1 UNITED STATES PATENT AND TRADEMARK OFFICE
2 BEFORE THE PATENT TRIAL AND APPEAL BOARD
3
4 _____
5 SAMSUNG ELECTRONICS CO., LTD.,
6 Petitioner
7 v.
8 RJ TECHNOLOGY LLC,
9 Patent Owner
10 _____
11 Case IPR2023-01183
12 Patent No. 7,749,641
13 _____
14
15
16 DEPOSITION OF MARC JUZKOW
17 TAKEN REMOTELY BY VIDEOCONFERENCE
18 May 3, 2024
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24 Reported by: Mary Ann Payonk
25 Job No. 1403

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3
4 May 3, 2023
5 7:00 a.m. Pacific
6
7 DEPOSITION OF MARC JUZKOW taken remotely by
8 videoconference pursuant to Notice and agreement of
9 counsel, stenographically reported by Mary Ann Payonk,
10 Shorthand Reporter and Notary Public, CA CSR No. 13431.
11 All attorneys participating in this deposition
12 acknowledge that the reporter is not physically present
13 in the deposition room and there is no objection to the
14 oath being administered remotely.
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1 APPEARANCES:
2 ON BEHALF OF PETITIONER:
3 ANDREW SOMMER, ESQ.
4 GREENBERG TRAURIG, LLP
5 1750 Tysons Boulevard
6 Suite 1000
7 McLean, VA 22102
8 United States
9
10 STEPHEN E. PULLEY, ESQ.
11 GREENBERG TRAURIG, LLP
12 222 South Main Street,
13 Suite 1730
14 Salt Lake City, UT 84101
15
16 ON BEHALF OF PATENT OWNER
17 GEORGE STAMATOPOULOS, ESQ.
18 KOBRE & KIM
19 800 Third Avenue
20 New York, New York 10022
21
22 MINGHUI YANG, ESQ.
23 CARMICHAEL IP, PLLC
24 8607 Westwood Center Drive, Suite 270
25 Tysons, VA 22182

1 Appearances (Cont'd.):
2 ROBERT ZHOU, ESQ.
3 KOBRE & KIM
4 43rd Floor
5 HKRI Centre One, HKRI Taikoo Hui
6 288 Shimen Yi Road
7 Shanghai, 200041
8 People's Republic of China (PRC)
9
10 ALSO PRESENT:
11 Deric Shults, videographer, BlueBear Law
12 Anniliese Coleman, BlueBear Law
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Page 5

1 THE VIDEOGRAPHER: We are now on the record.
2 The time is 7:02 AM Pacific Standard Time. Today's date
3 is May 3, 2024. This begins the remote video-recorded
4 deposition of Marc Juzkow in the matter of Samsung
5 Electronics Co., Ltd., versus RJ Technology LLC filed in
6 the United States Patent and Trademark Office, Patent
7 Number 7,749,641.
8 I will be recording this deposition remotely
9 and the reporter will swear in the witness remotely
10 pursuant to Federal Rules of Civil Procedure and the
11 stipulated deposition protocol in this case.
12 My name is Deric Shults, and I'm with BlueBear
13 Solutions. Our court reporter is Mary Ann Payonk.
14 Counsel, please identify yourselves and state
15 whom you represent.
16 ATTORNEY STAMATOPOULOS: George Stamatopoulos
17 with Kobre & Kim for patent owner, RJ Technology.
18 ATTORNEY SOMMER: Andrew Sommer of Greenberg
19 Traurig on behalf of petitioner, Samsung Electronics
20 Co., Ltd.
21 THE VIDEOGRAPHER: Are there any stipulations
22 or announcements from either party?
23 ATTORNEY SOMMER: I'd just like for the record
24 to note that I'm here with my colleague Steve Pulley of
25 Greenberg Traurig. He may be leaving the deposition

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1 early, but he is here at the moment.
2 ATTORNEY STAMATOPOULOS: And I'm likewise here
3 with my colleague Robert Zhou, also of Kobre & Kim.
4 THE VIDEOGRAPHER: Will the court reporter
5 please swear in the witness.
6 THE REPORTER: Yes. I'll first give you my
7 California license number, which is 13431. And now I'll
8 swear the witness.
9 MARC JUZKOW,
10 called as a witness, having been duly
11 sworn, was examined and testified as
12 follows:
13 EXAMINATION
14 BY ATTORNEY STAMATOPOULOS:
15 Q. Good morning, Mr. Juzkow.
16 A. Good morning.
17 Q. How are you today?
18 A. I'm good. Doing good. Yourself?
19 Q. Doing well.
20 Mr. Juzkow, have you ever been deposed before?
21 A. Yes.
22 Q. How many times?
23 A. 10.
24 Q. And in regard to what cases or what types of
25 cases have you been deposed before?

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1 A. Mostly IP-related, but also some product
2 liability cases.
3 Q. Have you ever been deposed in a case before
4 the PTAB before?
5 A. Yes.
6 Q. How many times?
7 A. Seven.
8 Q. And have you ever testified at trial in a
9 District Court case?
10 A. No.
11 Q. Now, you understand that your testimony here
12 today is under oath, just like it would be in court?
13 A. Yes.
14 Q. And you have to give accurate and complete
15 answers to my questions here today.
16 Do you understand that?
17 A. Yes.
18 Q. And is there any reason why you can't give
19 accurate and complete testimony here today?
20 A. No.
21 Q. All right. Now, I'll ask you, when you answer
22 my questions, to answer with words as opposed to
23 gestures or nonwords. That's for the benefit of the
24 record and the court reporter.
25 Is that fair?

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1 A. Yes.
2 Q. And if I ask a question that seems unclear to
3 you, you'll let me know?
4 A. Yes.
5 Q. Great.
6 And at times, your lawyer may object to a
7 question that I've asked. Do you understand that even
8 if your lawyer objects, you should still answer my
9 question unless instructed by your lawyer not to answer?
10 A. Yes.
11 Q. All right. And if I ask a question and you
12 provide an answer and you can think of something later
13 that's relevant to a question that I've asked you, let
14 me know so that we can go back to that question.
15 Is that fair?
16 A. Yes.
17 Q. Great.
18 And, sir, other than your laptop, do you have
19 anything, any other electronic devices with you in the
20 room today?
21 A. I have my phone, and I have a second laptop,
22 which is for a different purpose.
23 Q. Is that second laptop off?
24 A. Yes.
25 Q. And you understand that during the course of

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1 this deposition, you should not be communicating with
2 anybody else outside the room?
3 A. Yes, I understand.
4 Q. Do you have any notes with you?
5 A. No, I don't.
6 Q. Do you have the exhibits? So let me back up.
7 You provided a declaration in this case.
8 Correct?
9 A. Yes.
10 Q. And there were a number of exhibits attached
11 to the declaration.
12 A. Yes.
13 ATTORNEY SOMMER: Object to form.
14 BY ATTORNEY STAMATOPOULOS:
15 Q. And do you have those exhibits with you here
16 today or in the room with you today?
17 A. Yes.
18 Q. Do you have them in electronic form?
19 A. Yes.
20 Q. Okay.
21 Sir, what did you do to prepare for your
22 testimony today?
23 ATTORNEY SOMMER: I'm going to caution the
24 witness not to reveal the substance of any discussions
25 that he may have had with counsel, but you may answer in

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1 terms of general things that you did to prepare.
2 A. Yes, I spoke to counsel several times, and I
3 read through declarations, patents. And that's how I
4 prepared.
5 BY ATTORNEY STAMATOPOULOS:
6 Q. All right. And how many times, approximately,
7 did you speak with counsel?
8 A. Three.
9 Q. And roughly how many hours did those
10 conversations last in total?
11 A. Seven.
12 Q. Roughly seven?
13 A. Uh-huh.
14 Q. Okay. And you met with Mr. Sommer.
15 Is that fair?
16 A. Yes.
17 Q. Did you meet with anyone else?
18 A. Yes. Mr. Colin and --
19 Q. Okay, and -- sorry. Go ahead.
20 A. Mr. Pulley.
21 Q. Other than those two gentlemen or three
22 gentlemen, did you speak with anybody else?
23 A. No.
24 Q. All right. And you said that you reviewed
25 certain documents in preparation for your deposition.

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1 Correct?
2 A. Yes.
3 Q. And those documents included your declaration?
4 A. Yes.
5 Q. What other documents did you review?
6 A. Only the documents within -- that were
7 provided within my declaration.
8 Q. Okay. So no documents other than those listed
9 in your declaration. Fair?
10 A. Fair.
11 Q. Okay. Now, you submitted a declaration in
12 this case. Can you walk me through the process at a
13 high level of how you prepared your declaration?
14 ATTORNEY SOMMER: I'm going to caution the
15 witness not to reveal the substance of any particular
16 discussions that you've had with counsel regarding the
17 matter. But insofar as you can answer generally about
18 the process, you may do so.
19 A. So in general, I was provided with a number of
20 references. I went through all the references. I
21 examined them. I determined which ones we should use,
22 which ones I should not put in my deposition, which ones
23 I should put in my deposition. And then in writing of
24 the deposition, there was a collaboration effort.
25 BY ATTORNEY STAMATOPOULOS:

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1 Q. So when you say your deposition, did you mean
2 to say --
3 A. Sorry.
4 Q. -- your declaration?
5 A. Yes, my declaration.
6 Q. Okay. So to be clear, you were provided with
7 certain documents. Correct?
8 A. Yes.
9 Q. And then you looked at those documents, right?
10 A. Yes.
11 Q. And there were certain documents that you
12 decided to put into your declaration. Correct?
13 A. Yes.
14 Q. And then there were certain documents that you
15 decided not to put into your declaration, right?
16 A. Correct.
17 Q. How did you decide which documents not to
18 include in your declaration?
19 ATTORNEY SOMMER: I'll caution the witness not
20 to identify any particular documents. But you can
21 answer the question generally as long as you don't
22 disclose the identity of the information that you
23 reviewed or discussions with counsel about them.
24 A. When I -- before I read through them, I read
25 through the case, I read through the patents. I got an

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1 understanding of what this case was about. Then I went
2 through the documents and I looked at which ones would
3 be useful to include in the declaration and which ones
4 would not be useful to include in the declaration.
5 BY ATTORNEY STAMATOPOULOS:
6 Q. And was that your decision exclusively? Yes
7 or no.
8 ATTORNEY SOMMER: Object to form.
9 A. Yes.
10 BY ATTORNEY STAMATOPOULOS:
11 Q. Okay. So how did you decide which documents
12 were useful to include in your declaration?
13 ATTORNEY SOMMER: Again, I'm going to caution
14 the witness not to reveal the substance of any specific
15 discussions with counsel or the identity of documents
16 that you may have reviewed that are not included in your
17 declaration. But you can answer the question if you
18 can.
19 A. I looked at the documents and I determined
20 whether or not there was any useful information that we
21 could add, if I could add it to my -- to any of the
22 grounds in towards the -- you know, in reviewing the
23 claims and in providing the different grounds based on
24 obviousness and anticipation, I decided which ones would
25 be useful and which ones would provide no value.

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1 BY ATTORNEY STAMATOPOULOS:
2 Q. And just to be clear, my questions are not
3 about conversations with counsel. I'm not interested in
4 any of those.
5 My question is exclusively about the way that
6 you personally decided how to include or not to include
7 a particular document in your declaration.
8 Is that fair?
9 Do you understand that?
10 A. Yes.
11 Q. Okay. So when you say certain documents were
12 useful to include in your declaration, what do you mean
13 by that?
14 A. Documents that I was able to use within the
15 grounds to prove obviousness and anticipation.
16 Q. And so to the extent that a document was not
17 useful for you to prove obviousness or anticipation, you
18 decided not to include that in your declaration.
19 Correct?
20 A. Yes.
21 Q. And how many documents in total did you review
22 during the process of deciding whether to include or not
23 to include a particular document in your declaration?
24 A. I don't recall.
25 Q. Fair to say that it was more documents than

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1 those that are listed in your declaration in the
2 Materials Considered section?
3 A. Yes.
4 Q. Roughly how many more documents did you review
5 in this process that were not included in the Materials
6 Considered section of your declaration?
7 A. Maybe eight to 10.
8 Q. Did any of those documents relate to
9 lithium-ion battery technology?
10 A. Yes.
11 Q. Did any of those documents relate to the
12 charge voltages applied to lithium-ion batteries?
13 ATTORNEY SOMMER: Object to form.
14 A. Not that I recall specifically.
15 BY ATTORNEY STAMATOPOULOS:
16 Q. Do you recall definitively if any of the
17 documents that you reviewed and decided not to include
18 in your declaration related to the charge voltages
19 applied to lithium-ion battery technology? Sorry, to
20 lithium-ion batteries.
21 A. I don't recall specifically. I wrote the
22 declaration one year ago.
23 Q. Did any of the documents that you reviewed and
24 decided not to include in your declaration relate to the
25 capacities of either the anode or the cathode of

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1 lithium-ion batteries?
2 A. They may have, but I don't recall any specific
3 ratios that were determined within those documents.
4 Q. And you provided a number of opinions in your
5 declaration. Correct?
6 A. Yes.
7 Q. And to the extent that a particular document
8 did not support those opinions, you decided not to
9 include it in your declaration. Fair?
10 ATTORNEY SOMMER: Object to form.
11 A. If they didn't relate to this case, I did not
12 use them.
13 BY ATTORNEY STAMATOPOULOS:
14 Q. My question's a little bit different.
15 If a particular document did not support your
16 opinions, you decided not to include it?
17 ATTORNEY SOMMER: Object to form.
18 A. If I looked at it and realized that it would
19 not be useful towards my opinions, then I did not use
20 it.
21 BY ATTORNEY STAMATOPOULOS:
22 Q. And to be clear, you were asked -- let me back
23 up.
24 Who did you communicate with in connection
25 with providing testimony in this case?

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1 A. Mr. Sommer.
2 ATTORNEY SOMMER: Object to form.
3 A. Mr. Sommer, Mr. Colin, Mr. Pulley.
4 BY ATTORNEY STAMATOPOULOS:
5 Q. And you were asked to provide opinions that
6 would show or tend to show that the claims in the '641
7 patent are either obvious or anticipated in light of the
8 prior art?
9 ATTORNEY SOMMER: I'm going to object to the
10 question and instruct the witness not to answer, because
11 he's asking for the substance of a communication.
12 Insofar as the task that you were asked to perform is
13 revealed in your declaration, you can testify as to it.
14 BY ATTORNEY STAMATOPOULOS:
15 Q. So you provided opinions -- I'll withdraw the
16 question.
17 So you've provided opinions concerning whether
18 the claims in the '641 patent are obvious or
19 anticipated. Correct?
20 A. Yes.
21 Q. And you were retained by counsel for Samsung
22 to provide those opinions. Correct?
23 A. Yes.
24 Q. And you decided not to include certain
25 documents that you reviewed in connection with forming

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1 those opinions in your declaration. Correct?
2 A. Yes.
3 Q. And you decided not to include those documents
4 because they were not useful in forming your opinions.
5 Correct?
6 A. Yes.
7 Q. And so how did you decide whether a document
8 was useful or not?
9 A. As I said, it was over a year ago that I wrote
10 this. One comes to mind. One was a lithium metal
11 battery; and therefore, there was no ratios involved.
12 It was not a lithium-ion battery so I discounted it.
13 Q. What do you mean by a lithium metal battery?
14 A. Lithium metal as the anode. And it was a
15 rechargeable battery. It was a lithium metal anode
16 versus a cathode. And a cathode may be similar to a
17 lithium-ion type cathode. But there was no graphite
18 anode and therefore, no carbon anode. Therefore, there
19 was no ratios involved. And therefore, it was not
20 useful and it did not apply to my work.
21 Q. Why is it that a battery with a lithium anode
22 would not be relevant to your opinions in this case?
23 ATTORNEY SOMMER: Object to form.
24 A. The ratio would be infinite.
25 BY ATTORNEY STAMATOPOULOS:

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1 Q. And when you say "the ratio," what ratio are
2 you referring to?
3 A. Negative electrode versus positive electrode.
4 Q. And why is it that that ratio would be
5 infinite in the case of a lithium anode battery?
6 ATTORNEY SOMMER: Object to form.
7 A. There's a continuous supply of lithium; and
8 therefore, you do not have to worry about what the total
9 capacity of the anode is.
10 It's a very -- it's maybe not infinite, but
11 it's a very large number and there is no irreversible
12 capacity specifically with the lithium metal anode. You
13 always have lithium available to be transferred to your
14 cathode, and it's just not -- it's not part of the '641
15 patent.
16 If I look back at the '641 patent, it most
17 likely -- but I'd have to look back, but it most likely
18 speaks specifically about lithium-ion batteries.
19 BY ATTORNEY STAMATOPOULOS:
20 Q. Now, you mentioned a term, "irreversible
21 capacity" just now, right?
22 A. Yes.
23 Q. What is an irreversible capacity?
24 A. Irreversible capacity is where let's say you
25 move lithium-ions from the cathode into the anode.

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1 Those ions may -- the lithium-ions may react with the
2 anode active material and they may form compounds that
3 will not deintercalate from the anode back to the
4 cathode.
5 So they react. They form other compounds.
6 For example, lithium carbonate is one, just one example.
7 And therefore, that lithium is lost and it will not
8 transfer back and forth during subsequent cycles.
9 Q. Let me try to unpack that a little bit.
10 So you mentioned that the ions, the
11 lithium-ions may react with the anode active material.
12 Did I get that right?
13 A. Yes.
14 Q. What is the active material?
15 A. The active material would be a carbon.
16 Q. So the anode contains a carbon. Fair?
17 A. Yes.
18 Q. And the active material of a lithium-ion
19 battery is -- let me withdraw that question.
20 The active material of the anode of a
21 lithium-ion battery would be a carbon within the anode.
22 Correct?
23 A. Yes.
24 Q. Is there also inactive material in the anode?
25 A. Yes.

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1 Q. And what is the inactive material in the
2 anode?
3 ATTORNEY SOMMER: Object to form.
4 A. Binders.
5 BY ATTORNEY STAMATOPOULOS:
6 Q. To be clear, those -- oh, sorry. Did I cut
7 you off?
8 A. I was just going to say binders. Typically,
9 one binder type. Sometimes -- sometimes two.
10 Q. And what is a binder?
11 A. A binder, you can think of it as an adhesive
12 where it binds, adheres the carbon particles together
13 and it adheres the carbon particles to a metallic
14 current collector.
15 Q. And what is a typical form of binder in an
16 anode of a lithium-ion battery?
17 A. A typical one might be PVDF. All in capitals,
18 P-V-D-F.
19 Q. And when I asked you about the term
20 "irreversible capacity," you mentioned that the
21 lithium-ions may bind to or may react to the active
22 material. Is that a fair summary of what you testified?
23 A. Yes.
24 Q. Could the lithium-ions also react with
25 inactive material in the lithium-ion battery?

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1 A. They do not react with the binder.
2 Q. Aside from the active material in the
3 lithium-ion battery anode, could the lithium-ions react
4 with any other material in the anode?
5 A. The only other materials would be conductive
6 additives that improve the electrical connectivity of
7 the anode. And it's possible that they could also react
8 with that material.
9 Q. So I want to get a better sense of what the
10 irreversible capacity is.
11 Is it fair to say that the irreversible
12 capacity is a property of the anode that takes
13 lithium-ions out of circulation in subsequent charge and
14 recharge cycles?
15 A. Correct.
16 Q. And is the irreversible capacity attributable
17 exclusively to the active material of the anode?
18 A. I would say primarily.
19 Q. What do you mean by that?
20 A. Primarily for the most part a high percentage,
21 very high percentage. I don't have a number.
22 Q. Do you have an estimate of what that high
23 percentage might be?
24 A. No.
25 ATTORNEY SOMMER: Object to form.

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1 BY ATTORNEY STAMATOPOULOS:
2 Q. I'm sorry, just for the record, your counsel
3 objected.
4 What was your answer?
5 A. No.
6 Q. So you don't have, as you sit here today, a
7 rough estimate of what that percentage might be.
8 Is that fair?
9 A. That's correct.
10 Q. Could it be as high as 50 percent?
11 A. I don't have a number.
12 Q. So you can't say if it could be as high as
13 50 percent as you sit here today. Correct?
14 A. I don't have a number.
15 Q. So is it fair to say that the process of
16 preparing your declaration was collaborative between you
17 and counsel?
18 A. Yes.
19 Q. Can you please describe for me that
20 collaborative process at a high level without divulging
21 any substantive communications between you and counsel?
22 A. We all wrote certain sections, certain pieces
23 of it. And in the end, I did all the final
24 modifications of their work, my work.
25 You could consider them as scribes. We talked

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1 about, you know, the issues. We talked about, you know,
2 a lot of things, and then they helped with the writing
3 of it. And then in the end, you know, all the final
4 modifications to my writings and their writings were
5 done by myself.
6 Q. Roughly how much time would you say that
7 process took to complete?
8 A. Boy, it was a long time ago. If you want an
9 exact number, I could give you a better number after a
10 break.
11 Q. Okay. Let's -- how would you go about
12 determining the number, by the way?
13 A. Oh, by the hours that I prepared and entered
14 into my invoices.
15 Q. That's fair. We may come back to that.
16 A. Okay.
17 Q. Now, other than the materials that were
18 provided to you by counsel in connection with
19 potentially adding as exhibits to your declaration, did
20 you conduct any independent research to identify
21 materials that might be relevant to your declaration?
22 A. Yes.
23 Q. Can you describe to me that process?
24 A. I went through a list of names of people that
25 I worked with and I knew back in the time before the

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1 writing of this patent, and I looked for documents that
2 were prepared by them. And that's -- that was kind of
3 my process, was to look for experts in the field and
4 look at their documents that they had prepared.
5 Q. And were any of the materials that you
6 identified through this process eventually included in
7 your declaration?
8 A. Yes, at least one. I don't know -- I don't
9 recall exactly how many.
10 Q. And your declaration is Exhibit 1002 in this
11 proceeding. Correct?
12 A. Yes.
13 Q. And do you have your declaration in front of
14 you?
15 A. Yes.
16 (Exhibit No. 1002, previously marked, was
17 referenced and indexed.)
18 BY ATTORNEY STAMATOPOULOS:
19 Q. Would you turn to page 25 of your declaration.
20 A. Yes.
21 Q. And that page 25 includes a section 3 titled
22 Materials Considered. Correct?
23 A. Yes.
24 Q. And in paragraph 30 that's right underneath
25 that heading, you state: In developing my opinions, I

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1 have considered and relied upon the materials cited
2 herein, including the following materials. Correct?
3 A. Yes.
4 Q. And you have a list of documents in a table,
5 right?
6 A. Yes.
7 Q. Fair to say that some of the materials you
8 considered in connection with preparing your declaration
9 were actually not included in this table because you
10 determined they were not useful?
11 Is that fair?
12 ATTORNEY SOMMER: Objection to form.
13 A. There were documents that were not useful.
14 They -- as I explained earlier, they may not have been
15 the right type of lithium-ion -- or lithium cell.
16 That's an example.
17 BY ATTORNEY STAMATOPOULOS:
18 Q. You read those documents, right?
19 A. Yes.
20 ATTORNEY SOMMER: Object to form.
21 A. Yes.
22 BY ATTORNEY STAMATOPOULOS:
23 Q. And you considered them. Correct?
24 ATTORNEY SOMMER: Object to form.
25 A. Yes.

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1 BY ATTORNEY STAMATOPOULOS:
2 Q. And you decided not to include them. Correct?
3 A. Yes.
4 Q. Mr. Juzkow, you have worked in the lithium-ion
5 battery space for many years. Correct?
6 A. Yes.
7 Q. And there are different types of lithium-ion
8 batteries commercially available over the years.
9 Correct?
10 A. Yes.
11 Q. One type of lithium-ion battery is referred to
12 as a secondary lithium-ion battery cell. Correct?
13 A. Yes.
14 Q. Have you worked with secondary lithium-ion
15 battery cells?
16 A. Yes.
17 Q. Roughly how many years have you spent working
18 with lithium-ion battery cells?
19 A. 35.
20 Q. Sorry, let me add to my previous question.
21 Roughly how many years have you spent working
22 on secondary lithium-ion battery cells?
23 A. 35 years.
24 Q. And what is the meaning of the term "secondary
25 lithium-ion battery cell"?

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1 A. "Secondary" is analogous to rechargeable.
2 "Lithium" is the material that's used in the battery.
3 When you say "lithium-ions," that will mean that you do
4 not use lithium metal anodes.
5 So the difference -- the primary difference is
6 a secondary lithium metal battery versus a primary -- or
7 a secondary lithium-ion battery.
8 Q. And you mentioned the term "primary" there in
9 your response --
10 A. I --
11 Q. -- briefly.
12 A. That was -- strike that.
13 Q. Well, my next question was going to be, what
14 is a primary lithium-ion battery?
15 A. That would be a battery that would only
16 discharge one time.
17 Q. So is it fair to say that as long as a --
18 well, let me withdraw that question.
19 Is it fair to say that it is impossible to
20 recharge a primary lithium-ion battery?
21 A. You can recharge a primary lithium battery --
22 ion battery. I can't off the top of my head think of a
23 lithium-ion primary battery that's sold on the market.
24 Q. And why is it that primary lithium-ion
25 batteries are not sold on the market?

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1 ATTORNEY SOMMER: Object to form.
2 A. There's more value to the end user to have a
3 rechargeable battery that they can reuse over and over.
4 BY ATTORNEY STAMATOPOULOS:
5 Q. You testified just now that you can recharge a
6 primary lithium-ion battery.
7 Did I catch that correctly?
8 A. Yes. I -- any lithium-ion battery could be a
9 primary battery. You can also charge those lithium-ion
10 batteries. The alkaline cells that we use in our
11 standard AA alkaline cells, those are rechargeable.
12 There's many batteries that can be recharged. Even
13 though they're called primary batteries, some of them
14 can be rechargeable.
15 Q. So if both a primary and a secondary
16 lithium-ion battery can be recharged, what is it about a
17 secondary lithium-ion battery that makes it more
18 valuable to the end user?
19 A. The end user does not have to throw the
20 battery out after one use.
21 Q. Well, if a primary lithium-ion battery can be
22 recharged, why would the end user have to throw it out
23 after one use?
24 A. As I said, I don't know of any lithium-ion
25 batteries that have been sold as primary lithium-ion

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1 batteries.
2 Any battery can be a primary battery if you
3 just use it once, but I don't know of any that have been
4 sold on the market as primary lithium-ion batteries.
5 Lithium metal batteries, many lithium metal
6 batteries are sold as primary batteries.
7 Q. I want to focus -- I want to focus a little
8 bit on lithium-ion primary batteries, and here's my
9 question. There exists primary lithium-ion batteries.
10 Correct?
11 ATTORNEY SOMMER: Object to form.
12 A. As I said, I've never heard of a lithium-ion
13 primary battery that -- that's been used on the market.
14 BY ATTORNEY STAMATOPOULOS:
15 Q. What about off the market?
16 A. I mean, any lithium-ion battery can be used
17 one time and stop -- and then thrown away. That's
18 called a primary battery.
19 But lithium-ion batteries, because they're
20 rechargeable, people use them as rechargeable batteries.
21 So when I used the term "primary" previously to your
22 first question, I -- that -- that was a mistake. I
23 should have said the word "secondary lithium-ion
24 battery." I should not have used the word "primary."
25 Q. But the term "primary lithium-ion battery" is

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1 a term of art. Correct?
2 ATTORNEY SOMMER: Object to form.
3 A. You know, I -- in my years, I don't recall
4 seeing any documents or batteries that have been called
5 primary lithium-ion batteries.
6 BY ATTORNEY STAMATOPOULOS:
7 Q. You are familiar with the term, however,
8 right?
9 A. I'm familiar with the term "primary," and I'm
10 familiar with the term "lithium-ion."
11 Q. And you're also familiar with the term
12 "primary lithium-ion battery." Correct?
13 A. You could put the two words together, but it
14 doesn't mean there's a product on the market.
15 Q. Separate and apart of whether there's a
16 product on the market, in the field of -- well, let me
17 back up.
18 What would you consider to be the relevant
19 field that studies the behavior of lithium-ion
20 batteries?
21 ATTORNEY SOMMER: Object to form.
22 THE WITNESS: I'm not sure exactly what your
23 question is. Can you elaborate?
24 ATTORNEY STAMATOPOULOS: Let me try and get a
25 little bit more specific.

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1 THE WITNESS: Uh-huh.
2 BY ATTORNEY STAMATOPOULOS:
3 Q. Are you familiar with a field called
4 electrochemistry?
5 A. Yes.
6 Q. Fair to say that electrochemistry includes
7 within it a study of lithium-ion batteries?
8 A. Yes.
9 Q. In the field of electrochemistry -- let me
10 withdraw that.
11 Are you an expert in the field of
12 electrochemistry?
13 A. I don't have a degree in electrochemistry.
14 Q. You have a degree in chemistry. Correct?
15 A. Yes.
16 Q. You don't have a Ph.D. in chemistry. Correct?
17 A. No, that's -- yes, that's correct.
18 Q. You have a master's degree in chemistry?
19 A. Yes.
20 Q. And you consider yourself an expert in
21 lithium-ion batteries. Correct?
22 A. Yes. I consider myself an expert in
23 lithium-ion batteries, but not an expert of what I would
24 consider an expert in electrochemistry, which involves
25 so many other fields or so many other systems beyond

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1 lithium-ion batteries that I am not an expert within.
2 Q. And you're an expert in lithium-ion batteries
3 because you have studied lithium-ion batteries as part
4 of your academic and professional experience. Correct?
5 A. In my academic experience, no, I did not study
6 lithium-ion batteries. My academic -- my master's was
7 achieved in 1989, and that was about the year we started
8 working on lithium-ion batteries at the company I was
9 employed at.
10 So I was employed at a company and I was doing
11 my master's degree in parallel, and my -- the work I did
12 was on surface area of materials that were previously
13 used in lithium metal batteries.
14 Q. And what type of work did you do in this
15 particular area?
16 ATTORNEY SOMMER: Object to form.
17 THE WITNESS: In my masters?
18 ATTORNEY STAMATOPOULOS: Let me withdraw that.
19 BY ATTORNEY STAMATOPOULOS:
20 Q. Did you conduct experiments with lithium-ion
21 batteries?
22 ATTORNEY SOMMER: Object to form.
23 A. Not in my master's degree.
24 BY ATTORNEY STAMATOPOULOS:
25 Q. Did you conduct experiments with lithium-ion

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1 batteries at any other point in time in your career?
2 A. Yes, starting in 1989.
3 Q. What types of experiments did you conduct?
4 A. I prepared electrolytes. I prepared cathode
5 materials. I have over the years prepared anode
6 materials. I have built cells. I have tested cells.
7 I've designed cells and, I mean, anything -- many, many
8 tasks regarding lithium-ion batteries.
9 Q. And what was the objective of your testing of
10 lithium-ion batteries?
11 ATTORNEY SOMMER: Object to form.
12 A. One of the objectives was to make sure they
13 didn't explode, as our original lithium metal batteries
14 did before we had to pull them off the market.
15 The other is testing performance, trying to
16 understand how can we get the most performance out of
17 the various anode and cathode materials and
18 electrolytes.
19 You know, we were the first company in North
20 America to actually develop lithium-ion batteries, so
21 everything we did was completely novel, and we --
22 basically, starting from scratch. So you can imagine
23 all the work that we did in terms of product testing,
24 being able to find applications for those cells, making
25 sure the cells were safe under every possible condition

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1 we could think of.
2 BY ATTORNEY STAMATOPOULOS:
3 Q. Have you ever synthesized cathodes for
4 lithium-ion batteries?
5 A. Yes.
6 Q. Can you describe that process for me?
7 ATTORNEY SOMMER: Object to form.
8 A. Typically, you'd start with several components
9 and mix those components up, put them in a tube furnace,
10 run various gases through that tube furnace at high
11 temperatures and form a new compound, a lithium
12 compound. That was one I recall where we had quartz
13 tubes. They were 1,000 degrees Celsius and we had to
14 pull them out when they're red hot out of the oven,
15 hoping -- full of hydrogen, hoping they didn't -- the
16 glass didn't break and explode. So it was -- it was
17 fun.
18 BY ATTORNEY STAMATOPOULOS:
19 Q. Now, you testified just now that you were the
20 first company in North America to actually develop
21 lithium-ion batteries, right?
22 A. You know, there was -- I'm sure there was
23 other people -- there were other people working on
24 lithium-ion batteries at the time. We were the first
25 company to commercialize and sell lithium-ion batteries

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1 in the market, but there were other people working on
2 lithium-ion batteries.
3 Q. And what company was that?
4 A. One of them was Bell Labs. And some
5 universities, I believe.
6 Q. I'm going to cut you off because I think
7 you've misheard my question.
8 What was your company at the time?
9 Was it Moli Energy?
10 A. That's correct.
11 Q. And is it fair to say that you considered the
12 work that you did at Moli Energy to be innovative?
13 A. Yes.
14 Q. And there were also competitor companies in
15 North America that competed with Moli Energy at the
16 time. Correct?
17 ATTORNEY SOMMER: Object to form.
18 A. Yes.
19 BY ATTORNEY STAMATOPOULOS:
20 Q. And I see here on your CV that there are a
21 number of patents listed.
22 A. Yes.
23 Q. Did Moli Energy at the time try to protect the
24 innovations that it developed in the lithium-ion battery
25 space with patents?

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1 ATTORNEY SOMMER: Object to form.
2 A. Yes.
3 BY ATTORNEY STAMATOPOULOS:
4 Q. None of those patents have been included in
5 your declaration. Correct?
6 A. That's correct.
7 Q. And that would have been one repository of --
8 let me withdraw the question.
9 The patents and patent applications filed by
10 Moli Energy would have been one repository of
11 potentially relevant materials that you had access to
12 when you were preparing your declaration. Correct?
13 ATTORNEY SOMMER: Object to form.
14 A. You know, I did not specifically look for Moli
15 Energy patents. At the time, during my time there, I
16 did not -- I only prepared one patent application while
17 I was there, and we did not pursue it. But other
18 patents, I wasn't familiar and I did not work on any
19 other patents at Moli Energy.
20 Moli was unique. Our head of R&D, he wanted
21 to teach the world about lithium-ion batteries. He
22 wanted to work with other people in the industry and in
23 universities and share information, so there were
24 more -- you know, there were more technical documents
25 that were prepared, I believe, than patents. And this

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1 R&D director eventually went to university, became a
2 university professor.
3 BY ATTORNEY STAMATOPOULOS:
4 Q. Did he -- what's the name of the head of R&D
5 of Moli Energy at that time?
6 A. At that time, he wasn't the head of R&D. He
7 wasn't a vice president. He was more of a director.
8 His name was Jeffrey Dahn, D-A-H-N.
9 Q. And you've included one of his documents in
10 your declaration as an exhibit. Correct?
11 A. Yes.
12 Q. This particular document is not one of the
13 prior art references that are asserted against the '641
14 patent claims. Correct?
15 ATTORNEY SOMMER: Object to form.
16 A. That's correct.
17 BY ATTORNEY STAMATOPOULOS:
18 Q. So it sounds like you've had considerable
19 experience with lithium-ion batteries over the years.
20 Fair?
21 A. Yes.
22 Q. And in all of those years, have you
23 encountered the term "primary lithium-ion battery" in
24 any context?
25 A. No, not that I recall.

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1 Q. The first time that you are encountering this
2 term, "primary lithium-ion battery," is at this
3 deposition?
4 A. Yes, in my recollection, yes.
5 Q. Are there nonrechargeable -- let me withdraw
6 that question.
7 Is it possible to construct a lithium-ion
8 battery that is incapable of being recharged?
9 ATTORNEY SOMMER: Object to form.
10 A. Not -- I can't think of one offhand.
11 BY ATTORNEY STAMATOPOULOS:
12 Q. So it's possible -- so it's possible --
13 withdrawn.
14 So lithium-ion batteries are always capable of
15 being recharged.
16 Is that fair?
17 A. You can never say always. There may be some
18 that I don't know about, that I've never heard about,
19 that I don't recall.
20 Q. As you sit here today, you can't think of an
21 example of a lithium-ion battery that can't be
22 recharged. Is that fair?
23 A. That's fair.
24 Q. So insofar as a lithium-ion battery can be
25 recharged even once, does that make it a secondary

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1 lithium-ion battery?
2 A. It would have to be discharged twice, minimum.
3 Q. So as long as a lithium-ion battery can be
4 charged and discharged twice, that makes it a secondary
5 lithium-ion battery?
6 A. Yes, a secondary. "Secondary" refers to more
7 than one.
8 Q. More than one what?
9 A. Discharge.
10 Q. Would a secondary lithium-ion battery that can
11 only be just discharged twice be useful to an end user?
12 A. It's possible.
13 ATTORNEY SOMMER: Object to form.
14 A. It's possible, but I don't know of any
15 lithium-ion batteries that can only be used twice by a
16 user and then thrown away.
17 BY ATTORNEY STAMATOPOULOS:
18 Q. You're familiar with the term "person of
19 ordinary skill in the art"?
20 A. Yes.
21 Q. Now, just to make things a little bit easier
22 in this deposition, unless I specify otherwise, when I
23 ask you about the meaning of a particular term, is it
24 fair for me -- is it fair for us to just understand that
25 we're referring to the understanding of a person of

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1 ordinary skill in the art with respect to that term?
2 A. I think we'd have to specify based on my
3 answers.
4 Q. Well, unless we specify otherwise, is it okay
5 if, if I ask you about the meaning of a certain term, if
6 I omit that I'm asking about the meaning that a person
7 of ordinary skill in the art would apply?
8 A. Okay.
9 Q. Would a person of ordinary skill in the art
10 understand a secondary lithium-ion battery to include a
11 lithium-ion battery that can only be recharged twice?
12 A. By definition of "secondary" and definition of
13 "rechargeable," yes.
14 Q. Would a person of ordinary skill in the art
15 understand that a battery that can only be discharged
16 twice would be commercially viable as of the 2000 time
17 frame?
18 ATTORNEY SOMMER: Object to form.
19 A. They would likely be believing that it was not
20 commercially viable.
21 BY ATTORNEY STAMATOPOULOS:
22 Q. And why is that?
23 A. If you have a battery that can only be used
24 twice and you -- you're competing against a company that
25 has a battery that can be used hundreds of times, you

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1 know, it's difficult to compete.
2 Q. Did Moli Energy ever commercialize any of its
3 lithium-ion batteries?
4 A. Yes.
5 Q. Did Moli Energy ever commercialize any of its
6 secondary lithium-ion batteries?
7 A. Yes.
8 Q. Do you recall how many times Moli Energy told
9 its customers its batteries could be charged and
10 discharged?
11 ATTORNEY SOMMER: Object to form.
12 ATTORNEY STAMATOPOULOS: Well, let me withdraw
13 that question.
14 BY ATTORNEY STAMATOPOULOS:
15 Q. Moli Energy told its customers about the
16 performance characteristics of its secondary lithium-ion
17 batteries. Correct?
18 A. Yes.
19 Q. And one of those performance characteristics
20 was the amount of times that Moli Energy's secondary
21 lithium-ion batteries could be charged and discharged.
22 Correct?
23 A. Yes.
24 Q. Do you recall what Moli Energy told its
25 customers about the number of times that Moli Energy's

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1 secondary lithium-ion batteries could be charged and
2 discharged?
3 A. It was typically a minimum of 500 cycles to
4 80 percent capacity remaining, if I recall correctly.
5 And we had batteries that would last longer than that,
6 but I don't recall ever showing data for any cell that
7 would be less than 500 cycles that we would put on the
8 market.
9 Q. And you said 500 cycles to 80 percent
10 capacity. What did you mean by that?
11 A. If you discharge the battery 500 times, on the
12 500th cycle, you would have more than 80 percent of the
13 initial capacity.
14 Q. And was 80 percent capacity for 500 cycles an
15 industry standard at the time?
16 ATTORNEY SOMMER: Object to form.
17 A. There was no industry standard. We were the
18 first in North America.
19 BY ATTORNEY STAMATOPOULOS:
20 Q. And roughly what time frame was that?
21 A. 1994.
22 Q. And in the years that followed 1994, let's say
23 through 2000, did an industry standard develop in terms
24 of the number of cycles after which a battery could
25 retain 80 percent capacity?

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1 A. Yes.
2 Q. And what was that standard?
3 A. I'm sorry, I thought you meant industry
4 generic standard that people would use.
5 Q. What's the difference between an industry
6 generic standard and an industry standard?
7 A. Industry standard would be like an
8 International Electrotechnical Commissions document,
9 Underwriters Laboratory document. Those are just two
10 types of documents.
11 Q. So Moli Energy competed with other battery
12 manufacturers in the 1990s. Fair?
13 A. Yes.
14 Q. And you left Moli Energy in 1996. Correct?
15 A. Yes.
16 Q. And as of 1996, Moli Energy was competing with
17 other battery manufacturers. Correct?
18 A. Yes.
19 Q. And one of the things that Moli Energy
20 competed on with other battery manufacturers was battery
21 performance. Correct?
22 A. Yes.
23 Q. And one characteristic of battery performance
24 was the ability of the battery to retain a certain
25 percentage of its capacity after a certain number of

Page 45

1 charge/discharge cycles. Correct?
2 A. Yes.
3 Q. And Moli Energy's battery could retain
4 80 percent capacity after roughly 500 cycles as of
5 around 1996. Correct?
6 A. Yes.
7 Q. On average, how did Moli Energy's competitors
8 fare with respect to this particular metric?
9 A. I can't give you a specific number.
10 Q. Is it fair to say that competitive batteries
11 also could retain roughly 80 percent capacity after
12 several hundred cycles?
13 A. Yes.
14 Q. Is it fair to say that this was fairly common
15 in the market for commercially available secondary
16 lithium-ion batteries?
17 ATTORNEY SOMMER: Object to form.
18 THE WITNESS: Sorry, what was common?
19 BY ATTORNEY STAMATOPOULOS:
20 Q. Is it fair to say that retaining 80 percent
21 capacity after 500 or so cycles was fairly common in the
22 market for commercially available secondary lithium-ion
23 batteries in the mid '90s time frame?
24 A. That was a long time ago. Our competitors
25 were Sony and a consortium of two companies, Asahi and

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1 Toshiba. And I don't recall what the exact numbers
2 were. But I do recall that 80 percent was, you know, a
3 number that people would use, they would use, we would
4 use, and that became used throughout the industry.
5 80 percent was a good number that was used to
6 show that hey, you know, if your application used to run
7 at 10 -- for 10 hours, your phone could run for 10
8 hours, and then if it -- you know, after several years,
9 500 cycles, let's say two years of life, you can still
10 get 8 hours' use, that's pretty good.
11 ATTORNEY SOMMER: Counsel, we have been going
12 about an hour, so when you reach a good stopping point
13 to take a break, that would be great.
14 ATTORNEY STAMATOPOULOS: I think, yeah, I
15 think -- and, Mr. Juzkow, by the way, I forgot to
16 mention if at any point you need a break, let me know.
17 The only thing I ask is that you let me get through that
18 line of questioning, and then at a logical point we can
19 stop. And yes, Andrew, a break right now seems fine.
20 We can go off the record.
21 ATTORNEY SOMMER: Great.
22 THE VIDEOGRAPHER: The time is 8:06 AM. We
23 are off the record.
24 (Recess taken.)
25 THE VIDEOGRAPHER: Back on the record. The

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1 time is 8:21 AM.
2 BY ATTORNEY STAMATOPOULOS:
3 Q. Welcome back, Mr. Juzkow.
4 Did you speak with counsel during the break?
5 A. No.
6 Q. Now, earlier I asked you a question as to
7 whether a person of ordinary skill in the art would
8 understand a secondary lithium-ion battery to include a
9 lithium-ion battery that can only be recharged twice.
10 And I believe you answered by definition of "secondary"
11 and definition of "rechargeable," yes.
12 My question is, what is the definition of
13 "secondary" that you had in mind when you answered my
14 question?
15 A. Rechargeable.
16 Q. So "rechargeable" and "secondary" are
17 synonymous, in your view?
18 A. Yes.
19 Q. And is there a reference or other authority
20 that you have consulted with in forming the opinion that
21 "rechargeable" and "secondary" are synonymous?
22 A. No.
23 Q. This is based on -- what is your basis for
24 saying that the two are synonymous?
25 A. As long as I can remember, this is the way the

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1 two words are, you know, put together.
2 Q. So based on your experience, "secondary" and
3 "rechargeable" are synonymous in the space of
4 lithium-ion batteries. Is that fair?
5 A. Yes.
6 Q. And based on your experience, a battery that
7 can only be recharged twice would be considered
8 rechargeable.
9 Do I have that right?
10 A. By the definition of "rechargeable," yes.
11 Q. Again, what definition are you referring to?
12 A. Being able to discharge more than once.
13 Q. So based on your experience, as long as a
14 battery can be recharged or discharged more than once,
15 it is rechargeable. Correct?
16 A. Yes.
17 Q. Are there any batteries that you are aware
18 of -- withdrawn. New question.
19 Are there any lithium-ion batteries that you
20 are aware of as you sit here today that cannot be
21 recharged and discharged more than once?
22 A. No.
23 Q. Mr. Juzkow, I want to switch gears a little
24 bit and talk a little bit about battery performance.
25 Is -- withdrawn.

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What are the characteristics of a battery that are relevant to battery performance? At a high level. And when I say "battery," I mean secondary lithium-ion battery.

ATTORNEY SOMMER: Object to form.

A. Energy, power, cycle life, the time it takes to charge, thermal stability.

BY ATTORNEY STAMATOPOULOS:

Q. Is battery capacity a performance characteristic?

A. Battery capacity multiplied by voltage gives you energy. So when I said "energy," I am incorporating both voltage and capacity.

Q. Okay. And what is the meaning of battery capacity?

ATTORNEY SOMMER: Object to form.

BY ATTORNEY STAMATOPOULOS:

Q. Well, let me actually go back to something we discussed earlier. I'm going to ask you about the meaning of certain terms. And when I ask you about the meaning, I'm referring to the meaning that a person of ordinary skill in the art would apply to these terms as of the time of the invention. Just to avoid putting that prelude into every question, is it okay if I omit it and just ask you about the meaning?

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A. Yes.

Q. Great.

So what is the meaning of battery capacity?

A. It's the number of coulombs of electrons that can be transported from the cathode to the anode or the anode to the cathode, coulombs being amp seconds. And we convert that typically to amp hours.

Q. And when we're talking about lithium-ion batteries, does the number of lithium-ions that can be transported from the cathode to the anode and vice versa relate at all to battery capacity?

A. Yes.

Q. In what way?

A. The greater the number of lithium-ions you can transport back and forth lead to higher capacity.

Q. Are you familiar with a term called "specific capacity"?

A. Yes.

Q. And what is specific capacity?

A. In general, specific capacity is capacity per unit mass.

Q. So specific capacity refers to the capacity of a particular cathode that has a particular mass, for example?

ATTORNEY SOMMER: Object to form.

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A. It can refer to the amount, the mass of active cathode material. It could relate to the mass of the total cathode, including the binder and the conductive additives. And it can even refer to the mass of the total battery, including both anodes -- or, sorry. Strike that. Including anode, cathode, electrolyte, separator, current collectors, can. So there's many ways that you can describe per mass.

BY ATTORNEY STAMATOPOULOS:

Q. So is the specific capacity property of the battery that is independent of its particular mass?

A. Yes.

ATTORNEY SOMMER: Object to form.

BY ATTORNEY STAMATOPOULOS:

Q. And the cathode has a specific capacity, right?

A. Yes.

Q. And the anode too has a specific capacity?

A. Yes.

Q. And other than the fact that the anode specific capacity pertains to the anode and the cathode specific capacity pertains to the cathode, is there any other distinction with respect to the specific capacity of the anode or the cathode that you're aware of?

ATTORNEY SOMMER: Object to form.

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A. No.

BY ATTORNEY STAMATOPOULOS:

Q. Are you familiar with a term called "specific energy of the secondary lithium-ion cell"?

A. Very much so.

Q. You say very much so. What is the specific energy of a secondary lithium-ion cell?

A. It's the energy per unit mass. And people always get it confused with energy density. Energy density would be the energy per unit volume.

And so I also work with a -- I work for a company that makes aircraft, and aircraft mass is the most critical thing. But when people say how much energy density a cell has, it just -- it's not accurate, so I always have to say specific energy, energy by mass, more important for an aircraft than energy by volume.

Q. Just to make it a little bit more clear for the record, what is energy density of a lithium-ion battery cell?

A. That would be the amount of energy per unit volume. Typically, we would use the units watt-hours per liter.

Q. Is it fair to say that energy density is a property of -- withdrawn.

Is it fair to say that different lithium-ion

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1 batteries will have different energy densities depending
2 on the way in which they're constructed?
3 A. Yes.
4 Q. And would cathodes made of the exact same
5 material have the same specific capacities?
6 ATTORNEY SOMMER: Object to form.
7 A. Yes.
8 BY ATTORNEY STAMATOPOULOS:
9 Q. And why is that?
10 A. It's based on the molecule and the number of
11 lithium-ions that it can transport back and forth. So
12 for a given discharge rate for a given volt -- or for a
13 given voltage, for a given temperature, for a given
14 active material, cathode material, specific capacity
15 would be the same.
16 Q. So all other parameters being equal, the
17 specific capacity of a cathode is a variable that
18 depends upon the particular material from which that
19 cathode is made. Correct?
20 ATTORNEY SOMMER: Object to form.
21 A. Yes, that's true. You can have cathode
22 materials that are monocrystalline or polycrystalline.
23 You can make that material with different surface area.
24 When you discharge it at different discharge rates, you
25 can end up with different specific capacity. If you

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1 discharge it at different temperatures, you can end up
2 with different specific capacities, but --
3 Q. Okay.
4 A. Yeah, done.
5 Q. And if I asked you the same question about the
6 anode, I'd get the same answer?
7 A. Yes.
8 Q. You testified there's a distinction between
9 energy density and specific energy.
10 Did I get that right?
11 A. Yes.
12 Q. In which instances is energy density more
13 relevant than specific capacity in the context of
14 lithium-ion battery applications?
15 A. Automobiles. Electric vehicles. Typically,
16 volume is the most important requirement.
17 Q. What about portable devices?
18 ATTORNEY SOMMER: Object to form.
19 A. Portable devices are a combination. I mean,
20 you don't want a phone that is so large, but you also
21 want a light phone, so it -- portable devices, handheld
22 devices are a combination of.
23 BY ATTORNEY STAMATOPOULOS:
24 Q. You mentioned that battery capacity --
25 withdrawn.

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1 You mentioned that energy is obtained by
2 multiplying battery capacity and voltage.
3 Did I get that right?
4 A. Correct.
5 Q. And what voltage were you referring to?
6 A. That would be the average voltage over the
7 entire discharge.
8 Q. Is that the same as the average operating
9 voltage?
10 A. Marketing terms, when people say "nominal
11 voltage," not so accurate. But when you discharge a
12 battery and you segment it, maybe every one second, you
13 measure the capacity within that one second, you measure
14 the average voltage within that one second, and then you
15 add all of those up throughout the entire discharge,
16 that gives you a more accurate energy.
17 You can do it at one second, you can do it at
18 a tenth of a second. It depends. But that's the way
19 you get your, you know, the accurate energy for a
20 discharge in a cell.
21 Q. And the voltage you're referring to is a
22 voltage between the anode and the cathode?
23 A. Yes.
24 Q. When a battery is not connected to a
25 particular device, is there a voltage between the anode

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1 and the cathode?
2 A. Yes.
3 Q. Are you familiar with the term "open circuit
4 voltage"?
5 A. Yes.
6 Q. Is the voltage between the anode and the
7 cathode when the battery is not connected to any device
8 the open circuit voltage?
9 A. Yes.
10 Q. When a battery has been discharged, is there
11 an open circuit voltage between the anode and the
12 cathode?
13 A. Yes.
14 Q. And to charge that particular battery, would
15 it be possible to simply apply an external voltage that
16 is equal to the open circuit voltage?
17 ATTORNEY SOMMER: Object to form.
18 A. No.
19 BY ATTORNEY STAMATOPOULOS:
20 Q. The reason it would not be possible to charge
21 a battery by applying an external voltage that is equal
22 to the open circuit voltage is because there would be no
23 force leading the lithium-ions from the cathode to the
24 anode. Correct?
25 A. Yes.

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Q. So in order to move ions from the cathode to the anode, one would have to apply a voltage external to the battery that is greater than the open circuit voltage. Correct?
A. Yes.
Q. Once the charge is complete and the external voltage is removed, the battery will have an open circuit voltage. Correct?
A. Yes.
Q. And the open circuit voltage, upon completion of a charging cycle, will be greater than the open circuit voltage prior to completion of the charging cycle. Correct?
A. The open circuit voltage, after charging, will be less than the charge voltage, maximum charge voltage.
Q. What do you mean by that?
A. Once the -- when you're pushing, using force to put the battery to a higher voltage, you have a voltage maximum, a charge voltage cutoff. There's many terms for it. Once you release -- once you put the cell into open circuit, the voltage will relax, meaning it will drop, and then it will stabilize into an open circuit voltage.
Q. So there's a difference between the charge voltage and the open circuit voltage. Correct?

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A. Yes.
Q. And the charge voltage is higher than the open circuit voltage. Correct?
A. Yes.
Q. Is there a formula through which it would be possible to obtain the open circuit voltage simply by looking at the charge voltage?
A. No.
Q. Why not? Let me ask you a question, a different question. Or, rather, if you can answer my question, that's fine.
A. Okay. I mean, there's several components. And one of the components would be the power that you're using to charge the cell.
When you -- when you're putting current through the cell, then when you release that current, there's a drop in the voltage which can be calculated by voltage, the voltage. But I should say the delta voltage would be equal to the current times the DC resistance of the cell. That's --
Q. The DC resistance of the cell will be different for every cell. Correct?
A. Correct.
Q. What does the DC resistance of the cell depend upon?

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A. It depends on many factors, including mechanical, what's the thickness of the current collector, what's the length of the current collector to where you're capturing the electrons, what's the thickness of the cathode and anode coating on the current collector, what's the porosity of that active cathode -- active anode and cathode coating on those current collectors, what's the conductivity of the electrolyte, what's the thickness of the separator. I'm sure there's a few others I missed.
Q. And the DC resistance of the cell is one principal factor -- withdrawn.
The DC resistance of the cell is one principal parameter that a person of ordinary skill in the art would need to know to determine the difference between an applied charge voltage and the open circuit voltage at the end of charging. Correct?
A. Yes.
Q. Are you familiar with the term called "theoretic capacity"?
A. "Theoretical capacity" is more commonly known.
Q. Okay. What is the theoretical capacity?
A. Theoretical capacity outside of the patent means -- it's a calculated value, and it's based on the molecular weight of the molecule. And it's based on the

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number of the moles of lithium-ion for lithium-ion battery. So it's based on the molecular weight of the cathode and the number of moles total in that molecule.
Q. Is the theoretical capacity a material property?
A. Yes.
Q. And by material property, you mean that it does not depend upon any particular lithium-ion battery cell construction but, rather, it is dependent upon the particular material that is used in the anode or the cathode alone. Correct?
A. Yes.
Q. You mentioned earlier outside of the '641 patent when I asked you what theoretical capacity was, right?
A. Yes.
Q. Why is it that you distinguished between the patent and your response?
A. There's a claim construction that describes what Claim 5 means in terms of the word "theoretic" within Claim 5, and I didn't use that claim construction when I gave you the general definition of theoretical capacity that a POSITA would know without having access to this patent.
Q. You said without having access to this patent.

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1 Did you mean without having access to the claim
2 construction that you applied in your analysis?
3 A. Yes, that's --
4 ATTORNEY SOMMER: Object to form.
5 A. -- correct. That's correct.
6 BY ATTORNEY STAMATOPOULOS:
7 Q. And the claim construction that you applied in
8 your analysis was provided to you by counsel, as stated
9 in your declaration. Correct?
10 A. Yes.
11 Q. And this claim construction that was provided
12 to you by counsel was one with respect to which you have
13 not rendered any opinions in your declaration. Correct?
14 A. That's correct.
15 Q. Just to be clear, the claim construction that
16 you were provided by counsel is different than the
17 response you gave just now when I asked you about the
18 meaning of the term "theoretical capacity." Correct?
19 A. Sorry, could you repeat that question?
20 Q. Certainly.
21 The claim construction that you were provided
22 by counsel is different than the meaning of the term
23 "theoretical capacity" -- I'm sorry, my realtime seems
24 to be a little bit -- I'm going to withdraw that and
25 I'll ask you a different question, because I was trying

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1 to read back.
2 The claim construction that you were provided
3 by counsel is different than the answer you gave me when
4 I asked you about the meaning of the term "theoretical
5 capacity." Correct?
6 A. When I gave you the meaning of the word
7 "theoretical capacity," you know, I was very explicit in
8 how it was calculated.
9 Q. Is there any difference between -- let me
10 withdraw that.
11 Fair to refer to the answer you gave me about
12 theoretical capacity as your definition of theoretical
13 capacity?
14 ATTORNEY SOMMER: Object to form.
15 A. It would be that of a POSITA.
16 BY ATTORNEY STAMATOPOULOS:
17 Q. So the theoretical -- a POSITA's definition of
18 "theoretical capacity" corresponds to the answer that
19 you just give me. Correct?
20 ATTORNEY SOMMER: Object to form.
21 A. Yes.
22 BY ATTORNEY STAMATOPOULOS:
23 Q. How does a POSITA's definition of "theoretical
24 capacity" differ from the construction that you were
25 provided by counsel?

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1 A. The definition that I gave you speaks to how
2 the capacity is derived.
3 Q. And according to a POSITA's definition of a
4 theoretical capacity, the theoretical capacity is a
5 material property of the anode. Correct?
6 ATTORNEY SOMMER: Object to form.
7 A. Yes.
8 BY ATTORNEY STAMATOPOULOS:
9 Q. Or of the cathode, right?
10 A. Yes.
11 Q. Depending on whether we're referring to the
12 theoretical capacity of the anode or of the cathode.
13 Correct?
14 A. Sorry, I didn't --
15 Q. Let me make it easier. Let me make it easier.
16 A. Sure.
17 Q. The theoretical capacity of the cathode is a
18 property of the material that the cathode consists of.
19 Correct?
20 A. Yes.
21 Q. And the theoretical capacity of the anode
22 similarly is a material property of the anode material.
23 Correct?
24 ATTORNEY SOMMER: Object to form.
25 A. Yes.

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1 BY ATTORNEY STAMATOPOULOS:
2 Q. Does the theoretical capacity of a particular
3 material differ depending upon the conditions in which
4 it is measured for a given material?
5 ATTORNEY SOMMER: Object to --
6 A. No.
7 ATTORNEY SOMMER: -- form.
8 A. No.
9 BY ATTORNEY STAMATOPOULOS:
10 Q. What do you mean by that when you say no?
11 A. The theoretical definition is a calculated
12 definition. It's calculated. And it's based on the
13 total number of lithium-ions and the molecular weight of
14 that material.
15 Q. Does it differ depending on the voltage to
16 which the anode and cathode may be subjected?
17 A. No.
18 Q. Is it possible to arrive at the theoretical
19 capacity of an electrode through experiment?
20 ATTORNEY SOMMER: Object to form.
21 A. No. A POSITA would recognize the word
22 "theoretical" as a calculated value.
23 BY ATTORNEY STAMATOPOULOS:
24 Q. But if a POSITA wanted to experimentally
25 arrive at a theoretical capacity, would it be possible

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1 for a POSITA to conduct an experiment in which a POSITA
2 could measure the theoretical capacity?
3 A. You could do the experiment, and then you
4 could compare that result to the calculated value and
5 see if they match. But, you know, this is speaking
6 outside of the patent claims, so everything I -- I'm
7 saying is outside the patent claims unless I say
8 otherwise.
9 Q. Now, you formed your opinions taking into
10 account the claim constructions that were provided to
11 you by counsel. Correct?
12 A. Correct.
13 Q. And you did not form opinions in your
14 declaration taking into account any alternative
15 construction other than the one provided to you by
16 counsel. Correct?
17 A. Correct, with respect to the claims.
18 Q. With respect to the claims.
19 Do you have the patent in front of you?
20 A. Yes.
21 Q. Could you -- and this is Exhibit 1001 in these
22 proceedings.
23 (Exhibit No. 1001, previously marked, was
24 referenced and indexed.)
25 BY ATTORNEY STAMATOPOULOS:

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1 Q. Can I ask you to turn to Claim 5.
2 A. Yes.
3 Q. And you can take a moment to familiarize
4 yourself with Claim 5. My question is about the very
5 last clause in Claim 5, "as calculated by a theoretic
6 capacity with a charge cutoff voltage set at 4.2 volts."
7 Take a moment to familiarize yourself, and then I'll ask
8 you my question. Let me know when you're ready.
9 A. I'm ready.
10 Q. What is your understanding of the phrase "as
11 calculated by a theoretic capacity with a charge cutoff
12 voltage set at 4.2 volts"?
13 A. I was asked to construe the meaning of that as
14 per RJ Technology's proposed claim construction adopted
15 by the courts in California and provided to me by
16 Samsung's counsel.
17 Q. Is it fair to say that other than -- well,
18 withdrawn.
19 Is it fair to say that you have formed no
20 opinions as to the meaning of this term?
21 A. The term in Claim 5, I -- that's correct.
22 Q. In your opinion, would a POSITA understand
23 this term consistent with the claim construction that
24 was provided to you by counsel?
25 ATTORNEY SOMMER: Object to form.

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1 A. The claim construction was proposed by
2 RJ Technologies.
3 BY ATTORNEY STAMATOPOULOS:
4 Q. My question's a little bit different. I
5 understand who proposed the construction.
6 My question to you is, in your opinion, would
7 a POSITA understand this term, "as calculated by a
8 theoretic capacity with a charge cutoff voltage set at
9 4.2 volts" consistent with the claim construction that
10 was provided to you by counsel?
11 ATTORNEY SOMMER: Same objection.
12 A. I was not asked to make any opinions.
13 BY ATTORNEY STAMATOPOULOS:
14 Q. As you sit here today, do you have an opinion
15 as to whether a POSITA would understand this term
16 consistent with the construction that was supplied to
17 you?
18 A. A POSITA would look at the claim construction
19 provided by RJ, adopted by the claims -- the California
20 courts, and use that definition.
21 Q. Well, this patent has been around for -- since
22 2010, right?
23 So a POSITA looking at this patent, say, in
24 2013, before any proceedings with respect to this patent
25 had ever been initiated, would such a POSITA understand

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1 the term "as calculated by a theoretic capacity with a
2 charge cutoff voltage set at 4.2 volts" consistent with
3 the construction that was provided to you by counsel,
4 notwithstanding that a court had not made any findings
5 with respect to that construction and there was no court
6 case in which that construction had been proposed?
7 ATTORNEY SOMMER: Object to form.
8 A. That's a hypothetical question that I can't
9 answer.
10 BY ATTORNEY STAMATOPOULOS:
11 Q. Do you agree with the construction that was
12 provided to you by counsel?
13 ATTORNEY SOMMER: Object to form.
14 A. The claim construction -- the claim -- I --
15 I've not been asked to make any opinions on the claim
16 construction.
17 BY ATTORNEY STAMATOPOULOS:
18 Q. As you sit here today and you look at this
19 claim construction with your wealth of experience, do
20 you agree or disagree with the construction?
21 ATTORNEY SOMMER: Object to form.
22 A. I've not -- I've not been asked to make any
23 opinions.
24 BY ATTORNEY STAMATOPOULOS:
25 Q. Okay. So as you sit here today, you're not

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1 prepared to offer one. Correct?
2 A. That's correct.
3 Q. How much time would you need in order to be in
4 a position to offer an opinion?
5 ATTORNEY SOMMER: Object to form.
6 A. I'm not sure why I would need an opinion once
7 the -- RJ has proposed what they mean by the claim and
8 the California claims has, or California court has
9 adopted that.
10 BY ATTORNEY STAMATOPOULOS:
11 Q. Well, I'm asking you a different question,
12 sir. I'm asking you to the extent that you were called
13 upon to offer an opinion on this term, what would you
14 need in order to offer an opinion as to the appropriate
15 construction?
16 ATTORNEY SOMMER: Object to form.
17 A. I guess I would need to have not been
18 instructed to apply this construction.
19 BY ATTORNEY STAMATOPOULOS:
20 Q. Would it be sufficient for you to look at the
21 patent in order to render such an opinion?
22 ATTORNEY SOMMER: Object to form.
23 A. I had not read the patent before reading the
24 claim construction. Or I should say I read them both at
25 the same time.

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1 BY ATTORNEY STAMATOPOULOS:
2 Q. "Theoretical capacity" was a term that you
3 were familiar with prior to reading this patent.
4 Correct?
5 A. Prior to reading the patent, yes.
6 Q. And "theoretical capacity" is a term that you
7 were familiar with in 2001?
8 A. Yes.
9 Q. It's a term of art?
10 ATTORNEY SOMMER: Object to form.
11 A. It's a term of science within the art.
12 BY ATTORNEY STAMATOPOULOS:
13 Q. Is there a difference between theoretical
14 capacity -- outside of the '641 patent claims and the
15 particular construction that was provided to you, is
16 there a difference between theoretical capacity as a
17 standalone term and theoretical capacity at a particular
18 voltage?
19 A. Outside of the patent, yes.
20 Q. What is the difference?
21 A. When you consider a charge voltage, you
22 have -- you end up with a value for the lithium that's
23 transported to be up to and including 1. If it's less
24 than 1, then that value that you measure by taking -- by
25 charging the cell to a voltage would be different than a

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1 calculated voltage.
2 Q. Why is that?
3 A. In the formula to calculate the theoretical
4 capacity, you count the lithium-ion as 1. You have one
5 lithium-ion within that molecule. You count that as 1.
6 You -- when you do a charge, you may not discharge --
7 or, sorry, you may not move all of that lithium out of
8 the cathode, so you may end up with a value that's not
9 zero but may be, you know, X. And that value of X then
10 would change the calculation.
11 Q. So it's possible to obtain different
12 theoretical capacities for the same material at
13 different charge voltages. Is that fair?
14 A. Those would no longer be theoretical values,
15 or theoretical capacities. They'd be experimental
16 capacities, practical capacities.
17 Q. My initial question was if there is a
18 difference between theoretical capacity outside of the
19 particular construction that was provided to you between
20 "theoretical capacity" as a standalone term and
21 theoretical capacity at a particular voltage. And I
22 believe you answered yes.
23 Is that fair?
24 A. I said that they can be different --
25 Q. They can --

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1 A. -- unless the --
2 Q. -- or cannot?
3 A. They -- yes, they can be different. But if
4 you extract 100 percent of the lithium out of the
5 molecule, they'll be the same value.
6 Q. And why is it that they can be different
7 again?
8 A. When you charge a lithium-ion battery, let's
9 take example of lithium cobalt oxide. The theoretical
10 capacity, about 274 milliamp hours per gram. But if you
11 extracted 100 percent of that lithium from that active
12 material, that lithium cobalt oxide, leaving you with
13 CoO_2, cobalt oxide, that molecule does not exist. You
14 would end up converting that to other molecules, and you
15 would generate a lot of heat. It would break down, and
16 that battery would most likely go into thermal runaway.
17 So you are limited to how much lithium you can
18 extract from a cell. So that's -- practically speaking,
19 you can't discharge the -- you can't charge the battery
20 completely and remove all the lithium in a practical
21 lithium-ion cell.
22 So for lithium cobalt oxide, typically remove
23 about half. So therefore, the practical capacity would
24 be about half of the 274, so maybe 140, plus or minus.
25 Q. Okay. This practical number that you refer to

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1 is also a theoretical number in the sense that it's tied
2 to the theoretical capacity. Correct?
3 ATTORNEY SOMMER: Object to form.
4 A. Theoretical capacity considers the entire
5 lithium content within the molecule. When you have a
6 voltage that limits the amount of lithium you take out
7 of that, you end up with a different value than your
8 theoretical value.
9 If you know what the amount of lithium that
10 you take out is and you multiply -- and you insert that
11 value into the calculation, then you will end up with
12 the same result.
13 BY ATTORNEY STAMATOPOULOS:
14 Q. So if I have a particular cathode, for
15 example, lithium cobalt oxide, with a particular
16 theoretical capacity, the amount of lithium that I can
17 actually extract from that cathode is limited by the
18 voltage that I will apply to that cathode.
19 Is that fair?
20 A. That's one of the limitations. The other
21 might be the charge rate, the temperature. Those are
22 two other parameters that could change that value.
23 Q. If a person of ordinary skill in the art were
24 attempting to establish the practical capacity of
25 lithium cobalt oxide, meaning the maximum amount of

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1 lithium that it would be practicable to extract from
2 that cathode, that person of ordinary skill in the art
3 would have to apply a slow charging rate. Correct?
4 ATTORNEY SOMMER: Object to form.
5 A. You can use any charging rate. Probably more
6 accurate value at lower charge rates. Typically at
7 higher charge rates you don't get the full capacity out
8 of a cell at high charge rates.
9 BY ATTORNEY STAMATOPOULOS:
10 Q. And why is that?
11 A. It's impedance driven. It's diffusion, how
12 fast the lithium-ions can deintercalate from the cathode
13 and how fast they can intercalate into the anode. So
14 you have diffusion and impedance that slows down your
15 charge rate if you want to go to the full charge
16 capacity.
17 Q. So to obtain more accurate results, a person
18 of ordinary skill in the art would try to slow down the
19 charge rate. Correct?
20 A. Yes.
21 Q. And what determines the speed of the charge
22 rate? Or let me withdraw that question.
23 What determines the speed of charging?
24 ATTORNEY SOMMER: Object to form.
25 A. I mean, it's the current that you apply across

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1 the cell.
2 BY ATTORNEY STAMATOPOULOS:
3 Q. The higher the current, the higher the charge
4 rate --
5 A. Correct.
6 Q. -- all else being equal?
7 A. Correct.
8 Q. What about temperature?
9 Does temperature affect the charge rate?
10 A. No.
11 Q. Impedance is a form of resistance?
12 A. Yes. DC impedance is a little different from
13 AC impedance, but impedance is -- people use it similar
14 to resistance.
15 Q. While you were at Moli Energy, did you apply
16 charge voltages over 4.2 volts to secondary lithium-ion
17 battery cells?
18 A. Yes.
19 Q. And it was relatively safe to do so. Correct?
20 ATTORNEY SOMMER: Object to form.
21 A. That's not 100 percent accurate.
22 BY ATTORNEY STAMATOPOULOS:
23 Q. Tell me why.
24 A. When you extract an excess amount of lithium,
25 the molecule, the lithium cobalt oxide, will decompose.

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1 And first, you'll lose cycle life. And if you
2 overcharge further, that battery can explode.
3 Q. You said when you extract an excess amount of
4 lithium. What do you mean by excess amount of lithium?
5 A. More than the practical amount of lithium that
6 you would use to optimize the cycle life and safety of
7 the cell.
8 Q. And was 4.2 volts the threshold at which a
9 person of ordinary skill in the art would understand a
10 charge might lead to extracting excess lithium from a
11 cathode?
12 ATTORNEY SOMMER: Object to form.
13 A. We started with 4.1 volts and then we moved to
14 4.2 volts. But we did not go beyond 4.2 volts, as we
15 would lessen the cycle life of the cell.
16 BY ATTORNEY STAMATOPOULOS:
17 Q. Do you have an understanding as to whether
18 your competitors would go beyond 4.2 volts?
19 A. Not in the early days. People are more
20 conservative. Today, you know, I see cell voltages
21 going to 4.25, possibly 4.3.
22 I tested some cells in my lab at 4.6 volts.
23 They exploded in my lab just last year. So yeah, so
24 that, I mean, people do have voltages today that are
25 more aggressive. But back in the day, back in the '90s,

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1 you know, there was not very many lithium-ion suppliers.
2 We were very cautious about the technology, especially
3 Moli Energy, where we had many fires and explosions in
4 the field when we were selling lithium metal
5 rechargeable batteries.
6 And we ended up having to recall all of those
7 lithium metal rechargeable batteries because of the
8 fires in the computers and cellphones of our customers.
9 Q. So did I understand correctly that one of the
10 reasons you didn't go beyond 4.2 volts was out of
11 concern that doing so would extract an excess amount of
12 lithium that might lead to thermal runaway phenomena?
13 A. That was one of the reasons, yes.
14 Q. And that was considered dangerous?
15 A. Yes.
16 Q. And do you know when the industry transitioned
17 to a phase where manufacturers would routinely charge
18 their batteries with voltages above 4.2 volts?
19 A. I don't know. I can't recall.
20 Q. Was it generally desirable to charge batteries
21 at higher voltages if possible?
22 ATTORNEY SOMMER: Object to form.
23 A. By charging to higher voltages, so if you --
24 if you look at the voltage curve of a cathode material,
25 many cathode materials have capacity, you know, in

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1 excess of 4.2 volts. So if you charge the cell in
2 excess of 4.2 volts, you can access that excess
3 capacity.
4 BY ATTORNEY STAMATOPOULOS:
5 Q. Why is that desirable? In general.
6 A. You end up with a cell that has increased
7 capacity. You're -- if you're using that cell in a
8 cellphone, then your cellphone will run for a longer
9 period of time.
10 Q. Do you recall when Moli Energy transitioned
11 from a 4.1-volt charge voltage to a 4.2 volt charge
12 voltage?
13 A. It was probably in the year 1990 -- between
14 1990 and 1991 to '2. Let's say between 1990 and '92.
15 And one of the other reasons we did that was a
16 change in the anode material. So we went from a hard
17 carbon to a graphite. And a hard carbon has a higher
18 voltage versus the reference lithium, so the voltage of
19 the cell is dependent -- it's the difference between the
20 cathode voltage and the anode voltage.
21 So when we went to graphite, that anode
22 voltage dropped about by 0.1 volts, so then we were able
23 to charge from 4.1 to 4.2 without pushing the cathode
24 any further. So we basically extracted the same amount
25 of lithium material out of that cell by changing the

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1 anode potential.
2 Q. Let me try to unpack that a little bit.
3 Is it fair to say that the open circuit
4 voltage of the battery is the difference between the
5 cathode voltage and the anode voltage?
6 A. Versus the reference voltage of lithium for
7 each of those, correct.
8 Q. And what is the reference voltage for
9 graphite?
10 A. Graphite -- there's multiple plateaus as you
11 discharge it, so those plateaus -- you know, you can
12 charge graphite anode as high as, you know, 1.5 volts,
13 and then you can discharge it down to zero volts.
14 So the average plateaus are probably in the
15 0.1 to 0.2-volt range over the bulk of the discharge or,
16 sorry, charge, I should say. It's -- it's -- yeah.
17 When you're -- when you're putting lithium-ions into the
18 anode charge, you're charging the cell. So as you put
19 more and more lithium-ions in the graphite, it
20 continually -- used on the various voltage plateaus, it
21 drops and it continues to drop until there's no room
22 within that graphite to continue to absorb lithium-ions,
23 at which point you start plating lithium metal.
24 The lithium-ions plate on the surface of the
25 graphite. And when that happens, you're at the voltage

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1 of a lithium metal reference, so you're at zero volts.
2 Q. And so you said that for graphite, the
3 reference voltage is between 0.1 and 0.2.
4 What about for hard carbon?
5 A. It's more of a sloping plateau. So, you know,
6 it has a higher voltage. I don't recall the exact
7 voltage because it is -- it ranges from, you know, maybe
8 0.3 or 4 down to zero.
9 ATTORNEY STAMATOPOULOS: Is this a good time
10 to take another break?
11 ATTORNEY SOMMER: Good for me.
12 THE REPORTER: Yes.
13 THE VIDEOGRAPHER: The time is 9:23 AM. We
14 are off the record.
15 (Recess taken.)
16 THE VIDEOGRAPHER: We are back on the record.
17 The time is 9:38 AM.
18 BY ATTORNEY STAMATOPOULOS:
19 Q. Mr. Juzkow, welcome back.
20 Did you speak with counsel during the break?
21 A. No, I did not.
22 Q. Okay. Are you familiar with a term called
23 "equilibrium potential"?
24 A. Not specifically.
25 Q. What about "equilibrium voltage"?

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A. Not specifically.
Q. What does the term "equilibrium voltage" or "potential" bring to mind in the context of lithium-ion batteries, if anything?
A. I'm not sure. I'm not familiar with the use of "equilibrium voltage" within lithium-ion batteries that I've been involved with.
Q. Are you familiar with that term in any other context?
A. No.
Q. Now, we talked about how Moli Energy's battery would retain approximately 80 percent of capacity after 500 cycles.
Do you recall that?
A. Yes.
Q. And if a battery lost 80 percent of its capacity after, say, five cycles, would that be considered by a person of ordinary skill in the art a commercially viable lithium-ion battery?
A. You said if it loses 80 percent, or if it reaches 80? I think you said it loses 80 percent.
Q. If it retained 80 percent.
A. Yes, I thought that's what you meant.
Q. I think I actually said loss, so let me just repeat the question so it's clear.

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If a battery retained 80 percent of its capacity after, say, five cycles, would that be considered by a person of ordinary skill in the art a commercially viable lithium-ion battery?
A. It could.
Q. In what context?
A. If you have a sudden drop in, or a quick drop in capacity over five cycles, and then it flattens out, and then you continue along at maybe 79 percent capacity for the next, you know, hundreds of cycles, then that's -- that would be a viable battery.
But you would base that battery -- you would sell it based on that 79 or whatever percent. That would be what you would market that battery as, and that's what the customer would expect, not the first five cycles. But it's common. I've seen that.
Q. What if a battery lost or -- withdrawn.
What if a battery retained 80 percent of its capacity for 25 cycles? Would that be considered a commercially viable lithium-ion battery?
A. That would depend on the application. So, you know, military applications, for instance, they in a lot of instances would be happy with a high-energy battery that gave them 25 cycles.
If a consumer had a battery that only lasted

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25 cycles in their cellphone, then that would not be a viable product. So it really depends on the application.
Q. And you said that a battery would be marketed based on it flattened-out capacity to a consumer if that -- if the capacity of that battery flattened out after, say, five cycles. Correct?
A. That would be the right thing to do.
Q. Would those five first cycles be considered a formation period for the battery?
A. Yes. That's one way you could lose capacity. You could have the lithium-ions, instead of intercalating into the graphite anode or carbon anode, that they would react on the surface of that active material and would -- they create what we call a solid electrolyte interface layer, known as SEI layer.
And that layer builds up on the surface of the active material and it basically protects that anode material, which is active and reacts with the electrolyte.
So it protects that active anode material. And sometimes what happens is when that anode material expands and contracts, you can get cracks in that material in the passivation layer. We call it -- the SEI is a passivation layer. It protects. If it gets a

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crack, the next cycle, you lose more lithium-ions inside those cracks.
And, you know, there's some electrodes that will expand and contract more, like a -- you know, a silicon anode will expand and contract a lot more, more cracks, more irreversible capacity loss. So I believe that was the answer to your question.
Q. You said "more irreversible capacity loss." Did you mean to say reversible capacity loss?
A. No, you would -- for a cell that drops quickly in the first five cycles, you would be losing reversible capacity so you would have increased irreversible capacity.
Q. So the reason I ask is because you just said, I believe, in your answer that you would have more irreversible capacity loss.
A. If it continued to crack and you had to add more lithium to protect the surface of the passivation, you end up with increased irreversible capacity.
Q. Increased irreversible capacity?
A. Correct, yeah, lost -- you lose those lithium-ions and they're no longer reversible to deintercalate from the anode and move to the cathode to intercalate into the cathode.
Q. And to the extent that some of the anode

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1 material reacts with the lithium-ions to create this SEI
2 layer, then it's no longer active. Correct?
3 A. That lithium-ion -- those lithium-ions are no
4 longer active.
5 Q. And the anode material that's reacted with
6 those lithium-ions that are no longer active likewise is
7 no longer active. Correct?
8 A. No.
9 Q. Why not?
10 A. Well, lithium-ions can still diffuse through
11 that passivation layer.
12 Q. Just to backtrack for a second, these first
13 few cycles in which you have a loss of capacity in my
14 previous question, would those first few cycles be
15 properly characterized as a formation period?
16 A. Yes. You call them an SEI formation period,
17 correct.
18 Q. And the reason you call it a formation period
19 is because those SEI layers are formed during that
20 period. Correct?
21 A. Correct.
22 Q. And the anode active material prior to the
23 beginning of this formation period, is it more or less
24 than the active material after the completion of that
25 formation period?

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1 A. There's no change in the active -- there's no
2 change in the active material, but there is a loss of
3 lithium. So, I mean, you don't lose the amount. You
4 still have the same amount of anode, active by mass.
5 It's still there. It's just that you've lost the
6 lithium that comes back and forth into it.
7 Q. I guess my question is what's your
8 understanding of active material?
9 A. Active material is -- active material is
10 material that is involved in the intercalation and
11 deintercalation of lithium-ions.
12 Q. So if part of that anode material is no longer
13 involved in a deintercalation of lithium-ions, would it
14 be fair to say that it's no longer active?
15 A. Yes.
16 Q. And in contrast, anode material that is still
17 involved in intercalation as well as deintercalation of
18 lithium-ions would be considered active. Correct?
19 A. Yes.
20 Q. Is it safe to use lithium metal as the
21 negative electrode?
22 ATTORNEY SOMMER: Object to form.
23 A. In my experience at Moli Energy, it was
24 unsafe. There's a lot of companies out there now that
25 are using lithium metal, and they are trying different

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1 methods to control lithium dendrite growth on the
2 surface of the lithium metal.
3 And in my experience, when you charge and
4 discharge a lithium metal battery, as you charge -- as
5 you move the lithium-ions towards the lithium metal, you
6 can form metallic dendrites that are sharp and spikey
7 that would start on the surface of the lithium metal and
8 can actually grow through the separator and short out to
9 the cathode so you have a current path.
10 You can also get lithium that becomes -- it
11 reacts with the electrolyte and it becomes what we call
12 dead lithium. And it's typically very mossy and a very
13 high surface area.
14 So when you check for the thermal stability
15 using an arc type equipment, a cell that's fresh can be
16 quite safe. But if you cycle lithium-ion -- or, sorry,
17 if you cycle a lithium metal battery 100 times, let's
18 say, the thermal stability is decreased, making it less
19 safe.
20 So in my work, I test lithium metal batteries.
21 Lithium metal batteries typically have higher energy
22 density than lithium-ion batteries for a given cathode
23 material, higher specific energy, which is what we need
24 for aircraft.
25 But on the downside, we have to make sure that

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1 the thermal stability doesn't decrease to the point
2 where it would be too dangerous to put on an aircraft.
3 BY ATTORNEY STAMATOPOULOS:
4 Q. Is it fair to say that cathode capacity is
5 proportional to the amount of lithium-ions that can be
6 extracted from the cathode at a particular voltage?
7 ATTORNEY SOMMER: Object to form.
8 A. In a lithium-ion cell, your lithium-ions that
9 you have in your battery come from your cathode. So
10 that's your -- typically, that's your entire source of
11 lithium-ions within the battery.
12 BY ATTORNEY STAMATOPOULOS:
13 Q. The greater the voltage that's applied to the
14 battery, the greater the amount of lithium-ions
15 extracted. Correct?
16 A. Correct.
17 Q. And to the extent that a person of ordinary
18 skill in the art were attempting to decrease the total
19 amount of lithium-ions from the cathode, would it be
20 reasonable to decrease the voltage applied to the
21 battery?
22 A. No. You would increase the voltage of the
23 charge voltage.
24 Q. My question was to the extent that a person of
25 ordinary skill in the art were attempting to decrease

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1 the amount of lithium-ions from the cathode, would it be
2 reasonable to decrease the voltage?
3 A. So I'm trying to answer your question the best
4 I can. When you have a fresh battery, lithium cobalt
5 oxide, the value of the number of lithium within that
6 cobalt oxide is 1. When you charge the battery, you
7 extract lithium from that lithium cobalt oxide. The
8 higher the voltage you go, the more you extract of the
9 lithium.
10 Q. Right. But if I wanted to limit the amount of
11 lithium extracted from the cathode during a charge
12 cycle, make it less --
13 A. Uh-huh.
14 Q. -- wouldn't I decrease the charge voltage?
15 A. You would.
16 ATTORNEY SOMMER: Object to form.
17 A. You would. And I apologize for
18 misunderstanding your question.
19 BY ATTORNEY STAMATOPOULOS:
20 Q. No need to apologize. Like I said, I'm happy
21 to ask better questions if I can. Why is it that --
22 withdrawn.
23 You testified earlier that persons of ordinary
24 skill in the art were cautious about extracting an
25 excess amount of lithium from the cathode.

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1 Is that fair?
2 A. Yes.
3 Q. Why is it that there was a concern about
4 extracting excess lithium?
5 A. You would make the cathode material unstable.
6 Q. In what way?
7 A. The molecule will change its structure and it
8 will become more thermally unstable. So when you take
9 out too much lithium, you change the molecular structure
10 of the cathode material. When you do that, it becomes,
11 you know, more reactive, less thermally stable for, you
12 know, cobalt oxide, nickel oxide, all these type
13 compounds.
14 Q. Are you generally familiar with the typical
15 irreversible capacity for graphite anode material?
16 A. Yeah.
17 ATTORNEY SOMMER: Objection.
18 A. It could be -- could be in the 10 percent or
19 less range. It really depends on the, you know, the
20 quality of the lithium, the surface area -- or, sorry,
21 the quality of the graphite, the surface area of the
22 graphite. You know, there's a number of factors but,
23 you know.
24 BY ATTORNEY STAMATOPOULOS:
25 Q. What about for hard carbon?

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1 Does hard carbon have typical irreversible
2 capacity values?
3 ATTORNEY SOMMER: Object to form.
4 A. Yeah. They're higher. They'd be higher than
5 graphite. You have more -- the carbons are -- in
6 graphite are pretty well structured. You have graphite
7 C6 rings, and they're flat, and they sit on top of each
8 other like a deck of playing cards.
9 But when you have hard carbon, those flat C6
10 carbon rings are less -- they're more disordered. And
11 when they're more disordered, there's more reaction
12 sites and you can get more irreversible capacity loss,
13 more passivation occurring because the surface area is
14 typically larger.
15 BY ATTORNEY STAMATOPOULOS:
16 Q. And what's a typical range of irreversible
17 capacity for hard carbon?
18 ATTORNEY SOMMER: Object to form.
19 A. It could vary. It could be 20 percent. Some
20 materials can be much higher, to 45, 50 percent if it's
21 a really poor material.
22 BY ATTORNEY STAMATOPOULOS:
23 Q. Have you ever encountered a hard carbon anode
24 material that had a 1 percent irreversible capacity?
25 A. Not to my knowledge.

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1 Q. What about a 5 percent irreversible capacity?
2 A. Not to my knowledge. I don't have a lot of
3 experience with hard carbons. Most of my experience is
4 with graphite. We moved away from hard carbons back in
5 the early '90s to increase the gravimetric energy of the
6 cells.
7 Q. And for graphite, have you encountered any
8 graphite anodes with a 5 percent irreversible capacity?
9 A. Probably. Probably, over the years. I mean,
10 there's definitely a range, and it definitely is
11 dependent on the surface area of the material.
12 Q. What about a 1 percent irreversible capacity
13 for graphite?
14 A. I'm not that familiar with values that low
15 for --
16 Q. Would you be surprised if you were presented
17 with a graphite anode for which it was reported that the
18 irreversible capacity was 1 percent?
19 A. No, I would not be surprised.
20 Q. Why is that?
21 A. If the graphite's stable, you can have a lot
22 less -- and the surface area's low, you can have a lot
23 lower -- a lot lower irreversible capacity.
24 Q. What about 0.1 percent?
25 Would that be a surprising value?

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1 A. I've not personally seen materials that I've
2 worked with that are that low.
3 Q. Have you ever heard of any materials that had
4 irreversible capacity at that level?
5 ATTORNEY SOMMER: Object to form.
6 A. I know in the Uemura patent, the values for
7 irreversible capacity are pretty low. One of the
8 reference in my -- one of the references I use.
9 BY ATTORNEY STAMATOPOULOS:
10 Q. And you're referring to Exhibit 1009 of your
11 declaration. Correct?
12 A. Yes.
13 (Exhibit No. 1009, previously marked, was
14 referenced and indexed.)
15 BY ATTORNEY STAMATOPOULOS:
16 Q. And you have that in front of you?
17 A. Yes.
18 Q. And you're looking at Figure 3 of Uemura?
19 A. Yes.
20 Q. And when you said that Uemura reports low
21 irreversible capacities, you're referring to a column in
22 Figure 3 that is titled Total Irreversible Capacity.
23 Correct?
24 A. Yes.
25 Q. And other than examples 2, 3, and 4, Uemura

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1 reports 0.002 as the total irreversible capacity value
2 corresponding to the remaining examples. Correct?
3 A. Correct.
4 Q. Prior to the Uemura reference and your study
5 of the Uemura reference in connection with this case,
6 had you encountered any anode materials with total
7 irreversible capacity values as low as those reported in
8 Uemura?
9 A. Not personally.
10 Q. What about other than personally?
11 A. Not that I recall. I mean, it's a very
12 specific property. You know, you have to read specific
13 technical papers. And over the years, I've read a lot
14 of papers but I don't recall, you know, values, specific
15 values.
16 Q. And you studied Uemura in connection with
17 forming your opinions in this case, right?
18 A. Yes.
19 Q. And in addition to the Total Irreversible
20 Capacity column, there is another column two columns to
21 the right that is titled IC Over PC Times 100 percent.
22 Do you see that?
23 A. Yes.
24 Q. What is your understanding of the meaning of
25 IC over PC times 100 percent?

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1 A. That's the irreversible capacity divided by
2 the total capacity of the cathode.
3 Q. And for examples 1 and 5 through 17, that's
4 reported as 0.1 percent, right?
5 A. Yes.
6 Q. And to be clear, in your experience personally
7 as well as from papers that you had read or that you
8 have read in the last 30 or so years, you have not
9 encountered values as low as those reported in Uemura.
10 Correct?
11 A. I -- I can't recall.
12 Q. And once you encountered these values in
13 Uemura, did you conduct any research to determine
14 whether these values were accurate?
15 A. No.
16 Q. Why not?
17 A. I did not because I just went by the technical
18 data provided in the patent.
19 Q. Now, you have experience building secondary
20 lithium-ion battery cells. Correct?
21 A. Yes.
22 Q. And designing lithium-ion battery cells?
23 A. Yes.
24 Q. And you've had hands-on experience in the lab
25 testing these types of cells. Correct?

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1 A. Yes.
2 Q. And do you know if it would be possible for
3 you or someone under your supervision to reconstruct the
4 battery described in the Uemura reference?
5 A. I don't believe they specifically say where
6 they get their graphite material from. I'd have to read
7 through here again to see. But whether they -- where
8 they buy it from or if they make it themselves. But to
9 replicate this, you would need to use the very same
10 graphite material.
11 Q. When you say "the very same graphite
12 material," do you mean the same material procured from
13 the exact same source?
14 A. Yes.
15 Q. So if you were able to procure material that
16 was similar or had similar properties to the one
17 described in Uemura, would it not be possible to
18 recreate the Uemura battery?
19 ATTORNEY SOMMER: Object to form.
20 A. If you tested a graphite material and you
21 measured the irreversible capacity and you achieved
22 0.1 percent, then yes, that would be -- you would be
23 able to replicate.
24 BY ATTORNEY STAMATOPOULOS:
25 Q. You mentioned graphite. Do the examples in

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1 Uemura all pertain to graphite?
2 A. No, they don't.
3 Q. They pertain to hard carbon. Correct?
4 A. They give examples of coke, artificial
5 graphite, natural graphite, hard carbon.
6 Q. And the materials used are listed in page 11
7 of the exhibit as well as page 12, where it describes
8 the various examples, right?
9 A. Yeah. Also page 9, paragraph 53 is one area.
10 Q. And then also in paragraph 74, there's a
11 section titled Fabrication of Battery. Correct?
12 A. Yes. That's regarding the positive electrode.
13 Q. Now, if you reconstructed the Uemura battery
14 with respect to each of these examples and ran the tests
15 reported in Uemura to discover that the total
16 irreversible capacity reported in Uemura is actually not
17 the same as that experimentally determined by you in the
18 process of reconstructing the Uemura battery, would that
19 in any way affect your opinions?
20 ATTORNEY SOMMER: Object to form.
21 A. In paragraph 77, paragraph 77, they explain
22 the way they made the carbon negative electrodes to have
23 the irreversible capacity of .002. They performed a
24 number of cycles, discharge/charge cycles performed at
25 0.5 milliamps for 40 hours with a lithium metal plate as

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1 the opposite electrode, then decomposition was performed
2 in an argon gas atmosphere. Thus, the carbon negative
3 electrodes, each with -- each of which had a total
4 irreversible capacity of .002 milliamp hours, were made.
5 So it looks like, based on paragraph 77, that
6 they -- they created the irreversible -- they used up
7 the irreversible capacity. And once that was completed,
8 once those 40 hours of charge/discharge was performed,
9 if you took that carbon negative electrode and you ran
10 one more cycle on it, that the total irreversible
11 capacity of that negative electrode would be .002
12 milliamp hours.
13 BY ATTORNEY STAMATOPOULOS:
14 Q. So what you're saying I think -- I just want
15 to make sure I understand -- is that at the end of that
16 40-hour period, the, let's say, incremental irreversible
17 capacity was 0.002. Correct?
18 A. That's the way I read this paragraph.
19 Q. In other words, the irreversible capacity
20 before this process was much greater.
21 ATTORNEY SOMMER: Object to form.
22 A. They don't specifically say that here.
23 BY ATTORNEY STAMATOPOULOS:
24 Q. Would a person of ordinary skill in the art
25 understand that the irreversible capacity before the

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1 process described in paragraph 77 was greater than the
2 0.002 reported in Uemura?
3 A. Yes.
4 Q. Why is that?
5 A. As I said before, I had not seen negative
6 electrodes that -- carbon negative electrodes that had
7 low irreversible capacity such as this level. And, I
8 mean, 0.1 percent is very low.
9 I'm not familiar with materials like that.
10 This one's made by -- it's a hard carbon made by
11 Mitsubishi Gas & Chemical. Chances are, yeah, it would
12 not have 0 point -- it would not have 0.1 percent
13 irreversible capacity as provided by Mitsubishi Gas &
14 Chemical, or standard hard carbon, which they don't
15 specify exactly which hard carbon. I mean, there's a
16 multitude of hard carbons out there.
17 Q. Is the charge/discharge that was performed at
18 0.5 milliamps for 40 hours described in paragraph 77 of
19 Uemura, in your view, a formation period for the anode?
20 A. Yes, that's the way I read it.
21 Q. And is a formation period necessary --
22 withdrawn.
23 Is it necessary to complete the formation
24 period before testing a battery to see how it would
25 perform in normal operation?

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1 ATTORNEY SOMMER: Object to form.
2 A. In the experiments that Uemura was doing, he
3 needed a graphite material that had a low irreversible
4 capacity to prove out his thesis. And so therefore, the
5 way I read this is that he created those low
6 irreversible capacity electrodes to -- for the purpose
7 of his tests and what he was trying to prove.
8 BY ATTORNEY STAMATOPOULOS:
9 Q. And what was Uemura trying to prove?
10 A. He was trying to make electrodes that had --
11 it was like he's -- he's trying to get away from cobalt
12 and nickel and go to manganese-type materials.
13 Manganese, which is a very low-cost material.
14 And there's different manganese materials.
15 There's a manganese lithium, Mn204. But, you know,
16 there's problems with that one. Particularly, it's got
17 a lower capacity per gram and it's less stable at high
18 temperatures. The manganese will come out of the
19 material. The manganese will dissolve into the
20 electrolyte and poison the anode.
21 So he was looking at manganese dioxide. So
22 lithium LiMnO2, and he was looking at variations of that
23 material. And he was trying to create a cathode
24 material that had high capacity but also cycled with
25 high cycle life.

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1 Q. And why was it important to Uemura to carry
2 out this formation period in connection with showing
3 that lithium manganese dioxide was a suitable anode?
4 Sorry, cathode.
5 ATTORNEY SOMMER: Object to form.
6 A. So he was adjusting the lithium content within
7 those molecules. And his -- one of his theses was that
8 if you had a lithium-deficient molecule that you could
9 get higher cycle life. And by lowering that lithium
10 content, he wanted to know how that molecule would cycle
11 with a minimal amount of loss of the lithium in there.
12 So let's say there's example 14. He has 0.75
13 lithium per molecule. He wants to cycle that and see
14 how well it cycles with 0.75 lithium in that molecule.
15 If he had a higher reversible -- sorry, if he had a
16 higher irreversible capacity in his anode, that would
17 change the value of that .75 material that's available
18 on the second discharge. It would change that value,
19 and he would -- his thesis would be a little harder to
20 prove.
21 BY ATTORNEY STAMATOPOULOS:
22 Q. You said that for lithium manganese -- forgive
23 me, my chemical terminology is not -- my organic
24 chemistry, or maybe it's inorganic in this case, is not
25 that great.

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1 But when we have four oxygens, lithium
2 manganese 04, is that called layered?
3 A. No, that's a spinel structure, so lithium
4 Mn204, and that's a very different -- it's a spinel
5 structure whereas these, lithium manganese dioxide, so
6 LiMnO2, that's a layered structure.
7 Q. So for the lithium manganese oxide, the spinel
8 structure, you said that at high temperatures, this
9 could poison the electrolyte?
10 A. Well, that's been -- it's a common, you know,
11 understanding for that material that when you cycle it,
12 particularly at high temperatures, the manganese -- some
13 manganese will dissolve and it will travel over to the
14 anode, poison the anode, and your cycle life would be
15 decreased.
16 Q. And what would constitute a high temperature?
17 A. The amount of manganese that would dissolve
18 would be -- would be a function of temperature. So, you
19 know, the higher the temperature, the more manganese
20 would dissolve out.
21 There are manganese -- you know, spinel, when
22 I say lithium manganese spinel, I'm talking about Mn204.
23 There are materials out there that are sold on the
24 market that perform, you know, reasonably well. But
25 typically, when you go to a higher temperature, it will

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1 dissolve more.
2 I actually leased a Nissan LEAF, and it had a
3 manganese spinel material in it. And within three
4 years, my battery went from 80 miles to 64 miles of
5 range. So it, you know, it lost a significant amount of
6 capacity.
7 And you -- you know, it depends on the
8 application, it depends on the temperature that you take
9 it to. But there are applications like drills.
10 Milwaukee drills use lithium manganese spinel and they
11 work very well. But it's just the temperature -- I
12 should -- sorry, it's a long answer, but to answer a
13 short answer, the higher the temperature, the more
14 manganese dissolution.
15 Q. And is temperature affected by the charge
16 voltage?
17 ATTORNEY SOMMER: Object to form.
18 A. Those are two separate parameters.
19 BY ATTORNEY STAMATOPOULOS:
20 Q. Well, if I apply a higher charge voltage, all
21 else being equal, will the temperature increase or
22 decrease or remain the same?
23 ATTORNEY SOMMER: Object to form.
24 A. When you charge a battery, there's internal
25 impedance in that battery in that when you charge it,

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1 the higher the rate that you use, the higher the
2 current, generates more heat within the battery and
3 raises the temperature of the battery. So that's a
4 function of the square of the current multiplied by the
5 resistance of the battery is the amount of heat that's
6 generated. So higher charge rates, more -- higher
7 temperature within the battery.
8 BY ATTORNEY STAMATOPOULOS:
9 Q. And one way to increase the charge rate would
10 be to increase the voltage. Correct?
11 A. No.
12 Q. Is the current not related to the voltage?
13 A. No.
14 Q. The current of a -- the charging current of a
15 battery is not related to the voltage that is applied to
16 the battery?
17 A. Well, when you -- if you charge a battery
18 under normal -- a one-hour charge, you can charge fully
19 to the top upper cutoff voltage.
20 When you try to fast charge a battery, let's
21 say you want to charge a battery in 30 minutes, then if
22 you charge to -- at that rate, you can -- you'll
23 generate more heat within the battery. The temperature
24 of the battery will go up, but you'll also have a
25 possibility of plating lithium on the surface of the

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1 anode material. And when you do that, you end up with
2 irreversible capacity, loss of lithium, loss of lithium
3 in the cell, and your cycle life will drop.
4 So in that respect, voltage is important. But
5 voltage is just the -- it's just one part. It's the --
6 actually, voltage and the amount of lithium that's in
7 that molecule are related.
8 So when you say voltage, it's also the amount
9 of lithium within the molecule, and they're related. So
10 to do a fast charge, you don't want to fast charge a
11 cell that has less lithium inside the cathode material.
12 Q. Is it fair to say that typically, a person of
13 ordinary skill in the art might apply a constant current
14 for a period of the charging and then for a different
15 period of the charging switch to a constant voltage?
16 ATTORNEY SOMMER: Object to form.
17 A. Yes.
18 BY ATTORNEY STAMATOPOULOS:
19 Q. In what circumstance?
20 A. That's a very, very common method of charging
21 a lithium-ion battery.
22 Q. Why is that?
23 A. When you charge at a constant current, you
24 don't -- you can't move all the lithium from the cathode
25 that you want to move into the anode. You have some

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1 diffusion limits so you have to diffuse lithium through
2 the SEI layer into the active anode material, and that
3 takes time. And you have to allow it that time.
4 So you want to hold the battery at a voltage
5 so that you have that electromotive force so you hold it
6 at that upper charge cutoff and then the current slowly
7 drops and -- as you start -- as you continue to
8 intercalate lithium into the graphite.
9 So it's a very common method. If you only did
10 a constant current charge, you might only get, let's
11 say, 80 percent charge if you don't do the full charge.
12 If you charge at a very high rate, like a 2C rate, you
13 might only get 60 percent capacity in the cell if you
14 only do the constant current portion.
15 Q. I see.
16 Going back to the formation period, if a
17 person of ordinary skill in the art wanted to test the
18 performance characteristics of a battery in normal
19 operating conditions, would they conduct their testing
20 after the formation period is over?
21 ATTORNEY SOMMER: Object to form.
22 A. Yes. That's very typical.
23 BY ATTORNEY STAMATOPOULOS:
24 Q. And why is that?
25 A. The formation cycle is unique in that you have

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1 irreversible capacity loss, and it only occurs for -- at
2 the very beginning. If you do it correctly, you can
3 have most of the irreversible capacity, all the
4 passivation generated within the first one or two
5 cycles.
6 And then after that, the amount of
7 irreversible capacity would be much lower and those
8 future cycles would be very similar.
9 But if you tested your first cycle, your very
10 first charge and you compared it to your fifth charge
11 and your 10th charge and all that, very different.
12 And finally, final comment is that, you know,
13 the customer never sees the formation process. They
14 always get the battery after it's been formed so they
15 never see that part of the process.
16 Q. You mentioned a term there, "irreversible
17 capacity loss." What do you mean by irreversible
18 capacity loss?
19 A. Well, you're losing lithium. You're losing
20 lithium on the -- and generated in the passivation
21 layer. So I said earlier that in a standard battery,
22 lithium-ion battery, your lithium, you have a finite
23 amount of lithium within the cell. And that lithium
24 comes from the cathode.
25 So in your first charge, you take that lithium

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1 out of the cathode. You try to intercalate it into the
2 graphite anode, but you also generate that passivation
3 layer. When you do that, that lithium that goes into
4 the passivation layer's lost so you can no longer access
5 that lithium. That becomes irreversible lithium.
6 Q. I see.
7 Earlier, we discussed very briefly a reference
8 electrode. Do you recall that?
9 A. Yes.
10 Q. What is a reference electrode?
11 A. When you have two electrodes that both have
12 voltages that change, a reference electrode could be a
13 third electrode that you would put into the cell. It
14 does not -- it's not part of the working cell. You're
15 moving lithium-ions between the counter and the working
16 electrode, which you move -- and then you have a third
17 electrode that just sits there and doesn't really
18 intercalate/deintercalate, it just kind of sits there
19 and it acts like a reference.
20 So lithium metal is a very good reference for
21 this. Lithium metal, if you take lithium metal versus
22 lithium metal and you move lithium from one side to the
23 other, you'll just have a very flat voltage. It's a
24 flat voltage throughout. And because you have
25 lithium-ions within lithium-ion batteries, lithium metal

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1 is a very standard reference.
2 When we look at the -- when we talk about the
3 voltages of the individual cathode and anode, we talk
4 about those individual voltages as a function of the
5 lithium reference voltage.
6 Q. And is the reference electrode used in
7 lithium-ion batteries that are sold to consumers as a
8 final product?
9 A. No.
10 Q. Are reference electrode used in testing of
11 lithium-ion batteries?
12 A. Yes.
13 Q. And are reference electrodes used to establish
14 the capacities of the anode and cathode respectively?
15 A. Yes.
16 Q. And the cathode will have a potential versus
17 the lithium reference electrode. Correct?
18 A. Yes.
19 Q. For example, 4.3 volts might be the potential
20 of the cathode versus the reference electrode, right?
21 A. Yes.
22 Q. And is that known as the half-cell cathode
23 potential?
24 A. Yes.
25 Q. And similarly, the anode may have a potential

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1 versus the lithium reference electrode, right?
2 A. Yes.
3 Q. And that might be much lower than the cathode,
4 for example, 0.1, 0.2, or 0.3 volts. Correct?
5 A. Yes.
6 Q. And we discussed those earlier about different
7 anode materials like graphite or hard carbon, right?
8 A. Yes.
9 Q. And the anode potential versus the lithium
10 reference electrode would have to be determined on a
11 case-by-case basis for different anode materials.
12 Correct?
13 A. Yes.
14 Q. And that potential between the anode and the
15 lithium reference electrode is known as the half-cell
16 anode potential. Correct?
17 ATTORNEY SOMMER: Object to form.
18 A. Yes.
19 BY ATTORNEY STAMATOPOULOS:
20 Q. And the full-cell potential between the anode
21 and the cathode will be equal to the difference between
22 the half-cell potentials of the anode and the cathode.
23 Correct?
24 A. Yes.
25 Going back to your previous question, you said

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1 the lithium -- the anode versus a -- the anode versus
2 lithium metal, and you called that a lithium anode
3 half-cell? Could you -- the court reporter, could you
4 repeat the previous question?
5 (The reporter read from the record.)
6 THE WITNESS: Thank you. So it's -- in that
7 case, when you have a anode and you put it against the
8 lithium metal, the lithium metal is the actual anode by
9 definition, by electrochemical definition. So the
10 lithium metal becomes the anode in that case.
11 So it's a little -- it's just a nuance. I
12 just wanted to make sure I was clear on that because
13 your higher voltage was your anode material, your lower
14 voltage was the lithium metal, yeah.
15 BY ATTORNEY STAMATOPOULOS:
16 Q. But it's still a half-cell potential.
17 Correct?
18 A. It's still -- yeah. I -- I just wanted to be
19 absolutely clear in my answer.
20 Q. That's fair.
21 And we spoke earlier a little bit about
22 constant current charging. Just to be clear, what is
23 constant current charging?
24 A. Constant current is when you have a constant
25 number of electrons moving through the external circuit.

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1 Q. Current is measured in amps. Yes?
2 A. Yes. Amperes, to be -- but we call it -- we
3 say amps, but amperes, A-M-P-E-R-E, is the actual term.
4 But yeah, we say amps.
5 Q. And when you're charging with constant
6 current, a person of ordinary skill in the art would
7 understand that the number of amps doesn't change.
8 Correct?
9 A. Correct.
10 Q. And when a battery is charged with a constant
11 current, typically, charging will stop once a certain
12 voltage is reached. Correct?
13 A. If the charger is set up to not allow charge
14 beyond a specific voltage, then yes, it would stop.
15 Q. Let's go back to Uemura, which is Exhibit 1009
16 of your declaration, or to your declaration. And
17 specifically, paragraph 81. Let me know when you're
18 there.
19 A. I'm here.
20 Q. So Uemura describes here: The
21 charge/discharge was repeatedly performed at a constant
22 current of 0.5 milliamps per squared centimeter and a
23 voltage ranging from 4.3 volts to 2 volts at an
24 atmospheric temperature of 60 degrees Celsius.
25 Did I read that correctly?

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1 A. Yes.
2 Q. So Uemura's describing constant current
3 charging. Is that fair?
4 A. Yes.
5 Q. And according to Uemura's description, the
6 charging would stop once the externally applied voltage
7 would reach 4.3 volts. Correct?
8 A. The way it's written in paragraph 81, yes.
9 Q. Is there any other way to understand what's
10 written in paragraph 81?
11 ATTORNEY SOMMER: Object to form.
12 A. No, unless they left out the constant voltage
13 component, if they left that out. But when you charge
14 and discharge a cell, if you charge it at a slow enough
15 rate, you don't need that constant voltage component if
16 you charge at a slow enough rate.
17 BY ATTORNEY STAMATOPOULOS:
18 Q. And what would be a slow enough rate?
19 A. Depending on the cell.
20 Q. And how would the -- how would different cells
21 inform your view as to whether the constant current
22 applied to them produced a slow enough charge rate?
23 ATTORNEY SOMMER: Object to form.
24 A. The way you would test it is you would run at
25 a specific current to your upper voltage. You put it in

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1 constant voltage mode, and then you see how much
2 capacity is available during that constant voltage mode
3 to a lower cutoff current.
4 So, you know, if your lower cutoff current is
5 the same as your constant current that you use, then
6 there is no need for your -- that constant voltage
7 component. So it's -- you know, it -- also, like, if a
8 cell -- the way the cells are designed, cells that are
9 designed for very high power capability, very thin
10 electrodes, very porous, you can charge them fully at
11 low power -- at low current.
12 BY ATTORNEY STAMATOPOULOS:
13 Q. Is the current described here in Uemura low?
14 ATTORNEY SOMMER: Object to form.
15 A. Yes.
16 BY ATTORNEY STAMATOPOULOS:
17 Q. In what sense is it low?
18 A. Typically what you do is you look at the
19 milliamps versus the milliamps per square centimeter.
20 So they measure at milliamps per square centimeter. And
21 then you look at the materials, the actual electrodes,
22 and you determine what's the milliamp hours per square
23 centimeter. And you divide, and you end up with a, you
24 know, a rate, which would be what we call a C rate.
25 And that C rate could be, you know, C over 10,

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1 which would be a 10-hour discharge. It could be C over
2 5, which would be a 5-hour discharge. It could be 2C,
3 which is a 30-minute discharge. So that's how you
4 determine what the C rate is.
5 And then you have to look at the electrodes to
6 see how porous they are, what the power capability is,
7 and to determine what C rate is low.
8 Q. Can you determine the C rate here in Uemura
9 based on the information reported in the reference?
10 A. I'll have to look to see what the area of
11 those electrodes are. I don't recall. I can read
12 through the patent if you want.
13 Q. You can, yes. But before -- yes, please go
14 ahead and read it.
15 A. Okay. So the electrode diameter is 15
16 millimeters, so the area of that would be pi r squared
17 so -- can I open up my calculator?
18 Q. Sure.
19 A. Okay. Actually, if it's okay if I do it on my
20 phone?
21 Q. That's fine, yes.
22 A. Okay.
23 Q. I trust that you won't communicate with anyone
24 as you perform the calculation. It's totally fine.
25 A. It's a calculator. Okay, so 2015,

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1 1.5 centimeters, .75 times point -- see, that's about
2 1.8 square centimeters. And .5 divided by 1.8 works out
3 to about C over 3, C over 4 discharge rate. So that
4 would be a 4-hour discharge from start to finish.
5 Q. What capacity did you use?
6 A. Sorry, you're right. Sorry, let me do that
7 one more time. Okay, so that works out to about 1.3
8 milliamp hours per square centimeter, divided by .5, so
9 that's about a -- 2.6 -- so that's about a C -- it's
10 about a 4-hour discharge.
11 Q. Can you for the record describe the
12 calculation that you performed?
13 A. Sure. I took the diameter of the electrode.
14 I divided by 2 to get the radius. I squared that value,
15 then I multiplied by pi, and that gave me the area of
16 the electrode. And then I took the capacity of the
17 negative electrode, I divided by -- so that's milliamps.
18 And I divided by the area in square centimeters, and I
19 came up with a value for milliamp hours per square
20 centimeter.
21 Q. Why did you use the capacity of the negative
22 electrode?
23 A. That was the first one I found. But you're
24 very right. I found the diameter of the cathode, so
25 you're absolutely correct. When you have the diameter

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1 of the anode larger than the diameter of the cathode,
2 the diameter of the cathode should be the one I'm using,
3 yes.
4 Q. So how would your calculation be affected if
5 you used the diameter of the cathode?
6 A. Okay, so that one is about 2, 2 milliamp hours
7 per square centimeter. And at 0.5 milliamps per square
8 centimeter, that's about a 4-hour rate, so it's -- it
9 was a negligible difference. So it's a -- a 4-hour
10 discharge rate.
11 Q. And what is the practical significance of a
12 4-hour discharge rate?
13 ATTORNEY SOMMER: Object to form.
14 THE WITNESS: Can you clarify that question?
15 BY ATTORNEY STAMATOPOULOS:
16 Q. Is that a fast discharge rate or a slow
17 discharge rate?
18 ATTORNEY SOMMER: Object to form.
19 A. That would be kind of in the middle of your
20 typical 10 hours and one hour rates. But the actual --
21 you have to look at the electrodes themselves and look
22 at the porosity of the electrodes, the surface area of
23 the electrodes, the connectivity of the electrodes to
24 determine for that particular material, is that a low or
25 high rate for that particular material.

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1 And typically, when -- in research and
2 development, you know, researchers don't push the
3 envelope of the capacity per square centimeter. They go
4 very light, very low capacity per square centimeter just
5 for research purposes.
6 So in a typical lithium-ion battery, a 10-hour
7 rate would be slow, but that would be a very high, very
8 dense electrode. And so, you know, for this one, it's
9 hard -- they don't specifically say -- yeah, it's --
10 it's difficult for the amount of information they give
11 you whether or not that's a low or a high rate.
12 And typically in research, too, people don't
13 do CV component when you're trying to study electrodes.
14 A lot of times, not -- it's typically, a POSITA would
15 maybe use just constant current.
16 BY ATTORNEY STAMATOPOULOS:
17 Q. So just to sum things up a little bit, there's
18 a number of things that you would need to look at in
19 order to determine whether the charge -- the discharge
20 rate you just calculated for Uemura's example is slow or
21 fast. Correct?
22 A. Yes.
23 Q. And that information that would be necessary
24 for you to consider in order to make that determination
25 is not available in Uemura. Correct?

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1 A. That's correct.
2 Q. And you mentioned that persons of ordinary
3 skill in the art conducting experiments or testing such
4 as the one THAT'S disclosed here in Uemura will
5 typically omit a CV component. Correct?
6 ATTORNEY SOMMER: Object to form.
7 A. It's -- it's common.
8 BY ATTORNEY STAMATOPOULOS:
9 Q. And when you say -- and when you say a CV
10 component, you mean the constant voltage part of the
11 charging, right?
12 A. Correct. Yeah.
13 Q. And Uemura here doesn't show a constant
14 voltage period -- or let me withdraw that.
15 Uemura here doesn't disclose that constant
16 voltage charging was performed in the experiment
17 described in paragraph 81. Correct?
18 A. Correct.
19 Q. Why is it that persons of ordinary skill in
20 the art conducting these types of tests would omit the
21 constant voltage phase of the charging?
22 ATTORNEY SOMMER: Object to form.
23 A. Yeah, I don't have a specific answer for that.
24 BY ATTORNEY STAMATOPOULOS:
25 Q. It's just based on your experience that

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1 you're --
2 A. Based on my --
3 Q. -- basing it on?
4 A. -- experience in research and development type
5 papers, technical work, people use low currents. And
6 they're able to get really the full results using low
7 currents without having to do a CV component.
8 It's just in -- like with standard commercial
9 lithium batteries, lithium-ion batteries, you want to
10 charge them quickly. And to do that, you use the
11 constant voltage component and you use a much higher
12 charge current.
13 The way I read this, a POSITA would read it --
14 sorry. The way a POSITA would read this is saying that
15 if there's not using the constant voltage mode that they
16 are fully charging and fully discharging the cell at
17 that rate.
18 ATTORNEY STAMATOPOULOS: Okay. I think we've
19 reached another logical sort of breaking point. Should
20 we go off the record briefly?
21 THE VIDEOGRAPHER: Time is 10:57 AM. We are
22 off the record.
23 (Recess taken.)
24 THE VIDEOGRAPHER: We are back on the record.
25 The time is 11:47 AM.

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1 BY ATTORNEY STAMATOPOULOS:
2 Q. Welcome back, Mr. Juzkow.
3 Did you communicate with counsel at all during
4 the break?
5 A. No, I didn't.
6 Q. Now, we discussed earlier two different
7 lithium manganese oxide types of cathode, the layered
8 and the spinel.
9 Do you recall that?
10 A. Yes.
11 Q. Is the layered version of lithium manganese
12 oxide in use commercially currently?
13 ATTORNEY SOMMER: Object to form.
14 A. Not that I know of.
15 BY ATTORNEY STAMATOPOULOS:
16 Q. Why is that?
17 A. Well, lithium manganese dioxide has a low
18 voltage versus lithium metal, so its voltage is around
19 3 volts. So energy is a function of the product of
20 voltage times capacity. So if your voltage is
21 25 percent lower, then your energy is going to be
22 25 percent lower.
23 Q. What do you mean that lithium manganese
24 dioxide has a low voltage versus lithium metal?
25 A. When you put it in a half-cell and you cycle

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1 it in a half-cell, the voltage is around 3 volts. And
2 the difference -- the battery voltage, as we talked
3 about earlier, are the cathode minus the anode voltages.
4 Now, lithium manganese dioxide is used in
5 primary batteries and so it is used in lithium metal
6 primary batteries. Lithium metal primary batteries.
7 It's a lot of time coin cells, military batteries.
8 Q. What would happen to a battery using lithium
9 manganese dioxide as its cathode if a 4.3-volt voltage
10 were applied to it, for example?
11 ATTORNEY SOMMER: Object to form.
12 A. The average plateau voltage will still be
13 around 3 volts. And it's really the average voltage
14 that gives you the capacity. So you can charge it to
15 4.3, but the average is going to be lower.
16 BY ATTORNEY STAMATOPOULOS:
17 Q. What about spinel lithium manganese dioxide?
18 Is that currently in use commercially?
19 A. Yes.
20 Q. In what types of applications?
21 A. That's used in Milwaukee drills and power
22 tools, and it's used in the Nissan LEAF. Actually, the
23 Nissan LEAF uses -- we developed lithium manganese
24 spinel at Moli Energy. NEC was one of our owners, and
25 they took the technology to Japan and started a battery

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1 company, and they now use that same technology.
2 Q. And besides Nissan LEAF and Milwaukee drills,
3 are you familiar with any other types of applications
4 that employ lithium-ion batteries with spinel lithium
5 manganese oxide as the cathode?
6 ATTORNEY SOMMER: Object to form.
7 A. Not that I can think of today.
8 BY ATTORNEY STAMATOPOULOS:
9 Q. Are you aware of any reasons for which the use
10 of lithium manganese oxide in the spinel form is limited
11 to those two applications?
12 ATTORNEY SOMMER: Object to form.
13 A. The practical capacity of that material is
14 lower than other materials, other cathode materials that
15 are commonly used in the industry. It also has the
16 issues that I talked about earlier where you -- you
17 know, if you take it to high voltages at high
18 temperatures you have manganese dissolution, poisoning
19 of the anode, and reduction in cycle life.
20 BY ATTORNEY STAMATOPOULOS:
21 Q. And what do you mean by taking it to high
22 voltages?
23 A. Above 4 point -- well, even 4.2 is a high
24 enough voltage for that to occur. It's a really good
25 compound in the way that it's -- the manganese spinel is

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1 a zero strain material, so at zero strain, it doesn't
2 collapse on itself. It just stays -- you can cycle it
3 at -- when you're cycling at normal temperatures and,
4 you know, lower voltages, it will cycle very, very well.
5 We used it at -- when I was at Leyden Energy,
6 we used it as a cathode versus lithium titanate to make
7 start/stop batteries for cars that I don't believe
8 they're being used anymore.
9 Q. But if you charged it to 4.2 volts, various
10 issues would arise. Correct?
11 A. You know, the cycle life is good at 4.2. It's
12 just when you get to higher temperatures that it
13 starts -- you know, and there's been a lot of work --
14 General Motors has done a lot of work in this area in
15 terms of stopping the manganese dissolution. A lot of
16 work, because it's such a good material. It's safe.
17 Manganese is very, very safe. You can overcharge it,
18 overdischarge it. It's very safe that way.
19 So there's been a lot of work on it, but you
20 still have that high temperature dissolution issue.
21 Q. So what's the recommended voltage for lithium
22 manganese oxide in the spinel form?
23 ATTORNEY SOMMER: Object to form.
24 A. At the time I was working on it, it was
25 4.2 volts. But I don't know specifically what voltage

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1 it's used in today in the portable drills and the
2 electric vehicles. I'm not sure.
3 BY ATTORNEY STAMATOPOULOS:
4 Q. You cited Exhibit 1008 in your declaration.
5 Correct?
6 A. Yes.
7 (Exhibit No. 1008, previously marked, was
8 referenced and indexed.)
9 BY ATTORNEY STAMATOPOULOS:
10 Q. Exhibit 1008 is a reference by Guyomard.
11 A. Yes.
12 Q. Now, if you turn to page 4 of Exhibit 1008,
13 and when I say page 4, I mean the number that appears in
14 the bottom right corner of that exhibit. Page 4 of 19.
15 A. Okay.
16 Q. At lines 6 through 10, it says: Such use of
17 carbon, however, presents some detractions, such as loss
18 of average output voltage and energy density as compared
19 to lithium metal, since the voltage of lithium X carbon
20 6 negative electrode is always greater than that of pure
21 lithium negative electrode.
22 Do you see that?
23 A. Yes.
24 Q. What's your understanding of that sentence?
25 A. We talked about half-cells where you take the

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1 lithium X carbon 6 negative electrode and you put it
2 against a lithium metal electrode and you cycle it. The
3 voltage will always be greater than lithium metal
4 voltage.
5 Q. What is the relationship between the voltage
6 of the cathode relative to a reference electrode made of
7 lithium and the external voltage applied to a battery?
8 ATTORNEY SOMMER: Object to form.
9 A. If you make a half-cell with lithium manganese
10 spinel versus lithium metal, the voltage between the two
11 electrodes is larger than if you take the same lithium
12 manganese spinel versus carbon. The voltage difference
13 between those electrodes will be lower.
14 BY ATTORNEY STAMATOPOULOS:
15 Q. Is it fair to say that in normal operating
16 conditions, the temperature of a battery will be higher
17 than room temperature?
18 ATTORNEY SOMMER: Object to form.
19 A. Yes.
20 BY ATTORNEY STAMATOPOULOS:
21 Q. And why is that?
22 A. It's the heat generation, which is calculated
23 by the square of the current times the resistance of the
24 cell.
25 Q. And in your experience, how much higher --

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1 well, let me withdraw that.
2 In your experience, what is a common value
3 associated with room temperature?
4 ATTORNEY SOMMER: Object to form.
5 ATTORNEY STAMATOPOULOS: Let me ask it
6 slightly differently.
7 BY ATTORNEY STAMATOPOULOS:
8 Q. Is 25 degrees Celsius room temperature?
9 A. That's a very standard ambient temperature
10 that we use in the industry when we're cycling
11 batteries. When we say ambient temperature, it's
12 typically 25 Celsius.
13 Q. And what is a common temperature for the
14 battery when the battery's in normal operation?
15 ATTORNEY SOMMER: Object to form.
16 A. That's a very difficult question to answer. I
17 mean, it has to do with the resistance of the inside --
18 internal resistance, the current that you're flowing.
19 That generates heat in the unit's watts. And then you
20 have to consider your thermal mass of your battery and
21 how much heat it can absorb, how quickly, what's the
22 flow rate for that heat. And also, what's the -- how is
23 that heat being released in terms of what's a surface
24 area on the outside of the battery. Is it a cylindrical
25 cell, is it a prismatic cell, is it a pouch cell. It --

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1 you can't -- I can't answer that.
2 BY ATTORNEY STAMATOPOULOS:
3 Q. Okay, that's fine.
4 If you go to page 7 of 19 of Guyomard, you'll
5 see there's a reference to Figure 4. And it reads:
6 Figure 4 depicts comparative plots of cell current
7 against charging voltage at 55 degrees Celsius for
8 secondary cells comprising an Li interpolation electrode
9 and respective electrolytes, and it goes on. At that
10 point --
11 A. I'm sorry, what? I apologize. What page
12 number and what paragraph?
13 Q. Page 7 of 19.
14 A. And the line number?
15 Q. Line 25. There's an indented paragraph that
16 talks about Figure 4. Do you see that?
17 A. Yes.
18 Q. And do you see where it says: Comparative
19 plots of cell current against charging voltage at
20 55 degrees Celsius?
21 A. Yes.
22 Q. Do you have a view as to why 55 degrees
23 Celsius were included in this reference?
24 ATTORNEY SOMMER: Object to form.
25 A. I think what he was trying to show is that the

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1 impedance changes at the higher temperature and the
2 voltage plateaus might change a little bit as a function
3 of temperature.
4 BY ATTORNEY STAMATOPOULOS:
5 Q. Is this 55 degrees Celsius temperature a
6 temperature that a person of ordinary skill would
7 understand a battery might rise to in normal operations?
8 ATTORNEY SOMMER: Object to form.
9 A. They can, sure. They can reach those
10 temperatures at higher charge rates.
11 BY ATTORNEY STAMATOPOULOS:
12 Q. And when you say "higher charge rates," what
13 would a range for such higher charge rates be?
14 A. Probably in excess of a 30-minute charge.
15 Basically less than a 30-minute charge, so -- and it
16 really also depends on the impedance of the cell and the
17 surface area of the cell. And there's many, many
18 factors.
19 But when you discharge or charge a cell,
20 you're passing current. And that current squared times
21 the resistance of the cell gives you the heat generation
22 in watts. And, you know, I've seen -- in the work I'm
23 doing these days currently, you know, 55, I've seen
24 that, yeah, routinely.
25 Q. If you were to apply a high charge voltage,

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1 say, in excess of 5 volts, to a secondary lithium-ion
2 battery cell for a very brief period of time, say, under
3 a minute, would that lead to thermal runaway phenomena?
4 ATTORNEY SOMMER: Object to form.
5 A. The thermal runaway phenomena is a function of
6 the amount of lithium in the cathode. And if you go to
7 5 volts just for a very short period of time, you
8 probably -- if it's a very short period of time, and it
9 is all dependent on the current, how much lithium you
10 take out. So you can do that. You can take cells to
11 5 volts for a very short period of time and they won't
12 go into thermal runaway.
13 Q. If you apply constant voltage over a prolonged
14 period of time at a level as high as 5 volts, then you
15 might produce such phenomena. Correct?
16 A. It depends on what the active material is. So
17 with cobalt oxide, nickel oxide, definitely at those --
18 at that voltage for those materials.
19 Q. So is it fair to say that the risk of thermal
20 runaway is proportional to the time for which a battery
21 is charged at a particular high voltage?
22 A. It's a -- the amount of lithium that you have
23 inside the cell is one factor. Sorry. The amount of
24 lithium inside the cathode is one factor. That
25 material -- that cathode becomes less thermally stable.

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1 And if you're charging at a high current, you're also
2 generating a lot of heat, and that combination can lead
3 to thermal runaway.
4 Q. But the longer I charge the battery for at a
5 particular voltage, all else being equal, the higher the
6 likelihood of thermal runaway. Correct?
7 A. Yes. But once again, that's dependent on the
8 cathode.
9 Q. How is it dependent on the cathode?
10 A. Some cathodes are less thermally stable than
11 others. Lithium nickel oxide was the very first
12 electrode cathode that we used because of its higher
13 capacity than cobalt oxide. But those cells were less
14 thermally stable.
15 And when I was -- I would make coin cells, and
16 when I welded a tab to the coin cell, they'd explode in
17 my fingers. And that heat from the -- the resistance
18 welder put enough heat in that cell to cause that
19 cathode to go into thermal runaway, basically. Luckily,
20 it was a coin cell and it just happened very quickly.
21 And so, you know, you have to have that extra
22 heat. Well, you don't have to, but extra heat will
23 speed up the thermal runaway. If you take up too much
24 lithium for an electrode -- for a cathode like a lithium
25 cobalt oxide, if you take up too much lithium, it will

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1 generate its own heat.
2 Q. And that's because there's a chemical reaction
3 occurring in the cathode because of the elimination of
4 lithium from its chemical structure. Yes?
5 A. It's -- it's the structure change in the
6 material that changes. Not so much a chemical reaction,
7 but a structural change in the material.
8 Q. On page 9 of 19 of Guyomard, in the first full
9 paragraph, lines 20 to 25, or 19 to 25, it reads: The
10 initiation of electrolyte oxidation at about 4.3 volts
11 versus --
12 A. I'm sorry. I apologize. You're on page 9 of
13 19?
14 Q. 9 of 19, yes, starting at line 19.
15 A. That's not the start of a paragraph in the
16 version I'm on.
17 Q. No, no, no. It's not the start. It's the
18 middle of the paragraph, roughly.
19 A. Okay.
20 Q. And you're free to look at the full paragraph
21 if you want.
22 A. That's okay. I am there now. Please go
23 ahead.
24 Q. I just want to focus your attention on the
25 part where it says: The initiation of electrolyte

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1 oxidation at about 4.3 volts versus lithium and at even
2 lower voltage during later recharge cycles indicates
3 that the charging cutoff voltage must be limited to
4 about 4.1 volts versus lithium for practical operation
5 at the higher temperature. As a result of this
6 limitation, the available cell capacity is at best only
7 about 75 percent of that at room temperature.
8 Do you see that?
9 A. Yes.
10 Q. Is Guyomard saying that the charge cutoff
11 voltage for a spinel-type lithium manganese oxide
12 cathode must be limited to about 4.1 volts?
13 A. When it's operating at higher temperature.
14 And that's due to electrolyte reactions on the surface
15 of the electrodes, and you're getting -- you're breaking
16 down the electrolyte, you're oxidizing it, you're
17 generating gases. And he's saying that if you go beyond
18 4.1 volts at high temperature with that material, that
19 specific material, then your electrolyte breakdown is
20 going to cause you -- result in shorter cycle life.
21 Q. And Guyomard here is focused on the behavior
22 of the electrolyte during charge and discharge cycles.
23 Correct?
24 A. Yes. He's trying to optimize the electrolyte
25 to ensure he can have the available cell capacity,

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1 100 percent of the available cell capacity available.
2 Q. And Guyomard is not focused on the phenomenon
3 that you spoke about earlier concerning the cathode
4 poisoning the electrolyte with manganese. Correct?
5 ATTORNEY SOMMER: Object to form.
6 A. He's not speaking about that, correct.
7 BY ATTORNEY STAMATOPOULOS:
8 Q. Does that phenomenon occur only with spinel
9 lithium manganese oxide used as the cathode?
10 A. I'm not sure about lithium manganese dioxide.
11 It's been a long time since I did anything with that.
12 That was lithium metal rechargeable battery with
13 manganese dioxide. Never made it to market. Too
14 unsafe.
15 Manganese spinel, I don't know if people knew
16 about the manganese dissolution back at the time he
17 wrote this. There's a chance that he didn't know about
18 that effect. His consideration --
19 Q. Oh, sorry. Go ahead. I didn't mean to cut
20 you off.
21 A. His consideration here was the reaction of the
22 electrolyte with the electrodes and that -- trying to
23 stop, inhibit that oxidation of the electrolyte.
24 Q. You said it never made it to market in
25 reference to lithium manganese dioxide because it was

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1 too unsafe. Can you elaborate on that?
2 A. Yeah. That was a Molicel product at Moli
3 Energy, and we had a -- our first product, the lithium
4 metal rechargeable battery, we took it off the shelf
5 because it was too unsafe. But while it was on the
6 shelf, while we were selling it we had developed another
7 lithium metal battery with a 3-volt electrode, which was
8 the manganese dioxide electrode.
9 We had developed that. We called that the
10 Molicel II. But that was about 1990 when -- or '89 to
11 '90 that we were going to release it. And when we had
12 to call back the other lithium metal rechargeable
13 battery, we realized that this had the same thermal
14 stability problems. And that's when we switched to
15 developing lithium-ion. So that reason we didn't bring
16 it to market was because of the lithium metal aspect.
17 Q. And if you change the anode, would that cure
18 the problem with respect to the safety of lithium
19 manganese dioxide used as the cathode?
20 A. Yes.
21 Q. How so?
22 A. Well, the lithium metal is well known for when
23 you charge lithium metal, you can create lithium
24 dendrites. These are spikey formations of lithium metal
25 that grow on the surface of the lithium metal anode.

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1 The lithium metal anode is like -- you can
2 consider it like aluminum foil. Kind of looks like
3 that. But when you plate lithium metal onto that
4 material, it starts forming these dendrites, which can
5 go right through the separator and short the cell.
6 And as I said before, you also got dead
7 lithium, which is very highly -- high surface area,
8 mossy lithium, and thermal stability of those cells is
9 very poor.
10 Q. And if you change the anode material, that
11 also changes the voltage of the anode relative to a
12 reference electrode. Correct?
13 A. Yes. If you -- if you move from lithium
14 metal, which has the voltage of zero versus lithium
15 metal, and you moved to a graphite, which has a voltage
16 of maybe 0.1 volts, now your cell is 0.1 volts lower in
17 voltage for the entire cell and you've -- you're
18 decreasing the energy of that cell.
19 Q. How important was it to a person of ordinary
20 skill in the art to maintain the safety of a battery
21 when it operated in a high-temperature environment?
22 ATTORNEY SOMMER: Object to form.
23 A. Well, very important in regards to safety.
24 BY ATTORNEY STAMATOPOULOS:
25 Q. And why is that?

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1 A. Well, I mean, it's very important whether it's
2 at high temperature or low temperature. It's very
3 important to maintain the safety of the cell.
4 Q. If you go to page 11 of 19 of Guyomard,
5 starting at line 5 there's a sentence that starts with
6 the words "The ability," and it reads: The ability of
7 the electrolyte to extend the cycle life of the
8 batteries was amply demonstrated by the remarkable fact
9 that the cell capacities after 500 cycles was only about
10 10 percent less than after five cycles.
11 Do you see that?
12 A. Yes.
13 Q. Does Guyomard disclose the capacity of a
14 battery after the first cycle?
15 A. No.
16 Q. Does Guyomard disclose whether the batteries
17 tested had already been subjected to a formation period?
18 A. The first four cycles would -- during the
19 first four cycles, a formation of a passivation layer on
20 the anode would occur.
21 Q. Does Guyomard say that?
22 A. No.
23 Q. So what's your basis for saying that a
24 formation period would occur after the first four
25 cycles?

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1 A. The formation -- the formation cycle itself
2 when you're building a cell is the first cycle, but you
3 don't completely passivate the anode active material.
4 So over the next few cycles you can have a little bit of
5 increased passivation growth.
6 So, you know, it's interesting because, you
7 know, some people say, well, percentage of capacity
8 after initial cycles. He says after five cycles. This
9 is exactly what we did at Moli Energy when I was -- I --
10 I was a sales and marketing manager when we took the
11 product to market and this is what I did. I counted the
12 capacity as a function of the initial capacity of the
13 fifth cycle.
14 The cells that we had had, you know, drops in
15 capacity over the first four cycles. Well, you know,
16 once a customer gets the battery and he or she uses the
17 phone for, you know, four times, their phone, after
18 that, you're going to get a very flat plateau.
19 So we always -- and we always cited and
20 specified the capacity of the cell on the fifth cycle
21 because it was more fair to what the customer would see.
22 Q. Guyomard doesn't state anywhere in this
23 reference that the battery that was tested was actually
24 made available commercially. Correct?
25 A. That's correct. He was at Bell Labs at this

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1 time, and they did not -- they had a spinoff company,
2 but I don't believe he went into that spinoff company.
3 But they -- now, this particular battery, Guyomard did
4 not commercialize this battery.
5 Q. And there's no way to tell just from reading
6 the Guyomard reference how much capacity the battery
7 lost in its first five charge/discharge cycles.
8 Correct?
9 A. That's correct.
10 Q. I'd like to turn to your declaration at page
11 54, footnote 56.
12 A. Yes.
13 Q. And you discuss here in this footnote, among
14 other things, Exhibit 1012. Do you see that on the
15 third line of the footnote?
16 A. Yes.
17 (Exhibit No. 1012, previously marked, was
18 referenced and indexed.)
19 BY ATTORNEY STAMATOPOULOS:
20 Q. And that is a reference. We'll call it the Au
21 reference, A-U.
22 A. Yes.
23 Q. Right after the parenthetical or the two
24 parentheticals that you provide here, you state: I note
25 that the cells described in Au were designed for a

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1 cutoff voltage of 4.1 volts.
2 Do you see that?
3 A. I don't see that specific language that you
4 just said. Was it a Sony charging method? Is that the
5 sentence that you're talking about?
6 Q. It's right before Sony charging method.
7 A. Okay. Yeah, yeah, in the early days of
8 lithium-ion, in the very early days, 4.1 was the cutoff
9 voltage that was used in the first few years of
10 lithium-ion.
11 Q. And when you say that was the voltage cutoff
12 that was used, you mean using a constant current method
13 of charging?
14 A. Constant current, constant voltage.
15 Q. And constant current, constant voltage is the
16 method in which a constant current is followed by a
17 constant voltage. Correct?
18 A. Yes.
19 Q. And what does it mean for a battery to be
20 designed for a particular cutoff voltage?
21 A. There's a lot of considerations. And in the
22 early days, safety was the number one consideration, and
23 cycle life performance was also a big consideration. So
24 those are two considerations that would -- and then the
25 anode material also was a consideration. Before

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1 graphite was introduced, the cells were at 4.1 volts
2 when we were using the hard carbons.
3 Q. Is the Au battery a lithium anode battery?
4 ATTORNEY SOMMER: Object to form.
5 A. No. This is a lithium-ion battery.
6 BY ATTORNEY STAMATOPOULOS:
7 Q. With that in mind, were there anode material
8 considerations in designing a battery such as the Au
9 battery for a cutoff voltage of 4.1 volts?
10 ATTORNEY SOMMER: Object to form.
11 A. Au just purchased Sony lithium-ion cells and
12 tested them. He did not develop these. He purchased a
13 number of the cells and tested them at the Army Research
14 Lab.
15 BY ATTORNEY STAMATOPOULOS:
16 Q. And those batteries were designed to
17 4.1 volts. Correct?
18 A. Yes. At the time he purchased them, these
19 particular batteries that he purchased were 4.1 volts.
20 Q. And when designing a battery to 4.1 volts that
21 had a carbonate anode, was the anode material a limiting
22 factor in terms of the charge cutoff voltage to which
23 the battery was designed?
24 ATTORNEY SOMMER: Object to form.
25 A. Yes. The anode -- the voltage of the anodes

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1 versus a lithium reference are different for hard
2 carbons versus graphite.
3 And when you had the graphite, that gave you
4 an extra 0.1 volts, approximately, versus your hard
5 carbons. And that allowed you to increase the voltage
6 of the cell by 0.1 volts without increasing the voltage
7 of the cathode versus lithium metal reference.
8 BY ATTORNEY STAMATOPOULOS:
9 Q. And that's because hard carbon's voltage
10 versus the reference voltage was lower than that of
11 graphite?
12 A. The graphite voltage versus the lithium metal
13 reference was lower than hard carbon.
14 Q. Okay. I'd like to invite your attention to
15 page 10 of 37 in Exhibit 10012, the Au reference.
16 A. Uh-huh. So what page number?
17 Q. Page 10 of 37.
18 ATTORNEY SOMMER: Counsel, I think you said
19 Exhibit 10012. It's 1012. Correct?
20 ATTORNEY STAMATOPOULOS: You are correct. I
21 misspoke, I'm sorry. It's 1012.
22 ATTORNEY SOMMER: Thank you.
23 THE WITNESS: Okay, page 10?
24 ATTORNEY STAMATOPOULOS: That's right.
25 THE WITNESS: Okay.

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1 BY ATTORNEY STAMATOPOULOS:
2 Q. And you'll see at the very top of page 10
3 there's a heading 4.2, Analytical Results.
4 Do you see that?
5 A. Yes.
6 Q. You're familiar with these analytical results?
7 A. I'm familiar with the -- what they were
8 measuring, yes, the active material, the loading, the
9 capacity, yes.
10 This is a -- what you would do if you are
11 going to take apart a lithium-ion cell and try to
12 reconstruct or understand what the components are and
13 how it's assembled.
14 Q. And if you look at the active material
15 capacities for the cathode and for the anode, would you
16 agree that the cathode has more capacity than the anode?
17 A. You can't determine that without knowing the
18 binder content and the conductive additive content.
19 Q. You said the binder content and the?
20 A. Conductive additive content. So when you make
21 these electrodes, you can see how they have -- under the
22 category Binder under -- they say -- for the anode, it
23 says polyvinylidene fluoride. Let's just put down PVDF.
24 There's PVDF binder added to that anode. And when they
25 put it all together, they mix that with the active

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1 material and they don't -- you don't know what that
2 percentage of binder is so you really don't know how
3 many grams. That 6.56 grams may not be completely
4 accurate. Okay, let me -- yeah, so that might not be
5 completely accurate.
6 When I'm reading this, though, let's see. I'd
7 have to read through in more detail how he came up with
8 the active material capacity for the cathode and the
9 anode. I'm not sure how he measured those. I'd have
10 to --
11 Q. Let me try something else. Let me start first
12 of all by asking you the active material in the Au
13 reference and the analytical results we're looking at is
14 lithium cobalt dioxide. Correct?
15 A. Yes.
16 Q. Is it fair to say that the theoretical
17 capacity for lithium cobalt dioxide is 137 milliamps,
18 milliamp hours per gram?
19 A. And you're basing that on what number?
20 Q. I'm not basing it on anything, I'm just asking
21 you if you agree. You may disagree, by the way, that --
22 A. Okay.
23 Q. -- the theoretical capacity for lithium cobalt
24 dioxide, the material that's listed as the active
25 material here, is 137 milliamp hours per gram.

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ATTORNEY SOMMER: Objection to form.
A. So he has it written as lithium 0.5, cobalt oxide. So on a theoretical basis, you're correct.
BY ATTORNEY STAMATOPOULOS:
Q. Okay. So let's put that number to the side, 137, as the theoretical capacity.
The cathode here has a weight of 10.46 milligrams. Correct?
A. 10.46 grams.
Q. Grams, yes. I apologize. Grams.
And the active material capacity is listed as 1.43. Correct?
A. Yes.
Q. If you divide 1.43 by 10.46, that is, the capacity over the active material loading, isn't it true that you would get 137 milliamp hours per gram?
A. Yes.
Q. And --
A. So I have to read through this report, but it seems that he has the actual active material loading where he's taking out the binder content. And the 10.46 grams is lithium cobalt oxide only, that mass. That works out to 137 milliamp hours per gram.
Q. Which we agreed is the theoretical capacity for that material. Correct?

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ATTORNEY SOMMER: Object to form.
A. The theoretical capacity for lithium 0.5 cobalt oxide.
BY ATTORNEY STAMATOPOULOS:
Q. Right. And now if you look at the anode, if you were to run the same numbers, specifically the active material capacity over the active material loading, you would arrive at 186 milliamp hours per gram. Correct?
A. Yes.
Q. And 186 is the theoretical capacity for the active material listed here. Correct?
ATTORNEY SOMMER: Object to form.
A. It's the theoretical capacity for lithium 0.5, C6.
BY ATTORNEY STAMATOPOULOS:
Q. So in this example, the active material capacity is higher than -- sorry, withdrawn.
In this example right here, the active material cathode capacity is higher than the active material anode capacity, right?
A. For these 0.5 lithium values, yes. When you do the calculation, though, for design capacity, you start with lithium 1 C6, which is 372 milliamp hours per gram.

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Q. Why is that?
A. Lithium -- lithium graphite -- okay, lithiated graphite, you can put in 1.0 C6. So it's theoretical. You can pretty much reach its theoretical value.
What he's showing here, it's unclear to me what he's showing here in terms of active material capacity.
At 0.5 C6, he's not looking at the entire graphite capacity, he's only looking at what is being shuttled back and forth on a discharge and charge basis after the first cycle.
Q. But he's using the same 0.5 value for both the anode and the cathode. Correct?
A. Yes.
Q. So if you were to use the full lithium for both the anode and the cathode, the same relationship would apply. Correct?
ATTORNEY SOMMER: Object to form.
A. On a practical basis, you can reach lithium 1 C6. On a practical basis, you cannot reach lithium 1 cobalt oxide.
Q. Why not?
A. The structure CoO2 does not exist. It's not a thermal -- thermally stable material. So, you know, we've talked about lithium being taken out of that

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molecule, and we know that we cannot take all of it out; otherwise, the molecule becomes unstable. So he's showing here that it's lithium 0.5 cobalt oxide. That's what's shuttling back and forth, the 137 milliamp hours per gram.
Q. In any event, he's using the same 0.5 lithium, or lithium 0.5 for both the anode and the cathode. Correct?
A. Yes.
Q. And what's the anode active material here? Is it graphite?
A. It's not specifically saying it's graphite. To make graphite, you start with different types of carbon and then you graphitize them at high temperature. And he's calling it a carbon. It may or may not be a graphitized carbon.
Q. Here, it doesn't say it's a graphitized carbon. Correct?
A. That's correct. A lot of these old papers -- you know, it was so new. And this is the first time Mr. Au tested lithium-ion batteries. And, you know, people didn't know much about them at that time, so there's -- you can't take everything here at -- you know, it's not always accurate. It was accurate on the day it was written, but it might not be accurate today.

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1 Q. Was it accurate as of the priority date of the
2 '641 patent?
3 A. I'd have to go through more calculations to
4 see how he came about these calculations, how he came
5 about this, so I can't give you a definitive answer.
6 All I'm saying is that, you know, when
7 Guyomard didn't mention manganese dissolution as being
8 an issue, it's because, you know, we didn't know about
9 it back then. So, you know, we learn more and more all
10 the time.
11 Q. Is it fair to say that a charge voltage -- let
12 me withdraw that question, actually.
13 ATTORNEY STAMATOPOULOS: We have been going
14 for about an hour. Let's go off the record briefly.
15 THE VIDEOGRAPHER: Time is 12:49 PM. We are
16 off the record.
17 (Recess taken.)
18 THE VIDEOGRAPHER: We are back on the record.
19 The time is 12:58 PM.
20 BY ATTORNEY STAMATOPOULOS:
21 Q. Welcome back, Mr. Juzkow.
22 Did you communicate with counsel during the
23 break?
24 A. No.
25 Q. Okay. So I want to invite your attention back

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1 to the Uemura reference, Exhibit 1009.
2 A. Yes.
3 Q. At paragraph 10, Uemura talks about a
4 reference, an article by A. Robert and P.G. Bruce,
5 Nature, Volume 381, 1996.
6 Do you see that?
7 A. Yes.
8 Q. Did you review that reference?
9 A. No, I did not.
10 Q. Are you familiar with the so-called ion
11 exchange method for preparing lithium manganese dioxide?
12 A. You take manganese dioxide and you react it
13 with lithium to generate lithium, and you do that in
14 stoichiometric equivalents and you end up with lithium 1
15 Mn204.
16 Q. And is this a commonly used method for
17 preparing lithium manganese dioxide?
18 ATTORNEY SOMMER: Objection to form.
19 A. I don't -- I'm not sure what method's used in
20 large quantity. It's -- lithiated manganese dioxide,
21 it's not a common material used in lithium-ion batteries
22 or in lithium metal batteries.
23 So what Dr. Bruce was doing here was he was
24 taking manganese dioxide, which was well known in the
25 industry, and he was lithiating it, putting lithium into

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1 it, so that if you want to use that versus graphite, you
2 have your source of lithium within the lithium manganese
3 dioxide. That's your source of lithium. Whereas pure
4 manganese dioxide versus graphite, you have no source of
5 lithium.
6 Q. Are you aware of any benefits associated with
7 using the ion exchange method for preparing lithium
8 manganese dioxide?
9 A. No, I'm not -- I'm not familiar with any, no.
10 Q. Are you aware of any attempts to synthesize
11 lithium manganese dioxide prior to Uemura?
12 A. Well, I mean, Dr. Bruce did it in 1996. That
13 was his paper.
14 Q. Are you looking at his paper right now?
15 A. No, I'm reading the -- I'm reading the -- in
16 that paragraph that you showed me.
17 Q. Okay.
18 A. So that material was introduced by Dr. Robert
19 and Dr. Bruce in a paper in 1996.
20 ATTORNEY STAMATOPOULOS: Let me actually
21 introduce an exhibit that is not part of the record. So
22 let's call that Juzkow 1.
23 (Juzkow Exhibit No. 1 was marked for
24 identification.)
25 ATTORNEY STAMATOPOULOS: And I'll share it

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1 right now on my screen. And I'm not sure if the --
2 what's the best -- I also want to share it with you, so
3 I'm not sure. Can you see my screen? Can you see here
4 where it says Armstrong 1996, or am I sharing the wrong
5 part of my screen?
6 THE WITNESS: I can see it.
7 ATTORNEY STAMATOPOULOS: Okay.
8 ATTORNEY SOMMER: It's cut off. I can only
9 see half of it.
10 ATTORNEY STAMATOPOULOS: Okay. And what's the
11 best way for me to share this with Mr. Juzkow and with
12 counsel? Just drop it in the -- drop it in the chat?
13 THE VIDEOGRAPHER: Yes. If you want them to
14 be able to download it, just drop it in the chat and
15 they should be able to click on it and check where they
16 want to save it and click on it.
17 ATTORNEY STAMATOPOULOS: Great. Let me do
18 that real quick. Actually, with apologies, could I have
19 a couple minutes? Because I need to clear this of
20 annotations. I'm sorry.
21 THE VIDEOGRAPHER: Do you want to go off the
22 record?
23 ATTORNEY STAMATOPOULOS: Yeah.
24 THE VIDEOGRAPHER: The time is 1:05 PM. We're
25 off the record.

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1 (Discussion held off the record.)
2 THE VIDEOGRAPHER: We're back on the record.
3 The time is 1:09 PM.
4 BY ATTORNEY STAMATOPOULOS:
5 Q. So, Mr. Juzkow, thank you for your patience.
6 We're looking at the article by Armstrong and Bruce
7 that's cited in the Uemura reference. I'll represent to
8 you that this is the same article.
9 Do you see it on your screen?
10 A. Yes.
11 Q. Starting in the second full paragraph, it says
12 that many attempts have been made to prepare layered
13 lithium manganese dioxide, mainly involving the use of
14 aqueous solutions.
15 Do you see that?
16 A. Yes.
17 Q. And in the immediately succeeded sentence, it
18 says that the resulting products, though interesting,
19 have stoichiometries which differ from lithium manganese
20 dioxide, contain water or protons for poor
21 crystallinity, or do not maintain their structure during
22 cycling.
23 Do you see that?
24 A. Yes.
25 Q. Fair to say that what Armstrong's referring to

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1 here is previous failed attempts to synthesize an
2 acceptable form of lithium manganese dioxide?
3 A. Yes.
4 Q. And later on or, rather, in the immediately
5 following sentence, Armstrong reports: In contrast, we
6 have succeeded in preparing layered anhydrous and
7 stoichiometric lithium manganese dioxide, which is
8 analogous to lithium cobalt dioxide and may be cycled in
9 a rechargeable battery.
10 Do you see that?
11 A. Yes.
12 Q. So he's contrasting his successful preparation
13 of lithium manganese dioxide on the basis that it can be
14 used in a rechargeable battery. Correct?
15 A. Yes.
16 Q. And in the same sentence, followed by the
17 semicolon, Armstrong reports that this lithium manganese
18 dioxide is obtained by ion exchange from sodium
19 manganese dioxide.
20 Do you see that?
21 A. Yes.
22 Q. Now, do you know if Uemura used the ion
23 exchange method to prepare the lithium manganese dioxide
24 used in connection with the testing reported in Uemura?
25 ATTORNEY SOMMER: Object to form.

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1 A. I would have to reread the -- Uemura's
2 reference.
3 ATTORNEY STAMATOPOULOS: All right, I'm going
4 to temporarily stop sharing Armstrong. But you're, of
5 course, free to refer to it.
6 BY ATTORNEY STAMATOPOULOS:
7 Q. Do you know if the ion exchange method was a
8 commonly accepted method for preparing lithium manganese
9 dioxide?
10 ATTORNEY SOMMER: Object to form.
11 A. That method by Armstrong and Bruce, that
12 was -- from what they say, that was the first time it
13 was used.
14 BY ATTORNEY STAMATOPOULOS:
15 Q. And it says it was used successfully. Yes?
16 A. Yes.
17 Q. Do you know of any other successful methods
18 for preparing lithium manganese dioxide, from your
19 experience?
20 A. No, I don't.
21 Q. Have you ever prepared lithium manganese
22 dioxide?
23 A. No.
24 Q. Are you familiar with a so-called
25 co-precipitation method?

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1 A. Yes.
2 Q. And are you aware of a so-called solid phase
3 mixing method?
4 A. Yes.
5 Q. Have you used the co-precipitation method in
6 any context?
7 A. I don't specifically recall. But I did use
8 that solid method that I talked about with the tube
9 furnace. That was a very high temperature, mixing it
10 and having to take it out of the tube -- out of the
11 furnace at -- glowing red with hydrogen inside it. So
12 that was the method that -- that was a, you know,
13 mixture when we mixed solids together to make a new
14 compound.
15 Q. That's the solid phase mixing method?
16 A. Correct. We would crush -- crush up the
17 individual components, crush them up, put them in a
18 crucible, put them in the oven and heat them up and they
19 would mix.
20 Q. And you would -- did you mix the materials by
21 hand?
22 A. Yes. Mortar and pestle.
23 Q. So it's a manual preparation method.
24 A. In the R&D facility, yes. But it's very
25 scalable.

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Q. And is that the example that you were referring to earlier where the cell almost exploded in your hands?
A. Yes. But I don't recall what the material I was making was.
Q. Would you characterize that as a reliable method?
A. Yes.
Q. Did you repeat that method after the cell almost exploded in your hand?
A. Well, it -- it didn't. The tube furnace method was -- we used that quite a bit, where you put different gases through, reducing gases or oxidizing gases you would put through the furnace as you're heating up that mixture and it's melting and forming a new compound. That was done in a small vial or crucible but very easy to scale up.
Q. What are the advantages of the solid phase mixing method versus other lithium manganese oxide preparation methods?
ATTORNEY SOMMER: Object to form.
A. Yeah, it's difficult to answer. I'm not -- I don't know the answer to that.
BY ATTORNEY STAMATOPOULOS:
Q. Is it a cost-effective method?

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ATTORNEY SOMMER: Object to form.
A. The cost of heating the furnaces is your main cost to that method. But I think the co-precipitation method would be less expensive.
BY ATTORNEY STAMATOPOULOS:
Q. The co-precipitation method would be less expensive than the solid phase mixing method. Yes?
A. I believe so, because you're just mixing two materials in water, mixing them and then -- yeah, I believe that would be.
Q. What about the ion exchange method?
Where would that rank in terms of cost versus the solid phase mixing method and the co-precipitation method?
ATTORNEY SOMMER: Object to form.
A. I -- I'm not sure.
BY ATTORNEY STAMATOPOULOS:
Q. Are you familiar at all with the ion exchange method and what it takes to carry it out?
ATTORNEY SOMMER: Object to form.
A. Somewhat. I've done different ion exchange in the past, but it's been a long time. But yeah, I've -- I don't know which one would be more expensive or less expensive.
BY ATTORNEY STAMATOPOULOS:

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Q. What types of equipment do you need for the ion exchange method?
A. Mostly glassware and vacuum filtration system.
Q. A vacuum filtration system?
A. Yeah, where you pull a vacuum because you're -- you've got the new material, it's solidified within -- it's a solid within your aqueous -- or actually, they were using a Hexanol, Hexanol solution. And then once they -- once the solid was formed, they were able to cool it down, and then you filter. So you're using a vacuum to filter the liquid out of there so that you're left with the solid material.
Q. Does the ion exchange method have more steps than the solid phase mixing method?
A. Yes.
Q. Does the ion exchange method have more steps than the co-precipitation method?
A. That, I'm not sure.
Q. Which one is a more reliable method of the three?
ATTORNEY SOMMER: Object to form.
A. Based on this paper, the ion exchange method was the best method.
BY ATTORNEY STAMATOPOULOS:
Q. And the reason you say that the ion exchange

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method was the best method is because the solid phase mixing method was known to persons of ordinary skill in the art as of the time that this paper was published. Correct?
ATTORNEY SOMMER: Object to form.
A. Yes.
BY ATTORNEY STAMATOPOULOS:
Q. And so was the co-precipitation method, right?
A. It's not listed in this paper.
Q. Well, in your experience, was the co-precipitation method known as of 1996?
A. Yes.
Q. Now turning to paragraph 69 of the Uemura reference, are you there?
A. Yes.
Q. It reads: The positive electrode materials of the rechargeable lithium-ion batteries in examples 1 to 9 were prepared by the use of a co-precipitation method described below. Full stop. The positive electrode materials in examples 10 to 17 were prepared by the use of a solid phase mixing method. Full stop.
Do you see that?
A. Yes.
Q. Fair to say that the ion exchange method was not used in Uemura?

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1 ATTORNEY SOMMER: Object to form.
2 A. That's correct. It's not listed under this --
3 in this paragraph.
4 BY ATTORNEY STAMATOPOULOS:
5 Q. And the solid phase mixing method that was
6 used in Uemura is the same as solid phase mixing method
7 that you used resulting in a near-accident?
8 ATTORNEY SOMMER: Object to form.
9 A. In solid phase mixing, you're taking the
10 materials, several materials, you're crushing them into
11 powder and trying to mix them as best you can and then
12 heat them up, so it's a very standard technique. So I
13 think yes, I would say there's a good chance that that's
14 the same way I would do -- make them. He doesn't get
15 into too many details.
16 BY ATTORNEY STAMATOPOULOS:
17 Q. Do you have a sense as to why Uemura selected
18 the solid phase mixing method as well as the
19 co-precipitation method to prepare the layered lithium
20 manganese oxide cathode structure as opposed to using
21 the ion exchange method described in Armstrong?
22 ATTORNEY SOMMER: Object to form.
23 A. I can't answer that. I don't know.
24 BY ATTORNEY STAMATOPOULOS:
25 Q. Now going to Figure 3 of Uemura --

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1 A. Yes.
2 Q. -- you'll see that for the cathode, the Uemura
3 reports the total capacity PC.
4 Do you see that?
5 A. Yes.
6 Q. What would a POSITA understand the total
7 capacity of the cathode to mean from Uemura's
8 disclosure?
9 ATTORNEY SOMMER: Object to form.
10 A. That's the capacity within the positive
11 electrode.
12 BY ATTORNEY STAMATOPOULOS:
13 Q. That's not the theoretical capacity of the
14 positive electrode. Correct?
15 ATTORNEY SOMMER: Object to form.
16 A. Theoretical capacities are based on per unit
17 mass. This is just -- just milliamp hours.
18 BY ATTORNEY STAMATOPOULOS:
19 Q. Is it possible to determine the theoretical
20 capacity in a particular voltage from the numbers given
21 here with respect to total capacity by Uemura?
22 ATTORNEY SOMMER: Object to form.
23 A. You can determine the theoretical capacities
24 of these compounds using their molecular weights and
25 using the lithium content, and you can come up with a

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1 value. And that would be milliamp hours per gram. And
2 then you would have to multiply it by a mass to give you
3 milliamp hours, and that would be the full theoretical
4 value based on that lithium content.
5 BY ATTORNEY STAMATOPOULOS:
6 Q. And then at different voltage levels would
7 those theoretical capacities change?
8 A. Yes.
9 ATTORNEY SOMMER: Objection. Form.
10 A. I wouldn't call them theoretical capacities at
11 that point. They're more practical capacities.
12 BY ATTORNEY STAMATOPOULOS:
13 Q. Well, they're specific values at different
14 voltages. Correct?
15 ATTORNEY SOMMER: Object to form.
16 A. Yes.
17 BY ATTORNEY STAMATOPOULOS:
18 Q. Do you know how Uemura defines the total
19 capacity of the cathode?
20 A. From what I can tell is he's starting with the
21 theoretical capacity for the total amount of lithium,
22 multiplying it by the mass of the active material,
23 coming up with a experiment -- or coming up with a
24 theoretical -- strike that -- coming up with a total
25 capacity based on a theoretical value, and then using a

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1 voltage to -- upper voltage, which would then limit and
2 lower the actual value from the theoretical limit --
3 theoretical value to the practical value shown here on
4 your total capacity.
5 Q. Is that somewhere disclosed in Uemura?
6 ATTORNEY SOMMER: Object to form.
7 A. I'm not sure. I just -- looking at the
8 numbers, I was able to determine that that's how they
9 did it.
10 BY ATTORNEY STAMATOPOULOS:
11 Q. On what basis were you able to determine that
12 that's how they did it?
13 A. I calculated what the theoretical --
14 theoretical capacities of each of those materials should
15 be and then I multiplied by the mass that they were --
16 that was used and divided by the total capacity. And
17 the values that I reached were -- they always had the
18 same ratio, and that led me to believe that that ratio
19 was due to the cutoff voltage.
20 And the reason all those different materials
21 all had the same total capacity is that when you run the
22 numbers, the molecular weights are very similar in all
23 these materials.
24 Manganese, just all the -- all the different
25 materials, they have very similar molecular weights for

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1 those individual elements. And when you -- yeah, so
2 when you run the calculations, you end up with a ratio.
3 That ratio was pretty consistent among all these
4 materials.
5 And as I said, that would be the theoretical
6 capacity based on some voltage, which that voltage would
7 provide a ratio so that you take the calculated -- what
8 the total capacity should be if it was completely
9 delithiated, but it's not, and that's where the total
10 capacity here comes in.
11 Q. So when you say all of these materials had
12 very similar molecular weights, you mean the different
13 materials listed in all of these different examples?
14 A. Yes.
15 ATTORNEY SOMMER: Object to form.
16 A. Yes.
17 BY ATTORNEY STAMATOPOULOS:
18 Q. But the molecular weights of the different
19 cathode materials, did you calculate those?
20 A. Yes. Yes, I did.
21 Q. And were they all identical?
22 A. No. All the ones that have a total capacity
23 of 2.24, their molecular weights were very similar. And
24 they also had the same amount of lithium-ions within the
25 molecule. But when you had a lower number of

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1 lithium-ions in the molecule, you end up with a lower
2 total capacity. And when you have a higher amount of
3 lithium-ions within the molecule, you end up with a
4 higher capacity.
5 Q. And now the calculation of the molecular
6 weight for all of the different materials in the 17
7 different examples given in Uemura, did you provide it
8 somewhere in your report?
9 ATTORNEY SOMMER: Object to form.
10 A. No.
11 BY ATTORNEY STAMATOPOULOS:
12 Q. Why not?
13 A. I didn't feel it was necessary at the time.
14 Q. Do you have it somewhere?
15 A. I made an Excel spreadsheet with the numbers.
16 I don't have it in front of me.
17 Q. Do you have it saved somewhere?
18 A. Yes.
19 Q. And the reason you performed the calculation
20 at the time was -- let me withdraw that question.
21 Why did you perform this calculation on a
22 separate Excel sheet?
23 ATTORNEY SOMMER: Marc, I'm going to instruct
24 you not to answer the question if you were asked by
25 counsel to do that analysis. I wasn't present during

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1 all your preparation so I don't actually know what your
2 answer's going to be.
3 BY ATTORNEY STAMATOPOULOS:
4 Q. You might want to have a break with counsel to
5 discuss the circumstances, because I understand you're
6 not a lawyer. Right, Mr. Juzkow?
7 A. That's correct.
8 Q. And you don't know what would and what would
9 not fall under privilege and work product.
10 Is that fair?
11 A. That's correct.
12 ATTORNEY STAMATOPOULOS: So what I will tell
13 you, Andrew, for the record, is that we're going to ask
14 for that calculation to be provided to us because we
15 understand that it's part of the analysis that
16 Mr. Juzkow did. So I will be asking about it. You can
17 instruct him not to answer. But in the meantime, if you
18 want to go on break so you can discuss the parameters of
19 privilege, that's fine.
20 ATTORNEY SOMMER: Yeah, well, we can take up
21 the request for the document. I think you're assuming
22 some facts that you haven't established yet. But
23 nonetheless, Marc, do you understand my instruction,
24 that if you were asked to do the analysis, the
25 explanation of why it's privileged? Or would you like

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1 to discuss that?
2 THE WITNESS: I'd like to discuss that.
3 ATTORNEY SOMMER: Okay. Why don't we go off
4 the record? Marc, can you give me a call on my
5 cellphone?
6 THE WITNESS: Sure.
7 THE VIDEOGRAPHER: The time is 1:36 PM. We
8 are off the record.
9 (Recess taken.)
10 THE VIDEOGRAPHER: We are back on the record.
11 The time is 1:41 PM.
12 BY ATTORNEY STAMATOPOULOS:
13 Q. Welcome back, Mr. Juzkow. So just a couple
14 questions about your communication with counsel during
15 the break.
16 You discussed the question of what would and
17 what would not fall under privilege.
18 Is that fair?
19 ATTORNEY SOMMER: You can answer that question
20 yes or no, Marc.
21 A. Yes.
22 BY ATTORNEY STAMATOPOULOS:
23 Q. Did your conversation with counsel extend
24 beyond what would fall under privilege?
25 ATTORNEY SOMMER: Marc, you can answer that

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1 question yes or no.
2 A. No.
3 BY ATTORNEY STAMATOPOULOS:
4 Q. No?
5 A. No.
6 Q. Okay. So before we went on break, you
7 testified that you prepared an Excel sheet in which you
8 calculated the molecular weights of the different
9 cathode materials listed here in examples 1 through 17
10 of the Uemura reference. Correct?
11 A. Yes.
12 ATTORNEY SOMMER: Object to form.
13 A. I didn't calculate all of them, but maybe a
14 third of them, a half of them.
15 BY ATTORNEY STAMATOPOULOS:
16 Q. Who made the decision to calculate the
17 molecular weights of the materials for which you did
18 perform the calculation?
19 A. That was my decision, my curiosity.
20 Q. So it wasn't something that counsel asked you
21 to do. Correct?
22 A. That's correct. It was not.
23 Q. So why did you decide to perform that
24 calculation?
25 A. You know, when I was drilling down into the

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1 numbers, you see all the total capacities, and there's
2 many of them that are similar. And there's a few that
3 are higher and lower. And I was wondering, how did they
4 come up with those values? And were they using a -- you
5 know, just how did they come up with those numbers? Was
6 it experimental? Theoretical calculations?
7 And so then I ran the theoretical calculation
8 and determined that the theoretical calculation with a
9 fixed cutoff voltage, without knowing that fixed cutoff
10 voltage, but just understanding that what is the ratio
11 between the theoretical capacity and the total capacity
12 in that pellet, in that electrode.
13 So the ratio of the theoretical capacity
14 divided by the ratio -- divided by the total capacity
15 gave similar ratios, which led me to believe that that
16 ratio was based on the upper cutoff voltage.
17 Q. And when you say "similar ratios," what ratios
18 are you referring to?
19 A. I was referring to when I ran the calculation
20 of the molecular weights, I was able to calculate what
21 the theoretical capacity of that molecule should be in
22 milliamp hours per gram. Then I multiplied by the
23 weight in grams, and I ended up with a total capacity
24 value based on a theoretical calculation if 100 percent
25 of the lithium was removed from each one of those

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1 molecules. So my total capacities were higher than the
2 total capacities shown here.
3 When I did a ratio, the ratios were all very,
4 very similar, which led me to believe that these values
5 were a result of a theoretical calculation with a
6 voltage cutoff.
7 Q. Let me try to unpack that.
8 So your total capacities, meaning your
9 theoretical capacities? Is that what you meant when you
10 said your total capacity?
11 A. Yes. Well, there's two total capacities.
12 There's a theoretical total capacity, and then these
13 actual total capacity of the electrode.
14 Q. The theoretical total capacity is the one that
15 you would arrive at applying formulas based on the
16 molecular weight of the material. Correct?
17 A. Yes.
18 Q. And what you are referring to as a theoretical
19 total capacity is what's referred to here in Uemura?
20 A. No. The theoretical total capacity was the
21 capacity in milliamp hours per gram that I calculated
22 multiplied by the mass of the positive electrode
23 material. That is the total theoretical capacity, and
24 that is different from the total capacity in -- that's
25 listed here in this table, Figure 3.

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1 Q. So the theoretical total capacity is arrived
2 at through a multiplication of some value with the
3 weight that's listed here in Uemura?
4 A. And that works out to a result in a milliamp
5 hour value.
6 Q. How is that number a theoretical number if it
7 is dependent upon a weight that is an input to an
8 experiment?
9 A. Yeah, I see what you're saying. It's -- it's
10 a theoretical number in milliamp hours per gram that,
11 when I multiplied by the mass of the electrode, I came
12 up with the total capacity, which it's the theoretical
13 capacity multiplied by the mass of the electrode. So
14 may be splitting hairs here.
15 Q. So it ceases to be a theoretical value.
16 Correct?
17 ATTORNEY SOMMER: Object to form.
18 A. Okay, yes.
19 BY ATTORNEY STAMATOPOULOS:
20 Q. And you said whether I did a ratio, the ratios
21 were all very, very similar.
22 A. Yes.
23 Q. What were the numerator and the denominator of
24 those ratios?
25 A. I took the total capacities listed in Figure 3

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1 and I divided by the total capacity that I calculated as
2 a theoretical capacity multiple -- and then I multiplied
3 that by the weight. That was the denominator. So it
4 was the theoretical capacity times the mass gave me a
5 value in milliamp hours.
6 Q. What conclusion -- let me withdraw that.
7 You said they were very, very similar. They
8 were very, very similar to what?
9 A. Each other.
10 Q. So as between examples 1 through 17, for the
11 ones that you performed that calculation, the different
12 ratios were similar to one another?
13 A. Yes.
14 Q. And what conclusion did you arrive at based on
15 that similarity, if any?
16 A. Conclusion was that the total capacity values
17 that are shown in the table here are the values that
18 were measured experimentally, but there -- as with --
19 okay, the -- the theoretical capacity that I measured --
20 that I calculated multiplied by a ratio gave me these
21 total capacities here.
22 So the total capacity available in this
23 Figure 3 were lower than the theoretical value. And
24 that is because we're not taking all of the lithium out
25 of these molecules. There's always a little bit of

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1 lithium left in these molecules. And the reason for
2 that is because you have an upper charge cutoff voltage.
3 Q. And you arrived at the conclusion from your
4 analysis that the capacities reported in Uemura, the
5 total capacities reported in Uemura, were measured at
6 some voltage. Correct?
7 A. Yes.
8 Q. And you also opined, I believe, in your
9 declaration that that voltage must have been the charge
10 cutoff voltage reported in Uemura. Correct?
11 A. Yes.
12 Q. Uemura does not contain such a disclosure,
13 though. Correct?
14 ATTORNEY SOMMER: Object to form.
15 A. Uemura talks about cycling the batteries
16 between certain voltage limits.
17 BY ATTORNEY STAMATOPOULOS:
18 Q. And because it is constant current --
19 withdrawn.
20 Because the charging conditions in Uemura are
21 constant current, the upper limit of that range, which
22 is 4.3 volts, is actually only applied very briefly
23 during the charge and discharge cycle of these
24 batteries. Correct?
25 ATTORNEY SOMMER: Object to form.

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1 A. Yes, that's, yes, correct.
2 BY ATTORNEY STAMATOPOULOS:
3 Q. In fact, 4.3 volts are only applied to each
4 battery instantaneously, after which time the charging
5 stops. Correct?
6 A. You reach 4.3 volts, and at that point, after
7 you hit 4.3 volts, you stop charging. So yes, you
8 charge all the way to 3 volts -- 4.3. You charge all
9 the way to 4.3 volts.
10 Q. Do you have the Excel sheet on which you
11 performed the calculation in front of you?
12 A. No, I don't.
13 Q. Do you have it accessible to you?
14 A. I can open it, but I can't share it.
15 ATTORNEY STAMATOPOULOS: Andrew, I'm going to
16 ask that the Excel sheet be produced.
17 ATTORNEY SOMMER: And I'm going to object to
18 the additional discovery under Rule 42.51(b)(2). We can
19 have a meet and confer over this, but my understanding
20 is this Excel sheet includes a ton of privileged
21 information that you're not entitled to.
22 ATTORNEY STAMATOPOULOS: And it can be
23 produced in a redacted format, correct?
24 ATTORNEY SOMMER: I -- are you asking me that?
25 ATTORNEY STAMATOPOULOS: Well, let me ask --

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1 THE WITNESS: Yes.
2 ATTORNEY STAMATOPOULOS: -- Mr. Juzkow that.
3 THE WITNESS: The answer's yes.
4 BY ATTORNEY STAMATOPOULOS:
5 Q. You could -- could you -- is it possible to
6 redact information from the Excel sheet that you've
7 prepared?
8 A. Yes.
9 ATTORNEY SOMMER: I've not seen the sheet and
10 I'm not going to stand on Mr. Juzkow's representation of
11 what is and what is not privileged and what may or may
12 not be redacted. So on that, yeah, I'm not waiving any
13 objection or, you know, to this.
14 ATTORNEY STAMATOPOULOS: That's fine. I'm not
15 asking you to waive objections on the fly.
16 ATTORNEY SOMMER: No, but you're asking
17 Mr. Juzkow whether this can be redacted for privilege
18 after just admitting he's not a lawyer and can't make a
19 call on privilege, so --
20 ATTORNEY STAMATOPOULOS: Andrew, I'm going to
21 cut you off, not to be rude.
22 BY ATTORNEY STAMATOPOULOS:
23 Q. But, Mr. Juzkow, just to be clear, when I ask
24 if it can be redacted, I mean if you can actually
25 eliminate certain things as a technical matter from this

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1 Excel spreadsheet, like basically hide them from plain
2 view.
3 A. Yes.
4 Q. You can do that, right?
5 A. Yes.
6 Q. Okay. Not asking you if anything's privileged
7 or if it's not privileged. I know you're not a lawyer.
8 Just as a technical matter, whether you can eliminate
9 certain things from plain view.
10 Now, Mr. Juzkow, is it fair to say that the
11 reason why you did the analysis of the molecular weights
12 in the first place was because you had some concern with
13 respect to the total capacity numbers reported in
14 Uemura, and in particular, the fact that many of these
15 numbers are exactly the same as between all the
16 different examples reported in Uemura?
17 ATTORNEY SOMMER: Object to form.
18 A. What I wanted to understand was how they
19 arrived at these numbers. And so I went about it by
20 looking at the numbers, running some calculations, and I
21 was wanting to understand how did they arrive at those
22 numbers.
23 BY ATTORNEY STAMATOPOULOS:
24 Q. And you said that you only did the
25 calculations with respect to some examples and not

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1 others. Correct?
2 A. Yes. I did six -- five examples.
3 Q. You were more curious about those five or six
4 examples than you were about others. Fair?
5 A. I didn't -- I was lazy. I didn't want to go
6 through and look up these molecular weights for
7 germanium and niobium and stuff. I used the common ones
8 that I already knew. I used iron, nickel, manganese,
9 cobalt, and lithium and oxygen and -- so I used the
10 standard ones. And I was able to look at the --
11 determine what the theoretical specific capacity was in
12 milliamp hours per gram, multiply that by the mass of
13 that electrode, and come up with a milliamp hours what
14 that electrode should be.
15 Q. Did it strike you as at all curious that these
16 different materials, in particular, 1, 2, 3, 4, 5, 6, 7,
17 8, 9, 10, 11, 12 materials in 12 separate examples all
18 list a total capacity of 2.24 on the dot?
19 A. The reason is for those particular molecules,
20 the -- the molecular weights are very similar, and the
21 lithium-ions for those ones that are available in that
22 molecule were all the same. So with those two numbers
23 being the same, or very close, you end up with the same
24 theoretical capacity and -- yes, that's it.
25 Q. You end up with the exact same numbers.

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1 A. Not the exact same, but close.
2 Q. Uemura reports the exact same, right?
3 A. To several -- to several significant figures.
4 It's -- it's -- yeah, it -- okay, go ahead.
5 Q. No, I didn't mean to cut you off. I'm sorry.
6 A. No, go ahead.
7 Q. In addition to the total capacity numbers
8 being reported as the same, and I take your point about
9 the significant figures, the total irreversible capacity
10 for 14 out of the 17 examples of anode is also reported
11 as identical over all of these different experiments.
12 Do you see that?
13 A. Yes.
14 Q. Would you agree with me that experimental
15 conditions vary even when using the same materials from
16 one experiment to the other?
17 A. They can vary, yes.
18 Q. And very often do. Correct?
19 A. It's unclear how they determine -- how they
20 generated these numbers. It's possible that they had
21 one large electrode, one large anode and they did the
22 same experiment on that one large anode and then they
23 took pieces of that -- individual pieces from that one
24 anode, which has one number. You know, I'm speculating,
25 but it's possible.

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1 Q. Isn't it true that you yourself detected
2 errors when reviewing Uemura?
3 A. Yes.
4 Q. Did the fact that you detected errors in
5 Uemura cause you to want to look into Uemura's numbers
6 further and see how they were determined?
7 ATTORNEY SOMMER: Object to form.
8 A. No, not at the time I wrote the declaration.
9 I did these calculations subsequent to writing the
10 declaration.
11 BY ATTORNEY STAMATOPOULOS:
12 Q. You did these calculations after you wrote the
13 declaration. Did I catch that correctly?
14 A. Yes.
15 Q. What made you want to do the calculations
16 after you wrote the declaration?
17 ATTORNEY SOMMER: I'm going to caution the
18 witness not to reveal the substance of any discussions
19 that you may have had with counsel.
20 A. So when I was preparing for this deposition, I
21 was digging deeper into the patents, and it just came
22 upon me to try to understand these numbers a little bit
23 better.
24 And the, you know, the core numbers that were
25 really critical to this are the capacity balance

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1 numbers, but that's the core number. But then I wanted
2 to know how these other numbers were generated and so I
3 was wondering, can I calculate this to see how they
4 generated these numbers? And yes, I was able to
5 calculate how they determined these numbers.
6 BY ATTORNEY STAMATOPOULOS:
7 Q. So is it fair to say that you -- and when you
8 say -- let me withdraw my question.
9 So the calculations that you just referred to,
10 those are the ones in the Excel sheet that we were
11 talking about earlier?
12 A. Yes.
13 Q. So you performed these calculations in
14 connection with preparing for your deposition. Correct?
15 A. Yes.
16 Q. And you prepared these calculations in
17 connection with preparing for your deposition before you
18 spoke with counsel about the deposition?
19 ATTORNEY SOMMER: Object to form.
20 A. I performed the calculations last night.
21 BY ATTORNEY STAMATOPOULOS:
22 Q. You did it on your own?
23 A. Yes.
24 Q. Without speaking to counsel?
25 A. Correct.

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1 Q. And any conclusions that might be derived from
2 your calculations would not be reflected in your
3 declaration. Correct?
4 A. That's correct. As I said, my curiosity
5 stemmed from how did they come up with these total
6 capacity values? And that was my curiosity.
7 And I like to get into the numbers with my
8 spreadsheets, and so I put in all the numbers and lo and
9 behold, you know, I got my results. And yeah, it was an
10 interesting exercise.
11 Q. And do your calculations support the opinions
12 that are in your declaration?
13 A. They don't change my declaration whatsoever.
14 Q. The calculations that you performed, do they
15 bear upon the reliability of the data reported in
16 Uemura?
17 A. The calculations I did were consistent with
18 the values in Uemura.
19 Q. Did the calculations you performed inform your
20 views as to the reliability of the data in Uemura one
21 way or the other?
22 A. For that specific total capacity of the
23 cathode for those values in that one column, yes.
24 Q. And Uemura reports that those values were
25 experimentally determined?

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1 ATTORNEY SOMMER: Object to form.
2 A. I'd have to review it, but I don't believe he
3 said that.
4 BY ATTORNEY STAMATOPOULOS:
5 Q. Does your Excel sheet contain any information
6 that you were asked to prepare by counsel?
7 A. No.
8 Q. Does your spreadsheet contain any information
9 that was sent to you by counsel?
10 A. No.
11 Q. Does your spreadsheet contain any reference to
12 any communications with counsel?
13 A. No.
14 Can I ask a question, not being a lawyer?
15 Q. Yes.
16 A. The Excel spreadsheet, when we talk about the
17 Excel spreadsheet, are we talking about -- I'm answering
18 the questions based on one sheet within a large Excel
19 file with multiple sheets. So the answer to your
20 questions is regarding that one sheet that I'm using to
21 do calculations on.
22 Q. Are there several tabs in your Excel sheet?
23 A. Yes, there are.
24 Q. And right now -- or, withdrawn.
25 We have been talking about one of the tabs in

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1 that file. Correct?
2 A. Yes.
3 Q. And that file contains calculations that you
4 created on your own initiative without being prompted by
5 or otherwise discussing with counsel. Correct?
6 A. Exactly correct.
7 Q. There are other tabs in your spreadsheet.
8 Correct?
9 A. Yes.
10 Q. How many tabs?
11 Fair to say there are many tabs in your
12 spreadsheet?
13 A. Yeah, maybe 15.
14 Q. Okay. And do any of those tabs contain
15 information that's relevant to this case?
16 ATTORNEY SOMMER: Object to form.
17 BY ATTORNEY STAMATOPOULOS:
18 Q. Yes or no.
19 A. In the tabs are notes that I've prepared.
20 Q. And the notes that you have prepared, were
21 they in connection with forming your opinions in this
22 matter?
23 ATTORNEY SOMMER: Object to form?
24 A. They were summaries of various references.
25 BY ATTORNEY STAMATOPOULOS:

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Q. And did you consult with your notes in connection with forming your opinions as set forth in your declaration?

ATTORNEY SOMMER: Object to form.

A. I use these primarily to review a number of different references. So I took the different references, I reviewed them, I made notes about each reference. And this is one of the ways I was able to look at it and say okay, this reference is not applicable, this reference is. And that's what I did with those. It's just notes that I took on the -- each different reference.

BY ATTORNEY STAMATOPOULOS:

Q. And your notes relate also to references that you decided not to include in your declaration because they did not contain useful information?

A. Yeah. Like I said, there was -- one of them was lithium metal batteries, which had nothing to do with this.

Q. Did you create your notes at counsel's request?

A. I was asked to review the papers, and when I reviewed the papers, I made notes.

ATTORNEY STAMATOPOULOS: I want to -- I want to move this along, Andrew, because I don't want to

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consume the deposition with this right now. But I think that we're going to put in a request on the record right now for the full Excel sheet. We can meet and confer about what is and what is not privileged. It sounds like right now, based on Mr. Juzkow's testimony, that at least one tab in that spreadsheet is not privileged. But I understand that you may have a different view. We can meet and confer about this at a different time.

ATTORNEY SOMMER: George, let's set something up for Monday to talk about it once I've seen the sheet and seen the rest of this document. You know, these kind of requests at depositions are not typical at PTAB and not really in compliance with the rules. But let's talk about this on Monday. Let's find some time.

ATTORNEY STAMATOPOULOS: Okay, yeah, that's fine. And I don't mean to -- you know, I just want to make sure that it's clear that this is at this time our position, and we can --

ATTORNEY SOMMER: I understand. We can talk about it further to keep this thing moving.

ATTORNEY STAMATOPOULOS: Yeah, absolutely. Obviously, it's -- you know, I was not expecting to go into this line of questioning either, to be very candid with you.

BY ATTORNEY STAMATOPOULOS:

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Q. Now still focusing on the Uemura, Mr. Juzkow, do you know if the total capacity of the cathode reported in Figure 3 of Uemura is in reference to the total capacity after the first discharge of the battery?

A. A POSITA would use those values the very first cycle to do these capacity balances.

Q. So just to be clear, your opinion is that a POSITA reading Uemura would understand that the total capacity reported here for the cathode is the total capacity after the first discharge cycle?

A. The total capacity would be the first -- it's the first discharge of the cathode, yes.

Q. And on what basis is that your opinion?

A. Oh, that's a POSITA. When we do design capacities and we're trying to calculate what the ratios are for positive/negative ratio, we take the very first charge/discharge. So when we do the very first one, we're charging -- well, the very first cycle, the very first time you charge it, you -- you're putting capacity -- you're taking lithium-ions out of the cathode and putting them into the anode. So the values here are based on those values.

Q. Earlier, you testified that the total irreversible capacity was actually arrived at after the procedure that's described in paragraph 77 of Uemura.

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Correct?

A. That one was -- that one was very specific to one of the anodes where they wanted to generate an anode that had a very, very low irreversible capacity. And they wanted to specifically make that to -- to -- so they could do their calculations, their experimentation, to see if their hypothesis was correct.

Q. Going back to Figure 3 of Uemura, isn't it true that 14 out of the 17 examples listed here have a very low total irreversible capacity of the anode?

A. Yes.

Q. And in particular, it's 0.002 for, again, 14 out of the 17 examples. Correct?

A. Yes.

Q. And so the procedure described in paragraph 77 was actually followed with respect to at least 14 out of the 17 examples given in Uemura. Correct?

A. The electrodes that they generated in paragraph 77, those electrodes were used in examples 5 through 17, yes.

Q. So with respect to the anode, the values reported here in Uemura were not after the first charge/discharge cycle but after 40 hours of charge/discharge that was performed on these batteries as described in paragraph 77. Correct?

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1 ATTORNEY SOMMER: Object to form.
2 A. Yes.
3 BY ATTORNEY STAMATOPOULOS:
4 Q. And how is it that if for the anode the values
5 reported are after 40 hours of repeated charging and
6 discharging it is your opinion that for the cathode, the
7 values reported are those that apply after the first
8 cycle?
9 A. A POSITA would know to use the first cycle of
10 the cathodes and first cycle of the anode. But in this
11 case, they were very clever in reducing the total
12 irreversible capacity by that technique in paragraph 77,
13 very clever technique so that when they tested these
14 electrodes they could see what the lithium content value
15 has with respect to the number of cycles in respect to
16 the performance.
17 So they knew that what they started with with
18 lithium in your cathode is what they -- what this cell
19 cycled at. So there was no irreversible loss of that
20 lithium that they couldn't measure, so they had -- they
21 knew exactly what lithium they started with, what value.
22 So, you know, for example 14, they had .75
23 lithium and they knew that by cycling it, there would be
24 no irreversible capacity loss so that when it cycled,
25 they knew that was the value of lithium that they had in

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1 there. So it was clever.
2 Q. To arrive at the irreversible capacity of
3 0.002 reported, for example, in example 14 of Uemura,
4 Uemura describes charging and recharging and discharging
5 the whole battery. Correct?
6 A. That capacity is versus a lithium reference.
7 Q. So it's not the whole battery, it's just the
8 anode versus a lithium reference electrode?
9 A. Right. When you want to calculate individual
10 electrodes and you want to calculate what their
11 reversible and irreversible capacities are, you run
12 those versus a lithium metal reference.
13 Q. Is the --
14 A. You run --
15 Q. I'm sorry.
16 A. You run the anode. You put the anode versus
17 the lithium metal reference, and you intercalate lithium
18 and then you deintercalate lithium. So you look at the
19 difference between the initial intercalation and the
20 deintercalation that follows, and that difference
21 percentage is your irreversible loss.
22 Q. And that process that you just described, is
23 it performed on an experimental setup that includes the
24 cathode?
25 A. It can, but typically what we do, a POSITA

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1 would do, is make an individual coin cell with a sample
2 of the anode versus lithium, run the test. Then
3 afterwards, they would take a different anode, but
4 the -- or a different piece of the anode separate and
5 they would make another cell a full-cell knowing that
6 they know what the irreversible capacity would be in
7 that electrode.
8 Q. Now, on page 78 of your report in the
9 footnote, you state that you observed that a couple of
10 examples have obvious errors in them. And I'll wait for
11 you to get there.
12 A. Yes.
13 Q. You say: I observed that a couple of examples
14 have obvious errors in them.
15 Do you see that?
16 A. Yes.
17 Q. And you identify some of those examples. For
18 instance, some of the values in the Capacity Balance
19 column of Uemura figure 3 appear to incorrect list 1
20 over 1.3 when they should be listed as 1 over 1.1, see
21 e.g., examples 6 through 13 and 15 through 17.
22 Do you see that?
23 A. Yes.
24 Q. Now, later on in the same footnote, you say:
25 However, there are examples included in Figure 3 that

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1 correctly list 1 over 1, 1 over 1.3, and 1 over 1.5.
2 See examples 1 through 5 and 14.
3 Do you see that?
4 A. Yes.
5 Q. So in your view, examples 1 through 5 and 14
6 report accurate numbers based at least on what's
7 reported here in Uemura?
8 A. Yes.
9 Q. In example 5, it says the capacity balance is
10 1 over 1.3 in Uemura.
11 Do you see that?
12 A. Yes.
13 Q. That number is arrived at by dividing 2 over
14 2.36, right?
15 A. Yes.
16 Q. If you divide 2.3 -- and actually, I misspoke.
17 It's 2.36 over 2. Correct?
18 A. Correct.
19 Q. If you divide 2.36 over 2, that's 1.18, right?
20 A. Yes.
21 Q. So Uemura's example 5 lists an incorrect
22 ratio, right?
23 A. That is correct.
24 Q. On what basis did you opine that example 5 had
25 correctly reported the ratio?

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1 A. There was an error on my part.
2 Q. Let's go to Uemura, paragraph 23. Uemura
3 states at the very first sentence of this paragraph that
4 the irreversible capacity of the negative electrode
5 material determines a quantity of lithium-ions coming in
6 and out of the positive electrode material.
7 Do you see that?
8 A. Yes.
9 Q. This means that the anode takes the lithium
10 out of circulation after the first charge cycle such
11 that the capacity's reduced, right?
12 A. Yes.
13 Q. Then in paragraph 25 of Uemura, Uemura says
14 that the layered lithium manganese complex oxide with a
15 very large capacity or with an unstable crystalline
16 structure and the negative electrode material with a
17 larger irreversible capacity than the conventional one
18 are employed in combination.
19 Do you see that?
20 A. Yes.
21 Q. Fair to say that Uemura reports that the
22 layered lithium manganese oxide is not stable?
23 ATTORNEY SOMMER: Object to form.
24 A. He's saying that the manganese complex oxide
25 has an unstable crystalline structure.

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1 BY ATTORNEY STAMATOPOULOS:
2 Q. And Uemura goes on to say -- and I'm not
3 quoting -- that it uses an anode material that is
4 different from conventional anodes in the sense that it
5 has a larger irreversible capacity in order to stabilize
6 the crystal structure of the cathode.
7 Would you agree with that?
8 A. Yes.
9 Q. So is it fair to say that Uemura wants to take
10 out a larger portion of the lithium in circulation and
11 render it unusable in subsequent charge/discharge
12 cycles?
13 ATTORNEY SOMMER: Object to form.
14 A. He's approaching the -- using this material,
15 these various molecular formulas. He's looking at it
16 from two different angles. So the first one is he
17 starts with a high lithium content. So examples 3 and
18 4, you're almost at lithium 1 so you almost have the
19 full lithium in there.
20 And he's saying that by using a high
21 irreversible capacity -- irreversible anode, you're
22 extracting the lithium out of that lithium 0.967. So
23 then, you -- that results in a lower lithium value.
24 And he's trying to see if lithium-deficient
25 cathodes are more stable, so his approach -- he has two

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1 approaches. One of the approaches is to start with
2 lithium 1 and then extract the lithium using an
3 irreversible, highly irreversible anode.
4 And then the other way he's approaching it is
5 he's starting with lower lithium content in the first
6 initial molecule. And then he has a very low
7 irreversible capacity, so he gets to that same point
8 where he has a low -- he has a lithium-deficient
9 molecule for cycling. So he approaches it in two
10 different directions.
11 BY ATTORNEY STAMATOPOULOS:
12 Q. Is it fair to say that Uemura's trying to
13 reduce the capacity of the cathode?
14 A. No.
15 Q. Well, Uemura states that a lithium-deficient
16 cathode is more stable. Correct?
17 A. Yes.
18 Q. And in fact, Uemura considers it an
19 improvement to have a lithium-deficient cathode.
20 Correct?
21 A. Uemura is looking at a cathode material that
22 potentially has a very high specific capacity. So he's
23 taken that material that has a very high specific
24 capacity and he's saying I can stabilize this if I take
25 out a little bit of lithium. I will still end up with a

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1 molecule that has higher capacity than the conventional
2 lithium manganese spinel, so he'll still end up with a
3 higher capacity than that. And that's -- he's still --
4 that's his goal is to come up with a stable material
5 that has high specific capacity.
6 Q. And just to be clear, that material is lithium
7 manganese dioxide. Yes?
8 ATTORNEY SOMMER: Object to form.
9 A. That's -- that's the base material. But then
10 he's doping it with different materials. He's making it
11 oxygen- and lithium deficient. So it's the starting
12 material but not the actual material that he's generated
13 for his study.
14 BY ATTORNEY STAMATOPOULOS:
15 Q. But is it fair to say that all the cathode
16 materials that Uemura experiments with are manganese
17 based?
18 A. Yes.
19 Q. So Uemura's approach with respect to these
20 manganese-based cathodes is to decrease their capacity
21 in subsequent charge/discharge cycles. Correct?
22 A. So lithium manganese spinel has a low specific
23 capacity. Lithium manganese dioxide has a much larger
24 specific capacity, which would be what you would want to
25 use in a lithium-ion cell. You want the highest

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1 specific capacity.
2 So but then the lithium manganese dioxide
3 isn't as stable as he would like. So by reducing the
4 amount of lithium in there by a small amount, he's able
5 to come up with a final compound that is much higher
6 specific capacity than the spinel compound, the
7 manganese spinel. It will be lower than lithium
8 manganese dioxide pure, but that's not -- they're not
9 finding that they're able to get the performance out of
10 that material. So the end result is a material that's
11 still higher than lithium spinel, and that's his --
12 that's the goal.
13 Q. Okay. You said that the lithium-deficient
14 lithium manganese dioxide used in Uemura has a slightly
15 smaller capacity than the nondeficient lithium manganese
16 dioxide. Is that fair?
17 A. Yes.
18 Q. How much slighter? Or let me rephrase that
19 question.
20 How much smaller does Uemura report the
21 lithium manganese -- let me withdraw that question.
22 Sorry, it's getting late.
23 How much smaller is the difference in capacity
24 between the lithium-deficient lithium manganese dioxide
25 used in Uemura versus the nondeficient lithium manganese

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1 dioxide according to Uemura?
2 A. So he has many examples. And to determine the
3 difference, you would look at the Total Capacity column
4 in Figure 3, look at the comparative example at the
5 bottom, which for that electrode is 2.7-milliamp hours,
6 and you would compare that to all the other examples,
7 and that would be your -- the difference in specific
8 capacity.
9 When I say "specific capacity," it's because
10 they all have the same mass to start with so it's really
11 based on having the same mass.
12 Q. In the comparative example, what's the
13 capacity balance ratio?
14 A. 1.3 is listed.
15 Q. Okay. And how does Uemura arrive at that
16 figure?
17 A. He doesn't show what the negative electrode
18 total capacity is so I am not 100 percent sure.
19 Q. Are you a different percent sure than 100?
20 ATTORNEY SOMMER: Object to form.
21 BY ATTORNEY STAMATOPOULOS:
22 Q. You don't know how he arrives at this value.
23 Correct?
24 A. That's correct.
25 Q. Now, you mentioned that lithium manganese

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1 dioxide is unstable. Correct?
2 A. It's -- I have to read through here where he
3 talks about the stability of the materials.
4 Q. Let me try to ask you a different question.
5 A person of ordinary skill in the art, reading
6 Uemura's disclosure that, for example, lithium manganese
7 dioxide has an unstable crystalline structure as shown
8 in paragraph 25, would such a POSITA understand that
9 problems start to arise with respect to that cathode
10 material structure in higher temperatures?
11 ATTORNEY SOMMER: Object to form.
12 A. Yes. By substituting various elements for
13 manganese within that compound, they're achieving higher
14 cycle life, better performance at high temperature.
15 So you can see that the cycle life for lithium
16 manganese dioxide is very poor, 10 cycles. But by
17 substituting some of the manganese with other metals --
18 chromium, aluminum, gallium, vanadium, nickel -- sorry,
19 I'm going too fast. By substituting the manganese with
20 various other metals, you end up with a much more stable
21 structure, which provides a much higher cycle life when
22 cycling to 4.3 volts at high temperature.
23 BY ATTORNEY STAMATOPOULOS:
24 Q. And when you say cycling to 4.3 volts, again
25 you mean under constant current conditions. Correct?

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1 A. Yes.
2 Q. And not constant current, constant voltage
3 conditions. Correct?
4 A. He doesn't mention constant voltage. He only
5 mentions constant current.
6 ATTORNEY SOMMER: We've been going about an
7 hour and a half. I don't know if this is a good
8 breaking point.
9 ATTORNEY STAMATOPOULOS: Let's take 10
10 minutes, and then I don't think I'll have much more. So
11 let's reconvene in 10.
12 THE VIDEOGRAPHER: The time is 2:40 PM. We
13 are off the record.
14 (Recess taken.)
15 THE VIDEOGRAPHER: We are back on the record.
16 The time is 2:48 PM.
17 BY ATTORNEY STAMATOPOULOS:
18 Q. Welcome back, Mr. Juzkow.
19 Now, you didn't communicate with counsel over
20 the break?
21 A. No.
22 Q. Now, in your declaration, for example, on page
23 12, you have offered the opinion that those in the field
24 knew to ensure that the negative electrode had
25 sufficient capacity to avoid plating or precipitating

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1 lithium.
2 Do you see that?
3 A. Yes.
4 Q. Is it your opinion that, as a general matter,
5 designing a battery in which the anode capacity exceeded
6 the cathode capacity would result in better performance
7 characteristics?
8 A. Yes.
9 ATTORNEY SOMMER: Object to form.
10 BY ATTORNEY STAMATOPOULOS:
11 Q. I'm sorry, I didn't catch that.
12 A. Yes.
13 Q. For example, would it produce better
14 rechargeability?
15 A. Yes.
16 Q. Meaning that the -- withdrawn.
17 Meaning that a person of ordinary skill in the
18 art would expect that a battery in which the anode
19 capacity exceeded the cathode capacity would retain its
20 overall capacity over a higher number of cycles, all
21 else being equal. Correct?
22 A. When you start, the capacity of the cell is
23 based on the amount of lithium you have in there. And
24 the amount of lithium you have in there comes from the
25 cathode. So if you have your -- if your anode is larger

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1 than your cathode, then you -- all the -- you have a
2 space for all the lithium to enter into the anode and
3 then be available back to the cathode. So your ratios
4 should always have more negative than positive.
5 Q. I want to ask the question a little bit
6 differently. Let me ask a different question.
7 I asked you, for example, would it have better
8 rechargeability in reference to a battery in which the
9 anode capacity was greater than the cathode, and I
10 believe you answered yes.
11 Do you recall that?
12 A. I'd like to understand -- before I answer
13 that, I'll take that answer back and just understand,
14 what do you mean by rechargeability?
15 Q. That was going to be my next question to you,
16 so let me ask you a different question.
17 The ability of a battery to retain its
18 capacity over a number of cycles, what would -- how
19 would you call that property?
20 A. Rechargeability would be a good word for that.
21 Q. So now that we've come to an understanding as
22 to the meaning of rechargeability, do you want to change
23 your answer to my previous question?
24 A. No.
25 Q. So a person of ordinary skill in the art, all

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1 else being equal, would expect that a battery with
2 greater anode than cathode capacity would have better
3 rechargeability. Fair?
4 A. Yes.
5 Q. Turning to Figure 3 of Uemura again, examples
6 3 and 4, those two examples use the same cathode
7 material, right?
8 A. Yes.
9 Q. They also use the same anode material.
10 Correct?
11 A. 3 and 4?
12 Q. Yes.
13 A. It's a different material.
14 Q. Well, let's take a look at --
15 A. Oh, maybe -- I have to do the calculation.
16 Let's put that it way.
17 Q. I -- I don't think you need -- you're more
18 than free to do it, but I think it's probably easier if
19 I invite you to look at the relevant disclosure in
20 Uemura. So if you go to page 11 of 14, you see where it
21 says example 3 and example 4?
22 A. I'm sorry, which page was that again?
23 Q. 11 of 14, paragraph 85.
24 A. Okay.
25 Q. If you look at paragraph 85, in the right-hand

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1 column to which that paragraph extends, do you see where
2 it says: With employing this material as a positive
3 electrode and Binchotan hard carbon with a carbon
4 content of 83.5 percent as a negative electrode?
5 Do you see that?
6 A. Yes.
7 Q. That's the negative electrode used in example
8 3?
9 A. Okay. So one of them is smaller.
10 Q. Bear with me for one second.
11 In example 4, do you see where it says: With
12 employing the same material as that in example 3 as a
13 positive electrode and Binchotan hard carbon with a
14 carbon content of 83.5 as a negative electrode?
15 Do you see that?
16 A. Yes.
17 Q. With those two disclosures in mind, do you
18 believe that the anode materials in examples 3 and 4 are
19 the same, or are they different in any way?
20 A. The material's the same.
21 Q. So the anode material's the same. Correct?
22 A. The anode material is the same.
23 Q. And the same is true of the cathode material.
24 Correct?
25 A. Yes.

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Q. But if you look at Figure 3 of Uemura, you'll see that the capacity balances for these two examples are different, right?
A. Yes.
Q. And one -- in example 3, the capacity ratio is 1 over 1.3. Correct?
A. Yes.
Q. And that means that the anode is 30 percent greater than the cathode, right?
A. Yes.
Q. In example 4, there's a 1-to-1 ratio, right?
A. Yes.
Q. And based on that, a person of ordinary skill in the art would expect that example 3's battery would have better rechargeability than example 4. Correct?
ATTORNEY SOMMER: Object to form.
A. It's not that clearcut, given that the irreversible capacity losses are different. So you -- it's not exactly clear based on the irreversible capacity values.
BY ATTORNEY STAMATOPOULOS:
Q. What would the irreversible capacity values lead you to conclude?
A. That tells you what you -- you end up with in terms of anode capability. So this isn't a real -- you

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know, just a very general standard anode material. In general, I agree that having a -- a value of greater than 1 for your negative over your positive is preferable, but I'm not sure why there's a small difference in the number of cycles between these two.
Q. Well, when you say there's a small number of difference in the number of cycles, to be clear -- let me ask a question. Might make it better.
So example 3 reports a ratio or a capacity balance that indicates the anode has greater capacity than the cathode. Correct?
A. Yes.
Q. And it also reports 310 cycles as the number of cycles over which a particular level of capacity is retained for that battery. Correct?
A. Yes.
Q. Example 4 reports 350 cycles. Correct?
A. Yes.
Q. So the rechargeability of example 4, at least according to the numbers reported here in Uemura, is better than that of example 3. Correct?
A. Yes.
Q. However, example 4 reports a capacity ratio between the anode and the cathode that is exactly 1 to 1. Correct?

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A. Yes.
Q. So at least with respect to examples 3 and 4, which have identical anode and cathode materials, rechargeability is not positively correlated with the negative to positive capacity ratio. Correct?
A. Correct.
Q. Now --
A. It comes down to irreversible capacity. And then if you look at the irreversible capacity of 3 is 1.18 milliamp hours. So you're losing 2.6 -- starting with 2.6 and you're losing 1.18. In the other -- in number 4, you start with 2.6 and you lose only .94, so there's a difference there.
Q. Why is it that the total irreversible capacities are different in these two examples even though the total capacity of the cathode is the same, the cathode material is the same, and the anode material is the same?
A. There's a difference in the mass of the negative electrode. So you start with a smaller amount of negative electrode in example 4, and the irreversible capacity is lower because you have in the units milliamp hours. It's lower because you have less mass to start with.
Q. How is the total capacity of the anode defined

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in Uemura?
ATTORNEY SOMMER: Object to form.
A. I don't recall.
BY ATTORNEY STAMATOPOULOS:
Q. Take a look at paragraph 31.
A. Okay. So he has a formula based on an experimental set of data that they collected, which was Figure 2. So they took experimental data and they worked and they calculated a formula for irreversible capacity based on carbon content.
Q. The irreversible capacity as reported in Uemura, paragraph 31, is not dependent upon the weight of the anode. Correct?
A. The irreversible capacity can either be a percentage or it could be a total in milliamp hours.
Q. Okay.
A. So by having -- you could -- they have the same percentage of irreversible capacity, but the total irreversible capacity in milliamp hours is lower if you have less mass.
So when you cycle number 4, even though the capacity balance from the first cycle is 1.1, subsequent cycles, your capacity balance is going to be above 1 to 1. So there's no concern about having -- not having enough negative capacity. There's no concern whatsoever

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1 there because you have -- you're losing lithium from the
2 cathode. And when you do that, your ratio is no longer
3 1 to 1, it's going to be 1 to some 1.X value.
4 Q. So do you know if the difference in
5 rechargeability is attributable to the difference in
6 total irreversible capacity with respect to examples 3
7 and 4?
8 ATTORNEY SOMMER: Object to form.
9 A. Even though the capacity balance for number 4
10 is 1.1 -- 1 to 1 to start, which, you know, a POSITA
11 would not design a battery at 1 to 1 in a commercial
12 battery. But once you have that high irreversible
13 capacity loss on the first cycle, now you don't have all
14 that capacity in the cathode and so your anode -- your
15 ratio is going to be -- you'll have more negative than
16 positive. And as long as you have more negative than
17 positive, you're going to have good cyclability.
18 You're not going to have the issues -- I
19 should say you're not going to have the issues you would
20 have if you had less negative than positive. When you
21 have less negative than positive, as you know, you can
22 have lithium plating, lithium metal plating which
23 affects the rechargeability.
24 ATTORNEY STAMATOPOULOS: I want to -- I want
25 to invite your attention now to the Abe reference, which

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1 is Exhibit 1005 to your declaration.
2 THE WITNESS: Yes.
3 (Exhibit No. 1005, previously marked, was
4 referenced and indexed.)
5 BY ATTORNEY STAMATOPOULOS:
6 Q. Now, you've offered an opinion that Abe
7 discloses the capacity ratio that is claimed in the
8 independent claims of the '641 patent. Correct?
9 A. I have to refer to my deposition.
10 Q. Yeah, let me point you to the part of your
11 declaration that I'm referring to. So if you go to
12 paragraph 162 --
13 A. Yes.
14 Q. -- is that where your opinions start with
15 respect to Abe's -- to whether Abe discloses the claimed
16 ratio?
17 A. Yes.
18 Q. And in paragraph 163 of your declaration, the
19 very last sentence, you say: A specific example is
20 provided by Abe for a lithium manganese oxide, the
21 spinel form, in which the design capacity ratio is 1
22 over 1.1.
23 Do you see that?
24 A. Yes.
25 Q. And in paragraph 117 of your declaration, you

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1 state that a person of ordinary skill would calculate
2 the ratio at the voltage that a battery is intended to
3 operate.
4 Do you recall that?
5 A. Yes.
6 ATTORNEY SOMMER: Object to form. Counsel, do
7 you mean 117?
8 ATTORNEY STAMATOPOULOS: 117.
9 ATTORNEY SOMMER: Okay.
10 ATTORNEY STAMATOPOULOS: One one seven. Did I
11 say something else? I'm sorry.
12 ATTORNEY SOMMER: No, you didn't. Sorry.
13 ATTORNEY STAMATOPOULOS: No worries.
14 THE WITNESS: Yes.
15 BY ATTORNEY STAMATOPOULOS:
16 Q. Now, what is your basis for concluding that
17 Abe discloses a ratio that was calculated at either 4.2
18 or 4.3 volts?
19 A. So the ratios that he calculated were shown in
20 Table 1.
21 Q. I'm sorry? Table 1 of Abe?
22 A. Abe, yeah. On page 28 of 31.
23 Q. Okay.
24 A. So can you repeat your question, please?
25 Q. So my question was what is your basis for

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1 concluding that Abe discloses a ratio that was
2 calculated at either 4.2 or 4.3 volts?
3 A. Within my declaration, sorry, can you point me
4 again to where I said that 4.2 or 4.3?
5 Q. Well, let's try a different -- let's try
6 something different.
7 At paragraph 163, you state that a specific
8 example's provided by Abe for the spinel lithium
9 manganese oxide cell in which the design capacity ratio
10 is 1 over 1.1.
11 Do you see that?
12 A. In paragraph 163, yes.
13 Q. Okay. And you cite in the footnote to
14 paragraph 18 of Abe. Correct?
15 A. I cite 18, 78, and 103, paragraphs --
16 Q. You are correct. I apologize. You cite --
17 for that particular proposition, you cite 103.
18 A. So 103 is the -- okay.
19 Q. Yes. Now, in 103, it reads, of Abe: A
20 cylindrical nonaqueous electrolyte-based secondary
21 battery was made in the same manner as in embodiment 1
22 using a negative electrode, cathode, and electrolyte
23 solution similar to that in embodiment 1.
24 Do you see that?
25 A. Yes.

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1 Q. And fair to say that it is with respect to
2 this embodiment 1 that you opine that Abe has reported a
3 design capacity ratio of 1 over 1.1?
4 A. In embodiment 1, the ratio is 1 to 1.2 as --
5 Q. Well --
6 A. -- as per Table 1.
7 Q. Well, that's a different embodiment.
8 That's -- and that's a different -- that's a different
9 disclosure.
10 I'm asking you about what's here in paragraph
11 103, where it states: The negative electrode design
12 capacity to positive electrode design capacity value of
13 this nonaqueous electrolyte secondary battery was
14 adjusted to 1.1 and the value shown in Table 1.
15 Do you see that?
16 A. Yes.
17 Q. So here, at least, what you've cited says that
18 the value is 1.1, right?
19 A. In the table, it shows embodiment 1 as being
20 1.2.
21 Q. I -- I see that. In your report, it says it's
22 1 over 1.1. Do you see that?
23 A. Yes.
24 Q. So in any event, I'm not -- the purpose of my
25 question is just to establish what embodiment we're

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1 talking about. I don't want to squabble with you over
2 whether it's 1.1 or 1.2 right now. The Abe reference
3 says what it says. Your declaration says what it says.
4 But fair to say that what we're referring to
5 is what Abe refers to as embodiment 1?
6 ATTORNEY SOMMER: Object to form.
7 A. Yes.
8 BY ATTORNEY STAMATOPOULOS:
9 Q. Okay. I want to ask you about the
10 charge/discharge conditions of embodiment 1.
11 Fair to say that those are shown on page 29 in
12 the table that appears in the middle of that page?
13 A. Yes.
14 Q. And what Abe reports here in paragraph 97 in
15 reference to that table is the charge and discharge
16 tests were carried out at current values of
17 800 milliamps, 1600 milliamps, 2400 milliamps -- sorry,
18 microamps and 32 --
19 A. Milliamps.
20 Q. Milliamps. Sorry, I get my milli's and
21 micro's mixed up. I'm sorry.
22 So in any event, to rephrase the question,
23 what Abe reports here is current values in the range of
24 charge and discharge voltages of 2.5 to 4.1 volts.
25 Do you see that?

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1 A. Yes.
2 Q. Fair to say that the capacity ratios of
3 embodiment 1 correspond to a charge voltage no greater
4 than 4.1 volts based on what's stated here in Abe?
5 ATTORNEY SOMMER: Object to form.
6 A. Yes.
7 BY ATTORNEY STAMATOPOULOS:
8 Q. Now, we talked earlier about the difference
9 between constant current charging and constant current,
10 constant voltage charging.
11 Do you recall that?
12 A. Yes.
13 Q. You rendered certain opinions as to whether
14 Uemura and Abe disclose the claimed charge cutoff
15 voltage that is recited in the claims of the '641
16 patents. Correct?
17 A. Yes.
18 Q. And in rendering those opinions, did you
19 consider any construction or proposed construction for
20 the term "charge cutoff voltage" that appears in those
21 claims?
22 A. The different claims have the same -- charge
23 limited voltage limited to 4.2 or charge cutoff voltage
24 set at 4.2 have the same meaning.
25 Q. Well, let me invite your attention to page 48

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1 of your declaration where it says Claim Construction.
2 Let me know when you're there.
3 A. I'm there.
4 Q. And paragraph 76, you state that you have not
5 been asked to render any opinions on claim construction.
6 Is that fair?
7 A. Yes.
8 Q. Fair to say that you just applied the
9 constructions that you were provided by counsel in
10 rendering your opinions?
11 A. So in here, I have three claim constructions
12 listed --
13 Q. Okay.
14 A. -- in my document.
15 Q. Okay. And none of these claims -- oh, sorry.
16 Go ahead.
17 A. Okay. Yeah, there's -- there's one other
18 claim construction, charge cutoff voltage, which is
19 listed in the -- which I didn't -- I didn't have in my
20 declaration.
21 Q. I'm sorry, what are you referring to? What is
22 it listed in?
23 A. The Apple Markman order.
24 Q. You mean Exhibit 1016 to your declaration?
25 A. Yeah.

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Q. And what is your understanding of Exhibit 1016?
A. That -- my understanding is that it is that there's no construction needed per RJ's proposed construction.
Q. It also says that if this term needs construction, it should be afforded its plain and ordinary meaning, which is the maximum voltage to which the battery is configured to be charged, right?
A. Right. That's the plain and ordinary meaning that I agree with.
Q. Okay. And generally speaking, a person of ordinary skill in the art, when charging a battery, would use constant current, constant voltage charging. Correct?
A. Not always.
ATTORNEY SOMMER: Object to form.
A. Not always. You can use -- you could use constant current or constant voltage. You can use a combination of. So there's multiple ways to charge a battery. But there's also a maximum voltage that you adhere to. And sometimes we call that the upper voltage limit, upper cutoff voltage, charge cutoff voltage. There's many terms for it, but it's a single number that you -- the battery is designed to be charged to.

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BY ATTORNEY STAMATOPOULOS:
Q. You would get different open circuit voltage values if you applied constant current charging with the same voltage cutoff but different current values. Correct?
A. Yes.
ATTORNEY STAMATOPOULOS: No further questions.
ATTORNEY SOMMER: I don't have any questions for the witness. We'd like to reserve the right to review and sign. George, send me your availability to talk on Monday. I'm traveling on Tuesday so I'd like to resolve this if we can.
ATTORNEY STAMATOPOULOS: Yeah.
THE VIDEOGRAPHER: The time is 3:25 PM. We are off the record.

(Deposition adjourned at 3:25 p.m.)

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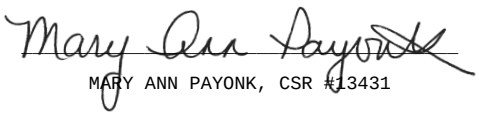
REPORTER'S CERTIFICATE

I, MARY ANN PAYONK, shorthand reporter and Notary Public, CA CSR No. 13431, do hereby certify that the witness whose deposition is hereinbefore set forth was sworn by agreement of all parties, that the proceedings were reported stenographically by me, and that this transcript is a true, correct, and full record of the testimony given.

I further certify that I am not related to any of the parties to this action by blood or by marriage, and that I am in no way interested in the outcome of this matter.

IN WITNESS WHEREOF, I have hereunto set my hand this 4th day of May, 2024.



MARY ANN PAYONK, CSR #13431

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INDEX TO WITNESSES

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MARC JUZKOW
Examination by Attorney Stamatopoulos 6

INDEX TO CERTIFIED QUESTIONS

PAGE/LINE TEXT OF THE QUESTION
17 5 And you were asked to provide opinions that would show or tend to show that the claims in the '641 patent are either obvious or anticipated in light of the prior art?

INDEX TO REFERENCED EXHIBITS

Exhibit No. 1001 65
Exhibit No. 1002 25
Exhibit No. 1005 210
Exhibit No. 1008 125
Exhibit No. 1009 93
Exhibit No. 1012 139

INDEX TO MARKED EXHIBITS

Juzkow Exhibit No. 1 Armstrong/Bruce article 151

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1 ERRATA SHEET FOR TRANSCRIPT OF: MARC JUZKOW
2 CASE CAPTION: Samsung vs. RJ Technology LLC
3 DEPOSITION DATE: May 1, 2024
4
Page _____ Line _____ Reason _____
5 From _____ to _____
6 Page _____ Line _____ Reason _____
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20 From _____ to _____
21 Page _____ Line _____ Reason _____
From _____ to _____
22
23 _____ _____
24 Signature of Deponent Date
25

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1 I,
2 MARC JUZKOW,
3 state that I have read the foregoing deposition and
4 declare under penalty of perjury:
5 That the foregoing is my deposition under
6 oath;
7 That I have read same and have made the
8 necessary corrections, additions or changes to my
9 answers that I deem necessary;
10 That my answers as indicated are true and
11 correct.
12
13 Executed at _____
14 this _____ day of _____, 2024.
15
16 _____
17 MARC JUZKOW
18
19
20
21
22
23
24
25

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