquid in them. I think there are some polymer 6 ones that are exclusively polymer and I don't – 7 they – I don't know what the term would be, I 8 don't know. 9 Q Sitting here today, can you identify any 10 solvent that is not a liquid? 11 MR. STEIN: Objection, relevance. 12 A So, you know, as both an organic chemist 13 and a person that is studying lithium battery 14 electrolytes, in general the solvents – I mean, 15 they could be low melting solids like ethylene 16 carbonate, but then when you mix it with the salt 17 it becomes a liquid, viscose liquid. So I mean, 18 they would typically – well, once again, they 19 could be low melting solids like EC. 20 Q And sorry, when you say low melting solids 21 like EC, you mean at one temperature they are a 22 solid but when they act as a solvent they are a	52 1 I said before, half, 1, 2, 5, could be more 2 percent usually by weight, but not always. 3 And then typically when you are 4 considering an additive, the additive is being 5 added to the electrolyte to – to do something to 6 improve the performance of the battery. 7 Q And when you referred to the base 8 electrolyte, are you referring to the lithium 9 salt? 10 A When I'm referring to the base 11 electrolyte, you are talking about the – the 12 solvent blend that then dissolves the salt. That 13 is the base electrolyte. 14 Q Okay. And to be clear, when you refer to 15 base electrolyte, are you referring to merely the 16 solvent or the solvent plus the dissolved salt? 17 MR. STEIN: Objection, asked and answered. 18 A So as I said, it is the liquid. The base 19 electrolyte is usually considered the solvents and 20 the salt. 21 Q Have you used propionates in your 22 research?

53 1 A I've definitely got a few papers on esters 2 and at this point I can't recall which esters we 3 used. 4 Q Have you ever used propyl propionate in 5 the context of a lithium-ion battery? 6 MR. STEIN: Objection, asked and answered. 7 A So in terms of my research publications, I 8 don't recall. As I said, I have a few papers 9 where we have used esters in parts of the 10 formulation. And I think we may have tried propyl 11 propionate, but I don't recall if those -- that 12 solvent is actually in any of the publications or 13 not. 14 Q And to be clear, I'm not limiting my 15 question to research publications. I'm talking 16 about any of your work or use of batteries. Does 17 that change your answer at all? 18 MR. STEIN: Objection, asked and answered. 19 A I mean, as I said I've looked at various 20 esters. I don't specifically recall if that ester 21 we looked at or not. 22 Q Do you know if you have used ethyl	55 1 they're infinitely interchangeable, however, it 2 would be obvious to try different esters if one of 3 them works well. 4 Q You mentioned boiling points and melting 5 points, and I realize we're almost at an hour I 6 will take a break in a second. 7 Is a lower melting point more desirable or 8 less desirable in a lithium-ion battery all else 9 being equal? 10 MR. STEIN: Objection, calls for 11 speculation. 12 A Ask your question again. 13 Q Is a lower melting point more desirable or 14 less desirable in a lithium-ion battery all else 15 being equal? 16 MR. STEIN: Same objection. 17 A I would say -- I would say it is not that 18 simple of a thing. That is one factor that you 19 would take into account, but typically if you have 20 lower melting points, you also have lower boiling 21 points. And the lower boiling points can cause 22 problems with safety, so it really would be
54 1 propionate? 2 MR. STEIN: Objection. 3 A Once again, we have looked at esters in my 4 research lab but I would have to look back at the 5 specifics to see what actual esters we used. 6 Q I assume the same answer is true if I 7 asked if you used a pentyl propionate? 8 MR. STEIN: Same objection. 9 A Once again, as I said, we have used 10 esters, but I don't specifically recall which 11 esters we have used. 12 Q Are all esters interchangeable, in your 13 opinion? 14 MR. STEIN: Objection, calls for 15 speculation. 16 A I mean, different esters could be utilized 17 for different properties, such as higher or lower 18 melting points or higher or lower boiling points. 19 However, you know, the chemical properties of the 20 different linear esters outside of the boiling 21 points and melting points are probably going to be 22 relatively similar. So I wouldn't say that	56 1 dependent upon the application. 2 Q And the same, I assume, is also true of a 3 higher boiling point. If I asked you is a higher 4 boiling point more desirable or less desirable in 5 a lithium-ion battery all else being equal, would 6 you give the same answer that it is not so simple 7 a thing. That is one factor you would take into 8 account, but it would be dependent upon the 9 application? 10 MR. STEIN: Objection to the form, same as 11 the previous objection, asked and answered. 12 A So once again, much like with the melting 13 points, the boiling points, it is going to be 14 dependent upon the application. If you were going 15 to be using a battery in a very high temperature 16 application like, let's say, some mining 17 applications or frequently such as the case with 18 jets or the battery for the military jets 19 frequently was in a location in the jet was quite 20 warm, then -- then higher boiling point would be 21 better. But it is once -- as I said, it is going 22 to be dependent upon the application that we are

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57 1 using the battery for. 2 Q So you cannot say categorically that a 3 lower melting point or a higher boiling point is 4 necessarily always preferable? 5 MR. STEIN: Objection to the form, asked 6 and answered. 7 A As I already stated, it would be dependent 8 upon the application. 9 Q Okay. Would you like to take a break for 10 5 or 10 minutes Dr. Lucht? I don't know how long 11 a break you would like to take. 12 A I would prefer the break to be no longer 13 than 10 minutes, 8. 14 Q Yeah we can come back in 8, sounds great. 15 (Recess, 11:10 to 11:19 a.m.) 16 Q Dr. Lucht, did you discuss the content of 17 your testimony with counsel during the break? 18 A No. 19 Q Okay, thank you. 20 Is it true that battery electrode systems 21 are very complex such that when you change one 22 thing it can change a lot of other things?	59 1 A It depends upon how large of a change you 2 make. If you make a large change to the 3 electrolyte formulation, yes, it can result in 4 large changes. If you make a small change, it 5 probably would not. 6 Q In your experience, is it true that 7 lithium batteries are very, very sensitive to very 8 small changes? 9 MR. STEIN: Objection to the form and 10 asked and answered. 11 A Once again, that was a -- you said 12 lithium-ion -- it is a very broad question. I 13 don't know if I can answer that broad of a 14 question just simply. 15 Q So you disagree with the statement that 16 lithium batteries are very, very sensitive to very 17 small changes? 18 MR. STEIN: Objection to the form, asked 19 and answered. 20 A That is not what I said. What I said was 21 that the -- you have asked a very broad question 22 that I don't think I can just simply answer with a
58 1 MR. STEIN: Objection, calls for 2 speculation and facts not in evidence. 3 A Can you restate that question because that 4 was -- that was kind of a lot there. 5 Q Is it true that battery electrolyte 6 systems are very complex such that when you change 7 one thing, it can change a lot of other things? 8 MR. STEIN: Objection to the form and 9 calls for speculation. 10 A I would say that electrolyte formulations 11 are very complex, yes. In terms of the changes of 12 things, small changes, you know, they will -- they 13 might not result in large deviations, but bigger 14 ones may. It is -- I think your question was a 15 little overly general, I think. I don't -- I 16 can't really answer it very well. 17 Q So you would disagree in the context of 18 battery electrolyte systems that whenever you 19 change one thing, it can change a lot of other 20 things? 21 MR. STEIN: Objection to the form and 22 mischaracterizes his prior testimony.	60 1 yes or a no. 2 Q True or false, lithium batteries are very, 3 very sensitive to very small changes? 4 MR. STEIN: Objection, asked and answered, 5 calls for speculation. 6 A It depends on what -- the change you make. 7 That is -- it is -- if it is a very small change, 8 then it is probably not going to make that big of 9 a difference to the battery. If it is a large 10 change it might. I don't -- it is -- it is not 11 that simple. 12 Q Can small changes have large impacts on 13 the lithium-ion battery? 14 MR. STEIN: Objection, mischaracterizes 15 prior testimony, asked and answered. 16 A Could you state that again? 17 Q Can small changes have large impacts on a 18 lithium-ion battery? 19 MR. STEIN: Same objections. 20 A It might be possible for a small change to 21 have a large impact, but if it is a small change 22 it probably would not.

61 1 Q Is propyl propionate in the context of a 2 lithium-ion battery a solvent or an additive? 3 MR. STEIN: Objection, calls for 4 speculation. 5 A I mean, I would in general think of it as 6 a solvent, however, depending upon the publication 7 and application of it, another researcher might 8 refer to it as an additive. 9 Q Are you familiar with the differences 10 between propyl propionate and ethyl acetate? 11 A Yes. 12 Q What are the differences in the context of 13 a lithium-ion electrolyte solution? 14 MR. STEIN: Objection, calls for 15 speculation. 16 A Well, both compounds are esters, so they 17 have similar properties. The one compound has 18 more carbon atoms, the propyl propionate, than 19 does the ethyl acetate. And the additional carbon 20 atoms would result in increasing the boiling point 21 and the melting point. 22 Q And as we dealt with earlier, increasing	63 1 A I mean, when you are building a battery, 2 you usually pick a specific cathode material. You 3 pick a specific anode material and then you pick a 4 specific electrolyte. And then you typically 5 would do a whole bunch of testing to make sure 6 that that battery works well before you would 7 start manufacturing it. 8 Q Is it true that if you change anything it 9 may cause you problems? 10 MR. STEIN: Objection, mischaracterizes 11 prior testimony, asked and answered. 12 A Well, once again, as I said, it -- if it 13 is a small change, it most likely isn't going to 14 make a large difference. If it is a large change, 15 it most likely would make a large difference, but 16 it could, you know, deviate from that. 17 Q Can a small change make a large 18 difference? 19 MR. STEIN: Objection, asked and answered. 20 A I believe I already answered that 21 question. 22 Q And is it a yes or no?
62 1 the boiling point and the melting point is not 2 necessarily better or worse for all lithium-ion 3 battery applications. It would depend upon the 4 application, correct? 5 A As I said earlier, yes, it would depend 6 upon the application. 7 Q Fair to say that you cannot make a general 8 blanket statement that a solvent containing propyl 9 propionate is always going to be better than a 10 solvent containing ethyl acetate? 11 MR. STEIN: Objection, calls for 12 speculation, asked and answered. 13 A As I said, it would depend upon the 14 application of the battery in terms of which of 15 those two solvents might be preferred. However, 16 the two solvents are both linear esters and so, 17 the properties of those linear esters are similar. 18 Q Are specific materials used in cathodes 19 and anodes and electrolytes because that is what 20 works? 21 MR. STEIN: Objection to the form, calls 22 for speculation.	64 1 A It is -- it could be. I wouldn't say yes 2 or no. I mean, it is -- it is possible that some 3 small change to the battery could make a large 4 difference, but usually small changes wouldn't 5 result in large differences. 6 Q Are electrolytes with propyl propionate 7 superior to electrolytes with ethyl acetate? 8 MR. STEIN: Objection, speculation, asked 9 and answered. 10 A As I already stated, the two esters, being 11 both esters, are going to have fairly similar 12 properties. And in terms of the superiority of 13 one of those esters versus the other ester, it 14 would probably be related to the application. 15 Q Would you turn to Exhibit 1006? 16 (Exhibit 1006 discussed.) 17 A Okay. 18 Q Have you reviewed this document before? 19 A Yes, I have. 20 Q And what is this document? 21 A This document is an invention patent 22 application.

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65 1 Q Is it all right if I refer to this 2 document as Zeng? 3 A Yes. 4 Q Is that what you referred to it as in your 5 deposition? 6 A Yes. 7 Q Zeng has multiple embodiments, correct? 8 A Yes. 9 Q And Zeng embodiments 4 and 6 contain 10 propyl propionate as a solvent component in their 11 electrolyte solutions, correct? 12 MR. STEIN: Objection to the form. 13 A So embodiment 4 and 6? 14 Q Correct. 15 A Yes, they contain propyl propionate. 16 Q As a solvent? 17 A Yes. 18 Q Does propyl propionate form part of the 19 base electrolyte mixture in Zeng's embodiments 4 20 and 6? 21 A Yes. 22 Q And what other components form part of the	67 1 Q Do you see that? 2 A Yes. 3 Q What does this -- I will call it a formula 4 rather than equation, what does this refer to? 5 A That refers to the solvent mixture which 6 is used as the baseline solvent to make the 7 electrolyte. 8 Q And so how would you make the electrolyte 9 at a mass ratio as laid out here? 10 A How would you do it experimentally? 11 Q No, like, I want you to explain how much 12 of everything you put in? 13 A So if you were going to -- you could -- 14 you would have the mass ratio, so you would use 25 15 parts EC and 10 parts of PC and 30 parts of DEC 16 and 5 parts of fluorobenzene and 10 parts of EP 17 and 20 parts of PP, and in mass ratios. You would 18 use that ratio of the masses. 19 Q And Zeng refers to mass ratio. You 20 describe the solvent components in weight 21 percentages elsewhere in your declaration, 22 correct?
66 1 base solvent mixture in embodiments 4 and 6? 2 A Embodiments 4 and 6 both contain EC, which 3 is ethylene carbonate; PC, which is propylene 4 carbonate; DEC, which is diethyl carbonate; FB, 5 which I believe is fluorobenzene; EP, which is 6 ethyl propionate; and PP, which is propyl 7 propionate. 8 Q If you look at paragraph 37 of Zeng in 9 Exhibit 1006, let me know when you are there. 10 A You said paragraph 37? 11 Q 37, that's right? 12 A Yes. 13 Q You relied on this paragraph in forming 14 your opinions, correct? 15 A Yes, I did. 16 Q Do you see the section where it says that 17 EC, PC, DiEC, FB, EP and PP are mixed at a mass 18 ratio of EC:PC:DEC:FB:EP:PP equals 19 25:10:30:5:10:20? 20 A Yes. 21 Q Do you -- 22 A I see that.	68 1 A I may have. I'm not -- you know, from 2 mass and weight are for me in terms of these 3 experimental procedures fairly interchangeable 4 terms. 5 Q Is it coincidental that the mass ratio 6 numbers listed here add up to 100? 7 MR. STEIN: Objection, calls for 8 speculation. 9 A Is it coincidental? 10 Q Yes, is it coincidental or should the mass 11 ratio add up to 100? 12 A I mean, I don't know what the intent of 13 the inventors were, but if you are describing 14 something in mass ratios, it doesn't have to be -- 15 add up to 100. One of the common electrolyte 16 formulations for lithium-ion batteries is a 17 one-to-one-one blend of EC to DEC to DMC. And 18 that is usually how it is referred to when 1 plus 19 1 plus 1 doesn't equal 100. 20 Q At the end of the steps in step 37 or 21 maybe not the end, it says finally the following 22 are added on the basis of the total weight of the

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69 1 electrolyte solution. Do you see that? 2 A Yes, I do. 3 Q And are these additional components listed 4 in weight percentages additives? 5 A These are listed as it says, as weight 6 percentages of the total electrolyte solution. 7 Q My question is are the compounds listed 8 here additives to FEC, ADN, SN, DENE and VC? 9 MR. STEIN: Objection, asked and answered. 10 A That is how I would interpret them, yes, 11 as additives, electrolyte additives. 12 Q Could you go to Table 1 in paragraph 45 of 13 Zeng for me and let me know when you have had a 14 chance to look at that? 15 A I don't see it listed as Table 1, but I 16 think there is only the one table is this 17 paragraph 45. 18 Q Paragraph 45, that's right? 19 A Yeah. 20 Q And do you see embodiment 1 in that table? 21 A Yes. 22 Q Is it your opinion that embodiment 1 in	71 1 weight percent. 2 Q So in terms of the formulation of 3 embodiment 1 and comparison example 1, those are 4 the differences? 5 A Could you say that again? 6 Q In terms of the formulation of embodiment 7 1 and comparison example 1, what you have 8 described are the differences between those two in 9 how the electrolyte solution is created? 10 A Yes, that is – that is what this 11 indicated in the table. 12 Q And the table also indicates differences 13 in, I will call it results, correct, in retention 14 rate and precipitation? 15 A Yes, the table also has retention rate 16 percentage and then precipitation. And there are 17 differences there, yes. The retention rate is 18 lower for comparative example 1 and it also 19 indicates the small amount precipitated. 20 Q And is, all else being equal, do you want 21 a higher retention rate or a lower retention rate 22 for your batteries?
70 1 this table corresponds to the electrolyte solution 2 that is prepared in paragraph 37? 3 A So paragraph – I mean paragraph 36 says 4 embodiment 1 and then it lists below 37. And then 5 we look at all the 25, 10, 35, 10, 20, 4, 2, 1. 6 That appears to be the case, yes. 7 Q Do you see comparison example 1? 8 A In the table? 9 Q Yes. 10 A Yes. 11 Q And how is that differ from embodiment 1? 12 MR. STEIN: Objection, calls for 13 speculation. 14 A Well, it has a little bit less FEC, and 15 then it does not include T1 or T2. I would have 16 to look back to see what T1 and T2 are. Does that 17 answer your question? 18 Q Are there any other differences? 19 A I don't – let me see. Embodiment 1, the 20 VC, looks like all of the other things are the 21 same except for the T1 and the T2. And then as I 22 said there is – yeah, and the FEC conc – the FEC	72 1 MR. STEIN: Objection, calls for 2 speculation. 3 A Retention rate is one property of a 4 battery, and generally, you would want better 5 retention rate. However, depending upon the 6 application, there could be other aspects of the 7 battery that are more important. 8 Q And is it true that embodiment 5 has a 9 higher retention rate than the other embodiments? 10 A It appears that in this table embodiment 5 11 has the highest retention rate. 12 Q All else being equal that would be 13 preferable to the other embodiments? 14 MR. STEIN: Objection. 15 A It depends upon the application of the 16 battery. 17 Q Is there an application of a battery for 18 which you would like a lower retention rate? 19 MR. STEIN: Objection, calls for 20 speculation. 21 A So when you make different electrolyte 22 formulations like shown here, there may be other

73 1 factors that are important than just the retention 2 rate. For example, when I was talking about the 3 company that I work with, eFlion Power, we might 4 be willing to sacrifice some retention rates if 5 we're getting improved power performance. 6 Q Does propyl propionate offer higher power 7 than ethyl acetate? 8 MR. STEIN: Objection, calls for 9 speculation. 10 A I don't know. If the two solvents are 11 both esters, so they would have similar 12 properties. And if one of them worked it would be 13 obvious to try the other one to see if you got 14 better performance, performance criteria that are 15 most important for you in your application. 16 Q Does comparison example 4 contain PC? 17 A Does comparison example 4? 18 Q Uh-huh. 19 A PC is not listed there. 20 Q And so comparison example 4 differs from 21 embodiment 1? 22 A Yes.	75 1 Q Do you see the phrase in paragraph 37 2 where it says, in the glove box filled with argon 3 gas, mixing the solvents together at a specified 4 mass ratio, then lithium hexafluorophosphate of a 5 concentration of 1.0 moles per liter is slowly 6 added to the mix solution? 7 A Yes, I see that. 8 Q What is molarity, Dr. Lucht? I assume you 9 teach this to your freshman chemistry students. 10 A I don't teach freshman chemistry. 11 Q Whatever -- 12 A Molarity is moles per liter. 13 Q And is molarity a measurement for a liquid 14 or for a solid? 15 A Molarity is a measurement of something 16 being dissolved into the liquid. 17 Q Have you used lithium hexafluorophosphate 18 in your work, Dr. Lucht? 19 A Yes. It is the industry standard salt for 20 lithium-ion batteries. 21 Q And can you purchase it as a solution? 22 A Yes, you can.
74 1 Q Because PC is removed as a solvent? 2 A PC has been removed as a solvent so that, 3 yes, that is a change. 4 Q Does that affect your mass ratios? 5 A Well, if you don't have PC in the solvent, 6 then you would have no mass ratio of PC. 7 Q You would, you know, by comparison have a 8 higher percentage of everything else, correct? 9 MR. STEIN: Objection, asked and answered. 10 A If you are talking about percentages, yes. 11 If you are talking about mass ratios, not 12 necessarily. The mass ratios are what the mass 13 ratios are. As I said before, the 14 one-to-one-to-one EC, DEC, DMC electrolyte is one 15 of the industry standards. 16 Q The mass ratio of EC, though, is 35 in 17 comparison example 4, right? 18 A Looking at the table, the mass ratio of EC 19 is 35, yes. 20 Q And that is higher than its mass ratio in 21 embodiment 1, right? 22 A Yes, 35 is higher than 25.	76 1 Q And you can purchase it as a solution at 2 various molarities, correct? 3 A You can purchase lithium 4 hexafluorophosphate as a pure salt, you can 5 purchase lithium hexafluorophosphate dissolved in 6 the variety of different solvents depending on 7 what solvent you chose to dissolve it into. 8 Q And when you purchase it as a solution, it 9 can be purchased having different molarities, 10 correct? 11 MR. STEIN: Objection, calls for 12 speculation. 13 A There are some -- I mean, the industry 14 standard electrolyte formulations are typically 15 around 1 molar, maybe as low as .8, up to 1.3 or 4 16 possibly. But yes, you could purchase an 17 electrolyte solution that is 1 molar or you could 18 purchase an electrolyte solution which was 1.2 19 molars. 20 Q That was true as of the priority date of 21 the '131 patent as well, correct? 22 A Could you say that question again?

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77 1 Q That was true as of the priority date for 2 the '131 patent as well, correct? 3 A That one could purchase the liquid 4 electrolyte already pre-dissolved? 5 Q Yes? 6 A Is that your question? 7 Yes, I mean, you know, I have been 8 purchasing or actually a lot of times I get 9 companies donate them to me liquid electrolytes 10 for the last 20 years. 11 Q And going back in time, the industry 12 standard electrolyte formulations are typically 13 around 1 molar, correct? 14 A Typically, yes. 15 Q And that is generally commercially 16 available and known? 17 A Yes. 18 Q Is it your opinion that the phrase lithium 19 hexafluorophosphate of a concentration of 1.0 20 moles per liter is slowly added to the mixed 21 solution means that lithium hexafluorophosphate 22 was added as a solid not a solution, correct?	79 1 premixed in different solvents to different 2 concentrations? 3 A You can purchase different salt 4 concentrations of lithium hexafluorophosphate in 5 different solvents. Typically the concentration 6 of LiPS6 is close to one molar. 7 Q If lithium hexafluorophosphate was instead 8 added as a solution having a molarity of 1.0, and 9 an indeterminate amount of that solution was added 10 to the solvents in paragraph 37, would the 11 resulting weight percentage of propyl propionate 12 in the total electrolyte differ from your 13 calculations? 14 MR. STEIN: Objection to the form, calls 15 for speculation and relevance. 16 A Can you state that again? 17 Q If lithium hexafluorophosphate was instead 18 added as a solution having a molarity of 1.0 and 19 an indeterminate amount of that solution was added 20 to the solvents in paragraph 37, would the 21 resulting weight percentage of propyl propionate 22 in the total electrolyte differ from your
78 1 A Yes, that is my opinion. 2 Q And your opinion that lithium 3 hexafluorophosphate was added as a solid rather 4 than in solution, is set forth in footnote 4 of 5 your declaration, correct? 6 A I would have to look at that to confirm. 7 Is it footnote 4? 8 Q Sure. I will point you to it on page 43 9 of 131. 10 A Something I can mark this with. 11 What page is that again? 12 Q I may have the wrong -- sorry, page 50? 13 A Page 50 that is the -- 14 Q Footnote 6 -- withdraw my question, it is 15 footnote 6. 16 Your opinions that lithium 17 hexafluorophosphate was added as a solid rather 18 than in solution is set forth in footnote 4, 19 correct -- sorry, footnote 6, correct? 20 A Yes. 21 Q And you agree that lithium 22 hexafluorophosphate is commercially available	80 1 calculations? 2 MR. STEIN: Same objections. 3 A If you added an indeterminate amount of an 4 electrolyte solution, which a POSITA would not do 5 to the solvent blend that is indicated there, then 6 the percentage of propyl propionate in the total 7 electrolyte would be indeterminate, because you 8 just added an indeterminate amount of an 9 electrolyte which would make no sense to somebody 10 making a battery formulation. 11 Q So as you recognize at the end of footnote 12 6, doing so would render the ultimate 13 concentration of lithium hexafluorophosphate 14 uncertain? 15 A Yes. 16 Q And you didn't provide any opinion or 17 calculation on what the propyl propionate weight 18 percentages would be for embodiments 4 and 6 of 19 Zeng if lithium hexafluorophosphate were 20 determined to instead have been added as a 21 solution? 22 MR. STEIN: Objection to the form.

81 1 Q Correct? 2 MR. STEIN: Asked and answered. 3 A So I read the paragraph, which to me 4 clearly indicates to begin to dissolve the salt in 5 the -- in the pre-made specific ratios of 6 solvents. I did not do a calculation to determine 7 if lithium salt solution, the LiPS6 solution of 8 undetermined quantity and undetermined solvent was 9 added to the electrolyte because in my opinion as 10 a POSITA, it would make no sense to add an 11 undetermined amount of an electrolyte solution 12 dissolved in an undisclosed solvent to an 13 electrolyte formulation. 14 Q How many liters of lithium 15 hexafluorophosphate are added in paragraph 37? 16 MR. STEIN: Objection, calls for 17 speculation, mischaracterizes. 18 A Can we go back to this? I just lost it. 19 What exhibit was that again? 20 Q 1006? 21 A What was your question again? 22 Q How many layers of lithium	83 1 today, electrolyte formulations are very important 2 and very specific. A POSITA would not add an 3 undisclosed amount of solvent or an undisclosed 4 amount of electrolyte with an undisclosed solvent. 5 That makes no sense. 6 Q What is concentration? 7 A What is concentration? 8 Q That's right. 9 A Described here it is moles per liter. 10 Q And concentration of 1 moles per liter is 11 a measurement that is used in the context of 12 liquid solutions, correct? 13 A It is a context that is used in terms of 14 liquid solutions and liquid electrolytes for 15 lithium batteries, yes. 16 Q A solid salt is not referred to as itself 17 having a molarity, correct? 18 A A solid salt would not have a molarity, 19 that is a solid. Molarity specifically refers to 20 dissolving something into something else. 21 Q Do the terms dissolve and dissolving 22 always mean that a solid solute is being dissolved
82 1 hexafluorophosphate are added in paragraph 37? 2 A Well, first off, this doesn't say how many 3 liters of hexafluorophosphate. What is indicated 4 you are going to take lithium hexafluorophosphate 5 and make the 1 molar solution, is how I read it. 6 Q That is not what the text says, is it, Dr. 7 Lucht? 8 MR. STEIN: Objection, asked and answered. 9 A The text says, lithium hexafluorophosphate 10 of a concentration of 1.0 moles per liter is 11 slowly added to the mixed solution. 12 Q The text does not say lithium 13 hexafluorophosphate is added to the mixed solution 14 until it reaches a concentration of 1.0 moles per 15 liter, correct? 16 MR. STEIN: Objection asked and answered. 17 A As a POSITA, the only thing that makes 18 sense from this sentence is adding lithium 19 hexafluorophosphate to the solvent blend that is 20 described. A POSITA would not add an undisclosed 21 quantity of a liquid that contains an undisclosed 22 solvent. As we discussed various times so far	84 1 into a liquid? 2 MR. STEIN: Objection, calls for 3 speculation. 4 A The dissolution process, I think, is 5 generally considered a solid dissolving in a 6 liquid. However, I would assume that some 7 scientist might describe dissolving a liquid in 8 another liquid, so I'm not really sure. 9 Q We discussed earlier that solutes could be 10 solid, liquid or gas, correct? 11 A Yes. 12 Q And would you agree that in some contexts 13 dissolving could refer to a solid or a liquid or a 14 gas solute being dissolved in liquid solvent? 15 MR. STEIN: Objection to the form, asked 16 and answered. 17 A You can dissolve gases in liquids and into 18 the solvents. It has dissolved -- 19 Q I'm sorry. 20 A -- Coca-Cola has CO2 dissolved in it. 21 Q Is it correct that Zeng in paragraph 37 22 adds propyl propionate before adding the lithium

85 1 hexafluorophosphate solution? 2 A Could you restate that question? 3 Q Is it correct in paragraph 37 that Zeng 4 adds propyl propionate before adding the lithium 5 hexafluorophosphate solution? 6 A What is stated in paragraph 37 is that 7 they first prepare the solvent mixture in mass 8 ratios, and then adds the lithium 9 hexafluorophosphate to that, yes, which is fairly 10 common. 11 Q Have you, in preparing electrolyte 12 solutions, added lithium hexafluorophosphate 13 solutions to existing solvents? 14 A So -- 15 MR. STEIN: Objection to the scope. 16 A I don't work in the lab very much. My 17 graduate students and postdocs are the ones that 18 work in labs. 19 And could you state that question again 20 just so I know what I am -- it is referring to the 21 management of my students. 22 Q Understood. And I'm going all the way	87 1 want to do. 2 Q Are there circumstances in which you would 3 want to dilute it? 4 MR. STEIN: Objection, calls for 5 speculation. 6 A I mean, in general, lithium salt 7 concentrations for lithium-ion battery 8 applications, as I said before, typically .8 9 molar'ish up to 1.2, 1.3. The reason you use 10 those electrolyte formulations at those 11 concentrations is you kind of get the best of both 12 properties. 13 If salt concentration is too dilute, your 14 ionic conductivity is low. If your salt 15 concentration is too high, you typically get too 16 much viscosity and the cost of the electrolyte 17 goes up pretty high. 18 Q Do you know what the theoretical or 19 crystalline density of LiCoO₂ is, lithium cobalt 20 oxide? And is it okay if I refer to that as LCO? 21 A LCO is fine. 22 Q Okay.
86 1 back in time to when you began working in 2 electrolyte solutions. Have you in preparing 3 electrolyte solutions added lithium 4 hexafluorophosphate solutions to existing 5 solvents? 6 MR. STEIN: Objection. 7 A It is -- it is possible that under some 8 set of experiments we may have done that, but that 9 generally is not what we would do. Usually you're 10 either going to have the baseline electrolyte 11 formulation, which has a known mix of solvents and 12 a known salt concentration and then you might add 13 additives to that. 14 If you were just going to make up an 15 entirely different baseline electrolyte, what you 16 would typically do is mix all the solvents 17 together and then dissolve the salt in it, because 18 if you just added the lithium hexafluorophosphate 19 solution to another solvent -- I mean, unless you 20 are adding a low concentration like what you are 21 doing with an additive, then you would be diluting 22 it significantly, which you typically wouldn't	88 1 A I believe that was something that was in 2 Dr. Wheeler's report, but I don't remember the 3 specific number. 4 Q Do you know how the crystalline density of 5 LCO, whatever it is, differs from the compaction 6 density of an LCO cathode? 7 MR. STEIN: Objection. 8 A Could you restate that question? I just 9 wasn't clear. 10 Q Sure. Is it correct that the compaction 11 density of an LCO cathode cannot exceed the 12 theoretical maximum or crystalline density of LCO? 13 MR. STEIN: Objection, calls for 14 speculation. 15 A I would say in general it probably would 16 not exceed that. If you had binders or other 17 materials that you were putting in there that had 18 a greater density than LCO, then it would be 19 possible to. 20 Q If the other materials all have a lower 21 density than LCO, you could not exceed the maximum 22 density of LCO for your compaction density,

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89 1 correct? 2 MR. STEIN: Same objection. 3 A I would agree with that, yeah. You could 4 not do that. 5 Q Have you ever worked with LCO cathodes 6 having a compaction density of greater than 5 7 grams per cubic centimeter? 8 A I don't know. We typically get commercial 9 electrodes for our electrolyte studies. And I 10 would say the compaction density is not something 11 that we usually are that concerned with for the 12 work that we do. 13 Q Fair to say you haven't studied it as part 14 of your work, compaction density? 15 MR. STEIN: Objection, mischaracterizes 16 the testimony. 17 A That is not what I said. We have made 18 electrodes ourselves, but that is not the focus of 19 my research. 20 Q Why is compaction density measured or 21 important in the context of the cathode? 22 MR. STEIN: Objection, calls for	91 1 Q You said you can have that problem, 2 correct? 3 A Yes, you can. I mean if -- if the -- if 4 the electrode is too -- packed too tight or packed 5 too dense, then it is kind of hard to wet the 6 electrodes with the electrolyte. 7 Q And I only ask because for a quarter 8 second the realtime transcript said can't and then 9 the court reporter fixed it. 10 A Okay, that is fine. 11 Q Can you pull up Exhibit 1010? 12 A Yes. 13 Q I guess before we fully set 1006 aside, I 14 do have one follow-up. 15 This document was not originally written 16 in English, 1006, Zeng? 17 A No, it was a Chinese patent application I 18 believe, so the original document was in Chinese, 19 and there is a certificate at the back of it of 20 the translation. 21 Q Do you speak or read Chinese, Dr. Lucht? 22 MR. STEIN: Objection, relevance.
90 1 speculation. 2 A Well, compaction density of both 3 electrodes is important, because it relates to the 4 overall energy density of the battery. 5 Q And is higher compaction density always 6 better? 7 MR. STEIN: Same objection. 8 A Once again, as I said with most things, 9 there is always advantages and disadvantages of 10 different things. Going to higher compaction 11 densities can give you greater energy density, 12 however, going to higher compaction densities 13 could also cause problems with a rate performance 14 related to, you know, the material not being very 15 coarse. 16 Q And does that relate to the materials 17 properties potentially impeding the flow of 18 lithium-ions at high densities? 19 A I mean the problem with going to higher, 20 really higher densities is you can have that 21 problem, I mean, that can occur. It is a 22 possibility.	92 1 A I do not speak or read Chinese, however, I 2 have had many graduate students and postdocs that 3 do. 4 Q Did you confirm the accuracy of the 5 translation of paragraph 37 with anyone else other 6 than just relying on the certificate? 7 MR. STEIN: Objection, relevance. 8 A I relied on the certificate. 9 Q Do you have any reason to doubt the 10 accuracy of the translation of paragraph 37? 11 A I had no -- I mean, I can see that the 12 certified -- I have no basis to -- to determine 13 whether the translation was accurate or not 14 accurate. But my understanding is if it is a 15 certified translation, then the translation is 16 generally correct. 17 Q Did you run the Chinese translation of 18 paragraph 37 by any other person including a 19 student or anyone else? 20 MR. STEIN: Objection, relevance. 21 A Did I personally do that? 22 Q That's correct?

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93 1 A No, I did not. 2 Q Are you aware of CosMX having done that? 3 MR. STEIN: Objection, relevance. 4 A I don't know if they did or not. I assume 5 they're the ones that paid for the translation, 6 but I don't know if they did or not. 7 Q Could you go now to Exhibit 1010? I will 8 refer to this as Sunose if that is all right. 9 A Yes. 10 (Exhibit 1010 discussed.) 11 Q Could you look at paragraphs 29 to 31 and 12 let me know when you have had a chance to review 13 that? 14 A 29? 15 Q 29 to 31. 16 A Okay. What is your question regarding 17 this paragraph? 18 Q There wasn't one, I just wanted to orient 19 you first. 20 You relied on this embodiment, embodiment 21 1, in forming your opinions, correct, regarding 22 Sunose?	95 1 Q -- 10 centimeter coating is stopped? 2 A Yes. 3 Q What is active material layer weight here? 4 A So what that is describing is the weight 5 of the layer of the active material. So there is 6 active material and that is the weight of that 7 active material layer. 8 Q And it is listed as 200 grams per 9 centimeter squared? 10 A Yes, but I believe Dr. Wheeler commented 11 that that is not correct and it is actually grams 12 per meter squared I believe is what he said, but I 13 would have to look back at his declaration. 14 Q What do you understand the -- is 200 grams 15 per square centimeter, in your estimation, 16 accurate? 17 A No, I believe I agree with Dr. Wheeler 18 that it is -- that it is most likely 200 grams per 19 square meter. But I would have to look back and 20 see what he said in his -- his declaration to 21 confirm that I -- that I agree with his opinion 22 there.
94 1 A My recollection is I relied on embodiments 2 2, 3 and 4, but I would have to look back at my 3 declaration to confirm that. 4 Q Sunose discloses an LCO positive electrode 5 or cathode in its embodiments, correct? 6 A Sorry, going back, I was just looking. 7 Excuse me, can you say that again? 8 Q Sunose discloses an LCO cathode in its 9 embodiments, correct? 10 A It says that there is an LCO cathode, yes. 11 Q What does the term active material layer 12 weight mean in Sunose? 13 A Where is that statement? I just want to 14 see. 15 Q Sorry, I've got too many windows up at 16 once. 17 In paragraph 29 you see about two-thirds 18 of the way down after applying a coating of 60 19 centimeters on the surface with an active material 20 layer weight of 200 grams per cubic centimeter, 21 the 10 -- 22 A Yes.	96 1 Q Sunose uses grams per centimeter square as 2 the weight of the -- going to paragraph 30, again, 3 uses grams per centimeter square referring to the 4 weight of the active material layer on both sides 5 of the applied portion? 6 A That's -- that's what is shown there, but 7 as I said, I would have to look back at the 8 declaration of Dr. Wheeler. But I believe he is 9 correct in that it is -- that it is a 10 typographical error and should be grams per square 11 meter. 12 Q What is -- looking at paragraphs 29 and 30 13 together, and looking only at the single-side 14 coated portion of embodiment 1, what is the active 15 material layer weight of the single-side coated 16 portion of embodiment 1? 17 A Okay, hold on. Well, it says here on the 18 single-side portion coating one coating device was 19 used again to apply the positive electrode coating 20 drying temp at 200 degrees centigrade at a speed 21 of 15 minutes per minute. So the weight, the 22 active material layer 120 grams per square

97 1 centimeter is what it says there. 2 Q And so that is a second layer, right? 3 A That is my understanding, yes, following 4 with the depiction in Figure 1 for the 5 single-sided layer is going to be initially 6 thicker before calendar. 7 Q So the active material layer weight of the 8 single-side coated portion is 320 grams per 9 centimeter squared as listed here, correct? 10 MR. STEIN: Objection, mischaracterizes 11 testimony. 12 A So what it says here is the weight of the 13 active material layer on both sides of the applied 14 portion reaches 400 grams per square centimeter 15 then the application is stopped at 20 centimeters. 16 So that -- your -- your statement of what 320 is 17 half of 400 plus 120. 18 Q Rather it is the 200 grams per centimeter 19 squared that is listed in paragraph 29, because I 20 believe that 400 was referring to the 21 double-sided? 22 A Yes, that is why -- that is why half of --	99 1 per cubic centimeter. 2 Q In your experience, is electrode 3 compaction density measured before or after 4 compressing the electrode? 5 A It would typically be measured after, 6 because that is when you need to do it. Which is 7 as is stated there in paragraph 31, rolling was 8 performed using a roll press machine to obtain the 9 density of the active material there. 10 Q And so it is your opinion that the density 11 of 4.0 is the compaction density for the two-sided 12 coated portion for embodiment 1? 13 A Well, that is what it says. It is the 14 density of the active material layer on the 15 two-sided portion after the pressing. 16 Q Do you believe that is true? 17 A I think that the value of 4.0 grams per 18 cubic centimeter is reasonable. 19 Q Okay. What about the density of the 20 active material layer on the single-side coated 21 portion of 5.7 grams per cubic centimeter? 22 A I would say once again, I don't recall
98 1 yes, I believe that is correct. 2 Q Yeah, yeah. It could be half of 400 or 3 using the 200 from -- from above, right? 4 A Yes. 5 Q Either way we get to 320 grams per 6 centimeter squared as listed here? 7 A Yes. 8 Q And again, you believe the -- that SI unit 9 is incorrect? 10 A I believe that I agree with -- with Dr. 11 Wheeler in his -- in his assessment that that is a 12 typographical error. 13 Q Did you address that in your opening 14 declaration anywhere? 15 MR. STEIN: Objection, relevance. 16 A I do not recall if I did. I don't think I 17 noticed that as I was writing my declaration. It 18 was a good catch by Dr. Wheeler. 19 Q What is the density of the active material 20 layer on the two-side coated portion in embodiment 21 1 according to Sunose and that is in paragraph 31? 22 A In paragraph 31, it is listed as 4.0 grams	100 1 exactly what the density of the lithium cobalt 2 oxide is itself, however, that number might appear 3 a bit high. 4 Q And why do you say that appears a bit 5 high? 6 A Well, from reviewing Dr. Wheeler's 7 declaration, I believe he indicated what the 8 density of lithium cobalt oxide was, but I don't 9 remember the specific number right now. 10 Q Do you believe this is an error in Sunose? 11 A I don't know. The number appears a bit 12 high. 13 Q Do you agree with Dr. Wheeler's assessment 14 that the densities reported in Sunose are 15 physically impossible? 16 A Well, I think the density of the 5.7 grams 17 per cubic centimeters is a little high. 18 Q High or impossible? 19 A I think it is high. 20 Q 5.7 was higher than the maximum 21 crystalline density of LCO. Is there any way that 22 the density of the active material layer for

101 1 Sunose could be 5.7 grams per cubic centimeter? 2 MR. STEIN: Objection, asked and answered. 3 A Once again, that -- it is -- let me look 4 at -- could you direct me to Dr. Wheeler's report 5 where he -- 6 Q And I can tell you the maximum density I 7 believe is 5.1. His declaration is Exhibit 2015 8 in your files. 9 (Exhibit 2015 discussed.) 10 A Got it right here. 11 Q I think that is at paragraph 71. 12 A It didn't open, come on. That was 2015 13 again? 14 Q 2015 is the exhibit? 15 A Page 71. 16 Q Sorry, paragraph 71, that is on page 46 of 17 189? 18 A Page 46, what paragraph again, sorry? 19 Q 71? 20 A 71, yes, I'm at 71. 21 Q You see -- you see Dr. Wheeler reports the 22 truer crystalline density as being around 5.1	103 1 A 2034? 2 (Exhibit 2034 discussed.) 3 Q That is one I didn't upload. 4 A What is 2034? 5 Q That is the one that lists the true 6 density of LCO as 5.1? 7 A I don't have that one here, but we can 8 look at it. 9 Q We have been a bit over an hour. Now is 10 probably a good time to get a break and I can get 11 that exhibit together for you. 12 A Okay. 13 (Recess, 12:25 to 1:04 p.m.) 14 Q So before we took a break, Dr. Lucht, did 15 you speak to your counsel about the content of 16 your testimony during the break? 17 A No, I did not. 18 Q We were talking about compaction density 19 and maximum theoretical compaction density and we 20 were referring to Dr. Wheeler offers a theoretical 21 maximum density in his declaration of 5.1 grams 22 22 per cubic centimeter for LCO.
102 1 grams per cubic centimeter? 2 A Yes, that is -- that is what it states 3 there. I'm not sure if that number is accurate or 4 not. 5 Q Do you have any reason to dispute that 6 number? 7 A I don't have any reason to dispute it, but 8 I don't see him using a reference to it. So I 9 don't know what, you know -- but I have no reason 10 to dispute it, but I am not positive it is 11 accurate. 12 Q Is it true that the presence of binder and 13 carbon black would lower the upper limit for 14 possible compaction density of an LCO active 15 material? 16 MR. STEIN: Objection, calls for 17 speculation. 18 A When you add the other materials that are 19 less dense to the -- to the laminate, to the 20 cathode laminate that would likely decrease the 21 density if the materials are less dense. 22 Q And do you have Exhibit 2034 with you?	104 1 Do you recall us talking about that? 2 A Yes, I recall us discussing that. 3 Q If you go to paragraph 138 of Dr. 4 Wheeler's declaration, which is Exhibit 2015? 5 A Okay, I will go back to that. 2015 down 6 here, okay. 7 Q You see that Dr. Wheeler provides -- 8 A Which page was this again? 9 Q Sorry, it is page 89 of 189, paragraph 10 138? 11 A Yes. 12 Q Then various footnotes thereto? 13 A Yes. 14 Q You see that Dr. Wheeler states that the 15 crystalline densities of the underlying solid 16 powders of these constituents are LCO, 5.1 grams 17 per cubic centimeter; carbon black, 1.8 to 2.1 18 grams per cubic centimeter; and PVDF binder, 1.7 19 to 1.8 grams per cubic centimeter. Do you see 20 that? 21 A Yes, I see that. 22 Q And you see that he also cites various

105 1 exhibits provided to you as exhibits 2034 through 2 2039 as evidence of the densities of those 3 constituents. Do you see that? 4 A I see that, yes. 5 Q Do you have any reason to dispute that the 6 crystalline density of LCO is 5.1 grams per cubic 7 centimeter? 8 MR. STEIN: Objection, asked and answered. 9 A I do not have any reason to dispute that, 10 although -- so is that 2034 the reference that has 11 that in it? 12 Q It is 2034 and 2035 and 2036 and 2037? 13 A Okay. Let me just quick look at 2034 -- 14 Q Sounds good. 15 A -- to see what -- 16 Q It is page 3 of 13 if that helps. 17 A Okay, I can see that. 18 Q And you see that the true density of LCO 19 is listed as 5.1 grams per cubic centimeter? 20 A That's what it says there, yes. 21 Q And the compacted density of approximately 22 4.1 to 4.3?	107 1 A Yeah. Okay, there we go, now I'm back. 2 Q You see the densities provided for carbon 3 black and PVDF binder? 4 A The densities of the lithium cobalt oxide 5 is 5.1 now, I'm not seeing -- 6 Q Paragraph 138? 7 A There it is, carbon black and then PVDF 8 binder, yes, I see that. 9 Q And do you agree that carbon black and 10 PVDF binders' maximum density is less than the 11 maximum theoretical density of LCO? 12 A The values that are shown here, which for 13 carbon black are 1.8 to 2.1 and 1.7 to 1.8 for 14 carbon black and PVDF respectively are lower than 15 that of the 5.1. 16 Q Not just -- 17 A That is -- 18 Q Sure. And not just asking about this 19 paragraph. In your practice and in your 20 experience, do you understand carbon black and 21 PVDF binder to be less dense than LCO? 22 A Yes, that makes sense to me.
106 1 A Yes. 2 Q Any reason to dispute that? 3 A Not -- this NuWare, I'm familiar with this 4 company, NuWare. I have no reason to dispute that 5 number. 6 Q I'm not going to go through 2035 through 7 2037. If you have no reason to dispute that 5.1 8 grams per cubic centimeter is the maximum 9 theoretical density of LCO? 10 A I mean, that is what is indicated in that 11 document from NuWare. 12 Q And Dr. Wheeler also provides densities of 13 carbon black and binder? 14 A Yes, I see that. 15 Q Are you -- 16 A What page is that on again? 17 Q That is, again, at page 89 of Exhibit 18 2015. 19 A 89, I'm on page 89, I don't -- is it -- 20 Q Sorry, page 89 of 189? 21 A I see, page 93 down there, I'm sorry. 22 Q No worries, it is confusing.	108 1 Q Is there any circumstance in which they 2 would be denser than crystalline LCO? 3 MR. STEIN: Objection, calls for 4 speculation. 5 A Not to my knowledge, but I don't know. 6 Q Now, crystalline LCO is going to be denser 7 than LCO as it exists in an active material layer, 8 correct? 9 MR. STEIN: Objection, calls for 10 speculation. 11 A I mean, in general if you are adding the 12 LCO to -- or should say you're adding the other 13 materials, the carbon black and the PVDF that are 14 less than an LCO, then the laminate would likely 15 also be less than -- the final laminate would 16 likely be somewhat less than the LCO. 17 Q And that is not entirely my question. I'm 18 asking more about when you create the active 19 layer, is it going to be a single crystalline 20 layer or is there going to be pores or holes in 21 the layer? 22 MR. STEIN: Objection, asked and answered.

109 1 A As I said earlier, you would want to have 2 some pores typically depending on the application, 3 but most applications you would want some pores, 4 porosity. 5 Q The introduction of pores would further 6 lower the compaction density below the maximum 7 theoretical crystalline density of LCO, correct? 8 MR. STEIN: Same objection. 9 A I mean, once again, if there were pores in 10 the material, then that would lower the density, 11 yes. 12 Q Would a POSITA create an active material 13 layer for a cathode that had no pores? 14 A I mean, there may be cases where you might 15 want to do that, but I would say generally that is 16 not what you would want to do. You would probably 17 want some level of pores. 18 Q Are you familiar with any application 19 where you would want entirely single layer 20 crystalline LCO with no pores in your active 21 material layer? 22 MR. STEIN: Objection, calls for	111 1 previously stated, in terms of wetting the 2 electrode you typically would want some porosity. 3 Q Having reviewed Dr. Wheeler's calculations 4 of the theoretical maximum compaction density of 5 the active material composite in Sunose's 6 embodiments and comparative examples, do you 7 disagree with it? 8 A I mean, I think that his calculation looks 9 reasonable, but I wouldn't necessarily say – I 10 mean, I haven't been going through it that much to 11 make sure that it is correct, but it looks 12 reasonable. 13 Q So you will agree that 4.5 is a reasonable 14 theoretical maximum compaction density for the 15 embodiments and comparative examples in Sunose? 16 MR. STEIN: Objection, asked and answered. 17 A I mean, I think the way that he did the 18 calculation looks reasonable. Like I said, I 19 haven't gone through the math myself, so assuming 20 that, I mean the number would appear to be 21 reasonable. 22 Q Are there reasons that in Sunose or Zeng
110 1 speculation. 2 A That is not something that I am aware of, 3 no. 4 Q Did you review Dr. Wheeler's calculation 5 of the maximum possible theoretical compaction 6 density of the active material composite in 7 Sunose's embodiments and comparative examples? 8 A I did look at that, but I don't remember 9 which paragraph that is. 10 Q It continues in kind of 139 onward? 11 A Yes, I did review this, yes. 12 Q Okay. Would the cathode of Zeng require 13 pores or use pores? 14 MR. STEIN: Objection, calls for 15 speculation. 16 A Would the cathode of Zeng? 17 Q That's right? 18 A I don't know for certain, but I would 19 think there would likely be some pores in it, yes. 20 Q And to use with Zeng's electrolyte, would 21 you need to have some pores? 22 A I mean, once again, in terms of – as I	112 1 you would not want to always increase the 2 compaction density? 3 MR. STEIN: Objection, calls for 4 speculation. 5 A Could you – could you state that again? 6 I didn't really follow the question very well. 7 Q Sure. Are there reasons that in Sunose or 8 Zeng you would not want to always increase the 9 compaction density? 10 MR. STEIN: Same objection. 11 A Well, I mean, I believe I answered that or 12 at least a very similar question before. I mean, 13 there is – depending on what the application is 14 that you are trying to use, your electrode 15 material, you may or may want, you know, more 16 porosity or you may want denser layers depending 17 on the application. So I mean, going to a higher 18 density wouldn't always be favorable. 19 Q And are there risks in increasing 20 compaction pressure in the manufacture of a 21 battery? 22 MR. STEIN: Objection, calls for

113 1 speculation. 2 A I mean, I believe that was one of the 3 things that Sunose was trying to address, but I 4 don't -- once again, I'm not really certain. I 5 don't do a lot of manufacturing myself, so in 6 terms of those issues, I wouldn't want to 7 speculate. 8 Q So you are not familiar with whether or 9 not increased pressure could lead to cracking in 10 the particles? 11 A Well, I am aware that if you -- that you 12 can crack particles under high pressure, yes. I'm 13 aware of that in terms of the, you know, how much 14 compaction density is related to when particles 15 start cracking, I would say that is -- I'm not 16 certain. 17 Q You said that Dr. Wheeler's calculated 18 theoretical maximum compaction density assuming no 19 pores of 4.5 grams per cubic centimeter is 20 reasonable, correct? 21 A I believe I have already answered that 22 question a couple of times.	115 1 presented. 2 Q So embodiment 1 of Sunose states that the 3 density of the active material layer on the 4 single-side coated portion is 5.7 grams per cubic 5 centimeter, correct? 6 MR. STEIN: Objection, asked and answered. 7 A That is what I see in embodiment 1 and in 8 the description both from the table and in the 9 description of embodiment 1. 10 Q Is that possible? 11 MR. STEIN: Objection, asked and answered. 12 A As I said previously, that number seems a 13 bit high. 14 MR. COX: Objection, nonresponsive. 15 Q You keep saying high, my question is is it 16 possible at all? 17 MR. STEIN: Objection, asked and answered. 18 A Once again, the number looks high to me. 19 I don't know if it is possible or not, I'm not 20 certain. 21 Q Did you check if that number was possible 22 at any point before or after submitting your
114 1 Q And I'm asking it. 2 MR. STEIN: Objection, asked and answered. 3 Q Correct? 4 A As I already said, that number I haven't 5 gone through the math myself to make sure that the 6 math is correct, but it appears that it might be 7 reasonable. 8 Q Why does the number appear reasonable to 9 you? 10 A Well, he has the math laid out there. And 11 just kind of looking roughly at the math it looks 12 like it might make sense. As I said, I haven't 13 actually gone and done the calculation myself. 14 Q Do you have a sense of what compaction 15 densities are normal in LCO active layers? 16 A I mean, as I said before, that is -- that 17 is not something that usually is correctly related 18 to my research, however, you know, there are 19 compaction densities in a variety of these 20 different patents, and, you know, compaction 21 densities, you know, around 4 to -- 4 to 4 and a 22 half seem reasonable, seem like what has been	116 1 declaration? 2 A No, I do not believe I did. 3 Q And you reviewed Dr. Wheeler's report, 4 correct, or declaration? 5 A I have reviewed Dr. Wheeler's declaration, 6 yes. 7 Q And you did not think it important to 8 confirm whether Sunose's listed compaction 9 densities were physically possible? 10 MR. STEIN: Objection, mischaracterizes 11 the testimony. 12 A As I said, I saw the numbers and they do 13 appear high to me. In terms of whether they're 14 possible or not, I'm not certain. 15 Q If they are impossible, does that give you 16 reason to doubt the measurements used by Sunose or 17 the method used to calculate calculation density? 18 A Could you restate that question again, I 19 don't -- 20 Q If Sunose's listed compaction densities 21 are impossible, does that give you reason to doubt 22 the measurements or methods used by Sunose to

117 1 calculate compaction density? 2 A I mean, as I've said I'm not -- I'm not 3 certain. I don't know if they're possible or not. 4 I think many of the embodiments in Sunose, 5 particularly embodiment 2 or embodiment 3, the 6 active material densities that are listed there 7 are very reasonable numbers and those are the 8 embodiments that I go to in my declaration. 9 Q Embodiment 2 states that the active 10 material density of the single-side coated portion 11 1 is 5 grams per cubic centimeter, correct? 12 A Yes, yes. 13 Q And that is higher than Dr. Wheeler's 14 calculated theoretical maximum compaction density 15 for the composite, correct? 16 A That is higher than that number that he 17 calculated, but it is also lower than the density 18 of lithium cobalt oxide. 19 Q Embodiment 2 also includes carbon black 20 and binder, right? 21 A Yes, it does. 22 Q And that is -- and that is true of the	119 1 A Excuse me, say that again. 2 Q Do you know if the same method of 3 calculating compaction density in Sunose was used 4 for every embodiment? 5 A I don't recall Sunose specifically saying 6 how they measured the compaction density. It is 7 possible they measured it wrong. 8 Q If their measurement of compaction density 9 was wrong, would that affect your calculations? 10 A The compaction density is the embodiments 11 that I use, particularly embodiment 3 and 12 embodiment 4, have active material densities that 13 appear to be reasonable and correct and those are 14 the ones that I utilized. 15 MR. COX: Objection, nonresponsive. 16 Q If Sunose's measurement of compaction 17 density was wrong, would that affect your 18 calculations? 19 MR. STEIN: Objection, asked and answered. 20 A State that again. 21 Q If Sunose's measurement of compaction 22 density was wrong, would that affect your
118 1 other embodiments as well, correct? 2 A Yes, that is my understanding. 3 Q In the comparative examples? 4 A Yes, that is my understanding. 5 Q And therefore, 5.0 grams per cubic 6 centimeter is higher than the theoretical maximum 7 density of the composition including LCO, carbon 8 black and PVDF binder, correct? 9 MR. STEIN: Objection, calls for 10 speculation. 11 A I would say that 5.0 is higher than the 12 number that was calculated by Dr. Wheeler in his 13 declaration. 14 Q And you have no position on whether or not 15 that number is the theoretical maximum density of 16 Sunose's composition that includes LCO, carbon 17 black and PVDF binder, correct? 18 A Once again, I haven't gone through the 19 math myself, so I'm not certain. 20 Q Do you know if the same method of 21 calculating compaction density was used for every 22 embodiment?	120 1 calculations? 2 A I'm not -- I don't know if their method of 3 calculating the active material density ratio is 4 wrong or not. I said that I don't know of that, 5 but if any value in any published or patented 6 thing is wrong, then if you try and calculate 7 something from that number, then the number might 8 not be correct either. 9 Q Thank you. Going back to embodiment 2, 10 what is the active material layer weight of the 11 two-side coated portion in embodiment 2? 12 A What did you say again? 13 Q What is the active material layer weight 14 of the two-side coated portion in Sunose's 15 embodiment 2? 16 A You mean the active material density? I'm 17 confused as to what you are trying to ask. Are 18 you asking about something in Table 1 or are you 19 asking about something in a different paragraph? 20 Q I'm asking about the active material layer 21 weight. So embodiment 2 mostly follows embodiment 22 1, but has some variations, correct?

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121 1 A Yes. 2 Q And so my question is, what is the active 3 material layer weight of the two-side coated 4 portion in embodiment 2? 5 A So my understanding from this is the 6 active material density of the two-sided coated 7 portion for all of the electrodes is the same and 8 it is the 200 grams per squared meter on each side 9 or 400 grams per square meter for both sides 10 together. 11 Q So embodiment 2 changes the coating amount 12 of single-sided coated portion 1, but keeps the 13 same active material density of the two-side 14 coated portion 2, correct? 15 A Well, looking, looking at Table 1, all of 16 the active material densities of the two-sided 17 portions are the same, and the thing that varies 18 is the one-sided portion. 19 Q So would it be fair to say that the active 20 material layer weight of the two-sided coated 21 portion in embodiment 2 is 400 grams per square 22 centimeter same as embodiment 1?	123 1 experiments could do that, yes. 2 Q But they would have to experiment to get 3 to it, correct? 4 A In terms of the description is for the 5 embodiment 1 and then they tell you what the 6 values are that are needed for the other portions 7 and what the final values are for the other 8 portions. I think this is something that a POSITA 9 could do, yes. 10 Q For embodiment 1, certain measurements of 11 coating are applied at specific temperatures and 12 at specific speeds, correct? 13 A That's -- 14 MR. STEIN: Objection to the form. 15 A That is what it indicated. 16 Q And values are provided for each of those, 17 right, the drying temperature, the speed, the 50 18 centimeters of coating? 19 A Those things are specified for embodiment 20 1, yes. 21 Q Embodiment 2, the coating amount is not 22 specified, right?
122 1 A That is my understanding, yes. 2 Q Thanks. And that is all I was trying to 3 get at. 4 What is the active material layer weight 5 of the single-side coated portion of embodiment 2? 6 A They didn't -- they did not show that in 7 the description. They just show what the density 8 is at least from where I am. 9 Q Sunose does say it changes the coating 10 amount of the single-side coated portion of 1, 11 correct? 12 A Yes. 13 Q It does not say what that amount is 14 changed to, correct? 15 A They don't specify what the coated layer 16 is. What they specify is the final active 17 material density. 18 Q Could a person of skill in the art 19 reviewing Sunose create embodiment 2? Would they 20 know how much coating to add for single-side 21 coated portion 1? 22 A Well, I think the POSITA doing standard	124 1 A It is not listed there. What is listed is 2 the active material density of the -- of the 3 single-side portion. 4 Q Does anything in Sunose tell a POSITA how 5 much coating amount to use for 2, 3 or 4? 6 MR. STEIN: Objection, asked and answered. 7 A My understanding, my opinion is that a 8 POSITA that was preparing these kinds of laminates 9 would yes, know how to do that. 10 MR. COX: Objection, nonresponsive. 11 Q Nothing in embodiments 2, 3 or 4 tells a 12 POSITA how much coating to use, correct? 13 MR. STEIN: Objection, asked and answered. 14 A As I said, that specific number is not 15 shown there. I've already stated that to you, but 16 in my opinion, a POSITA would put the value of a 17 single-side, the active material density of the 18 single-side coated portion a POSITA would be able 19 to do that. 20 Q I'm sorry, are you thinking or did you not 21 hear my question? 22 A I didn't hear your question. Did you ask

125 1 a question? 2 Q I said how? 3 A How? 4 Q How? 5 A How would a -- 6 MR. STEIN: Object to the form. 7 A How would a POSITA be able to do that? 8 Q Yes. 9 A Well, you would -- it shows you how to 10 make the layer that has the single-sided coated 11 portion or the -- for the 1 density, the 5.7 12 density. You would vary the amount of material 13 that you put on there. You would put -- get the 14 lower -- the lower number, you would put less 15 material on. 16 Q And is there a calculation you would do to 17 determine how much less material to include? 18 A Once again, you know, I am not a person 19 that typically makes laminates, but my 20 understanding of people that make laminates in 21 that type of experiment and this type of 22 methodology is something that they do as POSITAS.	127 1 A Well, you know, going back to the 2 calculation from Dr. Wheeler where he has got 4.5, 3 which, you know, as I said previously is a 4 reasonable value, 4.4 is less than 4.5 and so that 5 number certainly seems reasonable to me. 6 Q My question is is it -- is it nonetheless 7 a high density in the parlance of active material 8 layers? 9 A It is -- once again, I'm not really 10 certain. It is -- it is -- it is below this 4 and 11 a half value. I would say values closer to 4 12 probably seem more common, but the value of 4.4 13 appears reasonable. 14 Q And what is the density of the active 15 material layer on the single-side coated portion 16 in -- strike that. 17 What is the active material layer weight 18 of the single-side coated portion of embodiment 2? 19 A I think I've already answered that 20 question. 21 Q I don't believe you have. 22 What is the active material layer weight
126 1 Q Are you such a POSITA? 2 A I am an expert in lithium-ion batteries. 3 I do not have -- I have not made -- well, my 4 students have made laminates and basically what 5 you would do is would put down less material. 6 Q Is there any suggestion of how much less 7 to use in embodiments 2, 3 or 4? 8 A It is not specified. 9 Q The same is true as of comparative 10 examples 1 through 3? 11 A All of the values have the final density 12 of the layers. They don't specify how much 13 material was layered on additionally or less for 14 the -- for the single layer. 15 Q Can you have an active material density of 16 8 grams per cubic centimeter, is that possible? 17 A Much like I said with the 5.7, that 18 appears high. That does seem high. 19 Q Indeed too high? 20 A Once again, I don't know. 21 Q And 4.4 would also be considered a high 22 density, right?	128 1 of the single-side coated portion of embodiment 2? 2 A As I said previously, it is not specified 3 in embodiment 2 what the active material layer 4 weight is of the single-sided portion. What is 5 given is the density of the single layer, the 6 single-side coated portion. 7 Q And the same is true of embodiments 3 and 8 4, correct? 9 A Once again, I believe I've already 10 answered that question, and it is not indicated 11 there. The value that is given is the active 12 material density. 13 Q Comparative example 1 states that its 14 single-sided portion is created by rolling without 15 changing the coating amount of the single-side 16 coated portion while keeping the same active 17 material density of the two-side coated portion 2, 18 correct? 19 A Where did you -- you said -- you read that 20 pretty quickly, where are you? 21 Q I'm in comparative example 1, which is 22 paragraph 35.

129 1 A Comparative example 1, sorry. 2 Q Yes, comparative example 1? 3 A Yes. What is your question again? 4 Q So you see where it says that the 5 single-sided portion for comparative example 1 is 6 created by rolling without changing the coating 7 amount of the single-side coated portion 1 while 8 keeping the same active material density of the 9 two-side coated portion 2? 10 A Yes. 11 Q What is the density of the active material 12 layer on the single-side coated portion for 13 comparative example 1 according to Sunose? 14 A It says 2.0 grams per cubic centimeter. 15 Q Where Sunose says without changing the 16 coating amount of the single-side coated portion 17 1, does that mean that no separate layers were 18 added to the single-sided portion as compared to 19 embodiment 1 or does it mean that the -- it was 20 coated again with 200 grams per square centimeter? 21 MR. STEIN: Objection to the form. 22 A I'm just trying to read. I haven't really	131 1 Q And that is true also of the comparative 2 examples, right? 3 A Well, once again, from reading that, I'm 4 not -- it is somewhat unclear to me what they're 5 saying for this comparative example 1 for the -- 6 Q My question -- 7 A -- embodiments 2, 3 and 4 it's clear what 8 they're doing. 9 Q My question is how does comparative 10 example 1 have an active material density of 2.0 11 grams per cubic centimeter where embodiment 1 12 states that it has a density of 5.7 grams per 13 cubic centimeter -- 14 MR. STEIN: Objection. 15 Q -- but example -- comparative example 1 16 was created by rolling without changing the 17 coating amount of the single-side coated portion 18 1? 19 MR. STEIN: Objection to the form and 20 calls for speculation. 21 A So I said, I'm not certain in terms of 22 what is being stated here in comparative example
130 1 read this comparative example. What was your 2 question again? 3 Q So where comparative example 1 says 4 without changing the coating amount of the 5 single-side coated portion 1, does that mean that 6 no separate layers were added to the single-sided 7 portion basically corresponding to not performing 8 the last sentence of paragraph 30 or does it mean 9 the single-side was coated with 200 grams per 10 centimeter square? 11 MR. STEIN: Objection to the form. 12 A I don't know. It says what is created by 13 rolling without change in the coating amount of 14 the single-side coated portion 1, so I'm not 15 certain in regards to the comparative example 1, 16 which is not an example that I utilize in my 17 declaration. 18 Q But embodiments 2 and 3 and 4 are all 19 built on the context of varying the embodiments 20 that is in embodiment 1, correct? 21 A That is -- yes, that is what is indicated, 22 yes.	132 1 1, but that is not one of the examples I'm 2 utilizing in my declaration. 3 Q So why would the active material density 4 of the single-side portion 1 be 2.0 if embodiment 5 1, which has the same coating amount for the 6 single-side coated portion has a density of 5.7? 7 MR. STEIN: Objection to the form, asked 8 and answered. 9 A Once again, I don't know. 10 Q Should the density -- should the active 11 material density of the single-side coated portion 12 1 be -- for comparative example 1 be the same as 13 for embodiment 1? 14 MR. STEIN: Objection, calls for 15 speculation. 16 A Once again, state the question again. I 17 was just rereading. 18 Q Should the active material density of the 19 single-side coated portion 1 for comparative 20 example 1 be the same as for embodiment 1? 21 A As I said -- 22 MR. STEIN: Objection.

133 1 A -- from reading through the comparative 2 example 1, I don't know. 3 Q Why would it vary? 4 A I don't know. 5 Q What is the density of the active material 6 layer on the single-side coated portion in 7 comparative example 2 according to Sunose? 8 A What it states is 6.5 grams per cubic 9 centimeter -- 10 Q And you would agree that is high? 11 A Yes, I would agree that is high. 12 Q And the density of the active material 13 layer on the single-side coated portion in 14 comparative example 3 is 8.0, correct? 15 A Yes. 16 Q And that is high? 17 A Yes. 18 Q What is the method that Sunose uses to 19 determine packing density? 20 MR. STEIN: Objection, asked and answered. 21 A To measure the active material density? 22 Q No, to determine packing density?	135 1 correct? 2 A Yes, yes. 3 Q What is the method Sunose uses to 4 determine packing density? 5 MR. STEIN: Objection, asked and answered. 6 A It is not described in the patent per my 7 recollection. 8 Q And so how can you say that this matches 9 the density calculation in the '131 patent 10 specification? 11 A Because basically what he is stating is 12 that the packing density of active material layer 13 on the electrode as is in claim 1, so they're 14 describing the same thing. 15 Q Does Sunose's density exclude the weight 16 and thickness of the current collector to isolate 17 the active layer density? 18 A That is generally how you would make the 19 measurement, yes. 20 Q But does Sunose do that? 21 A But a POSITA, a POSITA would know that you 22 would do that, because the current collector is
134 1 MR. STEIN: Same objection. 2 A Where is the packing density? 3 Q If you go to paragraph 116 of your 4 declaration? 5 A Yes. 6 Q I believe you provide an opinion that 7 Sunose's densities are the claimed compaction 8 densities because, quote, they are the packing 9 density of the active material layer on which 10 coating has been applied? 11 A Hold on just a second, I lost my piece of 12 paper. What page was that again of mine? 13 Q 116 of your declaration, I will get you a 14 page in a minute. It is paragraph 66 of 131. 15 A Page what, 66? 16 Q Page 66, paragraph 116? 17 A Okay, paragraph, yes. 18 Q You provide an opinion that Sunose's 19 densities are the '131 patent's claimed compaction 20 densities, because you say, they are, quote, the 21 packing density of the active material layer on 22 which coating has been applied, end quote,	136 1 not part of the active material layer. The 2 current collector is the current collector. 3 Q Is it possible that Sunose failed to 4 exclude that and that is why the calculated 5 packing densities are too high to be compaction 6 densities? 7 MR. STEIN: Objection, calls for 8 speculation. 9 A Say that again. 10 Q Is it possible that Sunose failed to 11 exclude that and that is why the calculated 12 packing densities are too high to be compaction 13 densities? 14 MR. STEIN: Same objection. 15 A You know, it is not something that I would 16 want to speculate on. I don't know, but all I can 17 say is that the paper or the patent clearly states 18 the active material layer when it is talking about 19 the density, packing density of an active material 20 layer which the current collector is not part of 21 the active material layer. 22 Q It says on which coating has been applied,

137 1 correct? 2 A The coatings are applied on the current 3 collector. 4 Q The active material layer on which coating 5 has been applied? 6 A Where are you reading that? 7 Q Paragraph 116 of your declaration citing 8 paragraph 21 of Sunose? 9 A Sorry, I was back at Sunose. It was page 10 86? 11 Q Page 66 of your declaration? 12 A Page 66, which paragraph. 13 Q Paragraph 116? 14 A 116, yes, that is what it says. 15 Q Are there densities that are not 16 compaction densities? 17 A When describing electrodes? 18 Q Yes. 19 A I mean, generally what -- what people 20 measure are the compaction densities of the 21 electrodes after they -- they have calendared 22 them. That is -- and in terms of the lithium-ion	139 1 active material layer? 2 A Generally not. 3 Q What is the coating being referred to here 4 where it says the active material layer on which 5 coating has been applied? 6 A What it is describing is the active 7 material layer is a coating which is being applied 8 to the current collector. This is standard within 9 lithium-ion battery realm. You apply an active 10 material to the current collector, you let it dry, 11 and then you compact it. 12 Q That is not what Sunose says in paragraph 13 21, is it? 14 A Let me go back to Sunose, paragraph 21. 15 So what is your question again? 16 Q Sunose does not say the packing density of 17 the active material layer which is a coating, 18 correct? 19 A A POSITA -- 20 Q It says -- 21 A A POSITA would know that the active 22 material layer is, the coating, it is the
138 1 battery area, that is typically what is done, yes. 2 Q But okay, so Sunose says that what it 3 measures is the packing density of the active 4 material layer on which coating has been applied; 5 correct? 6 A Packing density of the acting material 7 layer on which coating has been applied, yes. 8 Q So does that include the coating as part 9 of the density? 10 A The coating is the density, the coating is 11 the laminate. 12 Q So sorry, you have an active material 13 layer; correct? 14 A Yes. 15 Q And you have coating on that active 16 material layer? 17 A No, you have an active material layer. 18 Q It says the packing density of the active 19 material layer on which coating has been applied? 20 A Active material layer is a coating that 21 you apply to the current collector. 22 Q Sure. Are there coatings on top of the	140 1 laminate. That is what it -- 2 Q That is not what Sunose says, right? It 3 says the packing density of the active material 4 layer on which coating has been applied? 5 A I disagree with you. That is how I read 6 it as a POSITA in the field. The coating is the 7 active material layer. 8 Q So is it applied on itself? 9 A It is itself. You apply the coating to 10 the current collector when you dry the coating. 11 Q What coating has been applied on the 12 active material layer? 13 A What coating has been applied according to 14 embodiment 1, the positive electrode current 15 collector 4 made of a strip of aluminum foil. And 16 what you add to that or coat on to it is 100 parts 17 by weight powder lithium cobalt oxide, mixed with 18 carbon black, mixed with PVDF. And then you add 19 in methyl pyrrolidone, which makes a slurry out of 20 it. Disperse mixing, then the prepared positive 21 electrode coating is applied using a coating 22 device at a speed of this blah, blah, blah, speed

141 1 of 15 minutes per minute. That is what the 2 coating is. The coating is applied and the 3 coating is lithium cobalt oxide, carbon black and 4 PVDF made into a slurry of PVDF. 5 Q So it is your opinion that no coating is 6 applied to the active material layer in Sunose? 7 A What is -- what is being described is the 8 active material layer is being coated on to the 9 current collector. 10 Q Is it possible that this refers to the 11 packing density of the current collector on which 12 the active material has been applied? 13 A The description says it is -- the 14 description says the packing density of an active 15 material layer. The current collector is not 16 active material layer. The active material layer 17 is the coating that is on the current collector. 18 Q This language says that the coating is 19 applied to the active material layer, correct? 20 A Well, I'm reading the description of 21 embodiment 1. It is very clear what they're 22 describing in terms of making the coating. I	143 1 standard laboratory procedure. 2 Q Does Sunose ever say that they measure the 3 packing density? 4 A What Sunose says is that they -- and a 5 packing density of an active material layer on the 6 opposite side. They describe a packing 7 material -- packing density of an active material 8 layer. They say that many, many times. 9 Q But does Sunose say that the figures in 10 Table 1 are packing densities? 11 A It says that they're active material 12 densities, which my perspective as a POSITA is the 13 same thing. 14 Q So is that a no? 15 A I'm sorry, what was your question? 16 MR. STEIN: Objection. 17 Q Is active material density always the same 18 thing as packing density? 19 A In my opinion as a POSITA, yes. 20 Q Doesn't it depend on whether it was 21 measured before or after compaction? 22 A Well, they're describing these being
142 1 don't see anywhere in here where they describe 2 coating the laminate with something else. 3 And it is not -- you would never -- you 4 would not coat something with some unnamed thing 5 much like what was in the terms of you would not 6 dissolve the lithium salt in some unknown solvent. 7 You wouldn't put a coating of undetermined 8 material on the top of your cathode laminate. 9 Q Sunose was also a translation from a 10 foreign language patent -- 11 A Yes. 12 Q -- or patent application? 13 A Yes. 14 Q Any reason to dispute the accuracy of that 15 translation? 16 A I do not. 17 Q Okay. How does Sunose measure thickness 18 to determine packing density? 19 MR. STEIN: Objection, calls for 20 speculation. 21 A I don't recall seeing where they 22 specifically described how they do it, but it is a	144 1 measured after compaction. They say that in the 2 process, but they measure after compaction. I 3 mean, frequently in the lithium-ion battery 4 literature there is multiple terms used to mean 5 the same thing. 6 Q Paragraph 8 talks about rolling the 7 coating and dried electrodes to a prescribed 8 density, correct? 9 A Yes. 10 Q Is that density prescribed rather than 11 measured? 12 A I don't know. 13 Q Is it possible that all of the 14 measurements listed in Table 1 are target 15 densities rather than actual measured densities? 16 MR. STEIN: Objection, calls for 17 speculation. 18 A I would have to review the patent again 19 more thoroughly to really be able to answer that 20 question. I don't know. They don't specify how 21 they measure the compaction densities, but as I 22 said, the dense -- measuring densities for these

145 1 materials is well-known. 2 Q He didn't specify anywhere in Sunose that 3 they measured these densities at all, correct, 4 that they were measured rather than calculated or 5 prescribed or dictated? 6 MR. STEIN: Objection, asked and answered. 7 A As I said, I don't know. I would have to 8 read back through it in greater detail to be able 9 to answer the question. 10 Q And you didn't review that in preparation 11 for your deposition today? 12 A I certainly did review this document. I 13 didn't -- I didn't look at that specific aspect 14 however. 15 Q In preparing your declaration, you didn't 16 review whether the densities identified in Table 1 17 are actually measured active material densities, 18 correct? 19 A Once again, the tables and the embodiments 20 in Table 1 describe active material densities. 21 My understanding of the researchers is that they 22 understand how to make their coatings that they're	147 1 Q Do Zeng's batteries need to use rolled 2 electrode configurations? 3 A In general, any kind of battery that you 4 are going to make and test, you need to use 5 electrodes that have been rolled or usually it is 6 referred to as calendared. You typically, you 7 would -- you would need a calendared electrode. 8 You wouldn't -- otherwise you wouldn't get good 9 performance. 10 Q Sorry, by rolled electrode configuration, 11 which you have in -- this is in your paragraph 12 123? 13 A Yes, I'm sorry, I misinterpreted what your 14 rolled electrode configuration was. Yes, this is 15 a spirally wound cell, rolled electrode or usually 16 spirally wound, like a -- like a double A -- 17 triple A battery. 18 Q That is what I meant by rolled electrode 19 configuration to be clear. I was not asking about 20 whether it has been calendared. I'm talking about 21 a rolled configuration as opposed to a laminate or 22 a pouch or other configuration of electrodes?
146 1 making, and those are the values that they 2 determined. Now, how exactly they determined the 3 value, I'm not certain. I wasn't an author on the 4 patent. 5 But as a POSITA I can look at the values 6 and see what the active material densities are. 7 Q Paragraphs 120 to 127 in your declaration 8 provide your opinion on the motivation to combine 9 Zeng and Sunose, correct? 10 A Which page is that again or what 11 paragraph? 12 Q Paragraphs 120 to 127, that is page 67 is 13 where it begins. 14 A 120 to 120 -- yes, in my opinion a POSITA 15 would have a reasonable expectation of success 16 using Sunose's rolled electrode configuration Zeng 17 batteries, yes. 18 Q Do you provide any opinion outside of 19 paragraphs 120 to 127 for motivations to combine 20 Zeng and Sunose? 21 A Not that I recall, but that is -- that is 22 what these sections were.	148 1 A So I mean, once again, the 2 configuration -- you know, there are variations 3 affecting the configuration. Usually when you are 4 doing electrolyte optimization testing you start 5 in what is called coin cell or button cell and you 6 make cells with those. And then you may expand to 7 pouch cells and you may expand to the spirally 8 wound cells. 9 In general, once something works well in 10 one it works well in the other ones. There are 11 exceptions to that. In general that is the way 12 that you would conduct the testing. 13 Q You say that Zeng's batteries need to use 14 a rolled electrode configuration, but that is not 15 true, right? 16 A Well, if you are going to commercialize -- 17 MR. STEIN: Objection, mischaracterizes 18 the testimony. 19 A Where do I say that? 20 Q In paragraph 123, you say, the need to use 21 some rolled electrode configuration in Zeng's 22 batteries, would have prompted a POSITA to adopt

1 Sunose's electrode configuration. 2 A If you were moving to commercialize Zeng's 3 patent, you would need to test it in rolled cells 4 and investigated rolled cells as one or more 5 common formats for a commercial cell. 6 Q There are other commercial types of 7 batteries that aren't rolled cells, correct? 8 A There are, yes. 9 Q For example, large-sized batteries, like, 10 on vehicle batteries are not rolled cells? 11 A There are. I mean, typically in terms of 12 commercial cells they're either prismatic cells or 13 they're rolled cells. But once again, if you are 14 going to commercialize something you would -- you 15 would usually test them in both formats. And if 16 you are going to use Zeng's battery, Zeng's 17 electrolyte in a rolled format, you would use 18 Sunose's electrode configuration. 19 Q Zeng identifies large battery applications 20 for its electrolytes such as in the energy storage 21 power and military aerospace fields, right? 22 A I will go to Zeng. Where does Zeng say	149 1 A It says in the digital, energy storage 2 power and military aerospace fields, right. 3 Q Yes. 4 A That is -- that is -- we're talking about 5 paragraph 2, the third sentence. 6 Q Yes. Energy storage, yeah. 7 A Well, you know, some energy storage 8 devices are not necessarily that large. I have an 9 energy storage device in front of me, I have got 10 one in my pocket. Some of them are large. I 11 mean, digital -- I would say most of the digital 12 things are pretty small. Power, that is not 13 necessarily clear. Military and aerospace fields, 14 there is a lot of military applications that use 15 small batteries, also. 16 Q So you provided -- 17 A That is -- 18 Q Go ahead, sorry. 19 A I just don't see where the word large is. 20 Q It is actually coming from you, Dr. Lucht. 21 A Okay. 22 Q Do you recall that you provided another
150 1 that? 2 Q Paragraph 2? 3 A Paragraph 2 I see widely utilized in 4 digital energy storage, power military or 5 aerospace fields. 6 Q Energy, energy storage power and military 7 aerospace fields? 8 A Yes, is that where you are at? 9 Q Yes, it is. 10 A What was your question? 11 Q Zeng identifies large battery applications 12 for its electrolytes such as energy storage power 13 and military aerospace fields, correct? 14 A I'm sorry, this is Zeng we're talking 15 about, right? 16 Q Yes. 17 A Exhibit 1006? 18 Q 1006. 19 A Where does he use the word large? 20 Q Sorry, energy storage, power and military 21 aerospace fields are large battery applications, 22 correct?	152 1 declaration with respect to the '131 patent for a 2 second IPR proceeding? 3 A Yeah, I vaguely recall that. 4 Q And do you recall opining that Zeng would 5 be combined with a laminate battery structure? 6 A Once again, I don't specifically recall 7 that, but if you could point me to that I can look 8 at that. I mean, I may have stated that. I don't 9 recall exactly. It was a while ago that I did 10 that. 11 Q Would one use Zeng with a laminated 12 battery structure instead of a rolled electrode 13 structure? 14 A I would say one could use Zeng with both 15 potentially depending on the application. Some 16 applications would be preferable for the rolled 17 format, some applications would be preferable for 18 the flared application. 19 Q And it is true, then, that Zeng does not 20 need to be a rolled electrode configuration, 21 correct? 22 A Let me see where I said this again, just

153 1 to make sure what I'm -- 2 Q Your paragraph 123? 3 A I think what I say is the need to use some 4 rolled configuration in Zeng's battery would have 5 prompted a POSITA to adopt Sunose's electrode 6 configuration. What I'm saying is if you are 7 going to put Zeng into a rolled electrode 8 configuration, which if you were wanting to do 9 that for commercialization, then you would use 10 Sunose's electrode configuration. 11 Q That is not what your declaration says 12 though, is it? 13 A It says, the need to use some rolled 14 electrode configuration in Zeng's batteries would 15 have prompted a POSITA to adopt Sunose's electrode 16 configuration. 17 Which I mean, if you are going to put it 18 into a rolled electrode configuration, then you 19 would need -- I'm not following what you are 20 saying. There is -- there is only so many 21 different formats of the batteries. 22 Q There are different formats for batteries,	155 1 (Exhibit 1007 discussed.) 2 A Which one again? 3 Q 1007? 4 A Okay, yes. 5 Q And you recognize this as the Matsuoka 6 reference you relied on? 7 A Yes. 8 Q And this one was actually an English 9 publication, correct? 10 A It is a US, United States patent 11 application, so yes. 12 Q Looking at paragraph 4, Matsuoka is 13 referencing an electrolyte solution that works at 14 an ordinary temperature? 15 A Yes, I see that. 16 Q Do you see that? What is an ordinary 17 temperature? 18 A To me ordinary temperature would be 19 something around room temperature or close to room 20 temperature. 21 Q And the paragraph further says, an example 22 of a common solvent used, therefore, is a
154 1 right, and Zeng is silent as to which electrode 2 configuration to use? 3 A I would have to go back and look through 4 Zeng entirely, but frequently with electrolyte 5 patents, you know, most of the original testing is 6 done in coin cells and that may be what the date 7 is from. 8 And once again, when you are doing these 9 kinds of research protects and developing these 10 things you start off with small cells and then you 11 go build larger cells. If you are going to 12 commercialize, you frequently will need to utilize 13 a variety or you may need to use a variety of 14 different configurations. 15 MR. STEIN: If I may interrupt here, we 16 have been going for over an hour. 17 MR. COX: Already? 18 MR. STEIN: Do you want to take a break? 19 MR. COX: We can take a break. 20 (Recess, 2:12 to 2:20 p.m.) 21 Q Could you turn to Exhibit 1007, which I'll 22 refer to as Matsuoka.	156 1 combination of a high-dielectric solvent such as a 2 cyclic carbonate with a low viscosity solvent such 3 as a lower acyclic carbonate. Do you see that? 4 A This is -- this is still in paragraph 4. 5 Q Yes, still paragraph 4? 6 A Yes. 7 Q And then it says, yet on the other hand, a 8 common high-dielectric solvent has a high melting 9 point, and thus, it may cause deterioration of the 10 low temperature properties of electrolyte used 11 depending on the type of the electrolyte solution. 12 Do you see that? 13 A Yes. 14 Q Is ethylene carbonate an example of a 15 common high-dielectric solvent having a high 16 melting point? 17 A Yes, ethylene carbonate is a 18 high-dielectric solvent that has a high melting 19 point. 20 Q It is a cyclic carbonate, correct? 21 A It is a cyclic carbonate. 22 Q Going back to paragraph 7 of Zeng?

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157 1 A Okay, paragraph 7 of Zeng. 2 Q Paragraph 7 of Zeng? 3 A Yes. 4 Q Keep Matsuoka handy. Zeng talks about 5 ethylene carbonate being a solvent commonly used 6 in electrolytes having a melting point of 35 7 degrees Celsius or higher, correct? 8 A Yes. 9 Q And that those solvent systems are prone 10 to precipitating some ethylene carbonate at low 11 temperatures so it cannot form a homogenous mixed 12 solution state? 13 A I see where it says that. 14 Q So Matsuoka recognizes that ethylene 15 carbonate and other cyclic carbonates have some 16 problems, correct? 17 A It says that, you know, high-dielectric 18 solvents can have a high melting point and can 19 have -- deteriorate the low temperature 20 properties, which is, you know, related to the 21 precipitation comment from Zeng. 22 Q Okay. And Zeng controls the content of	159 1 solvent capable of solving this problem, yes. 2 Q And that is a nitrile solvent, right? 3 A That is what he describes there, yes. 4 Q But Matsuoka identifies disadvantages with 5 nitrile-based solvents, correct? 6 A It says in the last sentence of that 7 paragraph, ever since these solvents containing a 8 nitrile group are seriously disadvantaged in terms 9 of electrochemical reductive decomposition, 10 several improvement plans have been reported. 11 Q So Matsuoka teaches solvents containing a 12 nitrile group are seriously disadvantageous, 13 correct? 14 A Well, it says that they're seriously 15 disadvantageous and then several improvement plans 16 have been reported is what he says. 17 Q Sure. But the nitriles are seriously 18 disadvantageous also and that is why the 19 improvement plans have been reported is because 20 the nitrile containing solvents are 21 disadvantageous? 22 MR. STEIN: Objection, asked and answered.
158 1 the high melting point solvent component EC in 2 adding PC having a similar molecular weight and 3 structure to prevent the precipitation of EC 4 crystals under low temperature conditions, right? 5 MR. STEIN: Objection to the form. 6 A So where -- where are you reading that? 7 Q Sorry, I'm back in -- let me -- let me go 8 back to Zeng paragraph 31. 9 A Okay. What is your question? 10 Q So Zeng -- Matsuoka doesn't address the 11 problems with cyclic carbonate solvents in the 12 same way that Zeng teaches, right? 13 A I am not -- I don't understand what your 14 question is. I mean, they -- they both mention 15 the problem with the high-dielectric solvents like 16 ethylene carbonate at low temperature, but I'm 17 not -- I'm not sure -- I'm not following your 18 question. 19 Q So paragraph 4 of Matsuoka teaches using a 20 different solvent capable of solving this problem. 21 MR. STEIN: Objection to the form. 22 A I see where it says in paragraph 4, a	160 1 A Well, I mean that is -- there is a 2 disadvantage of them, so then you develop an 3 electrolyte formulation to get around that 4 disadvantage, which is what the patent is on. 5 Q Paragraph 12 further in the technical 6 problem section teaches that nitrile containing 7 solvents have largely increased internal 8 resistance, correct? 9 A I see a comment about the increased -- 10 where? 11 Q You can read the whole paragraph 12? 12 A Okay. What is your question? 13 Q So Matsuoka describes that with nitrile 14 solvents internal resistance is largely increased 15 in comparison with the conventional lithium-ion 16 secondary battery, correct? 17 A That -- that was -- I mean, my 18 understanding was that was the problem that they 19 were trying to address. 20 Q And that internal resistance increase is 21 due to the disadvantages in reductive 22 decomposition, correct, those are connected?

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161 1 A That is my understanding. 2 Q Okay. And so Matsuoka's solution is 3 described in paragraph 14 as a non-aqueous 4 electrolyte solution containing at least 5 acetonitrile and a specific lithium salt that can 6 realize a non-aqueous secondary battery having 7 high-rate performance, correct? 8 A That is what it says. 9 Q And what type of lithium salt is Matsuoka 10 referring to? 11 A I'm not seeing it right here specifically. 12 Q It is in that kind of bracketed 13 subparagraph 1 under paragraph 14? 14 A Or an organic lithium salt where it has a 15 LUMO, et cetera. 16 Q Uh-huh? 17 A HOMO energy in the range, yes. 18 Q Right. So it -- Matsuoka uses an organic 19 lithium salt, correct? 20 A Well it says, wherein the mass percentage 21 of the organic lithium salt is 0.1 to 30 percent 22 based on the total mass of the non-aqueous	163 1 A In the context of chemistry LUMO is the 2 lowest unoccupied molecular orbital and HOMO is 3 the highest occupied molecular orbital. 4 Q And Matsuoka indicates in paragraph 22 5 specific LUMO and HOMO energy ranges for the anion 6 of the organic lithium salt. Do you see that? 7 A Which paragraph is that again? 8 Q 22. 9 A Yes. 10 Q That is real paragraph 22, not kind of 11 subparagraph 22 of paragraph 14? 12 A Yeah. 13 Q And you see those ranges of LUMO are 14 negative 2 to 4.35 and HOMO is negative 5.35 to 15 negative 2.9 electron volts? 16 A Yes. 17 Q When the LUMO and HOMO energies of the 18 anion of the organic lithium salt are in these 19 specified ranges that Matsuoka specifies, what 20 does Matsuoka indicate in paragraph 22 are the 21 benefits -- sorry, paragraph 22? 22 A I'm sorry, what is the question again?
162 1 solution, yeah. 2 Q And I'm just asking what kind of lithium 3 salt does Matsuoka use and I just want 4 confirmation that it is an organic lithium salt? 5 A That is one option. It also says down in 6 the bracket 8, the other, the organic lithium salt 7 or the inorganic lithium salt. 8 Q And these are different embodiments in 9 Matsuoka? 10 A The 1 through 7 or 1 through -- 11 Q All 1 through 21, I guess. They keep 12 going actually, 1 through 40. These are kind of 13 the claims essentially? 14 A Okay. And then the embodiments. 15 Q Matsuoka always requires organic lithium 16 salt, correct? There is no embodiment in Matsuoka 17 that is only inorganic lithium salt. 18 A I haven't looked through all of it, but it 19 appears that most of them, if not all of them, are 20 these organic -- organic lithium salts. 21 Q You understand what LUMO and HOMO refer to 22 in the context of Matsuoka?	164 1 Q What are the benefits of having the LUMO 2 and HOMO energies of the anion of the organic 3 lithium salt of Matsuoka within these ranges? 4 What does Matsuoka say the benefits are? 5 A Oh, the electrochemical reactivity of the 6 lithium salt it says. 7 Q Talks about forming a protective film on 8 the negative electrode? 9 A That is what it says, formation of the 10 negative film on the -- on the negative electrode. 11 Q And suppressing non-electrochemical side 12 reactions. 13 A Non -- yes. 14 COURT REPORTER: One at a time, please. 15 MR. COX: That is my fault. 16 Q Does that refer to gas generation, 17 reducing gas generation? 18 A It can. I mean, not -- whenever you have 19 electrolyte decomposition on the electrode surface 20 films, it can cause gassing problem, but it 21 doesn't necessarily always cause gassing problems. 22 Q And can you suppress the increase in

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165 1 internal resistance caused by repeating 2 charge/discharge cycles? 3 A Well, that sounds like what they're trying 4 to do. They're making a better solid electrode 5 interface. 6 Q This is all addressing issues with 7 acetonitrile specifically, correct? 8 A I mean, that looks like what the primary 9 objective is, although those organic lithium salts 10 are used in other patents and have advantages in 11 terms of SEI formation in the absence of 12 acetonitrile. 13 Q What is the HOMO energy of acetonitrile 14 according to Matsuoka? 15 A What is the what? 16 Q The HOMO energy of acetonitrile? 17 A Where did you see that? 18 Q I believe it was in paragraph 20. No, 19 sorry, it is 22 right in the middle. 20 A The HOMO energy of the acetonitrile 21 calculated DFT calculations is negative 8.87. 22 Q Is lithium hexafluorophosphate an organic	167 1 extent that it does not impair the effect of SEI's 2 formation of the organic lithium salt and sets 3 forth a formula representing a molar ratio of 4 inorganic to organic lithium salt. Do you see 5 that? 6 A Yes. 7 Q Okay. So the ratio has to be between .05 8 to 1? 9 A Yes. 10 Q And so if there is one mole of inorganic 11 lithium salt in an electrolyte solution, then what 12 range of organic lithium salt does Matsuoka teach 13 is necessarily present? 14 A So I'm confused by your question. What it 15 says here is the lithium inorganic salt is 1 or 16 less. So you could -- if you had one molar LiPF₆, 17 I would read that to mean you could have one molar 18 of the organic salt or more. 19 Q How much is my question -- 20 A That is -- once again -- 21 Q -- to stay in that ratio? 22 A .1, I mean, up to the 0.05.
166 1 lithium salt? 2 A No. 3 Q Fair to say, then, it is an inorganic 4 lithium salt? 5 A I would consider it an inorganic lithium 6 salt. 7 Q Does Matsuoka require an inorganic lithium 8 salt? 9 A I mean, it says that the non-aqueous 10 electrolyte solution of the present embodiment may 11 further contain an inorganic lithium salt. 12 Q So Matsuoka allows for an inorganic 13 lithium salt that requires an organic lithium 14 salt, fair to say? 15 A It says, moreover the content of the 16 organic lithium salt is preferably 0.1 to 30 17 percent mass. So it does appear that it requires 18 or has that as part of the organic lithium salt. 19 Q If you go to paragraph 31 of Matsuoka. 20 A Yes. 21 Q Matsuoka teaches that the inorganic 22 lithium salt if used needs to be used to such an	168 1 Q So 1 to 20 moles? 2 A Yes, that is, I guess, how I read that, 3 yes. 4 Q Matsuoka teaches that the molar quantity 5 of inorganic lithium salt, if present, cannot 6 exceed the molar quantity of the organic lithium 7 salt, right? 8 A Well, it says preferably the molar 9 quantity of the inorganic salt does not exceed the 10 molar quantity of the organic salt. And then 11 specifically it is preferable to satisfy the 12 condition represented by Ban Forman, so it is 13 preferred. 14 Q Yes. So the preference to not exceed is 15 represented by the number 1 in that equation, 16 right? 17 A Yes. 18 Q So Matsuoka prefers for the molar quantity 19 of inorganic -- inorganic lithium salt, for 20 example, LiPF₆ to not exceed the molar quantity of 21 organic lithium salt, right? 22 A That is what it appears to say in that.

169 1 Q And in fact, can be less or not included 2 at all, correct? 3 A Once again from the -- from the examples, 4 let's see here. It appears that it doesn't have 5 to be there. The content of the inorganic lithium 6 salt is preferably is .1 to 40 for week 1 to 210. 7 Q What is a non-nitrile additive? 8 A Where are you reading this on the -- 9 Q Paragraph 35? 10 A Well, it says it is not particularly 11 limited as long as it is a compound that does not 12 inhibit the solution of the problem by the 13 invention. And I think it lists a variety of 14 things. 15 Q And importantly, it doesn't have a nitrile 16 group, right? 17 A Well, if it is a non-nitrile additive, it 18 would not have a nitrile group. 19 Q And propyl propionate is a non-nitrile 20 additive? 21 A Propyl propionate is a non-nitrile 22 additive and it is one of the ones that is listed.	171 1 fluoroethylene carbonates as an example of 2 non-nitrile additives, correct? 3 A Where do you see that? 4 Q At the paragraph 38, first one in the 5 list? 6 A First one. 7 Q Fluoroethylene carbonates? 8 A No. 9 Q It says include fluoroethylene carbonates 10 including. 11 A Fluoroethylene carbonates, yes. 12 Q Very first thing, yeah. 13 A Yes. 14 Q And also lists vinylene carbonate, VC, top 15 of the right column? 16 A Vinylene carbonate, yes. 17 Q And is vinylene carbonate listed in Table 18 2? 19 A Yes. 20 Q And Matsuoka uses vinylene carbonate in 21 several of its examples, right? 22 A Vinylene carbonate yes, so yes, A3 is used
170 1 Q And where is it listed? 2 A Let me see here. It is in 38, paragraph 3 38. There is in propyl propionate. 4 Q Uh-huh, and also isopropyl propionate, 5 right? 6 A It also says isopropyl formate, isopropyl 7 acetate, isopropyl propionate, yes. 8 Q Going to Matsuoka's Table 2 it lists the 9 types of additives that Matsuoka uses in its 10 examples in comparative examples, correct? 11 A I see Table 2. 12 Q And that lists the types of additives that 13 Matsuoka uses in its examples and comparative 14 examples, correct? 15 A Yes. 16 Q And nowhere in here is propyl propionate 17 listed? 18 A Propyl propionate is not listed, however, 19 ethyl acetate is, and it is another ester. And as 20 we discussed earlier, ethyl acetate and propyl 21 propionate have similar properties. 22 Q Matsuoka also identifies FECs,	172 1 in several of the examples. 2 Q Propane sultone is another example of 3 another non-nitrile additive PS. 4 A I see 1 through propane -- where are you 5 seeing this at? Was it back in -- 6 Q Well, it is also in the Table 2 actually 7 maybe that is the easier place to find it. 8 A Yes, 1,3-propane sultone. 9 Q And 1,3-propane sultone is also used in 10 example 45 in electrolyte solution (S37)? 11 A Propane sultone is page 14, yes, it is an 12 example S37. 13 Q And so there are many, many non-nitrile 14 additives suggested and used as examples in 15 Matsuoka, correct? 16 A There is -- yeah, if as you said there is 17 a list of them in Table 2. There is a large 18 number there and there is many more in the other 19 list. 20 Q And Table 2 are the specific examples of 21 embodiments that were actually created, correct? 22 A That appears to be the case, yes.

173 1 Q Additives used in the actual examples? 2 A Yes. 3 Q Matsuoka first creates its mother 4 electrolyte solution, which it refers to, you 5 know, in 109 when we start discussing the 6 preparation of electrolyte solutions, paragraph 7 109 of Matsuoka? 8 A Yes. 9 Q It creates a base solution or mother 10 electrolyte solution by adding lithium salt to a 11 solvent to a predetermined concentration, right? 12 A Yes. 13 Q And this mother electrolyte solution is 14 the electrolyte solution before adding any 15 additives, right? 16 A The additives were added to the mother 17 electrolyte solution D to a predetermined 18 concentration. 19 Q So looking at Table 3, do you see where it 20 talks about the mother electrolyte solution? 21 A Yes. 22 Q And there is a line under it that	175 1 Q And -- and typical for solutions, right? 2 A Yes. 3 Q Going back to Table 3 and looking at 4 number S19? 5 A Yes. 6 Q What components make-up the solvent in 7 S19? 8 A It says acetonitrile/ethylene 9 carbonate/methyl ethyl carbonate and that shows 30 10 to 21 to 49. 11 Q What is the weight percentage of 12 acetonitrile in the final electrolyte solution of 13 S19? 14 A Well, of the ethylene carbonate? 15 Q I was asking for acetonitrile? 16 A Acetonitrile, so acetonitrile you are 17 starting in mass ratios of the solvents are 30 to 18 21 to 49. And then you add the salt to a known 19 salt concentration. So I mean, one can determine 20 what the final weight percentage of the 21 acetonitrile is from that information, but because 22 you don't know the exact mass -- it is not
174 1 indicates what components are part of the mother 2 electrolyte solution? 3 A Yes. 4 Q And so everything under that line under 5 the mother electrolyte solution D on the left, is 6 the solvent in the lithium salts not the 7 additives, correct? 8 A That is what it appears to be, yes. 9 Q And after Matsuoka makes this base 10 solution or mother electrolyte solution, he adds 11 the additives on the right-hand side of the Table 12 2 to the concentration noted there to get the 13 final electrolyte solution, right? 14 A That is my understanding, yes. 15 Q And that is a mass percentage is how the 16 concentration is reported? 17 A Mass percentage, yes. 18 Q Okay. Whereas on the -- on the left the 19 concentrations are reported in moles per liter not 20 as a mass percentage, right? 21 A Yes, which is pretty typical for lithium 22 salts.	176 1 indicated exact mass of the salt, you would, you 2 know, it is -- it is not clearly -- it is not 3 simply calculated. 4 Q The masses can vary with temperature, 5 right? 6 A Mass doesn't vary with temperature. 7 Q Sorry, so the solution is expressed as 8 moles per liter, right? 9 A Yes. 10 Q And the viscosity of the solution and the 11 volume of the solution, the mother electrolyte 12 solution, would vary depending on the temperature, 13 right? 14 MR. STEIN: Objection, calls for 15 speculation. 16 A Say that again. 17 Q The viscosity and volume of the mother 18 electrolyte solution would vary depending on 19 temperature, right? 20 MR. STEIN: Same objection. 21 A Well, I mean, of liquids and general 22 viscosity varies with temperatures and it starts

177 1 to become solid. In terms of the volume, you 2 know, there is -- there is a small change in 3 volume as a function of temperature, but over the 4 temperature ranges of your standard electrolyte 5 usages those -- those variations are very, very 6 small. 7 Q Can we go to Exhibit 1014? 8 (Exhibit 1014 discussed.) 9 Q Which I've referred to as Zhou. Let me 10 know how pronounce it. 11 A Zhou. 12 Q Zhou? 13 A I think that is how you pronounce that. I 14 frequently have a hard time with these 15 pronunciations. 16 Q So do you recognize Exhibit 1014 as the 17 English translation of the Zhou reference? And 18 for the court reporter Zhou is Z-h-o-u. 19 A Yes. 20 Q I want you to look at paragraphs 46 and 47 21 of Zhou. 22 A Okay.	179 1 components, correct? 2 A Yes. 3 Q You indicate here a weight percentage of 4 the solvent, correct? 5 A That is what is stated there which is -- 6 which the percentage should not have been that -- 7 that percent is an error on reevaluating this. 8 Q So you think it should not be weight 9 percent it should just be weight? 10 A Well, what is described in paragraph 47 of 11 Zhou is uniformly mixed in mass ratios of 25 to 30 12 to 10 to 20 to 5. That does not add up to 100 13 percent. And I mistakenly used the percent signs 14 in the figure there, however, the calculations 15 that I do in paragraph 207 are correct, because is 16 it 20 percent divided by 25 plus 30 plus 10 plus 17 20 plus 5. The error that was made is that those 18 percentage signs should not be percent signs, they 19 should be ratios. 20 Q Is that true of every instance of percent 21 that you use in these calculations with respect to 22 example 8 of Zhou -- of Zhou?
178 1 Q It discusses again here a mass ratio of 25 2 to 30 to 10 to 20 to 5. Do you see that? 3 A Yes. 4 Q Does that refer to the same measurements 5 that we were discussing earlier with respect to 6 Zeng for a mass ratio? 7 A That is a mass ratio, which I believe was 8 also in Zeng. 9 Q But I'm asking they're used to mean the 10 same thing here? 11 A Yes, this is the mass ratio. You know, I 12 would interpret them to mean the same thing, yes. 13 Q If you go to paragraph 203 of your 14 declaration, you provide kind of a rainbow of 15 solvents and additives as a picture? 16 A Let me get back to that, sorry, what page 17 was this again? 18 Q Paragraph 203? 19 A Paragraph 203. 20 Q So that is page 108 of 131? 21 A Got it, 203. 22 Q Zhou refers to mass ratio of its solvent	180 1 A I mean, in referring to the solvent, the 2 solvents that are added together, they should be 3 weight ratios and not percentages. 4 Q Is the same true of the additives? 5 A Well, the additives are specifically 6 weight percentages. That is what is stated in 7 the -- in the patent application. So those values 8 are, as I said, the calculations are all correct. 9 The only thing that is wrong is the percent signs 10 shouldn't have been there in the figure. For 11 example, 8 in paragraph 203 and also in 206 it 12 should have been ratios. 13 Q When did you notice that this was an 14 error? 15 A I believe we noticed it when we got the 16 report from or I noticed it when we got the report 17 from Wheeler who pointed it out. 18 Q And have you attempted to issue a 19 correction or an errata? 20 A I didn't know that that was something that 21 -- I am not aware of that being something to do. 22 That is something I depend on counsel for.

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181 1 Q So the sum of the mass ratios only adds up 2 to 90, correct, for this example? 3 A Yes, that is correct. 4 Q And for Zhou's other examples, the sum of 5 the mass ratios always add up to 100? 6 A I would have to go back and look at all 7 the other examples. I think you are correct. 8 They most generally do, but once again that is not 9 required. As I said earlier, one of the most 10 widely used electrolyte formulations is referred 11 to as the 1,1,1, ethylene carbonate, diethyl 12 carbonate, dimethyl carbonate. 13 Q So in this figure, that you have created 14 in paragraph 203, the solvents are shown on the 15 left and the additives are shown on the right? 16 A Yes. 17 Q Correct? 18 A That is correct. 19 Q Is lithium hexafluorophosphate an 20 additive? 21 A Well, the way -- it is the additives. It 22 also describes the salt as a percentage in the	183 1 Q What -- what in Zhou teaches you that 1.5 2 by mass is the total mass of the electrolyte 3 rather than the mass of the solvent. 4 A One thing that says it is paragraph 9, 5 preferably the solvent accounts for 70 to 80 6 percent of the total mass of the lithium battery 7 electrolyte and that is the value that we 8 determined here -- that I determined was 74.5 9 percent then the additives are the rest. 10 And it says in paragraph 13, preferably 11 the additive accounts for 0.1 to 20 percent of the 12 total mass of the lithium-ion battery electrolyte. 13 So by saying that, the percentages -- and once 14 again, preferably the first additive is at least 15 one of vinylene carbonate, fluoroethylene 16 carbonate and propane sultone. And the first 17 additive accounts for 0.5 to 10 percent of the 18 total mass of the lithium-ion battery electrolyte, 19 which is indicating that when you see the 20 additives that are added they're the -- the 21 weights are based on the total mass of the 22 electrolyte.
182 1 patent, as a weight percentage in the final 2 electrolyte. 3 Q So why is it listed here as an additive? 4 A I don't know. I probably should have 5 ended the additive bracket there at the ADN 6 dinitrile. 7 Q And the additives are all listed as having 8 certain weight percentages, correct? 9 A Yes, which is what is described in example 10 8. 11 Q It indicates, for example, 1.5 percent by 12 mass of 1,3,6 Hexane trinitrile? 13 A That is what is described in example 8, 14 yes. 15 Q The 1.5 percent by mass, to what mass does 16 that refer? 17 A It refers to the mass of the total 18 electrolyte. 19 Q Not the mass of the solvents? 20 A No, because the solvents are prepared 21 separately and then you add all of those other 22 things to it.	184 1 And as it also says in paragraph 15, 2 preferably the second additive is at least one of 3 several ones listed there, the second additive 4 accounts for 0.1 to 5 percent of the total mass of 5 the lithium-ion battery electrolyte. 6 Q What tells you that these paragraphs are 7 what is being referred to when it is discussing 8 building example 8 as opposed to being a different 9 measurement that is referring to the total result? 10 A I don't understand your question. 11 Q So what you were just reading to me was a 12 general content of the invention section, correct? 13 A It is the specification that is shown 14 there. 15 Q Right, right. And it is under the -- the 16 section of the specification labeled content of 17 the invention, correct? 18 A Content of the invention, yes. 19 Q Okay. Then when it gets to specific 20 embodiments, is there anything in paragraphs 46 21 and 47, the example 8 that tells you that the 22 percentage by mass used in example 8 is based on

185 1 the percentage by mass of the total electrolyte 2 solution rather than the percentage of the 3 solvent? 4 A They're added separately. As a POSITA, it 5 is very obvious that these – the additives are 6 added to the electrolyte to the – to the solvent 7 and that the additive percentages are as clearly 8 delineated in the paragraphs that I just described 9 13, 14, and 15, are the masses that you add are 10 based on the total mass of the lithium-ion battery 11 electrolyte. This is something commonly done in 12 the field of battery – batteries for electrolyte 13 scientists. As a POSITA, this is very clear to 14 me. 15 Q Did you do alternative calculations in the 16 event the percentage by mass refers to the 17 percentage of the solvent mass? 18 A I did not do that, because that would make 19 no sense to me as a POSITA to do that. 20 Q And you think the same is true of the 14 21 percent by mass of LiPF₆ that is slowly added and 22 stirred until it is completely dissolved, correct?	187 1 MR. STEIN: Objection, calls for 2 speculation. 3 A I don't see volume of the solvents 4 anywhere listed in the specification. I see mass 5 ratios. 6 Q Okay. 7 A So I'm not following your question. 8 Q If the 14 percent by mass refers instead 9 to a percentage of the total mass of the solvent, 10 then the mass percentage of the lithium salt as a 11 percentage of the total electrolyte solution would 12 still be within the ranges you just read off to 13 me, correct? 14 MR. STEIN: Same objection. 15 A I really didn't understand your question. 16 I mean, as I've said, it is very clear to me from 17 the patent description that the 14 percent by mass 18 of LiPF₆ is a weight percent based on the total 19 mass of the electrolyte as is indicated in 18. 20 I'm not – I'm really not following your 21 hypothetical question. 22 Q Sure. Okay. Looking at your figure where
186 1 MR. STEIN: Objection, misstates prior 2 testimony. 3 A So on the specification paragraph 18, it 4 states preferably the lithium salt accounts for 8 5 to 20 percent of the total mass of the lithium-ion 6 battery electrolyte. More preferably, in order to 7 improve the ability of fast charging of the 8 lithium – charging the lithium salt concentration 9 of the electrolyte is moderately increased, and 10 the lithium accounts for 12 to 18 percent of the 11 total mass of the lithium-ion battery electrolyte. 12 And what it says here is there is 14 13 percent by mass of LiPF₆, which it is, as a 14 POSITA, it is very obvious what is meant is that 15 the 14 percent of LiPF₆ that is slowly added is by 16 mass of the total electrolyte as is defined in 17 paragraph 18. 18 Q What if instead that 14 percent by mass 19 refers instead to the volume of the solvent, then 20 the mass percentage of the lithium salt as a 21 percentage of the total electrolyte would still be 22 within those ranges, correct?	188 1 you calculate that the mass of the solvent is 74.5 2 percent of the ultimate mass of the total 3 electrolyte solution, correct? 4 A Yes. 5 Q Okay. Now, if LipF6's 14.0 weight 6 percentage was the percentage of the weight of the 7 total solvent rather than the weight of the total 8 solution, would you be able to do the math to 9 determine what the ultimate weight percentage of 10 LiPF₆ is as a percentage of the total solution? 11 MR. STEIN: Objection, form. 12 A First off – 13 MR. STEIN: Speculation and asked and 14 answered. 15 A It is a very long question and I don't 16 understand it, because in Zeng – where are we at 17 again or Zhou, sorry, in Zhou, the solvents are 18 given as mass ratios relative to each other. The 19 LiPF₆ is 14 percent by mass of the total 20 electrolyte, but I don't even know how you would 21 try and put the 14 percent by mass into the 22 solvent ratios, because those are solvent ratios.

189 1 I don't -- I don't understand how you would even 2 -- as a POSITA, I don't even know how I would do 3 that. 4 Q So without knowing how much of the solvent 5 you are using, you would not be able to determine 6 the total concentrations of the ultimate total 7 solution? 8 MR. STEIN: Objection to the form. 9 A Can you restate that question? 10 Q Without knowing how much of the solvent 11 you are using, you would not be able to determine 12 the total concentration of the electrolyte total 13 solution? 14 A I don't understand your question. 15 Q What don't you understand about my 16 question? 17 A You can try and say it again. As a 18 scientist, as a chemist, I'm not understanding 19 what you are trying to ask me. 20 Q Okay. The solvent that you indicate on 21 the left-hand side of your composition of the 22 total electrolyte solution --	191 1 the salts are additives of a total mass of the 2 lithium-ion battery electrolyte. 3 It also states in paragraph 9 that 4 preferably the solvent accounts for 70 percent to 5 80 percent of the total mass of the lithium-ion 6 battery electrolyte, of which the value that I 7 calculated by subtracting all of the additives in 8 the salt from 100, is 74.5 weight percent, which 9 is between 70 and 88 percent. So once again, as a 10 POSITA, this is very clear. There is no 11 ambiguity. 12 Q Have you ever added additives as a mass 13 percentage where that mass percentage was 14 calculated as a percentage of the solvent into 15 which the additive is being dissolved? 16 MR. STEIN: Objection, relevance. 17 A Have I ever done that? 18 Q Uh-huh. 19 A Have I ever had a student do that? I'm 20 not sure. That is not typically what we would do. 21 We would typically add a weight percentage to the 22 electrolyte.
190 1 A Yes. 2 Q -- is incorrectly labeled as having weight 3 percentages, correct? 4 A Yes, because it is -- it is weight ratios 5 as clearly delineated in example A, a mass ratio, 6 a weight ratio. 7 Q And so before being provided with the 8 weight percentage of additives, you do not know 9 the total amount of solvent that you are using; 10 correct? 11 A Well, you know the total mass of the 12 electrolyte must add up to 100 percent. So the 13 amount of the solvents that you are adding by mass 14 is the total of all of the additives and the salt 15 minus 100 or 100 minus that, sorry, 100 minus as 16 is indicated in paragraph 203. 17 Q Zhou doesn't say anywhere that the total 18 mass of the solvent is 74.5 weight percent; right? 19 MR. STEIN: Objection, asked and answered. 20 A Zhou very clearly states that there is 21 additives in salt. And from paragraphs 18, 15 and 22 14 and 13, it clearly indicates the additives in	192 1 Q Sorry. What do you mean by you would add 2 a weight percentage to the electrolyte? 3 A Well, much like what is described here 4 you're adding 2 percent by mass propane sultone to 5 the -- as a function of mass of the total 6 electrolyte. 7 Q You state that a POSITA would have found 8 it obvious to substitute propyl propionate for 9 ethyl acetate in Zhou's example 8, right? 10 A Yes. 11 Q Did Zhou provide any experimental data or 12 comparative examples that show the performance of 13 propyl propionate compared to ethyl acetate? 14 A I don't believe so. 15 Q You said earlier -- go ahead? 16 A But, you know, they are both esters, 17 they're structurally similar, and they have 18 different boiling points and melting points. And 19 it would be obvious to replace one ester with 20 another ester. 21 Q And that is categorically true. It is 22 always obvious to be replace one ester with

193 1 another ester? 2 A It is an obvious thing to try. 3 Q How does propyl propionate structure 4 differ from ethyl acetate? 5 A It has more carbon atoms. 6 Q It has two additional methyl groups, 7 right? 8 A Propyl propionate has six carbons in it 9 and ethyl acetate has three carbons in it. 10 Q Does propyl propionate have a higher 11 boiling point than ethyl acetate? 12 A Yes, it does. 13 Q And higher melting point? 14 A Yes. 15 Q And so for low temperature applications, 16 it would be less preferred? 17 A Potentially. Depends on, like I said, 18 once again for a low temperature application it 19 potentially might be less advantageous, for a high 20 temperature application it might be more 21 advantageous. For safety – for applications 22 where safety is important, it would probably be	195 1 term was. 2 Q Sorry, is pentyl propionate, structurally 3 similar to -- 4 A Yes, it -- it is -- it is structurally 5 similar. It is going to have that many more 6 carbons. Going from pentyl -- from propyl to 7 pentyl you are adding two more carbons, so the 8 boiling point is going to be higher. And also if 9 you start to make really long alkyl chains like 10 that, the polarity may be going down slightly. 11 Q And so you mentioned pentyl propionate 12 does have a higher boiling point than propyl 13 propionate? 14 A I would have to look at a table, but it is 15 higher molecular weight, so I would assume it has 16 a higher boiling point. That is generally the 17 trend with those kind of molecules. 18 Q And it is an ester? 19 A Yes. 20 Q Why would a POSITA not use pentyl 21 propionate instead of propyl propionate? 22 MR. STEIN: Objection, calls for
194 1 more advantageous. 2 Q Your -- the basis for your substitution of 3 propyl propionate for ethyl acetate is that propyl 4 propionate has a higher boiling point than ethyl 5 acetate, correct? 6 A Well, they're both esters, so they have 7 similar structure and properties and it has a 8 higher boiling point. 9 Q And that is -- that is the basis? 10 A That is the basis, yes. They're similar 11 in structure, so they're going to have similar 12 reactivities. That is what -- that is what one 13 would do as a POSITA. When you are optimizing 14 electrolyte formulations, you might vary these 15 things. Such as the variation of dimethyl 16 carbonate versus diethyl carbonate versus ethyl 17 methyl carbonate. Depending on what you are doing 18 you might vary those things, but in general the 19 properties of those have similarities. 20 Q Is pentyl propionate also similar to 21 propyl propionate and ethyl acetate? 22 A I'm sorry, I didn't hear what the	196 1 speculation. 2 A So I mean as a POSITA I might look at a 3 variety of different esters. I could look at 4 which once might be the best. And propyl 5 propionate has a reasonable molecular weight, 6 reasonable polarity. And that is -- to me that 7 would be a good choice. 8 Q Pentyl propionate has a higher boiling 9 point, right? 10 A Pentyl propionate would have a higher 11 boiling point. 12 Q Would -- 13 A It would also have a higher melting point 14 so that might be a disadvantage with pentyl 15 propionate. It is all a balancing act in terms of 16 balancing the advantages and disadvantages of all 17 of the different components of the electrolyte. 18 Q Esters with longer alkyl chains are 19 preferable for SEI formation, right? 20 A I don't know. 21 Q You don't know whether esters with shorter 22 alkyl chains have the advantage in getting better

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197 1 ionic conductivity for bulk electrolyte, but have 2 a disadvantage of more resistive and less 3 protective SEIs compared to their longer chain 4 counterparts? 5 MR. STEIN: Objection to the form. 6 A Where are you reading that from? 7 Q It is one of your papers. I don't know if 8 we have it uploaded yet. 9 A Once again, there is a variety of things 10 that you could look at. Yeah, I would be happy to 11 look at my paper. 12 Q We will get it uploaded. We will come 13 back to it after a break. 14 Do butyl propionate and pentyl propionate 15 both have longer alkyl chains than propyl 16 propionate? 17 MR. STEIN: Objection to the scope. 18 A So in terms of organic chemistry, there is 19 methyl, which is one carbon, ethyl which is two 20 carbons, propyl which is three carbons, then it 21 goes Greek. It goes butyl for four, pentyl for 22 five, hexi for six, hepta for 7.	199 1 performance? 2 MR. STEIN: Same objection. 3 A If you change the total amount of 4 carbonates, it could change the performance of the 5 electrolyte also. 6 Q You mentioned earlier a prismatic cell. 7 Can you describe what a prismatic cell is? 8 A Prismatic cells are kind of like a book. 9 So you have electrodes stacked on electrode 10 stacked on electrode and stacked on electrode and 11 their tabs are at the end of it. 12 Q And what is a pouch cell? 13 A A pouch cell is an example of that. You 14 can have single layer pouch cells or you can have 15 multilayer pouch cells. A single layer pouch cell 16 would have only one cathode and one anode. A 17 multilayer pouch cell would have multilayers. 18 Q And neither of those are rolled cells, 19 right? 20 A Generally prismatic cells are not 21 considered rolled cells, but they do have some 22 ones that are kind of like a, I don't know,
198 1 Q Is that a yes? 2 A What was your question again? 3 Q Do butyl propionate and pentyl propionate 4 have longer alkyl chains than propyl propionate? 5 A Yes, they do. Propyl propionate is three 6 carbons chain, butyl propionate has four carbons 7 and pentyl propionate has five carbons. 8 Q Does changing the total amount of linear 9 carboxylic esters in an electrolyte impact the 10 performance of the electrolyte solution? 11 MR. STEIN: Objection, calls for 12 speculation. 13 A State that again. 14 Q Can changing the total amount of linear 15 carboxylic esters in an electrolyte impact the 16 performance of the electrolyte? 17 MR. STEIN: Same objection. 18 A I mean, yes, changing the concentration of 19 any of the solvents can affect the performance, 20 yes. 21 Q Can changing the total amount of 22 carbonates in an electrolyte impact the	200 1 they're wound like that where they're kind of flat 2 but they are still somewhat wound. So those are 3 kind of in between. 4 Q They're not what you would -- when you are 5 referring to rolled cells in the context of 6 combining Zeng with Sunose, you are referring to a 7 rolled cell that is more in a true spiral like a 8 like a double A battery, right? 9 A That -- that is my understanding, although 10 it could potentially be the other style of rolled 11 cell also. I would have to look back at the 12 details. 13 Q Exhibit 1008 is the Kim reference. 14 (Exhibit 1008 discussed.) 15 Q I guess maybe before we dig in, have I 16 been going an hour at this point? 17 MR. STEIN: Yes. 18 A We have been going about that or a little 19 more. 20 Q Do you want to take 5 to 8 minutes and 21 stretch your legs -- 22 A Sure.

201 1 Q -- before we jump in? Let's go off the 2 record. 3 (Recess, 3:27 to 3:35 p.m.) 4 Q Looking at Exhibit 1008, do you recognize 5 this as the Kim reference? 6 A Yes. 7 Q And all of the references that we've 8 looked at today that you relied on as your 9 invalidating references for the '131 patent, are 10 the same references that you relied upon for the 11 '910 patent, correct? 12 A I believe that is correct, but I would 13 have to confirm it. 14 Q Do you know of any prior art that is at 15 issue in the '131 that is not at issue in the 16 '910? 17 A Not that I recall. If there is something, 18 again I recall them being similar. 19 Q And vice versa, you do not recall anything 20 that is in the '910 declaration prior art that you 21 authored that is not in the '131? 22 A I believe that is correct.	203 1 A Figure 1, yeah. 2 Q Is Figure 1 depicting evaluation 2? 3 A I'm not sure. It says here Figure 1 4 illustrates the schematic view showing the 5 structure of a rechargeable lithium battery 6 according to the embodiment. 7 Q Right, so Figure 1 is an embodiment? 8 A Yeah. 9 Q Any reason to believe that is the 10 embodiment of Figure 2 or, sorry, of evaluation 2? 11 A I would have to look through the patent 12 description in more detail. 13 Q Paragraph 70? 14 A Yes, that is what I was just reading, 15 paragraphs 70 and 71. 16 Q Right. 70 says you, Figure 1 depicts a 17 wound electrode assembly, but also says in another 18 implementation a stacked electrode assembly may be 19 used. Do you see that? 20 A Yes, yes. 21 Q And so do we know which one of those is 22 used in connection with evaluation 2?
202 1 Q And paragraphs 95 to 97 of Kim talk about 2 evaluation 2? 3 A Paragraphs 195? 4 Q 95 to 97? 5 A Yes. 6 Q There is this evaluation 2? 7 A Yes. 8 Q What type of cell does Kim use in 9 evaluation 2? 10 A It says evaluation of prismatic cell 11 during storage at high temperature. 12 Q What kind of electrode structure is used 13 in the prismatic cells of evaluation 2? 14 A I'm not sure if I understand what your 15 question is, what type of electrodes? 16 Q What type of electrodes structure does it 17 use, yeah? 18 A So looking at the image on the cover plate 19 of it, it is -- it is, like I said, the thing that 20 is kind of a -- it is the prismatic wound type 21 cell. 22 Q Well, and you're referring to Figure 1?	204 1 A I don't know. Like I said, I would have 2 to look through the patent in more detail to be 3 able to answer that question, but I'm not certain. 4 Q Does the compaction density that you are 5 able to achieve on different electrodes vary 6 depending on the configuration of how that 7 electrode is created or assembled? 8 A Can you state that again? 9 Q Sure. Does the compaction density that 10 you are able to achieve on a given electrode's 11 active layer vary depending on the arrangement or 12 configuration of that electrode? 13 MR. STEIN: Objection to the form. 14 A I would -- again, I would say I'm not 15 really certain. 16 Q So you don't know? 17 A I think -- I think it could, but I don't 18 know. 19 Q So you don't know one way or the other if, 20 you know, for example, wound cells compared to 21 flat or laminar electrodes may have different 22 compaction densities of their active layers or

205 1 not? 2 MR. STEIN: Objection, calls for 3 speculation. 4 A As I said, there may be, but I don't know. 5 Q How does Kim measure the initial thickness 6 of the prismatic cells in evaluation 2? 7 A I don't see where they specify how they 8 measure the thickness. 9 Q Same for -- 10 A Although it says in Table 3 the initial 11 thickness is 3 millimeters, 3.3 millimeters for 12 most of them. So I mean that is fairly thin, but 13 I mean there is various -- a variety of ways you 14 could measure something that is 3.3 millimeters 15 thick, calipers, for example. 16 Q And then the thickness is measured after 17 being allowed to stand at 60 degrees Celsius for 18 four weeks, correct? 19 A That's what is stated there in Table 3. 20 Q And they calculate based on that a 21 thickness variation ratio? 22 A Yes, that is what I see.	207 1 A 98 evaluation 3, thickness change and 2 capacity evaluation of cell during high 3 temperature storage. Examples 1 to 6 were 4 measured after being allowed to stand at 60 5 degrees centigrade for three weeks. The results 6 are provided in Table 3 below. 7 Q And then Table 3 below says that the 8 thickness is measured after standing at 60 degrees 9 Celsius for weeks, right? 10 A That is what it states. 11 Q Do you know which is correct? 12 A No, I do not. 13 Q Seems like an error? 14 A It may be an typographical error. Once 15 again, I have -- so once again the patents from 16 Samsung, which is a pretty large battery producer, 17 they have perhaps had some typographical error in 18 the patent. 19 Q Kim refers to recovery capacity, correct? 20 A Actually hold on, because in paragraph 97, 21 referring to Table 2 and figures 3 and 4, the 22 examples show a much lower thickness variation
206 1 Q And is thickness variation ratio as 2 they've calculated, is that a figure that you want 3 to keep low or get high? 4 A You don't want the thickness to vary, so 5 you would want to keep it low. 6 Q Do you know where the thicknesses are 7 measured on the cell? 8 A Once again, I'm not sure -- I would have 9 to look through the whole patent description in 10 greater detail to see if they describe where they 11 measure the thickness. But the patent is from 12 Samsung SBI, which is one of the world's larger 13 producers of lithium-ion batteries, so I would 14 assume that they probably know how to measure the 15 thickness of their batteries. 16 Q I'm sorry, do you know if it is measured 17 in the center or on the edge? 18 A I'm not certain. 19 Q How long does Kim store the pouch cells in 20 evaluation 3? 21 A Where is evaluation 3? 22 Q Evaluation 3 begins at paragraph 98.	208 1 ratio after having been allowed to stand at 60 2 degrees centigrade at four weeks. So Table 2 is 3 both four weeks and four weeks. 4 Q Table 2 is about evaluation 2? 5 A Okay. Sorry, go ahead. 6 Q Kim refers to recovery capacity -- 7 A Yes. 8 Q -- as being measured after either three or 9 four weeks? 10 A Yes. 11 Q And that is a number, again, that you 12 would want to keep high, correct? 13 MR. STEIN: Objection, calls for 14 speculation. 15 A Recovery capacity is -- you would want it 16 to be higher, yes, because you don't want the 17 battery to degrade. 18 Q Do you know how Kim measures the initial 19 capacity of the pouch cells in evaluation 3? 20 A How they measure the initial capacities? 21 Q Yes. 22 A The 22, 30 milliamp hours?

209 1 Q Right. 2 A Well, you measure that by charging and 3 discharging the battery. 4 Q And does Kim say that that is what they 5 did? 6 A I'm not sure if they specified that in the 7 patent, but that -- I mean, that is -- that is 8 what initial capacity is, the amount of capacity 9 in the battery. It is a common term. 10 Q Do you know under what conditions they 11 measure the initial capacity, what they charged it 12 to, what they charged it down to? 13 A I would have to look through the patent in 14 more detail, but I'm not sure if they provided 15 that specific detail or not. 16 Q Does it tell you about what charging rate 17 or discharging rate was used to measure capacity? 18 A I'm sorry, but the initial capacity it 19 said that the recovered capacity of each cell for 20 4.4 volts, so it appears that they're charging it 21 to 4.4 volts. In terms of the rate for which they 22 charged it, I don't see that necessarily. It	211 1 typically charged? 2 MR. STEIN: Objection, calls for 3 speculation. 4 A The patent was in 2017. Once again, I 5 would say it depends on the application what 6 people were charging these things to. The longer 7 life you are wanting for the application, the 8 lower voltage you go. The more you really want an 9 energy density, the higher voltage you go to 10 depending on the application. 11 Q In evaluation 4 of Kim at paragraphs 101 12 to 103 Kim uses the pouch cell, right? 13 A Valuation 4. 4, where is that valuation 14 4? 15 Q Paragraphs 101 to 103? 16 A 101 to 103 it says, charge each 4.4 volt 17 pouch cell according to examples 1 and 2. 18 Q So that is a different type of cell than 19 we were looking at in evaluation 2 and 3 or, 20 sorry, than evaluation 2? 21 A Going back to evaluation 2, evaluation of 22 prismatic cell during storage at high temperature.
210 1 might be somewhere in here. 2 Q The rate that charging and discharging are 3 performed at affects the battery's total capacity, 4 right or total measured capacity? 5 MR. STEIN: Objection, calls for 6 speculation. 7 A Yes. I mean, the faster you charge and 8 discharge the battery, in general, you get less 9 capacity out of the battery, slower recharge it 10 you get more. 11 Q Is there a difference between a battery 12 that charges or discharges at 4.4 volts compared 13 to 4.3 volts? 14 A I mean, in general the higher voltage 15 these are all layered metal oxides, I believe. In 16 general the higher voltage you go to you get more 17 overall capacity out of the cell, but then you 18 also have problems with electrolyte degradation on 19 the cathode. 20 Q Is there a -- or at the time of the 21 invention of the '131 patent, was there a standard 22 voltage to which lithium-ion batteries were	212 1 I'm not sure. A pouch cell could be a prismatic 2 cell. I think there are prismatic pouches, but 3 since they're referring to two different cell 4 types they might be referring to -- you know, they 5 are using two different names. They might be 6 talking about two different cell types, I don't 7 know. 8 Q What kind of electrode structure is used 9 in the pouch cells in evaluations 3 and 4? 10 A What type of electrodes? 11 Q Electrode structure, right, is it wound, 12 is it flat, is it -- 13 A Well, for evaluation 4 it is a pouch, 14 so -- 15 Q Right, so that -- that is flat? 16 A A pouch cell is generally flat, yes. So 17 that is my understanding of a pouch cell. Being 18 the prismatic cell back here that could also be a 19 prismatic pouch cell, although this, as I said, 20 the figure on the front that is considered a 21 prismatic cell also. 22 Q Looking at Table 4 of Kim. This, again,

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213 1 illustrates the capacity retention of the 2 different examples and comparative examples? 3 A Yes. 4 Q Example 1 has better capacity retention 5 than example 2 after 250 cycles, right? 6 A 95.7 is higher than 92.7, yes. 7 Q And it has a lower thickness variation 8 ratio, right? 9 A Yes, slightly lower, 8.7 versus 9.2. 10 Q And so all else equal, the POSITA would 11 understand that example 1 is preferable to example 12 2? 13 MR. STEIN: Objection, calls for 14 speculation. 15 A You know, for that specific capacity 16 retention and thickness ratio, you know, they -- 17 it is -- I don't know, but the example 2 might 18 have lower impedance, and so that could be an 19 advantage for example 2 or example 2 could have -- 20 is it a lower resistance for better rate 21 performance. It is not clear to me. 22 Q Is there -- I'm sorry.	215 1 increase. 2 Q And it measures thickness increase and if 3 you look on the left-hand side, capacity retention 4 as a percentage? 5 A Okay. 6 Q And example 1 outperforms example 2 across 7 all of the different cycle measurements, correct? 8 A It is kind of hard to see that figure, but 9 it looks like the example 1 is better than example 10 2 in that experiment. 11 Q Has every number of cycles, right? 12 A Sorry, let me go back to look at that 13 again. Yes, across the first 800 cycles it is 14 higher. However, I will point out that in Table 2 15 example 1 has lower recovery capacity than example 16 2 and it has greater thickness variations in 17 example 1 than example 2. So for both of those 18 two examples, it appears that example 1 is 19 superior to example -- example 2 is superior to 20 example 1. 21 Q With respect to evaluation 2? 22 A Table 2 is evaluation 2.
214 1 Is there anything in Kim that suggests 2 that example 2 has better impedance or better rate 3 performance. 4 A Not that I'm aware of, but I would say 5 from a perspective as a POSITA both example 1 and 6 example 2 look promising. 7 Q Example 1 is more promising? 8 A They're both promising. Example 1, once 9 again, just from looking at the capacity retention 10 and the thickness ratio those are better, but 11 there are -- there are other measurements one 12 would make. 13 Q Figure 7 is kind of another illustration 14 of capacity retention and thickness increase of 15 the various examples? 16 A Figure what? 17 Q Figure 7? 18 A Where is Figure 7? 19 Q Figure 7 is up at the front matter? 20 A Okay. Let's see here, what is this. 21 Thickness increase, yes, that is -- I think that 22 is the same thing that is in there, thickness	216 1 Q Yes. 2 A Yes, and also I will point out that in 3 Table 3, example 2 has better recover capacity and 4 less thickness variation than example 1. So in 5 both Table 2 and in Table 3, example 2 appears to 6 be superior to example 1. 7 Q Is a lower oxidation current at a given 8 potential indicative of a more stable electrolyte? 9 MR. STEIN: Objection, calls for 10 speculation. 11 A Can you say that again? 12 Q Is a lower oxidation current at a given 13 potential indicative of a more stable electrolyte? 14 MR. STEIN: Same objection. 15 A In general if you have got residual 16 oxidation current that is not a good thing, so you 17 would want it lower. 18 Q Could you look at Figure 2 of Kim and 19 explain to me what is shown and feel free to refer 20 to the text about it. 21 A So what that is showing is basically the 22 -- what you are talking about is the residual

217 1 current that is flowing in the cell when you do 2 linear sweep of the aperture. 3 Q What is the oxidation current of examples 4 1 and 2 at 4 volts? 5 A They're zero both of them, all of them 6 zeros. 7 Q 4 and a half volts and 5 and 5 and a half? 8 A It is -- they're all baseline all along 9 there. 10 Q And beginning, you know, at about 5.75 11 volts, you start seeing some oxidation current, 12 correct? 13 A Yes. 14 Q On the various examples? 15 A Yes. 16 Q But everywhere below 5.5 volts these are 17 equal? 18 A They're -- they're all indistinguishable 19 at least on this plot. I don't know if you blew 20 it up there might be a difference. On this plot I 21 can't tell the difference. 22 Q Table 1 of Kim lists the constituents of	219 1 oxidation and some of them have less. That is 2 more long line/short line. I think the 3 comparative example 1 looks like is the one that 4 is the worst. 5 Q And it uses diethyl carbonate, right? 6 A It uses diethyl carbonate, yes. 7 Q Does that teach a POSITA not to use 8 electrolyte solutions with diethyl carbonate? 9 A Not necessarily. I mean it shows that 10 there is more oxidation with that one with that -- 11 that is a specific -- a specific formulation. 12 Q If you would go ahead and open Exhibit 13 2042. 14 (Exhibit 2042 discussed.) 15 A 2042, okay. Is that one of the new ones 16 on here? 17 Q That is one of the ones that we had 18 uploaded earlier today? 19 A Okay, 2042, okay. 20 Q Let me know when you have got it up. 21 A Okay. 22 Q Do you recognize this document?
218 1 its electrolyte solutions? 2 A I'm sorry, what did you say? 3 Q Table 1 of Kim lists the constituents of 4 its electrolyte solutions, correct? 5 A Yes. 6 Q Example 2 and example 1 both use no 7 diethyl carbonate, right? 8 A Both example 1 and example 2 use no 9 diethyl carbonate, yes, that is correct. 10 Q And comparative examples 1 and 2 do use 11 diethyl carbonate, right? 12 A Comparative examples 1 and 2 do use 13 diethyl carbonate. 14 Q And examples 1 and 2 have superior 15 oxidation currents compared to comparative 16 examples 1 and 2, right? 17 A These lines are kind of hard to tell which 18 ones are which. 19 Q Not wrong. 20 A Example 1 and 2 are -- is the printout of 21 this, and maybe better quality in other examples. 22 1 and 2 are in the middle, some of them have more	220 1 A Videotaped deposition of Brett Lucht, 2 Ph.D. conducted virtually on Tuesday, September 3 13th, 2020. I have seen this transcript from my 4 deposition. 5 Q Yeah. Do you recall giving a deposition 6 in connection with your defense of various Maxel 7 patents in the Maxel Amperex IPRs? 8 A Yes, that is what this is. 9 Q And are you aware of any of the testimony 10 you gave in that deposition being inaccurate or 11 incorrect? 12 A I don't. I'm not aware of something, but 13 there might be. 14 Q Is it true lithium batteries are very, 15 very sensitive to very small changes? 16 MR. STEIN: Objection, asked and answered. 17 A Again, once again it depends what the 18 change is. Some changes are large, could cause 19 large problems and some small changes could not 20 cause -- I mean, it depends on what the change is. 21 Q You testified earlier on page 156 of the 22 deposition transcript that lithium batteries are

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221 1 very, very sensitive to very small changes, 2 correct? 3 A Where are we at? 4 Q It is page 156 of the transcript. That 5 would be page 39 of the PDF. 6 A Which page is again, 1 – 7 Q Page 156, lines 5 to 7? 8 A That would include the electrolyte 9 formulation or current are very, very sensitive to 10 small changes, yes, they can be. 11 Q And what is a small change? 12 A It depends on what the small – I mean, it 13 depends on what the small change is. If the small 14 change is adding a very small amount of water, the 15 problem could be that. If the small change is 16 something – it is – that is what I said there. 17 You are correct and it can be, but it isn't always 18 depending on what the change is. 19 Q I'm sorry, I keep thinking you're done. 20 Are you done? 21 A Yes. 22 Q Okay. And on page 157 you say that any	223 1 Q Lithium-ion batteries are complex systems, 2 fair to say? 3 A Probably said that in some quote 4 somewhere, but yes, they are very complex systems. 5 Q And changes to an electrolyte solution can 6 result in unpredictable changes in behavior, 7 correct? 8 A Once again depending on how large or small 9 the change is, it can make some things more or 10 less predictable, yes. It depends on how much 11 similarity there is and what the change is. 12 Q And part of the reason you and other 13 professors continue in research in electrolyte 14 solutions is because perfecting the amounts of 15 additives in solvents is not an exact or 16 straightforward science, correct? 17 A I mean that is a – that is what we do the 18 research in, yes. We do the research in the 19 electrolytes to study the electrolyte 20 formulations. And when you change electrolyte 21 formulations, so, you know, that can change the 22 performance of the battery. That is what we
222 1 time you change one thing it can cause both 2 advantageous changes and disadvantageous changes, 3 correct? 4 A It can. 5 Q And further down that page you testified 6 any time you change something it can cause both 7 good problems and bad problems. What are good 8 problems? 9 A Well, it shouldn't say good problems. I 10 mean, it can cause good things to happen, it can 11 cause bad things to happen. 12 Q And it is true, isn't it, that if you 13 change anything it may cause you problems? 14 A If you make changes to the battery, they 15 can cause problems. It depends on what the change 16 is. 17 Q And that is a change, whether it is the 18 cathode or the anode or the electrolyte, correct? 19 A A change to any of those things could 20 cause once again advantageous things or 21 disadvantageous things. It depends on how large 22 the change is.	224 1 optimize, that is what we as POSITAs do. 2 Q What factors of the battery you are 3 optimizing vary depending on exactly your goals or 4 intended applications for the battery are, 5 correct? 6 MR. STEIN: Objection to the form. 7 A That was – 8 MR. STEIN: Foundation. 9 A That was a little long. Can you say that 10 again? 11 Q What factors of the battery you are 12 optimizing will vary depending on exactly what 13 your goals are or what the intended application 14 for the battery is, right? 15 A I mean, in general, yeah. You are – you 16 are optimizing for some – some type of 17 performance. It could be low temperature 18 performance, it could be high temperature 19 performance, it could be high voltage performance, 20 but you usually – and that is typically the, you 21 know, dependent upon what the application is that 22 you are designing the battery for.

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225 1 Q Would you pull up Exhibit 2043? 2 (Exhibit 2043 marked.) 3 A Okay. 4 Q Do you recognize this document? 5 A This is a declaration of mine. 6 Q And is that a declaration you submitted in 7 connection with another IPR? 8 A It looks like IPR2023-01016, the '828 9 patent. 10 Q Do you recall what proceeding that was 11 relating to that you testified in the 12 Semiconductor Energy Laboratories? 13 A This was with SEL. 14 Q That is what I think it was. 15 A Okay. I don't -- these things kind of all 16 blur together, yes, Amperex versus SEL, yes. 17 Q If you go to paragraphs 67 through 69 you 18 address multiple reasons why different coatings 19 and different coating materials can have 20 meaningfully different properties, correct? 21 A I'm trying to get there, 67. 22 Q Yeah, through 69 perhaps more of it is in	227 1 talking about coating here, are we talking about 2 active material layers? 3 A These types of coatings are -- yeah. So 4 you -- so my recollection with the patent is you 5 have a patent or you have a cathode active 6 material and then you coat the material with a 7 thin layer of something and then you make a 8 laminate out of that. So surface modification of 9 cathode materials is a fairly common thing to do. 10 Q Can you not automatically assume that just 11 because coatings are similar that they will behave 12 the same? 13 (Exhibit 1005 discussed.) 14 A There may be differences, yes, as is 15 highlighted in this Exhibit 1005 showing that 16 coatings made with the same elements and different 17 ratios have different properties -- 18 Q And different -- 19 A -- similar. 20 Q Sorry. 21 A Yeah. These are different kinds of 22 lithium titanates from what it looks like here.
226 1 the 68 and 69 than it is in 67. 2 A Okay. Okay, I kind of looked at it 3 quickly. What was your question. 4 Q So you're addressing here that different 5 coating materials for cathode materials can have 6 meaningfully different properties with respect to 7 how they operate in a battery, right? 8 A I believe that is what I was saying, yes. 9 Q And even coatings made of the same 10 elements in different ratios can have different 11 properties? 12 A Could you point to where I specifically 13 said that, just so I can -- 14 Q Sure. Paragraph 68 you're citing various 15 evidence and you are saying showing that even 16 coatings made of the same elements in different 17 ratios, such as $\text{Li}_4\text{Ti}_5\text{O}_{12}$ and $\text{Li}_2\text{Ti}_2\text{O}_5$ can have 18 different properties? 19 A Yeah, I'm referencing Table 2 from this, 20 from whatever paper was Exhibit 205, that is what 21 the data shows. 22 Q Just because one coating -- and when we're	228 1 Same -- they're the same elements but in different 2 ratios, so they're -- they're somewhat of 3 different materials because of the different 4 ratios, but they're all the same elements. 5 Q So you can't expect one 6 fluorene-containing coating material to behave 7 similarly to coatings having different 8 chemistries, right? 9 A I mean, they can have similar properties, 10 but they also cannot. It is possible for them not 11 to. 12 Q And the method of manufacture also impacts 13 the properties of the coating, right? 14 A Where do I say that? 15 Q I think it is paragraph 69. 16 A 69. Yeah, how different coating 17 manufacturing process, yes, because that is -- 18 there are, once again solid state 19 co-precipitation, sol-gel, hydrothermal, there is 20 multiple different ways you could put a coating 21 on. And those different ways are going to -- you 22 know, could result in fairly different coatings

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229 1 just in terms of their thickness and their crystal 2 structures and things like that. 3 Q Do different methods of applying active 4 materials result in different compaction 5 densities? 6 A What was that again? 7 Q Could different methods of applying active 8 materials result in different compaction 9 densities? 10 A So different methods of coating result in 11 different compaction densities? 12 Q Sorry, no. Different -- different methods 13 of applying active materials? 14 MR. STEIN: Objection, calls for 15 speculation. 16 A So different methods of applying active 17 materials is different coating processes. 18 Q Sure. 19 A And yeah, if you coat differently you 20 could get different densities. If you coat 21 thicker you could have more dense or thinner, it 22 is less dense but yes, that is what you do with	231 1 layer vary depending on how thick the active layer 2 is? 3 MR. STEIN: Same objection. 4 A I'm not really sure. 5 Q Okay. 6 A I am not sure. Once again, it might but 7 I'm not certain. 8 Q So you are not typically involved in 9 manufacturing or compacting cathode active layers. 10 You are more of an electrolyte solution expert? 11 MR. STEIN: Objection, asked and answered. 12 A My expertise is in electrolytes and 13 electrolyte reactions with the surface of 14 electrode materials. I mean, I do have a fairly 15 good understanding of electrode materials and the 16 electrode process. That is not my primary area of 17 expertise. 18 Q In paragraph 92 of Exhibit 2043 you refer 19 to battery chemistry as having complexity and an 20 unpredictable nature, correct? 21 A Which paragraph is this again? 22 Q Paragraph 92 on page 57?
230 1 the coating process. 2 Q Do you think that if the layer is applied 3 more thickly you are able to compact it more? 4 A Well -- 5 MR. STEIN: Same objection. 6 A -- if you have a thicker layer and compact 7 it the same as a thinner layer then that is going 8 to be denser is what. So you can change -- you 9 can vary your compaction density by how you 10 process the electrode. 11 Q Does your ability to compact the layer 12 vary depending on how thick the layer is? 13 MR. STEIN: Same objection. 14 A Say that again. 15 Q Does your ability to compact the active 16 layer vary depending on how thick the active layer 17 is? 18 MR. STEIN: Same objection. 19 A I mean, it is -- if your layer is too 20 thick and you try and you try and -- say the 21 question again, I'm not really -- you know. 22 Q Does your ability to compact the active	232 1 A Yes, I say that in reference to the 2 fluorine-containing coating material versus the 3 magnesium aluminum oxide coating material is what 4 the statement is there. But yeah, I mean, you 5 know, there are a lot of complexities in batteries 6 and there is -- there is various things that can 7 be unpredictable. As I said a little while ago, 8 sometimes small changes can make large effects and 9 some time small changes don't. 10 Q If you could go back to the download page 11 for the exhibits? 12 A Yes. 13 (Exhibits 2045 and 2045 discussed.) 14 Q There should be two new exhibits, 2045 and 15 2046. 16 A Let me refresh this thing, sort by 17 uploaded date. These were recently uploaded. 18 Q That's right. 19 A Yes, 246 and. 20 Q 2045 and 2046? 21 A Yes, I see them. 22 Q Can you pull these up and let me know if

233 1 you recognize them? 2 A Okay. The first one Review on 3 Low-Temperature electrolytes, yes. Fluoroethylene 4 Carbonate and Vinylene Carbonate Reduction. 5 That is a strange, strange format for that 6 one okay, yeah. 7 Q And do you recognize both of these papers? 8 A Yes, I do. 9 Q And you're an author on both of these 10 papers? 11 A I was the -- Fluoroethylene I was the lead 12 author of that. 13 Q Why is your name so far deep? 14 A What? 15 Q Why is your name so deep? 16 A No, typically the submitting author is the 17 last one. The first author is the student that 18 did most of the work. The person mentoring and 19 managing their thing is the one that goes last. 20 Like on this other one Xiao-Qing Yang, he was the 21 lead person on it. 22 Q Got it.	235 1 lithium naphthalenide. And then we used a variety 2 of techniques to characterize what these potential 3 SEI components were. 4 Q What was your role in conducting the 5 research in Exhibit 2045? 6 A I was the mentor for Bharathy Parimalam 7 and Taeho Yoon. We were the ones that did the 8 reactions, the synthesis of the materials and then 9 we did the XPS -- XPS characterization, might have 10 been IR. And then Clare Grey, she is an expert in 11 solid state NMR spectroscopy, so Alison Michan and 12 Rachel Kerber all worked with Clare. 13 Q And when you said you worked on the 14 reactions, you're referring to the dilute 15 reduction reactions? 16 A Yes. We took -- we took lithium 17 naphthalenide solutions and reacted them -- 18 reduced FEC and BC, yes. 19 Q Yeah. I wanted to ask about you used 20 lithium naphthalenide solutions? 21 A Yes. 22 Q And you used that as a solution not as a
234 1 A Which one do you want to talk about? 2 Q So first you recognize both of these as 3 papers that you authored and were published, 4 correct? 5 A Yes. 6 Q Anything incorrect about these papers that 7 you are aware of? 8 A I don't -- you know, this first one here 9 is a review article that is 40 pages long. I 10 think there were some typographical errors or 11 something in it, because I think we had some form 12 of a retraction. But it was like they did -- they 13 did something where they had to correct something. 14 There was a correction made to it, I believe. 15 Q Got it. What was the paper in 2045 about? 16 A 20 what? 17 Q 2045, Exhibit 2045? 18 A Sorry, I was at 2046 right now. 2045? 19 Q Yes. 20 A This was a paper where we synthesized 21 reduction products of vinylene carbonate and 22 fluoroethylene carbonate by reducing them with	236 1 solid salt, correct? 2 A No. That is -- this -- lithium 3 naphthalenide is a reducing agent. It is a one 4 electron reducing agent. What lithium 5 naphthalenide is is a mimic of lithiated graphite. 6 So this isn't an electrolyte solution, this is a 7 reagent that we're using to reduce these solvents. 8 Q And it says on page 2 that you added these 9 solutions that have specified molarities with 10 certain volumes to the solution at room 11 temperature, correct? 12 A So once again, what we were doing was we 13 made lithium naphthalenide solutions, which is a 14 reducing agent and then we used that to decompose 15 the fluoroethylene carbonate. These are not 16 lithium battery electrolytes. These are lithium 17 ion -- the FEC and the BC are additives that are 18 frequently utilized for lithium-ion batteries. 19 The lithium naphthalenide is a reducing agent. 20 In this paper what we were doing was we 21 were trying to synthesize SEI components 22 independently and characterize the SEI components.

237 1 These are not lithium-ion battery electrolytes. 2 Q When you say these are not, you mean as 3 used here? 4 A Nothing in this paper is a lithium-ion 5 battery electrolyte. 6 Q Is it a lithium battery electrolyte 7 additive? 8 A FEC is an additive that can be used in 9 lithium-ion batteries as can BC, which BC and FEC 10 we talked about several times earlier today. This 11 is not a lithium battery electrolyte. We have 12 those additives and then we took the whole 13 additive and reduced it. 14 So when you generate an SEI in a 15 lithium-ion battery, which we kind of talked about 16 earlier, the electrolyte components are reduced on 17 the surface of the anode to generate the solid 18 electrolyte interface. 19 FEC and BC are two of the most widely used 20 additives. They are preferentially reduced on the 21 anode compared to the other electrolyte components 22 and they generate a more stable SEI.	239 1 Q That's right. So on the right-hand side 2 about a third of the way down it says, it was 3 concluded -- 4 A Yes. 5 Q -- that esters with shorter alkyl chains 6 have the advantage in getting better ionic 7 conductivity for the bulk of electrolyte, but the 8 disadvantage in forming more resistive and less 9 protective SEIs as compared to longer chain 10 counterparts. Do you see that? 11 A Yes. 12 Q Is that accurate? 13 A I mean, this is -- this is what -- this 14 particular paper is a review article. So when we 15 review articles, what happens is you have grad 16 students and postdocs read a whole bunch of 17 different papers from the literature. And they 18 kind of summarize everything together and will 19 write a review article about that. 20 And so this paper is summarizing other 21 people's work, and so that was what the conclusion 22 was from this -- from these manuscripts by
238 1 In this paper what we did was we took FEC 2 and BC as pure compounds and then used a one 3 electron reducing agent to reduce these things to 4 generate the insoluble components that would 5 potentially be SEI components, and then we 6 characterized those SEI components. There is no 7 battery cycling, no battery testing in this. This 8 is a basic science investigation of the reduction 9 -- the reduction reactions of FEC and BC. 10 Q And that is what is shown here in the 11 subtitle of the paper. It is understanding 12 lithium-ion battery electrolyte additives -- 13 A Yes. 14 Q -- and SEI formation? 15 A Yes. That is what we did. It is also one 16 of my most highly cited papers. 17 Q And FEC and BC are non-nitrile electrolyte 18 additives, right? 19 A They are not nitriles. 20 Q Going to Exhibit 2046 and turning to PDF 21 page 9. 22 A Yes, carboxylic esters.	240 1 Marshall Smart. 2 Q And those are --in the footnotes or end 3 notes rather those are notes 39 through 41? 4 A Yeah, 39 through 41 are a bunch of papers 5 by Marshall Smart who is NASA's jet propulsion 6 laboratory. Did a sabbatical with him, good guy. 7 Q All of those predate the priority date of 8 the '131 patent? 9 A I would have to look down at the bottom of 10 it, but yeah, those papers were mid 2000s, I 11 think. 12 Q One of them is '99. 13 A 99, yeah. Marshall has been at this a 14 long time. 15 Q And so it was known then as early as the 16 mid 2000s or 1999 that esters with shorter alkyl 17 chains form more resistive and less protective 18 SEIs compared to longer chain counterparts? 19 A You know that is what -- what is stated 20 there. You know, in terms of the ionic 21 conductivity, they probably measured that. I 22 mean, understanding the SEI in the early 2000s,

241 1 was, you know, I wouldn't say super great, but 2 that is what -- that is the conclusions that 3 Marshall -- those are the conclusions that 4 Marshall made so from those different ones. 5 Q And do you disagree with that? 6 A Those are what Marshall's conclusions are. 7 I mean I think, you know, the -- it says here the 8 methyl propionate is particularly promising, you 9 know, but it certainly suggests that various 10 esters are potentially useful. 11 Q As you reviewed Dr. Wheeler's declaration, 12 Exhibit 2015, did you identify anything that you 13 disagreed with? 14 A I don't. I mean there were definitely 15 some of his opinions that I didn't necessarily 16 agree with, but I don't remember all the different 17 specific things as to each -- everything that I 18 disagreed with. 19 Q We've been going about another hour. I 20 would like to take a 10 minute break and come back 21 and hopefully wrap up pretty soon. 22 (Recess, 4:34 to 4:50 p.m.)	243 1 much propyl propionate to use? 2 A Yes, because the description of Zeng 3 describes how to make the electrolyte formulation 4 so they would know how much propyl propionate to 5 use. 6 Q Is Zeng, in your opinion, clear as to how 7 much propyl propionate to use? 8 A Let me look at Zeng again. I mean, in 9 embodiment 1 it says that the different solvent 10 mixtures, ethylene carbonate, propylene carbonate, 11 diethyl carbonate, fluorobenzene, ethyl propionate 12 and propyl propionate are mixed in mass ratio of 13 25 to 10 to 30 to 5 to 10 to 20. 14 Q So does a POSITA reading Zeng know how 15 much propyl propionate to use in the base solvent 16 mixture? 17 A Yes. 18 Q Okay. And is there any reason provided in 19 Zeng to alter the amount of propyl propionate in 20 the base solvent mixture? 21 A Could you state the question again? 22 Q Is there any reason provided in Zeng why a
242 1 Q In your declaration going to paragraph 84, 2 which is on page 52 of 131. 3 A Let me get back there. 4 Q Yes. 5 A 52. 6 Q Of 131, that is the 52 in the bottom 7 right-hand corner? 8 A Yes, okay. 9 Q And I assume you didn't do 131 pages just 10 because this was the '131 patent, it is just a 11 happy coincidence. 12 A Didn't even notice. 13 Q You provide an opinion that Zeng 14 embodiments 4 and 6 have the compositions that you 15 show in your report? 16 A Yes. 17 Q Correct. And the PP shown as part of the 18 solvent on the left-hand side refers to propyl 19 propionate, correct? 20 A Yes. 21 Q In your opinion, does a person 22 implementing Zeng's embodiments 4 or 6 know how	244 1 POSITA should alter the amount of propyl 2 propionate in the base solvent mixture? 3 A Not that I'm aware of, but, you know, a 4 POSITA might vary things somewhat to try to 5 optimize performance. 6 Q Is the same true of every other component 7 of the electrolyte solution? 8 A What do you mean? I'm not -- 9 Q Might a POSITA vary any constituent part 10 of the electrolyte solution to try to optimize 11 performance? 12 A I mean, that's frequently what -- in terms 13 of research and development what a POSITA would 14 do, they would vary, you know, modify things to 15 get optimal performance. 16 Q Is there any suggestion that Zeng's 17 embodiments 4 or 6 are deficient or somehow 18 lacking? 19 A I mean, the ones give -- some of the -- 20 good performance, 4 and 6 both give some of the 21 better performance that are described. So I would 22 think those two formulations are good ones to

245 1 investigate. 2 Q And they're both worse performance than 3 embodiments 5 and 2, right? 4 A I mean, they're -- you know, they're not 5 -- in the one example, they're the retention rate 6 which is in the table slightly lower. But as I've 7 said before, there are other factors that may, you 8 know, be better for those different formulations. 9 But, you know, there are certainly some of the -- 10 they're two of the better formulations. 11 Q A POSITA would not need to look beyond 12 Zeng to determine how much propyl propionate to 13 use, correct? 14 MR. STEIN: Objection, asked and answered. 15 A Could you state that again? 16 Q A POSITA would not need to look beyond 17 Zeng to know how much propyl propionate to use, 18 correct? 19 A I mean, I don't think you would need -- as 20 I've said in my declaration, I don't think you 21 would need to go beyond Zeng, although there are 22 other, as I've said, other examples that would	247 1 how much propyl propionate to use as was indicated 2 in Dr. Wheeler's declaration. 3 Q In the base solvent, correct? 4 A It tells you how much propyl propionate to 5 use in the electrolyte formulation. 6 Q And I think that is -- 7 A You -- 8 Q I think that is the thing where we 9 disagree, because I think Dr. Wheeler has provided 10 the opinion that you don't know how much of the 11 base solvent to use with the additives and you 12 disagree with that, correct? 13 A State that again. 14 Q Dr. Wheeler's provided an opinion that you 15 don't know how much of Zeng's base solvent to use 16 with the additives? 17 MR. STEIN: Objection to the form. 18 A So I would have to look back at 19 specifically what you are talking about in 20 Mr. Wheeler's opinion, but in my opinion in, you 21 know, the first part of my declaration, I said 22 that, you know, the electrolyte formulation in the
246 1 suggest how much propyl propionate to use, but 2 Zeng does indicate how much propyl propionate to 3 use. 4 Q And to be clear, I'm asking with respect 5 to the base solvent mixture. 6 A Yes. Once again, the base solvent mixture 7 it is clear what is used is the -- so the base, 8 the mass ratios that are listed there in the 9 table. 10 Q Going to your paragraph 174 you suggest 11 combining Zeng with Matsuoka, correct? 12 A Yes. 13 Q The teaching suggestion or motivation you 14 provide in paragraph 174 is to the extent that 15 Zeng's recipe is hypothetically unclear about how 16 much propyl propionate to use, that would have 17 prompted the POSITA to consider Matsuoka's 18 teachings about appropriate amounts of propyl 19 propionate to use, right? 20 A Yes, that is what it indicates, but as I 21 said earlier in the declaration, I agree with your 22 expert that Zeng provides the information as to	248 1 concentration of propyl propionate is defined by 2 Zeng. 3 Q So if Zeng does teach how much propyl 4 propionate to use, either in the base solvent or 5 in the total mixture, a POSITA would not need to 6 have relied on Matsuoka to learn the, quote, 7 appropriate amount of PP to include in Zeng's 8 electrolyte, correct? 9 A I believe that is what I'm stating in the 10 first section of my declaration when I'm talking 11 about just combining Zeng and Sunose and that is 12 all that is needed. That was ground 1A. 13 Q So are you no longer relying on Matsuoka? 14 A I'm not saying that. It is just a 15 secondary motivation. 16 Q Other than Matsuoka allegedly teaching a 17 POSITA how much propyl propionate to use in the 18 event that Zeng is unclear about how much propyl 19 propionate to use, you don't provide another 20 motivation, correct? 21 MR. STEIN: Objection to form. 22 A Sorry, I don't really understand that

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249 1 question. Can you say that again? 2 Q Other than Matsuoka allegedly teaching a 3 POSITA how much propyl propionate to use in the 4 event that Zeng is unclear about how much propyl 5 propionate to use, you don't provide another 6 motivation for a POSITA to turn to Matsuoka, 7 correct? 8 MR. STEIN: Objection to the form, 9 misstates testimony. 10 A Once again, I'm utilizing both of those 11 two examples of those two references. And the 12 amount of propyl propionate is indicated in Zeng, 13 and then it is, as stated there, if it is 14 hypothetically unclear, then I could or a POSITA 15 could go to Matsuoka to see the weight proportion 16 range for propyl propionate. 17 Q Why would a POSITA using Matsuoka only use 18 it for the percentage of propyl propionate and not 19 any of the other additives or solvents? 20 A Because -- 21 MR. STEIN: Objection, calls for 22 speculation.	251 1 solvent, propyl propionate is one of those 2 possibilities, and you can add it in that weight 3 percentage. 4 Q There are other possibilities too, 5 correct? 6 A That is my interpretation of it. 7 MR. COX: Objection, nonresponsive. 8 Q There are other possibilities too, right? 9 A Can you define what you mean by other 10 possibilities too? 11 Q There are other non-nitrile based solvents 12 that you could add, correct? 13 A There are several other -- there are 14 several non-nitrile based solvents that are 15 described in Matsuoka, yes. 16 Q And I'm sorry, non-nitrile based 17 additives, correct? 18 MR. STEIN: Objection to the form. 19 A That is what Matsuoka is describing. In 20 the concentration ranges that they're using, I 21 would refer to them as co-solvents, but they refer 22 to them as non-nitrile additives.
250 1 A Because the propyl propionate is one of 2 the solvents that is utilized in Matsuoka and that 3 Matsuoka specifically states that the non-nitrile 4 additive is added in a weight percentage of the 5 total electrolytes. And so a POSITA might choose 6 to use propyl propionate in the preferred weight 7 ranges that are described by Matsuoka. 8 Q But my question is, why only propyl 9 propionate? Why not any of the other solvents or 10 other things that are listed as weight percentages 11 in Matsuoka? Why would a POSITA only alter the 12 amount of propyl propionate and not anything else 13 if they're turning to Matsuoka? 14 MR. STEIN: Same objection, asked and 15 answered. 16 A Can you say that again? 17 Q Why would a POSITA turning to Matsuoka 18 only turn to it to determine a weight percentage 19 of propyl propionate and not to determine a weight 20 percentage of any other solvent or additive? 21 A Well, because in my opinion, it suggests 22 that adding -- you can add the non-nitrile based	252 1 Q And what are those other non-nitrile based 2 additives that Matsuoka teaches? 3 A Well, in Matsuoka there are a lot of other 4 possibilities of non-nitrile additives of which 5 propyl propionate is one, but the list is -- there 6 is a fairly significant number of them. 7 Q Among that list why select propyl 8 propionate to be the only additive or solvent 9 whose weight percentage you alter as opposed to 10 anything else? 11 MR. STEIN: Objection, asked and answered. 12 A I don't understand the question though, 13 can you say that again? 14 Q Matsuoka lists a large number of 15 non-nitrile additives, correct? 16 A Yes. 17 Q And you are relying on Matsuoka to 18 determine the weight percentage of propyl 19 propionate to use, correct? 20 A Yes. 21 Q Are any of the other non-nitrile additives 22 also used in Zeng?

253 1 A Some of them are. 2 Q And why would a POSITA not look to 3 Matsuoka to alter those weight percentages? 4 A Well, as I said, I think what it provides 5 is the option of adding these non-nitrile solvents 6 or non-nitrile additives to the electrolyte 7 formulation. And propyl propionate is one 8 possibility that is listed and that would give a 9 POSITA an idea of how much propyl propionate to 10 add from that. 11 Q But didn't you testify that Zeng already 12 teaches a POSITA how much propyl propionate to 13 add? 14 MR. STEIN: Objection. 15 A Yes, I did. 16 Q And so there is no reason for a POSITA to 17 turn to Matsuoka if Zeng already teaches how much 18 propyl propionate to use, correct? 19 MR. STEIN: Objection, asked and answered. 20 A Well, once again it is a secondary 21 reference which is just providing additional 22 support for how much propyl propionate to add --	255 1 the total electrolyte formulation. 2 Q What does Matsuoka add that a POSITA would 3 not know from the other references you are 4 combining it with? 5 A Say that again, I'm not -- 6 Q What does Matsuoka add that a POSITA would 7 not know from the other references that you were 8 combining it with? 9 A It is adding the same thing. It is adding 10 the propyl propionate. That is already in the 11 other reference, it is just a secondary reference. 12 Q So Matsuoka is adding what is already 13 known in the other references? 14 A As I said in the declaration, it is 15 already known in Zeng what -- how much propyl 16 propionate to add. That is what is stated in the 17 reference. And this is just another example of 18 how much propyl propionate to add, so another 19 example of why a POSITA would add that 20 concentration or that quantity of propyl 21 propionate. 22 Q So in your opinion, there is nothing in
254 1 to add. 2 Q And that is a different amount than what 3 is added in Zeng? 4 A Well, in terms of Zeng, there is, you 5 know -- as it was described in Zeng, from the 6 description there is a range of what the 7 concentration and the total electrolyte 8 formulation would be. Which is there is also a 9 range in Matsuoka and part of those ranges overlap 10 with each other. 11 Q And so why would you change the amount 12 that Zeng has already selected in embodiments 4 13 and 6? 14 A I'm not saying that I would change the 15 concentrations from Zeng. I'm just saying 16 Matsuoka offers an additional prior art example of 17 how much propyl propionate to add to an 18 electrolyte formulation. I'm not saying that I'm 19 changing the concentrations from Zeng. This is 20 just an additional reference showing the 21 importance of propyl propionate and the 22 concentration of the propyl propionate to add to	256 1 Zeng that fails to teach the limitation of the 2 claims? 3 MR. STEIN: Objection, asked and answered. 4 A I'm sorry, what are you asking? Could you 5 restate the question in a different fashion 6 because I think you had two double negatives or 7 something. 8 Q I said there is nothing in Zeng -- yeah, 9 you are right, I will withdraw that question. 10 In your opinion, Zeng itself teaches all 11 the limitations of the claims to a person of skill 12 in the art, correct? 13 A So in my declaration starting on page 36 14 where I describe ground 1A, and at this time at 15 Zeng and Sunose renders obvious claims 1, 2, 4 16 through 7 and et cetera, I describe why that is my 17 opinion going there through page 69, yes. 18 Q And yes, sorry, Zeng and Sunose, in your 19 opinion? 20 A Yes. 21 Q Zeng and Sunose alone teach all the 22 limitations of those claims, correct?

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257 1 A That is what I'm saying in ground 1A, yes. 2 Q Including how much propyl propionate to 3 use? 4 A That is what I state in the description on 5 – let me see what page it is. Wherein the total 6 weight of the propyl propionate Z is between – 7 the Y and Z is less than .3 and greater than .1 on 8 page 59. 9 Q And so in your opinion, there is nothing 10 in Zeng and Sunose missing that you need Matsuoka 11 to fill? 12 MR. STEIN: Objection to the form and 13 asked and answered. 14 A I believe I've answered that question 15 several times and I believe that is what my ground 16 1A states. 17 MR. COX: I will pass the witness. 18 MR. STEIN: We have no questions. 19 (Deposition adjourned at 5:11 p.m.) 20 21 22	
258 1 CERTIFICATE OF SHORTHAND REPORTER 2 I, Susan S. Klinger, the officer before 3 whom the foregoing deposition was taken, do hereby 4 certify: 5 That BRETT LUCHT, PH.D., the witness whose 6 deposition is hereinbefore set forth, was duly 7 sworn by me before the commencement of such 8 deposition and that such deposition was taken 9 before me and is a true record of the testimony 10 given by such witness. 11 I further certify that the adverse party, 12 ZHUHAI COSMX BATTERY CO., LTD., was represented 13 by counsel at the deposition. 14 I further certify that the deposition of 15 BRETT LUCHT, PH.D., occurred virtually on 16 Wednesday, October 22, 2025, commencing at 17 10:02 AM to 5:11 PM. 18 I further certify that I am not related to 19 any of the parties to this action by blood or 20 marriage, I am not employed by or an attorney to 21 any of the parties to this action, and that I am 22 in no way interested, financially or otherwise, in the outcome of this matter. IN WITNESS WHEREOF, I have herunto set my hand on the 28th of October, 2025.  Susan S. Klinger, RMR-CRR, CSR Texas CSR 6531, Exp: 10/31/27 California CSR 14487, Exp: 11/30/26	

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1175 Peachtree Street NE 100 Colony Square Suite 2000
Atlanta, GA 30361

Re: Deposition of **Brett Lucht, Ph.D.**

Date: 10/22/2025

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

Dear Sir/Madam,

Attached please find the above-referenced deposition transcript. If applicable, signature is required within 30 days from the date of receipt of this letter.

In accordance with the disposition of signature at the deposition or the pertinent jurisdictional rules, the deponent should follow these instructions to complete the Errata Sheet:

(1) Read the transcript and indicate any corrections or changes in ink on the enclosed Errata Sheet. Please include page and line numbers. If more space is needed for corrections, please use a blank sheet of paper. If no corrections or changes are necessary, please indicate "no corrections" or "no changes" on the Errata Sheet.

(2) Sign and date the Errata Sheet and Acknowledgement of Deponent/Affiant pages.

(3) Please return the executed Errata Sheet and Acknowledgement pages to the address indicated below, submit via fax (888-503-3767) or email (transcripts@planetdepos.com).

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Sincerely,

Production Department
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451 Hungerford Drive
Suite 400
Rockville, Maryland 20850

No. 604184

No. 604184

Re: Deposition of **Brett Lucht, Ph.D.**

Date: 10/22/2025

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Page	Line	Correction/Change and Reason
29	15	deprotonate species
33	1	Pawcatuck, Connecticut
50	17	viscous liquid
76	15	up to 1.3 or 1.4
79	6	LiPF ₆
90	15	porous
97	6	thicker before calendaring.
114	17	is directly related
143	4-5	is that they have a packing density of
152	18	the layered application
154	6-7	what the data is from.
154	9	research projects
168	12	represented by the formula
190	21	additives and salt.
190	22	additives and
193	9	ethyl acetate has four carbons in it
197	22	hexyl for six
206	12	Samsung SDI
210	9	slower you charge it
235	18	FEC and VC
236	17	FEC and the VC

11/5/25

(Date)



(Signature)

No. 604184

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237	9	can VC, which VC and FEC
238	2	and VC
238	9	of FEC and VC

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(Date)


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ACKNOWLEDGMENT OF DEPONENT

I, Brett Lucht, 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.

11/5/25

(Date)



(Signature)

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