

In the Matter of

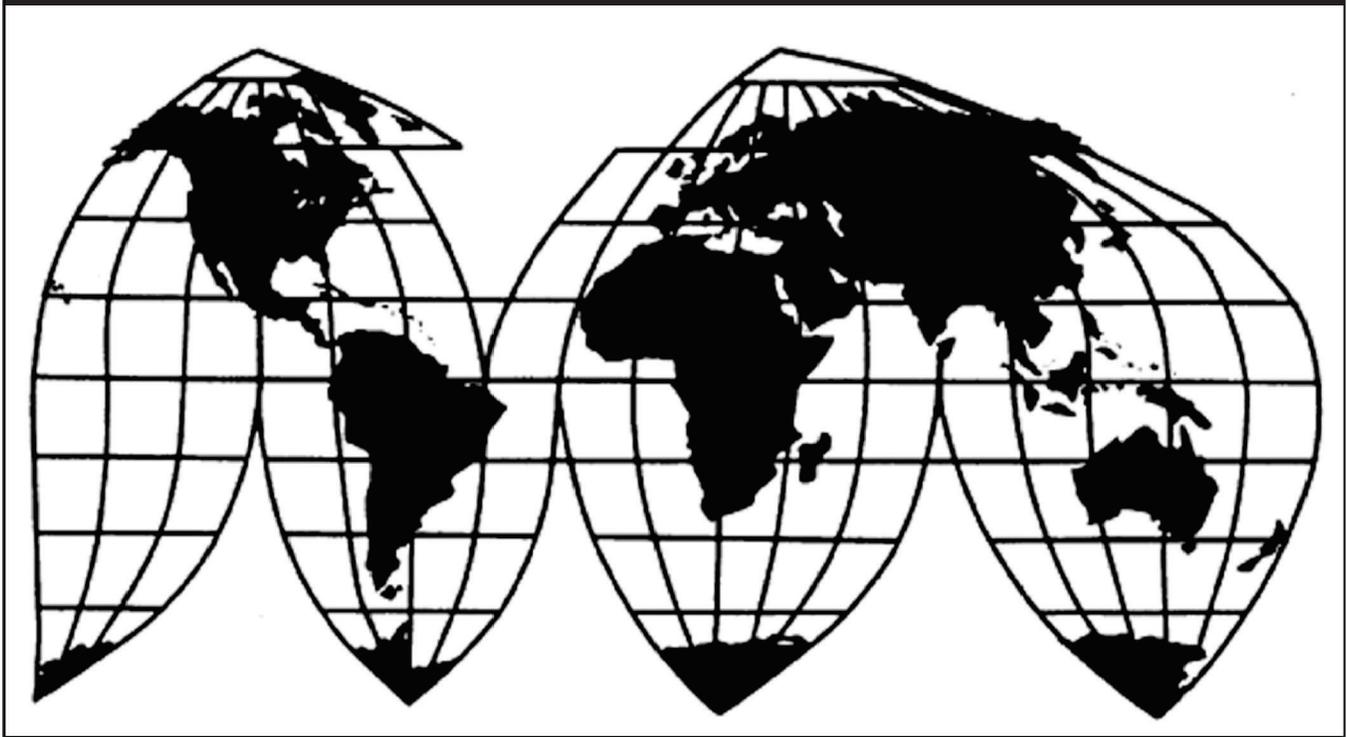
**CERTAIN LITHIUM METAL OXIDE CATHODE
MATERIALS, LITHIUM-ION BATTERIES FOR
POWER TOOL PRODUCTS CONTAINING SAME,
AND POWER TOOL PRODUCTS WITH LITHIUM-
ION BATTERIES CONTAINING SAME**

337-TA-951

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U.S. International Trade Commission



Washington, DC 20436

U.S. International Trade Commission

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United States International Trade Commission
Washington, DC 20436**

U.S. International Trade Commission

Washington, DC 20436
www.usitc.gov

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UNITED STATES INTERNATIONAL TRADE COMMISSION
Washington, D.C.

In the Matter of

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CATHODE MATERIALS, LITHIUM-
ION BATTERIES FOR POWER TOOL
PRODUCTS CONTAINING SAME, AND
POWER TOOL PRODUCTS WITH
LITHIUM-ION BATTERIES
CONTAINING SAME**

Investigation No. 337-TA-951

**NOTICE OF THE COMMISSION'S DETERMINATION TO RESCIND
A LIMITED EXCLUSION ORDER**

AGENCY: U.S. International Trade Commission.

ACTION: Notice.

SUMMARY: Notice is hereby given that the U.S. International Trade Commission has determined to rescind a limited exclusion order prohibiting importation of infringing lithium metal oxide cathode materials based upon settlement.

FOR FURTHER INFORMATION: Panyin A. Hughes, Office of the General Counsel, U.S. International Trade Commission, 500 E Street, S.W., Washington, D.C. 20436, telephone 202-205-3042. Copies of non-confidential documents filed in connection with this investigation are or will be available for inspection during official business hours (8:45 a.m. to 5:15 p.m.) in the Office of the Secretary, U.S. International Trade Commission, 500 E Street, S.W., Washington, D.C. 20436, telephone 202-205-2000. General information concerning the Commission may also be obtained by accessing its Internet server (<https://www.usitc.gov>). The public record for this investigation may be viewed on the Commission's electronic docket (EDIS) at <https://edis.usitc.gov>. Hearing-impaired persons are advised that information on this matter can be obtained by contacting the Commission's TDD terminal on 202-205-1810.

SUPPLEMENTARY INFORMATION: The Commission instituted the underlying investigation on March 30, 2015, based on a complaint filed by BASF Corporation of Florham Park, New Jersey ("BASF") and UChicago Argonne LLC of Lemont, IL ("Argonne") (collectively, "Complainants"). 80 *Fed. Reg.* 16696 (Mar. 30, 2015). The complaint alleged violations of section 337 of the Tariff Act of 1930, as amended (19 U.S.C. § 1337), in the importation into the United States, the sale for importation, and the sale within the United States after importation of certain lithium metal oxide cathode materials, lithium-ion batteries for power tool products containing same, and power tool products with lithium-ion batteries containing same by reason of infringement of one or more of claims 1-4, 7, 13, and 14 of U.S. Patent No. 6,677,082 ("the '082 patent") and claims 1-4, 8, 9, and 17 of U.S. Patent No. 6,680,143 ("the

'143 patent"). *Id.* The notice of investigation named the following respondents: Umicore N.V. of Brussels, Belgium; Umicore USA Inc. of Raleigh, North Carolina (collectively, "Umicore"); Makita Corporation of Anjo, Japan; Makita Corporation of America of Buford, Georgia; and Makita U.S.A. Inc. of La Mirada, California (collectively, "Makita"). *Id.* The Office of Unfair Import Investigations was a party to the investigation.

On November 5, 2015, the ALJ granted a joint motion by Complainants and Makita to terminate the investigation as to Makita based upon settlement. *See* Order No. 32 (Nov. 5, 2015). The Commission determined not to review this order. *See* Notice of Non-Review (Nov. 23, 2015).

On February 29, 2016, the ALJ issued his final initial determination ("ID"), finding a violation of section 337 by Umicore in connection with claims 1-4, 7, 13, and 14 of the '082 patent and claims 1-4, 8, 9, and 17 of the '143 patent. On May 11, 2016, the Commission determined to review the final ID in part. 81 *Fed. Reg.* 30548-50 (May 17, 2016). The Commission also granted Umicore's request for a Commission hearing. *Id.* On November 17, 2016, the Commission held a hearing on contributory infringement, laches, and the public interest. On review, the Commission determined to affirm the ALJ's finding of violation of section 337 with respect to the claims identified above. 81 *Fed. Reg.* 93960-62 (Dec. 22, 2016).

Having found a violation of section 337, the Commission determined that the appropriate form of relief was: a limited exclusion order prohibiting the unlicensed entry of lithium metal oxide cathode materials that infringe one or more of claims 1-4, 7, 13, and 14 of the '082 patent, or claims 1-4, 8, 9, and 17 of the '143 patent that are manufactured by, or on behalf of, or imported by or on behalf of Umicore N.V. and Umicore USA Inc. or any of their affiliated companies, parents, subsidiaries, agents, or other related business entities, or their successors or assigns.

On May 5, 2017, BASF, Argonne, and Umicore filed a joint petition under 19 U.S.C. § 1337(k) and Commission Rule 210.76(a) (19 C.F.R. § 210.76(a)) to rescind the limited exclusion order based upon settlement. The parties filed both confidential and public versions of the settlement agreements. On May 9, 2017, the Commission investigative attorney filed a response in support of the motion.

The Commission has determined to grant the petition. The limited exclusion order issued in this investigation is hereby rescinded.

The authority for the Commission's determination is contained in section 337 of the Tariff Act of 1930, as amended (19 U.S.C. § 1337), and in Part 210 of the Commission's Rules of Practice and Procedure (19 C.F.R. Part 210).

By order of the Commission.

A handwritten signature in black ink, appearing to read 'Lisa R. Barton', written in a cursive style.

Lisa R. Barton
Secretary to the Commission

Issued: June 6, 2017

**CERTAIN LITHIUM METAL OXIDE CATHODE
MATERIALS, LITHIUM-ION BATTERIES FOR POWER
TOOL PRODUCTS CONTAINING SAME, AND POWER
TOOL PRODUCTS WITH LITHIUM-ION BATTERIES
CONTAINING SAME**

Inv. No. 337-TA- 951

PUBLIC CERTIFICATE OF SERVICE

I, Lisa R. Barton, hereby certify that the attached **NOTICE** has been served by hand upon the Commission Investigative Attorney, Vu Bui, Esq., and the following parties as indicated, on **June 6, 2017**.



Lisa R. Barton, Secretary
U.S. International Trade Commission
500 E Street, SW, Room 112
Washington, DC 20436

**On Behalf of Complainants BASF Corporation and UChicago
Argonne LLC:**

Sean M. McEldowney
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655 Fifteenth Street, N.W.
Washington, D.C. 20005

- Via Hand Delivery
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- Via First Class Mail
- Other: _____

**On Behalf of Respondents Umicore N.V. and Umicore USA
Inc.:**

Joseph V. Colaianni, Jr.
FISH & RICHARDSON P.C.
1425 K Street, N.W., 11th Floor
Washington, D.C. 20005

- Via Hand Delivery
- Via Express Delivery
- Via First Class Mail
- Other: _____

UNITED STATES INTERNATIONAL TRADE COMMISSION
Washington, D.C.

In the Matter of

**CERTAIN LITHIUM METAL OXIDE
CATHODE MATERIALS, LITHIUM-
ION BATTERIES FOR POWER TOOL
PRODUCTS CONTAINING SAME, AND
POWER TOOL PRODUCTS WITH
LITHIUM-ION BATTERIES
CONTAINING SAME**

Investigation No. 337-TA-951

**NOTICE OF THE COMMISSION'S FINAL DETERMINATION; ISSUANCE OF A
LIMITED EXCLUSION ORDER; TERMINATION OF THE INVESTIGATION**

AGENCY: U.S. International Trade Commission.

ACTION: Notice.

SUMMARY: Notice is hereby given that the U.S. International Trade Commission has found a violation of section 337 in this investigation and has issued a limited exclusion order prohibiting importation of infringing lithium metal oxide cathode materials for consumption in the United States.

FOR FURTHER INFORMATION: Panyin A. Hughes, Office of the General Counsel, U.S. International Trade Commission, 500 E Street, S.W., Washington, D.C. 20436, telephone 202-205-3042. Copies of non-confidential documents filed in connection with this investigation are or will be available for inspection during official business hours (8:45 a.m. to 5:15 p.m.) in the Office of the Secretary, U.S. International Trade Commission, 500 E Street, S.W., Washington, D.C. 20436, telephone 202-205-2000. General information concerning the Commission may also be obtained by accessing its Internet server (<https://www.usitc.gov>). The public record for this investigation may be viewed on the Commission's electronic docket (EDIS) at <https://edis.usitc.gov>. Hearing-impaired persons are advised that information on this matter can be obtained by contacting the Commission's TDD terminal on 202-205-1810.

SUPPLEMENTARY INFORMATION: The Commission instituted this investigation on March 30, 2015, based on a complaint filed by BASF Corporation of Florham Park, New Jersey and UChicago Argonne LLC of Lemont, Illinois (collectively, "Complainants"). 80 *Fed. Reg.* 16696 (Mar. 30, 2015). The complaint alleges violations of section 337 of the Tariff Act of 1930, as amended (19 U.S.C. § 1337), in the importation into the United States, the sale for importation, and the sale within the United States after importation of certain lithium metal oxide cathode materials, lithium-ion batteries for power tool products containing same, and power tool

products with lithium-ion batteries containing same by reason of infringement of one or more of claims 1-4, 7, 13, and 14 of U.S. Patent No. 6,677,082 (“the ’082 patent”) and claims 1-4, 8, 9, and 17 of U.S. Patent No. 6,680,143 (“the ’143 patent”). *Id.* The notice of investigation named the following respondents: Umicore N.V. of Brussels, Belgium; Umicore USA Inc. of Raleigh, North Carolina (collectively, “Umicore”); Makita Corporation of Anjo, Japan; Makita Corporation of America of Buford, Georgia; and Makita U.S.A. Inc. of La Mirada, California (collectively, “Makita”). *Id.* The Office of Unfair Import Investigations is a party to the investigation.

On November 5, 2015, the ALJ granted a joint motion by Complainants and Makita to terminate the investigation as to Makita based upon settlement. *See* Order No. 32 (Nov. 5, 2015). The Commission determined not to review. *See* Notice (Nov. 23, 2015).

On December 1, 2015, the ALJ granted an unopposed motion by Complainants to terminate the investigation as to claim 8 of the ’082 patent. *See* Order No. 35 (Dec. 1, 2015). The Commission determined not to review Order No. 35. *See* Notice (Dec. 22, 2015).

On February 29, 2016, the ALJ issued his final ID, finding a violation of section 337 by Umicore in connection with claims 1-4, 7, 13, and 14 of the ’082 patent and claims 1-4, 8, 9, and 17 of the ’143 patent. Specifically, the ID found that the Commission has subject matter jurisdiction, *in rem* jurisdiction over the accused products, and *in personam* jurisdiction over Umicore. ID at 10-11. The ID found that Complainants satisfied the importation requirement of section 337 (19 U.S.C. § 1337(a)(1)(B)). *Id.* at 9-10. The ID found that the accused products directly infringe asserted claims 1-4, 7, 13, and 14 of the ’082 patent; and asserted claims 1-4, 8, 9, and 17 of the ’143 patent, and that Umicore contributorily infringes those claims. *See* ID at 65-71, 83-85. The ID, however, found that Complainants failed to show that Umicore induces infringement of the asserted claims. *Id.* at 79-83. The ID further found that Umicore failed to establish that the asserted claims of the ’082 or ’143 patents are invalid for lack of enablement or incorrect inventorship. ID at 118-20. The ID also found that Umicore’s laches defense fails as a matter of law (ID at 122-124) and also fails on the merits (ID at 124-126). Finally, the ID found that Complainants established the existence of a domestic industry that practices the asserted patents under 19 U.S.C. § 1337(a)(2). *See* ID at 18, 24.

On March 14, 2016, Umicore filed a petition for review of the ID and a motion for a Commission hearing. Also on March 14, 2016, the Commission investigative attorney (“IA”) petitioned for review of the ID’s finding that a laches defense fails as a matter of law in section 337 investigations. Further on March 14, 2016, Complainants filed a contingent petition for review of the ID. On March 22, 2016, the parties filed responses to the petitions for review.

On April 8, 2016, 3M Corporation (“3M”) filed a motion to intervene under Commission Rule 210.19. 3M requested that the Commission grant it “with full participation rights in this Investigation in order to protect its significant interests in the accused materials.”

On May 11, 2016, the Commission determined to review the final ID in part. 81 *Fed. Reg.* 30548-50 (May 17, 2016). Specifically, the Commission determined to review (1) the ID’s contributory and induced infringement findings; (2) the ID’s domestic industry findings under 19

U.S.C. § 1337(a)(3)(C); and (3) the ID's findings on laches. The Commission determined to deny 3M's motion to intervene, but stated that it would consider 3M's comments in considering remedy, bonding and the public interest this investigation if a violation of Section 337 is found. Pursuant to Commission rule 210.45 (19 C.F.R. § 210.45), Umicore's request for a Commission hearing was granted.

The Commission requested the parties to brief their positions on the issues under review with reference to the applicable law and the evidentiary record, and posed specific briefing questions. On May 23, 2016, the parties filed submissions to the Commission's questions. On June 3, 2016, the parties filed responses to the initial submissions. Interested public entities, including 3M and the Belgian Ambassador also submitted comments on the public interest.

On August 2, 2016, Complainants filed a motion pursuant to 19 C.F.R. § 210.15(a)(2) and 19 C.F.R. § 210.38(a) for the Commission to reopen the record in this Investigation to admit a July 6, 2016 news article that allegedly includes statements by Umicore Greater China Senior Vice President Chuxian Feng as to this investigation. On August 11 & 12, 2016, Umicore and the IA filed respective oppositions to the motion. The Commission has determined to deny Complainants motion to reopen the record.

The Commission was interested in hearing presentations concerning the appropriate remedy (if any) and the effect that such remedy would have upon the public interest. The Commission invited Government agencies, public-interest groups, and interested members of the public to make oral presentations on the issues of remedy and the public interest. The Commission held a public hearing on Thursday, November 17, 2016, in the USITC Main Hearing Room. The hearing was limited to the issues of laches, contributory infringement, and the public interest. The hearing consisted of two panels. The first panel was limited to the parties (*i.e.*, complainants, respondents, and the IA), who were given an opportunity to comment on the issues identified above. The second panel consisted of non-party witnesses on the public interest.

The Commission thanks the various entities who appeared to testify on the public interest.

Having examined the record of this investigation, including the final ID, the petitions for review, responses thereto, and all other appropriate submissions, the Commission has determined to reverse the ALJ's finding that Umicore does not induce infringement. The Commission finds that the record evidence fails to support the ALJ's finding that Umicore had a good faith belief of non-infringement. The Commission has determined to affirm the ALJ's finding that Umicore's laches defense fails on the merits. The Commission vacates and takes no position on the legal question of whether laches is an available defense at the Commission. The Commission has determined to vacate and take no position on the ALJ's finding that Complainants established the existence of a domestic industry under 19 U.S.C. § 1337(a)(3)(C) with respect to BASF.

Having found a violation of section 337 in this investigation, the Commission has determined that the appropriate form of relief is a limited exclusion order prohibiting the unlicensed entry of lithium metal oxide cathode materials that infringe one or more of claims 1-

4, 7, 13, and 14 of the '082 patent, or claims 1-4, 8, 9, and 17 of the '143 patent that are manufactured by, or on behalf of, or imported by or on behalf of Umicore N.V. and Umicore USA Inc. or any of their affiliated companies, parents, subsidiaries, agents, or other related business entities, or their successors or assigns.

The Commission has also determined that the public interest factors enumerated in section 337(d) (19 U.S.C. § 1337(d)) does not preclude issuance of the limited exclusion order. Finally, the Commission has determined that a bond in the amount of three percent of entered value is required to permit temporary importation during the period of Presidential review (19 U.S.C. § 1337(j)) of lithium metal oxide cathode materials that are subject to the limited exclusion order. The Commission's orders and opinion were delivered to the President and to the United States Trade Representative on the day of their issuance.

The authority for the Commission's determination is contained in section 337 of the Tariff Act of 1930, as amended (19 U.S.C. § 1337), and in Part 210 of the Commission's Rules of Practice and Procedure (19 C.F.R. Part 210).

By order of the Commission.



Lisa R. Barton
Secretary to the Commission

Issued: December 16, 2016

**CERTAIN LITHIUM METAL OXIDE CATHODE
MATERIALS, LITHIUM-ION BATTERIES FOR POWER
TOOL PRODUCTS CONTAINING SAME, AND POWER
TOOL PRODUCTS WITH LITHIUM-ION BATTERIES
CONTAINING SAME**

Inv. No. 337-TA-951

PUBLIC CERTIFICATE OF SERVICE

I, Lisa R. Barton, hereby certify that the attached **COMMISSION NOTICE** has been served by hand upon the Commission Investigative Attorney, Vu Bui, Esq., and the following parties as indicated, on **December 16, 2016**.



Lisa R. Barton, Secretary
U.S. International Trade Commission
500 E Street, SW, Room 112
Washington, DC 20436

**On Behalf of Complainants BASF Corporation and UChicago
Argonne LLC:**

D. Sean Trainor
KIRKLAND & ELLIS LLP
655 Fifteenth Street, N.W.
Washington, D.C. 20005

- Via Hand Delivery
 Via Express Delivery
 Via First Class Mail
 Other: _____

**On Behalf of Respondents Umicore N.V. and Umicore USA
Inc.:**

Joseph V. Colaianni, Jr.
FISH & RICHARDSON P.C.
1425 K Street, N.W., 11th Floor
Washington, D.C. 20005

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UNITED STATES INTERNATIONAL TRADE COMMISSION
Washington, D.C.

In the Matter of

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Investigation No. 337-TA-951

LIMITED EXCLUSION ORDER

The United States International Trade Commission (“Commission”) has determined that there is a violation of section 337 of the Tariff Act of 1930, as amended (19 U.S.C. § 1337), in the unlawful importation, sale for importation, or sale within the United States after importation by Respondents Umicore N.V. and Umicore USA Inc. (collectively “Respondents”) of certain lithium metal oxide cathode materials covered by one or more of claims 1-4, 7, 13, and 14 of U.S. Patent No. 6,677,082 (“the ’082 patent”), or claims 1-4, 8, 9; and 17 of U.S. Patent No. 6,680,143 (“the ’143 patent”).

Having reviewed the record in this investigation, including the written submissions of the parties, the Commission has made its determination on the issues of remedy, the public interest, and bonding. The Commission has determined that the appropriate form of relief is a limited exclusion order prohibiting entry of infringing lithium metal oxide cathode materials that are manufactured abroad by or on behalf of, or imported by or on behalf of Respondents or any of their affiliated companies, parents, subsidiaries, agents, or other related business entities, or their successors or assigns.

The Commission has further determined that the public interest factors enumerated in 19 U.S.C. § 1337(d) do not preclude issuance of the limited exclusion order, and that the bond during the Presidential review period shall be in the amount of three percent (3%) of the entered value of covered products.

Accordingly, the Commission hereby **ORDERS** that:

1. Lithium metal oxide cathode materials that infringe one or more of claims 1-4, 7, 13, and 14 of the '082 patent, or claims 1-4, 8, 9, and 17 of the '143 patent that are manufactured by, or on behalf of, or imported by or on behalf of Umicore N.V. and Umicore USA Inc. or any of their affiliated companies, parents, subsidiaries, agents, or other related business entities, or their successors or assigns are excluded from entry for consumption into the United States, entry for consumption from a foreign trade zone, or withdrawal from a warehouse for consumption, for the remaining term of the patent, except under license of the patent's owner or as provided by law.

2. Notwithstanding paragraph 1 of this Order, the aforesaid lithium metal oxide cathode materials are entitled to entry into the United States for consumption, entry for consumption from a foreign trade zone, or withdrawal from a warehouse for consumption, under bond in the amount of three percent (3%) of the entered value of the products pursuant to subsection (j) of section 337 of the Tariff Act of 1930, as amended, 19 U.S.C. § 1337(j), and the Presidential Memorandum for the United States Trade Representative of July 21, 2005 (*70 Fed. Reg.* 43,251), from the day after this Order is received by the United States Trade Representative, and until such time as the United States Trade Representative notifies the Commission that this action is approved or disapproved but, in any event, not later than 60 days after the issuance of receipt of this Order.

3. At the discretion of U.S. Customs and Border Protection (“CBP”) and pursuant to procedures it establishes, persons seeking to import lithium metal oxide cathode materials that are potentially subject to this Order may be required to certify that they are familiar with the terms of this Order, that they have made appropriate inquiry, and thereupon state that, to the best of their knowledge and belief, the products being imported are not excluded from entry under paragraph 1 of this Order. At its discretion, CBP may require persons who have provided the certification described in this paragraph to furnish such records or analyses as are necessary to substantiate this certification.

4. In accordance with 19 U.S.C. § 1337(l), the provisions of this Order shall not apply to infringing lithium metal oxide cathode materials that are imported by or for the use of the United States, or imported for and to be used for, the United States with the authorization or consent of the Government.

5. The Commission may modify this Order in accordance with the procedures described in section 210.76 of the Commission’s Rules of Practice and Procedure (19 C.F.R. § 210.76).

6. The Secretary shall serve copies of this Order upon each party of record in this investigation and upon the Department of Health and Human Services, the Department of Justice, the Federal Trade Commission, and CBP.

7. Notice of this Order shall be published in the *Federal Register*.

By order of the Commission.



Lisa R. Barton
Secretary to the Commission

Issued: December 16, 2016

**CERTAIN LITHIUM METAL OXIDE CATHODE
MATERIALS, LITHIUM-ION BATTERIES FOR POWER
TOOL PRODUCTS CONTAINING SAME, AND POWER
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Inv. No. 337-TA- 951

PUBLIC CERTIFICATE OF SERVICE

I, Lisa R. Barton, hereby certify that the attached **COMMISSION ORDER** has been served by hand upon the Commission Investigative Attorney, Vu Bui, Esq., and the following parties as indicated, on **December 16, 2016**.



Lisa R. Barton, Secretary
U.S. International Trade Commission
500 E Street, SW, Room 112
Washington, DC 20436

**On Behalf of Complainants BASF Corporation and UChicago
Argonne LLC:**

D. Sean Trainor
KIRKLAND & ELLIS LLP
655 Fifteenth Street, N.W.
Washington, D.C. 20005

- Via Hand Delivery
 Via Express Delivery
 Via First Class Mail
 Other: _____

**On Behalf of Respondents Umicore N.V. and Umicore USA
Inc.:**

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PUBLIC VERSION

**UNITED STATES INTERNATIONAL TRADE COMMISSION
Washington, DC**

In the Matter of

**CERTAIN LITHIUM METAL OXIDE
CATHODE MATERIALS, LITHIUM-
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Investigation No. 337-TA-951

COMMISSION OPINION

This investigation is before the Commission for a final determination on the issues under review, remedy, the public interest, and bonding. The Commission has determined to affirm the presiding administrative law judge's ("ALJ") initial determination ("ID") that Respondents, Umicore N.V. of Brussels, Belgium; Umicore USA Inc. of Raleigh, North Carolina (collectively, "Umicore" or "Respondents"), violated section 337 of the Tariff Act of 1930, as amended, 19 U.S.C. § 1337, in connection with claims 1-4, 7, 13, and 14 of U.S. Patent No. 6,677,082 ("the '082 patent") and claims 1-4, 8, 9, and 17 of U.S. Patent No. 6,680,143 ("the '143 patent"). The Commission has determined to affirm the ID's finding that Umicore contributorily infringes the asserted claims. The Commission has determined to reverse the ID's finding that Umicore does not induce infringement of the asserted claims because it had a good faith belief of non-infringement. The Commission has determined to affirm the ID's finding that Umicore's laches defense fails on the merits. The Commission has determined to vacate and take no position on the legal question of whether laches is an available defense at the Commission. Finally, the

PUBLIC VERSION

Commission has determined to vacate and take no position on the ID's finding that Complainants established the existence of a domestic industry under 19 U.S.C. § 1337(a)(3)(C) as to BASF.

The Commission adopts the ID to the extent it does not conflict with this opinion.

Having found a violation of section 337 in this investigation, the Commission has determined that the appropriate form of relief is a limited exclusion order ("LEO") prohibiting the unlicensed entry of lithium metal oxide cathode materials that infringe one or more of claims 1-4, 7, 13, and 14 of the '082 patent, or claims 1-4, 8, 9, and 17 of the '143 patent that are manufactured by, or on behalf of, or imported by or on behalf of Umicore N.V. and Umicore USA Inc. or any of their affiliated companies, parents, subsidiaries, agents, or other related business entities, or their successors or assigns.

The Commission has also determined that the public interest factors enumerated in section 337(d) (19 U.S.C. § 1337(d)) do not preclude issuance of the LEO. Finally, the Commission has determined that a bond in the amount of three percent of entered value is required to permit temporary importation during the period of Presidential review (19 U.S.C. § 1337(j)) of lithium metal oxide cathode materials that are subject to the LEO.

I. BACKGROUND

A. Procedural History

The Commission instituted this investigation on March 30, 2015, based on a complaint filed by BASF Corporation of Florham Park, New Jersey ("BASF") and UChicago Argonne LLC of Lemont, IL ("Argonne" or "ANL") (collectively, "Complainants"). 80 *Fed. Reg.* 16696 (Mar. 30, 2015). Argonne owns the patents-in-suit, and the complaint states that "BASF makes . . . lithium metal oxide cathode materials under an exclusive license, subject to preexisting

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license grants, to the Asserted Patents.”¹ Complaint at ¶ 2. The complaint alleges violations of section 337 of the Tariff Act of 1930, as amended (19 U.S.C. § 1337), in the importation into the United States, the sale for importation, and the sale within the United States after importation of certain lithium metal oxide cathode materials, lithium-ion batteries for power tool products containing same, and power tool products with lithium-ion batteries containing same by reason of infringement of one or more of claims 1-4, 7, 13, and 14 of the '082 patent and claims 1-4, 8, 9, and 17 of the '143 patent. *Id.* The notice of investigation named the following respondents: Makita Corporation of Anjo, Japan; Makita Corporation of America of Buford, Georgia; and Makita U.S.A. Inc. of La Mirada, California (collectively, “Makita”) and Umicore. *Id.* The Office of Unfair Import Investigations is a party to the investigation.

On November 5, 2015, the ALJ issued an ID granting a joint motion by Complainants and Makita to terminate the investigation as to Makita based upon settlement. *See* Order No. 32 (Nov. 5, 2015). The Commission determined not to review the ID.²

The ALJ held an evidentiary hearing the week of October 26, 2015, and thereafter

¹ It appears that BASF is Argonne’s primary licensee to commercialize the lithium metal oxide cathode battery technology. *See* Complainants Statement Regarding the Public Interest dated February 20, 2015, at 1-2. However, the General Counsel for the U.S. Department of Energy (“DOE”) explained that since the patents at issue originated from Argonne, one of the country’s national laboratories, “the entire government retains rights to use [the patented technology] for university research, defense research or any government research or government-funded research whatsoever,” and “[t]hat would be true notwithstanding an exclusion order.” Commission Hearing Tr. at 193; *see also*, Commission Hearing Tr. at 70 (“even in the license that Argonne entered with BASF, there was a specific provision that carves out also the government as a licensee.”). DOE further testified that other entities, including Toda, LG Chem, and General Motors, have obtained licenses to the patented technology. Commission Hearing Tr. at 188.

² *See* Notice of Commission Determination Not to Review an ID Granting a Joint Motion to Terminate the Investigation as to Respondents Makita Corporation, Makita Corporation of America, and Makita U.S.A. Inc. Based on a Settlement Agreement (Nov. 23, 2015).

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received post-hearing briefing from the parties.

On December 1, 2015, the ALJ issued an ID granting an unopposed motion by Complainants to terminate the investigation as to claim 8 of the '082 patent. *See* Order No. 35 (Dec. 1, 2015). The Commission determined not to review the ID.³

On February 29, 2016, the ALJ issued his final ID, finding a violation of section 337 by Umicore in connection with claims 1-4, 7, 13, and 14 of the '082 patent and claims 1-4, 8, 9, and 17 of the '143 patent. Specifically, the ID finds that the Commission has subject matter jurisdiction, *in rem* jurisdiction over the accused products, and *in personam* jurisdiction over Umicore. ID at 10-11. The ID finds that Complainants satisfied the importation requirement of section 337 (19 U.S.C. § 1337(a)(1)(B)), noting that Umicore does not dispute that the accused products have been imported into the United States. *Id.* at 9-10. The ID finds that the accused products directly infringe asserted claims 1-4, 7, 13, and 14 of the '082 patent; and asserted claims 1-4, 8, 9, and 17 of the '143 patent, and that Umicore contributorily infringes those claims. *See* ID at 65-71, 83-85. The ID, however, finds that Complainants failed to show that Umicore induces infringement of the asserted claims because it finds that Umicore had a good faith belief of non-infringement. *Id.* at 79-83. The ID further finds that Umicore failed to establish that the asserted claims of the '082 or '143 patents are invalid for lack of enablement or incorrect inventorship. ID at 118-20. The ID also finds that Umicore's laches defense fails as a matter of law (ID at 122-124) and also fails on the merits (ID at 124-126). Finally, the ID finds that Complainants established the existence of a domestic industry that practices the asserted

³ *See* Notice of Commission Determination Not to Review an Initial Determination Granting an Unopposed Motion to Partially Terminate the Investigation with Respect to Claim 8 of U.S. Patent No. 6.677,082 (Dec. 22, 2015).

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patents under 19 U.S.C. § 1337(a)(2). *See* ID at 18, 24.

On March 3, 2016, the ALJ issued his recommended determination on remedy, the public interest, and bonding. *See* Recommended Determination on Remedy, Bond, and Public Interest (“RD”). The RD recommends that in the event the Commission finds a violation of section 337, the Commission should issue an LEO prohibiting the importation of Umicore’s MX and TX products. RD at 2-3. The RD does not recommend issuance of cease and desist orders due to a finding that “Complainants failed to adduce evidence of a commercially significant inventory of Umicore’s NMC materials in the United States.” RD at 3-4. With respect to the amount of bond that should be posted during the period of Presidential review, the RD recommends that the Commission set a bond in the amount of three percent of entered value during the period of Presidential review. *Id.* The RD notes that the Commission directed the ALJ to take evidence and provide recommendations on the public interest. RD at 1. After taking evidence and hearing arguments on the public interest, the RD finds that “none of the public interest factors weighs against the issuance of a limited exclusion order with respect to Umicore’s accused NMC materials.” *Id.* at 10

On March 14, 2016, Umicore filed a petition for review of the ID, challenging a number of its findings.⁴ Specifically, Umicore questioned the ID’s infringement and domestic industry findings, and rejection of its laches defense. Umicore also requested a Commission hearing pursuant to Commission Rule 210.45 (19 C.F.R. § 210.45). That same day, the Commission investigative attorney (“IA”) petitioned for review of the ID’s finding that a laches defense fails.

⁴ *See* The Umicore Respondents’ Petition for Review of the Final Initial Determination on Violation of Section 337 (“Umicore Pet.”).

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as a matter of law in section 337 investigations.⁵ Complainants also filed a contingent petition for review on March 14, 2016.^{6 7} Complainants challenged construction of one claim term and the ID's finding that they failed to establish induced infringement. On March 22, 2016, the parties filed responses to the petitions for review.⁸

On May 11, 2016, the Commission determined to review the final ID in part and requested the parties to brief certain issues. *See* 81 *Fed. Reg.* 30548-50 (May 17, 2016). Specifically, the Commission determined to review (1) the ID's contributory and induced infringement findings; (2) the ID's domestic industry finding under 19 U.S.C. § 1337(a)(3)(C); and (3) the ID's findings on laches. In its notice of review, the Commission posed the following questions:

1. Please discuss whether laches should be an available defense in a Section 337 investigation. In your response, please address how *SCA Hygiene Products v. First Quality Baby Prod.*, 807 F.3d 1311 (Fed. Cir. 2015) applies and any statutory support for your position.
2. Please discuss whether a good faith belief of non-infringement negates a contributory infringement finding, where the accused products have no substantial non-infringing uses. In your response, please address the impact of the following cases:

⁵ *See* Petition of the Office of Unfair Import Investigations for Review of the Initial Determination on Violation of Section 337.

⁶ Under the Commission's rules, contingent petitions for review are treated as petitions for review. 19 C.F.R. § 210.43(b)(3).

⁷ *See* Complainants UChicago Argonne LLC and BASF Corporation's Contingent Petition for Review of the Initial Determination.

⁸ *See* Complainants' UChicago Argonne LLC and BASF Corporation's Combined Response to Umicore's and Staff's Petitions for Review of the Initial Determination; Response of the Office of Unfair Import Investigations to the Private Parties' Petitions for Review of the Initial Determination on Violation of Section 337; Umicore Respondent's Combined Response in Opposition to Complainants' Contingent Petition for Review of Initial Determination.

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Commil USA, LLC v. Cisco Sys., Inc., 135 S. Ct. 1920 (2015); *Global-Tech Appliances, Inc. v. SEB S.A.*, 131 S. Ct. 2060, 2068 (2011); *Spansion, Inc. v. Int'l Trade Comm'n*, 629 F.3d 1331, 1359 (Fed. Cir. 2010); *Golden Blount, Inc. v. Robert H. Peterson Co.*, 438 F.3d 1354 (Fed. Cir. 2006).

3. Please point to evidence (or lack of evidence) showing that Umicore had a good faith belief of non-infringement, including evidence showing that Umicore relied upon that belief.
4. Please discuss in detail the extent to which an exclusion order would affect research and development efforts with respect to lithium ion batteries by universities and private companies. *See* Statement of Umicore S.A. And Umicore USA Inc. Regarding the Public Interest at 1. In your response, identify each university and private company engaged in such research and development efforts.
5. Please provide a detailed discussion of the record evidence as to whether Umicore's NMC material is uniquely suited for specific applications in energy saving technology, cutting-edge research and development, including identifying those specific areas and volumes involved and whether any other material can be used in such applications. *See* Statement of Umicore S.A. and Umicore USA Inc. Regarding the Public Interest at 1-2 (Apr. 4, 2016).
6. Please discuss whether each of the research companies and universities currently using Umicore NMC material (*See* Statement of Umicore S.A. and Umicore USA Inc. Regarding the Public Interest at 1-2) may also use materials from other sources for each of their specific research projects.
7. Please discuss whether NMC materials produced by other suppliers have lower performance characteristics and consistency. *See* Statement of Umicore S.A. and Umicore USA Inc. Regarding the Public Interest at 2-3.
8. Please discuss how the Umicore NMC material relates to 3M's research and whether other suppliers provide comparable material that 3M can use in its research. *See* 3M Company's Comments on the Effect on the Public Interest of the Proposed Remedy in the Recommended Determination (Apr. 8, 2016).
9. Please identify the suppliers of NMC to the U.S. Market and the percentage of the market held by each.

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On May 23, 2016, the parties filed submissions to the Commission's questions.⁹ On June 3, 2016, the parties filed responses to the initial submissions.¹⁰

On November 17, 2016, the Commission held a public hearing on the issues of contributory infringement, laches, and the public interest. On November 29, 2016, the parties and witnesses appearing on the public interest filed responses to specific Commission questions and corrections to the Commission hearing transcript.

B. Patents and Technology at Issue

The technology at issue in this investigation generally relates to the field of lithium metal oxide electrodes for lithium cells and batteries. Specifically, the asserted claims are drawn to lithium metal oxide positive electrodes having a general formula $x\text{LiMO}_2 \cdot (1-x)\text{Li}_2\text{M}'\text{O}_3$ wherein Li is lithium, O is oxygen, and M and M' are transition metals. *See* '082 patent (JX-1) Reexamination Certificate; '143 patent (JX-2) col.10 ll.18-26, Certificate of Correction.

As the ID explains, a lithium-ion battery includes several components, including: (1) a positive electrode (generally referred to as the cathode), which is a conductive element having a net positive charge, (2) a negative electrode (generally referred to as the anode), which is a

⁹ *See* The Umicore Respondents' Response to Request for Written Submissions Regarding Issues Under Review ("Umicore Sub."); Response of the Office of Unfair Import Investigations to the Commission's Request for Written Submissions on the Issues Under Review and on Remedy, the Public Interest, and Bonding ("IA Sub."); Complainants UChicago Argonne LLC and BASF Corporation's Initial Written Submission in Response to the Commission's Determination to Review-in-Part a Final Initial Determination of a Violation of Section 337 ("Compl. Sub.").

¹⁰ *See* Complainants UChicago Argonne LLC and BASF Corporation's Response to Written Submissions by Respondents, Staff, and 3M on the Issues Under Commission Review ("Compl. Resp."); Response of the Office of Unfair Import Investigations to the Written Submissions on the Issues Under Review and on Remedy, the Public Interest, and Bonding ("IA Resp."); The Umicore Respondent's Reply in Response to Written Submissions by Complainants and Staff Regarding Issues Under Review ("Umicore Resp.").

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conductive element having a net negative charge, (3) an electrolyte (into which the positive and negative electrodes are placed and which facilitates the flow of charge between the electrodes), and (4) a physical separator positioned between the positive and negative electrodes to avoid direct contact of the oppositely charged electrodes. *See* ID at 4-9; RX-753C (Delmas RWS) at Q/A 55-57, 139-41. In operation, positively-charged lithium ions flow from the negative electrode to the positive electrode. *Id.* This flow of charged ions from the battery (*i.e.*, the power source) creates an electrical current in the external circuit. *Id.* When the charged ions have been depleted from the negative electrode, the battery can be recharged via an external power source such that lithium ions flow back from the positive electrode to the negative electrode. *Id.*

Of importance in this investigation is the active cathode material used to form the positive electrode. In the past, lithium cobalt oxide was the main cathode material used to make positive electrodes in lithium-ion batteries. *Id.* In recent times, other cathode materials such as a combination of nickel, manganese, and cobalt (NMC) have replaced cobalt as the transition metal, *i.e.*, the metal element in the lithium metal oxide cathode material is a combination of nickel, cobalt, and manganese. *Id.* The NMC compounds used for positive electrodes can be denoted by the chemical formula Li_xMO_x , where Li is lithium, O is oxygen, and M is one or more transition metals such as manganese, nickel, and/or cobalt (*i.e.*, $\text{Li}_x(\text{Ni}, \text{Mn}, \text{Co})\text{O}_x$). *See id.* The subscript “x” refers to the number of atoms of each element in the chemical formula. *Id.* For instance, LiMO_2 contains one lithium atom and two oxygen atoms. *Id.* When atoms of different elements interact with each other to form a chemical compound, they tend to gain or lose electrons. *Id.* This in turn imparts a net positive or negative electrical charge on the atoms.

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The “oxidation state” of an atom refers to the number of electrons that an atom has lost or gained. *Id.* Thus, if an atom loses one electron, it has an oxidation state of +1 (since electrons carry a negative electrical charge). *Id.* Similarly, if an atom gains an electron, it becomes more negatively charged and its oxidation state is -1. *Id.* The net electrical charge on a chemical compound can be determined by summing the oxidation states of each of the constituent atoms. *Id.* For instance, LiCoO_2 will have a net charge of zero because the oxidation states of lithium, cobalt, and oxygen are +1, +3, and -2, respectively: $\text{Li (+1)} + \text{Co (+3)} + \text{O}_2 (-4) = 0$. *Id.* at 20-21.

NMC material generally exists in powder form, and the proportions of manganese, nickel, and cobalt can vary between NMC product families. *Id.* For example a “1:1:1” NMC compound will include equal proportions of manganese, nickel, and cobalt, while a “5:3:2” compound will contain 5 parts nickel, 3 parts manganese, and 2 parts cobalt. *Id.* at 21. NMC material in powder form is used to form a positive electrode by combining the material with binder and perhaps other chemicals, and adhering the mixture to a conductive element.¹¹ *Id.*

The '082 patent entitled “Lithium Metal Oxide Electrodes for Lithium Cells and Batteries” issued on January 13, 2004. '082 patent (JX-1). The patent describes a lithium metal oxide positive electrode for a non-aqueous lithium cell. *Id.* at Abstract. “The cell is prepared in its initial discharged state and has a general formula $x\text{LiMO}_2 (1-x) \text{Li}_2\text{M}'\text{O}_3$ in which $0 < x < 1$, and where M is one or more trivalent ion with at least one ion being Mn [Manganese] or Ni [Nickel],

¹¹ As Umicore explains, “[m]anufacturing a positive electrode generally involves creating a wet slurry mixture by adding active cathode material (like NMC cathode material powder), binder (e.g., polyvinylidene fluoride), conductive carbon, and slurry stabilizing chemical additives into a liquid solvent, with subsequent high-energy mixing.” Umicore Pet. at 18. “The slurry mixture is coated onto an aluminum foil, which acts as the current collector, and is dried in an oven. *Id.*

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and where M' is one or more tetravalent ion.” *Id.* Claims 1-4, 7, 13, and 14 are at issue in this investigation. Claim 1, which is representative of the asserted claims, recites:

1. A lithium metal oxide positive electrode for a non-aqueous lithium cell prepared in its initial discharged state having a general formula $x\text{LiMO}_2 \cdot (1-x)\text{Li}_2\text{M}'\text{O}_3$ in which $0 < x < 1$, and where M is one or more ions having an average oxidation state of three with at least one ion being Ni, and where M' is one or more ions with an average oxidation state of four with at least one ion being Mn, with both the LiMO_2 and $\text{Li}_2\text{M}'\text{O}_3$ components being layered and the ratio of Li to M and M' being greater than one and less than two; and wherein domains of the LiMO_2 and $\text{Li}_2\text{M}'\text{O}_3$ components exist side by side.

The '143 patent also entitled “Lithium Metal Oxide Electrodes for Lithium Cells and Batteries” issued on January 20, 2004. '143 patent (JX-2). The patent issued from a continuation-in-part application to the patent application that issued as the '082 patent. The '143 and '082 patents share substantially similar specifications. Claims 1-4, 8, 9, and 17 of the '143 patent are at issue in this investigation. The parties stated that the asserted claims of the '143 and '082 patents are substantially similar. The ALJ agreed, finding that the “only relevant difference between the asserted claims of the '082 patent and the '143 patent that requires further analysis, is that the '143 patent claims recite that M is one or more ions, with at least one ion being Mn.” ID at 110 (citing CIB at 137-38; RIB at 192; SIB at 61).

The asserted claims, as shown above, are directed to dual-phase NMC cathode materials: a LiMO_2 phase and a $\text{Li}_2\text{M}'\text{O}_3$ phase. A primary dispute regarding infringement is whether the accused products contain the $\text{Li}_2\text{M}'\text{O}_3$ phase (*i.e.*, second phase). *See* ID at 41.

C. Products at Issue

The accused products in this Investigation include Umicore's Cellcore® MX (NMC 111) and TX (NMC 532) products. *See* ID at 9. Complainants contend that Umicore indirectly

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infringes the asserted claims when Umicore's customers use the accused products in a positive electrode, electrochemical cell, or battery in the United States. *Id.*

II. ISSUES UNDER REVIEW

A. Laches

1. Applicable Law

“To prove laches, a defendant must show that the plaintiff delayed filing suit an unreasonable and inexcusable length of time after the plaintiff knew or reasonably should have known of its claim against the defendant; and the delay resulted in material prejudice or injury to the defendant.” *Wanlass v. General Elec. Co.*, 148 F.3d 1334, 1337 (Fed. Cir. 1998). Laches exists under the principle that “Courts of equity . . . will not assist one who has slept upon his rights, and shows no excuse for his laches in asserting them.” *Lane & Bodley v. Locke*, 150 U.S. 193, 201 (1893).

2. The ID

The ID finds that Umicore's laches defense against Complainants' infringement claims fails as a matter of law and fact. ID at 121. Umicore argued that the Federal Circuit, in *SCA Hygiene*, permits prospective relief to be barred under laches. *Id.* at 121-122 (citing *See RIB* at [100-01] (citing *SCA Hygiene Products Aktiebolag v. First Quality Baby Products, LLC*, 807 F.3d 1311, 1331 (Fed. Cir. 2015) (en banc))). Complainants argued that “laches is not a defense at the ITC in a section 337 Investigation.” *Id.* at 122 (citations omitted). Complainants further argued that Umicore cannot establish the elements of laches because there is “no delay between the time Complainants knew Umicore was infringing and the time Complainants filed their complaint,” and that “Umicore has not been materially prejudiced or harmed by the delay.” *Id.*

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(citing CIB at 134). The IA argued that “the Federal Circuit’s *SCA Hygiene* decision may provide a basis under some circumstances to assert laches before the Commission” but that “the evidence does not support [Umicore’s] laches defense.” *Id.* (citing SIB at 59-60).

The ID agrees with “Complainants that, in the context of a Section 337 exclusion order, *SCA Hygiene* does not alter the principle that ‘laches does not provide a respondent accused of patent infringement with any meaningful defense in a Section 337 investigation.’” ID at 122 (citations omitted).

Further, the ID explains that “injunctive relief before a district court is distinct from a Section 337 exclusion order” and “*eBay* does not apply to Commission remedy determinations under Section 337.” *Id.* at 123-24 (citing *Spansion, Inc. v. International Trade Comm’n*, 629 F.3d 1331, 1359 (Fed. Cir. 2010)). Thus, the ID concludes that “*SCA Hygiene* applies to laches in the context of injunctive relief before a district court, but not to Section 337 exclusion orders.” *Id.*

The ID also considers the merits of the laches defense and finds that “Umicore’s laches defense, with respect to the ’082 patent and ’143 patent, fails as a matter of fact.” *Id.* Specifically, the ID finds no evidence of delay, explaining that “[t]he period of delay begins at the time the patentee has actual or constructive knowledge of the defendant’s potentially infringing activities.” *Id.* (citing *Wanlass v. General Elec. Co.*, 148 F.3d 1334, 1337). The ID recognizes that “constructive knowledge of the infringement may be imputed to the patentee even where he has no actual knowledge of the sales, marketing, publication, public use, or other conspicuous activities of potential infringement if these activities are sufficiently prevalent in the inventor’s field of endeavor.” *Id.* (citing *Wanlass* at 1338). The ID finds, however, that

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“between 2005, when Umicore provided Argonne with 1 kg of its Cellcore® MX10 product for performance testing, and the time Complainants filed their complaint against Umicore in this investigation, there is no evidence that Complainants knew that Umicore had launched its NMC products *in the United States*.” *Id.* at 125 (emphasis in original). The ID finds that “the evidence suggests that Umicore’s NMC activities were not prevalent in the United States” and that “the importation records Umicore provided in this Investigation go back only to 2014.” *Id.* (citing CIB at 136 (citing CX-262C)).

The ID finds that the evidence failed to “show that BASF knew Umicore was selling the accused materials in the *United States* in 2009 when BASF discussed a potential collaboration with Umicore.” *Id.* (citing RX-633C; RX-320 at 9 (“Li-ion battery market is an exclusively Asian one”)). The ID further finds that “the evidence suggests that, as of today, Umicore’s NMC materials have not been “incorporated in a commercial product” in the United States” and that “small samples of accused cathode materials [] are used in the research and development activities . . . of manufacturers of EV and ESS batteries, []].” *Id.*

The ID also finds that “there is no evidence that any alleged delay by Complainants caused Umicore to alter its position or otherwise to act differently, to the prejudice of Umicore.” *Id.* at 126 (citing *See Hemstreet v. Computer Entry Systems Corp.*, 972 F.2d 1290, 1294 (Fed. Cir. Aug. 12, 1992) (“But these expenditures have no explicitly proven nexus to the patentee’s delay in filing suit, as *Aukerman* requires for a finding of prejudice. It is not enough that the alleged infringer changed his position—*i.e.*, invested in production of the allegedly infringing device. The change must be because of and as a result of the delay, not simply a business decision to capitalize on a market opportunity.”) (citing *A.C. Aukerman Co. v. R.L. Chaides Construction*

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Co., 960 F.2d 1020, 1033 (Fed. Cir. 1992), *abrogated on other grounds by SCA Hygiene*, 807 F.3d 1311). The ID notes that “Umicore asserted it made the products at issue pursuant to a license with 3M” and that “Umicore’s license claim is inconsistent with any claim of prejudice or changed circumstances by Umicore in the context of laches.” *Id.*

3. Commission Review

As noted above, the Commission determined to review the ID’s findings on laches. On review, the Commission finds that, regardless of whether or not laches may be an available defense in Section 337 investigations, Umicore failed to prove the merits of its laches defense based on the facts established in the record. *See* ID at 124-26.

With respect to the legal question of whether laches is an available defense in section 337 investigations, the Commission has determined to vacate the ID’s discussion, and consistent with recent Commission reasoning, has determined to take no position on the legal issue. *See Certain Network Devices, Related Software and Components Thereof (I)*, Inv. No. 337-TA-944, Comm’n Op. at 26 (July 26, 2016).

The Commission notes that it previously took the position that laches is not available as a defense in section 337 investigations based upon *Aukerman’s* holding that laches does not bar prospective relief. Because the Commission’s remedy is prospective in nature, the Commission reasoned that “laches does not bar the type of prospective relief sought in Section 337 investigations.” *Personal Watercraft*, Inv. No. 337-TA-452, Order No. 54 at 2 (unreviewed); *EEPROM*, Inv. 337-TA-395, Supplemental Views of Chairman Bragg at n.65, 1998 WL 35428257, at *28. The Commission notes that the holding in *Aukerman* has now been overruled by *SCA Hygiene*. *SCA Hygiene*, 807 F.3d at 1332 (“We, accordingly, reject *Aukerman’s* bright

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line rule regarding the interplay between laches and injunctive relief”).^{12 13} *SCA Hygiene*, however, is currently pending before the Supreme Court, which heard oral argument on November 1, 2016.¹⁴ Thus the Commission has determined to take no position on the legal issue at this time.

B. Contributory Infringement

1. Applicable Law

Under 35 U.S.C. § 271(c), “[w]hoever offers to sell or sells within the United States or imports into the United States a component of a patented machine, manufacture, combination, or composition, or a material or apparatus for use in practicing a patented process, constituting a material part of the invention, knowing the same to be specifically made to or specially adapted for use in the infringement of the patent, and not a staple article or commodity suitable for substantial non-infringing use, shall be liable as a contributory infringer.” 35 U.S.C. § 271(c); *Global-Tech Appliances, Inc. v. SEB S.A.*, 563 U.S. 754, 763-64 (2011) (quoting *Aro Mfg. Co. v. Convertible Top Replacement Co.*, 377 U.S. 476, 488 (1964) (*Aro II*)); *Spansion*, 629 F.3d at 1355; *Wordtech Sys., Inc. v. Integrated Networks Solutions, Inc.*, 609 F.3d 1308, 1316 (Fed. Cir.

¹² We note that the entire *en banc* Court in *SCA Hygiene* rejected *Auckerman’s* holding that laches cannot bar prospective relief. See *SCA Hygiene*, 807 F.3d at 1333 n.1 (The dissent agreeing with the majority that laches is available to bar equitable relief).

¹³ Commissioner Kieff determines that the Federal Circuit’s *en banc* decision in *SCA Hygiene*, standing on its own, does not disturb the ITC practice regarding the availability of laches as a defense at the ITC because *SCA Hygiene* on its own terms speaks only to *Aukerman’s* impact on district court injunctions in view of the *eBay* framework, while ITC exclusion orders follow our different, statutory framework. *SCA Hygiene*, 807 F.3d at 1333.

¹⁴ *SCA Hygiene* is currently pending before the Supreme Court, where the question presented is: “Whether and to what extent the defense of laches may bar a claim for patent infringement brought within the Patent Act’s six-year statutory limitations period, 35 U.S.C. § 286.”

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2010). “Contributory infringement imposes liability on one who embodies in a non-staple device the heart of a patented process and supplies the device to others to complete the process and appropriate the benefit of the patented invention.” *Vita-Mix Corp. v. Basic Holding, Inc.*, 581 F.3d 1317, 1327 (Fed. Cir. 2009).

To state a claim for contributory infringement, an infringer must sell, offer to sell or import into the United States a component of an infringing product “knowing [the component] to be especially made or especially adapted for use in an infringement of such patent, and not a staple article or commodity of commerce suitable for substantial non infringing use.” 35 U.S.C. § 271(c); see *Global-Tech Appliances, Inc. v. SEB S.A.*, 131 S. Ct. 2060, 2067-68 (2011) (“[A] violator of § 271(c) must know ‘that the combination for which his component was especially designed was both patented and infringing.’”); *Lucent Techs. v. Gateway, Inc.*, 580 F.3d 1301, 1320 (Fed. Cir. 2009). In addition, the patentee bears the burden of proving that the accused products have no substantial non-infringing uses. See *Golden Blount, Inc. v. Robert H. Peterson Co.*, 438 F.3d 1354, 1363 (Fed. Cir. 2006).

A seller of a component of an infringing product can be held liable for contributory infringement if: (1) there is an act of direct infringement by another person; (2) the accused contributory infringer knows its component is included in a combination that is both patented and infringing; and (3) there are no substantial non-infringing uses for the accused component, *i.e.*, the component is not a staple article of commerce. *Carborundum Co. v. Molten Equip. Innovations, Inc.*, 72 F.3d 872, 876 (Fed. Cir. 1995).

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2. The ID

The ID notes that “Umicore does not dispute that it has known about the Asserted Patents since late 2004 or early 2005.” ID at 78 (citing RX-750C, Goffaux WS at Q/As 28, 42-43, 52-54; Hearing Tr. at 702:9-703:14 (Oct. 28, 2015) (Goffaux); RIB at 33-34).

The ID states that “intent” for a contributory infringement finding can be presumed when the accused products do not have any substantial noninfringing uses. ID at 83 (citing *In re Certain Semiconductor Chips With Minimized Chip Package Size and Products Containing Same*, Inv. No. 337-TA-605, Comm’n Op. at 55 (U.S.I.T.C. May 20, 2009), *aff’d*, *Spanston*, 629 F.3d at 1355 (citing *Metro-Goldwyn-Mayer Studios Inc. v. Grokster, Ltd.*, 545 U.S. 913, 932 (2005) (“One who makes and sells articles which are only adapted to be used in a patented combination will be presumed to intend the natural consequences of his acts; he will be presumed to intend that they shall be used in the combination of the patent.”))).

The ID notes that to prevail on contributory infringement, Complainants must show that: (1) Umicore made and sold the accused NMC materials; (2) that the accused NMC materials have no substantial non-infringing uses; (3) and that Umicore engaged in conduct within the United States that contributed to another’s direct infringement. *Id.* at 83 (citing *DSU Med. Corp. v. JMS Co.*, 471 F.3d 1293, 1303 (Fed. Cir. 2006) (*en banc*)). Once Complainants make a *prima facie* case that the accused NMC materials have no substantial non-infringing uses, the burden shifts to Umicore to rebut Complainants’ evidence. *Id.* at 83-84 (citing *Golden Blount, Inc. v. Robert H. Peterson Co.*, 438 F.3d 1354, 1363 (Fed. Cir. 2006) (“[T]he district court had ample basis to conclude that Golden Blount had made out a *prima facie* showing that Peterson’s product was not ‘suitable for substantial non-infringing use,’ thus shifting the burden of

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production to Peterson.”); *Semiconductor Chips*, Inv. No. 337-TA-605, Comm’n Op. at 55).

The ID states that here, “Umicore does not dispute that it makes and sells the accused NMC materials for use in positive electrodes.” ID at 84. The ID finds that Complainants persuasively established that Umicore’s accused NMC materials are designed for use in a positive electrode and have no substantial non-infringing uses. *Id.* The ID further finds that Umicore failed to rebut Complainants’ evidence and that “Umicore’s own witnesses (its employees) failed to identify any use for the accused NMC products other than for positive electrodes in batteries.” *Id.* (citing CX-3329C, Levasseur Dep. Tr. at 280:23-281:1).

Accordingly the ID finds that “Umicore’s accused NMC materials have no substantial non-infringing use” and finds that “Umicore had the requisite intent for contributory infringement.” *Id.* (citing *Grokster*, 545 U.S. at 932 (“One who makes and sells articles which are only adapted to be used in a patented combination will be presumed to intend the natural consequences of his acts.”)). The ID also points to the ALJ’s previous findings that “there is also ample evidence that Umicore engaged in conduct within the United States that contributed to direct infringement by its customers.” *Id.* (citing ID at 79-81).

3. Commission Review

As noted above, the Commission determined to review the ID’s findings on contributory and induced infringement. On review, the Commission has determined to find that Umicore contributorily infringes the asserted claims. The central legal question raised by Umicore is whether a good-faith belief of non-infringement can rebut a *prima facie* showing of contributory infringement. Namely, Umicore contends that Complainants failed to prove that Umicore had

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the requisite “knowledge”¹⁵ to establish contributory infringement based upon Umicore’s alleged good-faith belief of non-infringement. *See* Umicore Sub. at 17; *see also* Compl. Pet. at 31-35.

With respect to the legal question of whether a good-faith belief of non-infringement rebuts a *prima facie* showing of contributory infringement, the Commission has determined to take no position.¹⁶ Regardless of whether, as a legal matter, a good faith belief in non-infringement rebuts a *prima facie* showing of contributory infringement, the Commission finds that the record evidence does not support the ID’s findings that Umicore had established a sufficient good-faith belief of non-infringement, as discussed further below with respect to induced infringement.¹⁷ *See* Section C.3 below.

¹⁵ The record is clear that the accused products meet all the limitations of the asserted claims and that there are no substantial non-infringing uses. ID at 31-72.

¹⁶ Commissioner Kieff determines that, under existing present law, a good faith belief of non-infringement is not, in and of itself, a full defense to or a safe harbor from liability for contributory infringement under 271 (c). The Supreme Court’s decision in *Commil*, which involves what everyone seems to agree is a requirement for a higher mental state under the inducement doctrine of 271(b), specifically held that a good faith belief of non-infringement is not a sufficient defense to liability for inducement. If such a good faith belief is not sufficient to keep one from surpassing the higher bar of inducement’s mental state requirement, then it can’t be sufficient to keep one from surpassing contributory infringement’s lower mental state requirement. It makes sense for the specific intent requirement of inducement to be the easier of the two mental state requirements to avoid because it gives clear notice to all. More particularly, potential infringers can control their own destinies by sailing simply into inducement’s safe harbor of no specific intent following any of the many established guidelines the Supreme Court has set forth for avoiding specific intent.

¹⁷ Commissioner Kieff is of the view that, as a result, because there appears to be agreement that the height of the bar for inducement’s mental state is either higher or the same height as that for contributory (Commission Hearing Tr. at 39-40) the Commission’s determination of inducement liability discussed more fully below also compels a determination of liability for contributory infringement.

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C. Induced Infringement

1. Applicable Law

Section 271(b) of the Patent Act establishes liability for inducement of infringement: “[w]hoever actively induces infringement of a patent shall be liable as an infringer.” 35 U.S.C. § 271(b); *DSU Med. Corp. v. JMS Co.*, 471 F.3d 1293, 1305 (Fed. Cir. 2006) (*en banc*) (“To establish liability under section 271(b), a patent holder must prove that once the defendants knew of the patent, they actively and knowingly aided and abetted another’s direct infringement.”) (citations omitted). “The mere knowledge of possible infringement by others does not amount to inducement; specific intent and action to induce infringement must be proven.” *Id.* (citations omitted).

2. The ID

The ID finds insufficient evidence to support a finding that Umicore had the specific intent to induce others to infringe the asserted patents. ID at 81-82. The ID points to a study commissioned by Umicore for the Institute of Condensed Matter Chemistry of Bordeaux, France to characterize the composition and crystal structure of the MX10 product (“Bordeaux Study”), and which allegedly reported that there was no Li_2MnO_3 . *Id.* The ID finds that thus Umicore reasonably believed that it did not infringe the asserted patents. *Id.* (citing RRB at 91-95; CX-161C at 29); *DSU*, 471 F.3d at 1307 (“[T]he record contains evidence that ITL did not believe its Platypus infringed. Therefore, it had no intent to infringe. Accordingly, the record supports the jury’s verdict based on the evidence showing a lack of the necessary specific intent.”). The ID further finds that a license agreement between Umicore and 3M “could also be construed as

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further evidence that Umicore credibly believed it practiced the 3M patents rather than the Asserted Patents.” *Id.* (citing Hearing Tr. 796:7-17 (Oct. 28, 2015) (Goffaux) [[

]])). The ID also points to an XRD analysis performed by Umicore in 2010 that allegedly showed non-infringement. *See* ID at 81.

3. Commission Review

The Commission has determined that the ID’s finding that Umicore possessed a good faith belief of non-infringement is not adequately supported by the record evidence. As discussed below, the evidence of record does not support a finding that Umicore possessed a good faith belief of non-infringement. Moreover, there is no evidence that Umicore actually relied on the information cited by the ALJ – *i.e.*, the Bordeaux Study, the XRD testing, and Umicore’s 3M license – in the context of assessing infringement. *See Applied Med. Res. Corp. v. U.S. Surgical Corp.*, 435 F.3d 1356, 1365 (Fed. Cir. 2006) (holding that a party asserting that it had a good-faith belief of non-infringement must demonstrate not only that there existed a potential good-faith basis for believing non-infringement, but that it actually relied upon this purported basis).

The record evidence shows that Umicore commissioned the Bordeaux Study to characterize the composition and crystal structure of the MX10 product. CX-161C; CX-162C. No evidence suggests that Umicore relied on the Bordeaux Study to conclude that its products did not infringe prior to this investigation. Indeed, Umicore represented in its briefing before the Commission that the Bordeaux Study was launched with [[

]]) Respondents’ Opposition to Complainants’

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Contingent Petition at 30.

The ID appears to rely on the testimonies of Umicore's expert, Dr. Delmas, and Umicore's employee, Dr. Levasseur, to support its finding. ID at 81 (citing RRB at 91-95; CX-161C at 29). But the testimony of Dr. Delmas that is discussed in the ID's citation is his expert testimony developed for this very investigation (RRB at 92-93; RX-753C (Delmas) at Q/A 117), which cannot support a previous good faith belief of non-infringement.

With respect to Dr. Levasseur, he testified that he relied on the analysis of her legal team to determine that Umicore's accused products do not infringe the asserted patent. CX-3329C at 168:3-13, 174:25-175:11. However, Umicore refused to disclose the analysis that Dr. Levasseur allegedly relied upon, and thus the ALJ precluded Umicore from relying on it at the hearing.¹⁸ Hearing Tr. at 770:4-772:18.

Moreover, as both the IA and Complainants point out, and the ID finds, the Bordeaux Study shows infringement, not non-infringement. Specifically, [[

]] See CX-4C

Q158-177; CX-4C Q158-177; CX-5C Q553-65; ID at 81 [[

].

¹⁸ At the Commission hearing, Complainants distributed an email dated July 14, 2005, purporting to show that the opinion of counsel was an opinion that the asserted patents were invalid and not an opinion on infringement. See Commission Hearing Tr. at 29. This is an improper attempt to introduce into the record evidence that could have been presented to the ALJ, and thus the Commission has determined to reject it.

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Second, the ID points to Umicore's XRD analysis. ID at 81-82. Umicore explains that it conducted the XRD analysis in response to a concern from its customer, [[]], regarding [[]] claim that Umicore's products are covered by the patents asserted in this investigation. According to Umicore, [[

]]. See ID at 81; CX-122C.001C; Hr'g Tr. at 797:19-798-800:23, 801:18-803:12; CX-123C at 1. But the evidence shows that Umicore was aware that XRD testing was not sufficient to determine whether there was infringement. CX-123C.1-2; Goffaux, Tr. 804:15-17; CX-3329C at 156:3-16 ("XRD is not used to check that it [NMC] is single phase or not."). Thus, the more reasonable conclusion is that Umicore performed only XRD testing to avoid knowing about possible infringement.

Third, the ID finds that a license agreement between Umicore and 3M "could also be construed as further evidence that Umicore credibly believed it practiced the 3M patents rather than the Asserted Patents." ID at 82. Yet, the evidence tells a different story. [[

]].

Tellingly, the evidence shows that in November 2010, well after the Bordeaux Study and 3M license agreement, [[

]]. This evidence undermines at least the degree or extent of Umicore's alleged good faith belief of non-infringement. The Commission has determined to reverse the ID's finding of sufficient good

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faith belief.

The ID's finding of a good faith belief of non-infringement is the sole basis for its finding no induced infringement. Indeed, the record evidence demonstrates that all elements of induced infringement are met. ID at 78-81. Specifically, the record establishes Umicore's specific intent to infringe. The evidence shows that in August 2009, BASF approached Umicore about the possibility of a joint venture for NCM materials. RX-633C.3. During the meeting, Umicore discovered that BASF had partnered with another company (Toda Kogyo) to make NCM materials covered by the Asserted Patents. RX-633C.3 ("They pretend to have a co-exclusive license with Toda (this is not in line with our info, needs to be checked)"); RX-750C Q74-78, 87-89; Goffaux, Tr. 784:24-785:10. Umicore thus declined to partner with BASF. Yet, Umicore contacted Argonne on September 29, 2009 "to find out who had access to the ANL patent." Goffaux, Tr. 791:13-20. At the meeting Argonne indicated that Umicore could obtain a sublicense from BASF or Toda. RX-750C Q92-96; CX-1C Q96-100; CX-1389C (meeting presentation); CX-2C Q171-75. Umicore, rather than obtaining a license to the ANL patents, continued to market its NMC in the United States without a license to the Asserted Patents. RX-750C Q100.

In 2010, Umicore's customers began inquiring as to whether Umicore's products infringe the asserted ANL patents. Goffaux, Tr. 797:14-798:4. Specifically, one of Umicore's customers, [[]], gave Umicore a document from [[]] that (1) identified compositions that fall within the scope of ANL's patents and (2) explained how to confirm whether material falls within the scope of the claims. CX-123C.1-3, 5; CX-122C.1

]]; CX-3330C 201:15-203:15. The [[]] document

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indicated that although XRD can be used as an initial check for infringement, electron diffraction (*i.e.*, TEM) should be used if the patented features are not seen in XRD patterns. CX-123C.1-2; Goffaux, Tr. 804:15-17. In particular the document identified excess lithium NMC 111 (corresponding to Umicore's MX) as covered by Argonne's patents, and [[]] wanted to know Umicore's position on infringement in light of this document. CX-3330C 201:15-203:15. However, in response to [[]] inquiry about the [[]] document, Umicore only performed XRD testing, and not TEM. CX-122C.1; Goffaux, Tr. 807:12-808:24. Tellingly, [[]], likely convinced that Umicore's products infringe, obtained a license from ANL in November 2010. CX-66. At a minimum, Umicore willfully blinded itself to infringement. *Info-Hold, Inc. v. Muzak LLC*, 783 F.3d 1365, 1372-73 (Fed. Cir. 2015) (citing *Global-Tech*, 131 S. Ct. at 2070) (willful blindness "requir[es] that the alleged inducer (1) subjectively believe that there is a high probability that a fact exists and (2) take deliberate actions to avoid learning of that fact."). Accordingly, the Commission finds that Complainants have proven that Umicore induces infringement of the asserted patent claims.

D. Domestic Industry Under 19 U.S.C. 1337(a)(3)(C) (BASF)

The ID finds that BASF established the existence of a domestic industry under 19 U.S.C. §§ 1337(a)(3)(A), (B), and (C), and that Argonne established the existence of a domestic industry under 19 U.S.C. § 1337(a)(3)(C). ID at 13-24. The Commission has determined to affirm the ID's finding that BASF established a domestic industry under 19 U.S.C. §§ 1337(a)(3)(A) and (B) and that Argonne established the existence of a domestic industry under 19 U.S.C. § 1337(a)(3)(C), but has determined to take no position on the ID's finding that BASF established a domestic industry under 19 U.S.C. § 1337(a)(3)(C).

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V. REMEDY

A. Limited Exclusion Order

Where a violation of section 337 has been found, the Commission must consider the issues of remedy, the public interest, and bonding. Section 337(d)(1) provides that “[i]f the Commission determines, as a result of an investigation under this section, that there is a violation of this section, it shall direct that the articles concerned, imported by any person violating the provision of this section, be excluded from entry into the United States ...” 19 U.S.C. § 1337(d)(1). The Commission has “broad discretion in selecting the form, scope, and extent of the remedy.” *Viscofan, S.A. v. U.S. Int’l Trade Comm’n*, 787 F.2d 544, 548 (Fed. Cir. 1986). The Commission may issue an exclusion order excluding the goods of the person(s) found in violation (a limited exclusion order) or, if certain criteria are met, against all infringing goods regardless of the source (a general exclusion order). The Commission also has authority to issue cease and desist orders in addition to or in lieu of exclusion orders. *See* 19 U.S.C. § 1337(f). The Commission generally issues cease and desist orders to respondents who maintain commercially significant inventories of infringing products in the United States.¹⁹ *See, e.g., Certain Laser Bar Code Scanners and Scan Engines, Components Thereof, and Products*

¹⁹ Commissioner Schmidlein observes that the existence of a commercially significant domestic inventory of infringing product is not a statutory requirement. *See* 19 U.S.C. § 1337(f)(1). The statutory language of section 337(f)(1) leaves it to the discretion of the Commission and does not establish any particular test or standard for issuing a cease and desist order against a party in violation aside from consideration of the public interest factors. Therefore, in Commissioner Schmidlein’s view the Commission is not obligated to confirm the existence of a commercially significant domestic inventory of infringing product prior to issuing a cease and desist order. *See, e.g., Certain Three-Dimensional Cinema Systems and Components Thereof*, Inv. No. 337-TA-939, Commission Op. at 63-64, n. 33 (Aug. 23, 2016) (footnote expressing Commissioner Schmidlein’s views).

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Containing Same, Inv. No. 337-TA-551, Comm'n Op. at 22 (June 14, 2007).²⁰

As noted above, the ALJ issued his RD on March 3, 2016. The RD recommends that in the event the Commission agrees with the ALJ's finding that a violation of section 337 has occurred, the Commission should issue an LEO directed to Umicore's MX and TX products. RD at 3. The RD, however, does not recommend issuance of cease and desist orders because "Complainants failed to adduce evidence of a commercially significant inventory of Umicore's NMC materials in the United States." RD at 4.

Complainants and the IA support the RD's recommendation that the Commission should issue an LEO directed to Umicore's infringing products. Compl. Sub. at 47; IA Sub. at 30; RD at 2-3. Complainants, however, argue that the LEO should include a provision requiring the Commission rather than U.S. Customs and Border Protection ("CBP") to adjudicate any purported redesigns before importation. Compl. Sub. at 47. Complainants in their reply submission, without pointing to any evidence, state that the Commission should issue a cease and desist order because Respondents have imported

]] *Id.*

Umicore argues that "no remedy can issue as to power tools or power tool batteries, because there is no respondent in the case found to be in violation with respect to those products." Umicore Sub. at 49 (citing *Kyocera Wireless Corp. v. ITC*, 545 F.3d 1340, 1356 (Fed. Cir. 2008)). Umicore explains that "Makita was the only named respondent that allegedly imported lithium-ion batteries for power tools and power tool batteries" and that "Complainants

²⁰ Commissioner Kieff does not join the Commission's determination to not issue cease and desist orders ("CDOs") in this case for the reasons he recently offered in more detail in the 934 investigation. See *Certain Dental Implants*, Inv. No. 337-TA-934, Comm'n Op., Additional Views of Commissioner Kieff (May 11, 2016).

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settled with Makita, and the Investigation was terminated as to Makita.” *Id.* Umicore further argues that no remedy should issue “with respect to the remaining ‘cathode materials’ manufactured by Umicore” because “Complainants deliberately reduced the scope of the Investigation to focus on power tool batteries.” *Id.* Finally, Umicore contends that any exclusion order should include an exemption for “R&D, given the important public interest in clean energy R&D using the accused MX/TX materials and the undue impact an exclusion order would have on such efforts.” *Id.* According to Umicore, a certification provision should be included in any LEO so that importers can certify that importations are for research purposes and not subject to the exclusion order.

B. Analysis and Recommendation

The Commission agrees with the RD’s recommendation and issues herewith an LEO directed to Umicore’s infringing products. As discussed above, we find, as did the ID, that a violation of section 337 has occurred.

The Commission declines Complainants’ suggestion that the LEO include a provision requiring the Commission to adjudicate redesigns before importation. CBP is tasked with administering Commission exclusion orders and has procedures in place for redesigns. We see nothing in this investigation that warrants inclusion of such provision. In addition, the parties may choose to seek enforcement, advisory, and/or modification proceedings at the Commission in accordance with Commission rules.

The attached proposed LEO provides that:

Lithium metal oxide cathode materials that infringe one or more of claims 1-4, 7, 13, and 14 of the ’082 patent, or claims 1-4, 8, 9, and 17 of the ’143 patent that are manufactured by, or on behalf of, or imported by or on behalf of Umicore N.V. and Umicore USA Inc.

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or any of their affiliated companies, parents, subsidiaries, agents, or other related business entities, or their successors or assigns are excluded from entry for consumption into the United States, entry for consumption from a foreign trade zone, or withdrawal from a warehouse for consumption, for the remaining term of the patent, except under license of the patent's owner or as provided by law.

The proposed LEO is similar to the order proposed by the IA and Complainants and also includes a standard certification provision that allows Umicore to certify that under procedures to be specified by CBP, Umicore is familiar with the terms of the exclusion order, that Umicore has made appropriate inquiry, and that, to the best of Umicore's knowledge and belief, the products being imported are not subject to the exclusion order.

In response to the Commission's notice requesting information on remedy from the parties, Complainants did not request cease and desist orders, did not address the ALJ's recommendation on cease and desist orders, and did not submit draft cease and desist orders for the Commission's consideration. It was only later in their reply brief responding to Umicore's remedy brief that Complainants made their request to the Commission for cease and desist orders. Complainants state in their reply submission that the Commission should issue cease and desist orders because Umicore has imported

]] Compl. Reply Sub. at 25. Yet Complainants present no evidence to substantiate that assertion. Accordingly, the Commission declines to issue cease and desist orders.

III. THE PUBLIC INTEREST

Section 337(d) of the Tariff Act of 1930, as amended, directs the Commission to consider certain public interest factors before issuing a remedy. These public interest factors include the effect of any remedial order on the "public health and welfare, competitive conditions in the

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United States economy, the production of like or directly competitive articles in the United States, and United States consumers.” 19 U.S.C. §§ 1337(d). In this investigation, the Commission delegated to the ALJ the task of taking evidence on the public interest, and further took testimony on the public interest at the Commission hearing on November 17, 2016. Delegation in appropriate cases allows the Commission to develop a record on the public interest earlier in the investigation, and allows that record (including evidence on the purported public interest issues) to be developed by the ALJ, the IA, and the parties through the ordinary adversarial process.

A. ALJ’s Findings

After considering the evidence, the RD concludes that “none of the public interest factors weighs against the issuance of a limited exclusion order.” RD at 7. The RD made the following findings:

1) Public Health and Welfare

The RD notes Umicore’s argument that “[b]asic scientific research and the practical applications of such research ‘is precisely the kind of activity intended by Congress to be included in the negative effects of a remedy on the public health and welfare.’” RD at 8 (citing RIB at 207-08 (citing *Certain Inclined-Field Acceleration Tubes*, Inv. No. 337-TA-67 (“*Inclined-Field Acceleration Tubes*”), Comm’n Op., 1980 WL 594319 at *11 (U.S.I.T.C. Dec. 1, 1980)). The RD, however, finds that unlike in *Inclined-Field Acceleration Tubes*, “Umicore’s accused materials are not used for basic scientific research but for performance testing, along with several other competitive materials, for potential use in commercial downstream products.” *Id.* (citing RX-748C, Pilot WS at Q/A 48 (“Since different suppliers’ cathode materials have

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different characteristics, battery manufacturers and OEMS generally conduct research and development on samples from various suppliers to evaluate and test the specific attributes and performance characteristics of each difference material.”)). Specifically, the RD observes that in *Inclined-Field Acceleration Tubes*, the evidence showed that “research programs would have to be modified and some may have to be dropped” because “[t]he users consider the [accused product] to be greatly superior in performance to the [domestic product]—not to mention substantially less expensive—and therefore indispensable to their research efforts.” *Id.* (citing *Inclined-Field Acceleration Tubes*, 1980 WL 594319 at *14). Here, in contrast, the RD finds that there is no evidence that Umicore’s accused materials are indispensable to basic scientific research or that they are superior to alternative cathode materials (*i.e.*, other cathode materials such as LCO, NCA, LFP, and LMO), as well as NMC cathode materials that are available from other suppliers such as Nichia Chemical, Tanaka Chemical, L&F Corporation, Hunan Reshine, Toda Kogyo, and BASF Toda Battery Materials. *Id.*

2) Competitive Conditions in the U.S. Economy

The RD finds that any effect on the competitive conditions in the U.S. economy is insufficient to bar entry of relief in this investigation. RD at 9. Specifically, the RD observes that “there are several alternative suppliers of NMC materials as well as several alternative cathode materials (*i.e.*, other than NMC).” *Id.*

3) The Production of Like or Directly Competitive Products in the U.S.

The RD finds that issuance of an LEO will not adversely affect the production of like or directly competitive products in the United States because the evidence shows that Umicore’s accused NMC materials are not currently produced in the United States. RD at 9 (citing CX-8C,

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Mulhern WS at Q/A 176). The RD further adds that “the evidence shows there are several alternative suppliers of NMC materials as well as several alternative cathode materials (*i.e.*, other than NMC).” *Id.*

4) United States Consumers

The RD states that “issuance of a limited exclusion order will not adversely affect U.S. customers because [[

]]. RD at 9 (citing SIB at 74). The RD further states that “the evidence shows there are several alternative suppliers of NMC materials as well as several alternative cathode materials (*i.e.*, other than NMC).” *Id.*

B. Commission Proceedings

After issuance of the RD, the Commission requested public interest comments from the general public. In response, 3M, [[]], and the Belgian Ambassador provided comments (summarized further below). As noted above, in its notice of review, the Commission posed a number of questions on the public interest to the parties. The parties’ responses are summarized below.

i. Umicore’s Response

Umicore identifies the following entities as using the accused products:

- 3M has used the accused Umicore NMC materials to develop high-performance Li-ion battery cells for EV [Electric Vehicle] /PHEV [Plug-in Hybrid Electric Vehicles], pursuant to a contract funded by the U.S. Department of Energy.
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diminished universe of options when selecting the right material for a particular application.” *Id.* (citing RX-748C at Q48). Umicore explains that “materials have different characteristics, and a wide variety of materials increases the likelihood that a researcher will find the material most suited for the particular application.” *Id.* Umicore contends that “[e]ven if developers of power tool batteries could find suitable alternative sources for NMC material, as Mr. Pillot testified, that is decidedly not true of applications such as EV/ESS [EV (electric vehicle) and ESS (energy storage system)], where the quality, consistency, and performance of the NMC material is much more critical.” *Id.* at 42 (citing RX-748C at Q43; RX-739C at 67:3-68:18 (discussing importance of energy density), 76:3-8 (discussing that increased energy density “would benefit the transportation sector [and] the grid storage sector); CX-389C.1 (comparing energy density required for EV and portable electronics); RX-730C at 82:6-22).

Umicore notes Mr. Pillot’s testimony that “Umicore is one of two suppliers in the industry (the other being the Japanese supplier Nichia, and certainly not BASF) with the capability of supplying NMC cathode material with the performance needed for EV/ESS, and on the commercial scale needed for large volume production (on the scale of thousands of tons per year).” *Id.* (citing RX-748C at Q44; RX-749C at Q65). Umicore acknowledges that other entities produce NMC but argues that “they are not able to produce it on the scale and with the performance and consistency required for EV/ESS.” *Id.* (citing RX-748C at Q45). Umicore states that an exclusion order will prevent the U.S. from having access to the high-quality products of the world’s leading cathode material producer, severely impacting innovation in the U.S. EV market and that “[i]f U.S. car manufacturers cannot perform R&D with Umicore’s cathode materials in the U.S., they will be unable to perform the necessary testing to evaluate

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whether batteries incorporating those materials are suitable for their EV, HEV [Hybrid Electric Vehicle], and PHEV [Plug-In Hybrid Electric Vehicle] applications.” *Id.*

According to Umicore, “3M has used Umicore’s MX/TX materials to develop high-performance Li-ion battery cells for EV/PHEV since 2011, including research performed pursuant to a DOE (Department of Energy)-funded contract.” Umicore Sub. at 47-48 (citing 3M PI Statement at 3-4). Umicore states that “3M has noted the need for high-quality NMC cathode materials for EV/PHEV” and has found “Umicore’s MX/TX materials particularly suitable for those applications.” *Id.* Umicore asserts that “there are few, if any, suitable alternatives to Umicore’s MX/TX materials for EV/ESS” especially “when considering suppliers that have an established track record for producing such materials in large-scale commercial quantities—an end goal which may impact the selection of materials for R&D.” *Id.*

Umicore states that “market analysts generally do not track NMC market shares for the United States” but that data available for the worldwide market shows that “Umicore is the leading worldwide supplier of NMC.” Umicore Sub. at 48 (citing RX-738C at 388:14-389:2; RX-730C at 227:2-229:3). According to Umicore, “in 2014, it supplied about 24% of the worldwide market for NMC (*see* RX-748C at Q34; RDX-503), which has increased slightly in 2015 to 25%” and that “[t]he next closest individual supplier is Nichia, with 13% of the worldwide NMC market.” *Id.* (citing RX-748C at Q35). Umicore adds that its [[

]] *Id.*

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ii. IA's Response²¹

The IA argues that the current record lacks evidence “to fully detail the extent to which an exclusion order would affect research and development efforts with respect to lithium ion batteries by universities and private companies.” IA Sub. at 19. The IA, however, sets forth the relevant record evidence and argues that it does not warrant denying entry of an exclusion order in this investigation.

The IA notes that Mr. Pillot testified that from [[

]]. The IA adds that “[e]xcept for [[

]], Dr. Pillot did not identify further the extent to which each entity is engaged in research and development efforts, or specify the nature of their research and development efforts.” *Id.* at 20.

The IA argues that “[t]hese entities have received only small amounts of Umicore’s NMC materials, and it appears that other suppliers of NMC materials are able to replace the amount of Umicore’s NMC materials that may be excluded in this investigation.” *Id.* at 22. With respect to the potential impact of switching to another supplier of NMC materials on the research and development efforts of these entities, the IA observes that these entities do not limit themselves to using only one supplier of NMC materials. *Id.* The IA further argues that there is no evidence

²¹ Complainants’ comments are similar to the IA’s comments. *See* Compl. Sub.

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that research and development of lithium ion batteries involving a specific supplier's NMC materials will be adversely affected by switching to a different supplier's NMC materials. *Id.*

The IA notes Mr. Pillot's testimony regarding the nature of research and development of cathode materials and that different suppliers' materials have different characteristics. *Id.* (citing RX-748C (Pillot WS) at Q/A 46-48). However, the IA argues that the record lacks "evidence to fully detail whether Umicore's NMC material is uniquely suited for specific applications in energy saving technology and cutting-edge research and development, including evidence about specific areas and volumes involved and whether any other material can be used in such applications." IA Sub. at 22. Specifically, the IA notes Mr. Pillot's testimony regarding the different applications for new batteries, and that for EV and ESS applications, the quality of NMC cathode material is more important than for portable devices. *Id.* (citing RX-748C (Pillot WS) at Q/A 22-23, 43). The IA also noted Dr. Pillot's testimony that Umicore is one of two suppliers (the other being Nichia) that currently has the capability to supply NMC material with the performance needed for EV and ESS applications and on the scale needed for large volume production (*i.e.*, on the scale of thousands of tons per year). *Id.* (citing RX-748C at Q/A 44). The IA, however, notes that Mr. Pillot acknowledged that "other companies such as 3M and Mitsubishi Chemical are considered to have NMC materials suitable for EV and ESS applications," although they "currently are not known to have the expertise or capacity of providing those materials in large production quantities with consistency." *Id.* (citing RX-748C (Pillot WS) at Q/A 46).

The IA points to the testimony of Complainants' expert, Ms. Mulhern, who testified that "it is unlikely that Umicore is the sole source of NMC cathode materials used in domestic

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research and development activities.” *Id.* at 21 (citing CX-3300C (Mulhern RWS) at Q/A 31).

Ms. Mulhern noted that “BASF has supplied NMC materials to [[]] customers of Umicore in the United States – [[]] – which collectively account for approximately 97% of Umicore’s shipments of the accused NMC materials to the United States.” *Id.* Ms. Mulhern further testified that “(i) [[]] of these customers are currently using BASF NMC materials [[]] or close to qualifying BASF NMC materials for certain uses [[]], and (ii) the [[]] customer [[]] may be moving away from the use of NMC materials for business reasons.” *Id.*

The IA also points to Ms. Mulhern’s testimony that “even if Nichia is the only other supplier of NCM material with the performance needed for EV and ESS applications, as alleged by Dr. Pillot, there is no further allegation or evidence that Nichia would be unable to supply sufficient quantities of NMC material with the performance needed for EV and ESS applications in the event that Umicore’s NCM materials were excluded by an exclusion order in this investigation.” *Id.* (citing CX-3300C (Mulhern RWS) at Q/A 38, 44). Ms. Mulhern noted that Mr. Pillot admitted during his deposition that there are five or six “important” suppliers of NMC materials.

Ms. Mulhern also explained that “there are different types (or chemistries) of non-accused materials that are used in lithium ion batteries, including: (i) lithium cobalt oxide (“LCO”); (ii) lithium manganese oxide (“LMO”); (iii) lithium ion phosphate (“LFP”); and (iv) lithium nickel cobalt aluminum oxide (“NCA”).” *Id.* (citing CX-3300C (Mulhern RWS) at Q/A 31). Ms. Mulhern further explained that “NMC materials (including the accused NMC materials) are not the most prevalent chemistry in use currently; and (ii) that NMC materials are

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forecasted to account for only 25% of the various cathode materials used in lithium ion batteries in 2025, compared to 22% in 2014.” *Id.* Ms. Mulhern noted that “[] has a license to the Asserted Patents and, thus, would be able to import and use the accused NMC materials in the United States for research and development purposes, as well as for manufacturing purposes.” *Id.* (citing CX-3300C (Mulhern RWS) at Q/A 40). Thus, the IA contends that entry of an exclusion order in this investigation would not adversely affect the research and development efforts with respect to lithium ion batteries by the above identified universities and private companies. *Id.* at 21-22.

With respect to 3M, the IA asserts that the record evidence does not “fully detail how Umicore’s NMC material relates to 3M’s research and whether other suppliers provide comparable NMC material that 3M can use in its research.” IA Sub. at 27-28. The IA notes that “3M did not seek to intervene in this investigation until after the Final ID issued and no party sought to obtain discovery from 3M through a subpoena.” *Id.* The IA states that 3M’s comments and the current evidence do not support denying entry of an exclusion order in this investigation. *Id.* The IA notes that 3M asserts that it has used “Umicore’s accused materials almost exclusively in testing and in research and development of its High Energy (HE) LIB [Lithium Ion Battery] cells” and that “[R]esearch 3M pursues using Umicore’s NMC cathode materials includes improving the performance of cells through development of improved electrolytes, improved anode materials, and improved current-collector materials by testing their performance in cells that include Umicore’s materials and in certain studies matching 3M’s anodes and electrolytes to Umicore’s materials, including the accused materials.” *Id.* (citing 3M’s Comments at 3-4). The IA further notes 3M’s statement that “it was the primary recipient

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of a contract that was awarded by the U.S. Department of Energy for research and development of an HE LIB cell for PHEV (Plug-In Hybrid Electric Vehicles) and EV (Electric Vehicles).” *Id.* (citing 3M’s Comments at 3-4). According to the IA, “[w]hile this contract evidences 3M’s use of Umicore’s accused materials, this contract does not support denying entry of an exclusion order.” *Id.* The IA observes that “3M notes that the work was conducted under the contract ‘from October 1, 2013 to March 31, 2016’” and that it remains unclear “whether any work pursuant to the contract has been performed beyond March 31, 2016, such that it would be affected by entry of an exclusion order in this investigation.” *Id.* Further, the IA points out that 3M has stated that “[i]n conducting the contract, 3M used several different types of cathode materials, including Umicore’s accused materials, to produce cells that [[]] evaluated and compared to vehicle requirements.” *Id.* The IA states that [[]] has “a license to the Asserted Patents and, thus, would be able to import and use the accused NMC materials in the United States for research and development purposes, as well as for manufacturing purposes.” *Id.* The IA also notes that both Mr. Pillot and Ms. Mulhern testified that “research companies generally conduct research and development using various suppliers” and that “3M’s statement regarding the use of different types of cathode materials under the contract is consistent with and provides support for that testimony.” *Id.*

The IA states that the current record lacks adequate evidence to completely identify the suppliers of NMC to the U.S. market and the percentage of the market held by each. IA Sub. at 28-29. The IA notes, however, that “Umicore’s witness, Dr. Pillot, and Complainants’ witness, Ms. Mulhern, each prepared a demonstrative summarizing worldwide NMC market share for 2014, each demonstrative based on an Avicenne market report prepared by Dr. Pillot.” *Id.*

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(citing RX-748C (Pillot WS) at Q/A 35 (citing RDX-503); CX-0008C (Mulhern WS) at Q/A 148 (citing CDX-2410C)). Dr. Pillot identified suppliers of NMC materials to the world (and their shares of the 2014 worldwide NMC market) as follows: (i) Umicore (24%); (ii) Nichia (13%); (iii) ShanShan (11%); (iv) L&F (9%); (v) Reshine (4%); (vi) EASPRING (3%); (vii) “Chinese” (9%); and (viii) “Others” (8%). *Id.* (citing RX-748C (Pillot WS) at Q/A 35 (citing RDX-503)). Ms. Mulhern identified suppliers of NMC materials to the world (and their shares of the 2014 worldwide NMC market) as follows: (i) Umicore (24%); (ii) Sumitomo (16%); (iii) Nichia (11%); (iv) ShanShan (8%); (v) L&F (6%); (vi) NKS (4%); (vii) Toda (4%); (viii) Reshine (3%); (ix) “Other China” (8%); and (x) “Others” (5%). *Id.* (citing CX-0008C (Mulhern WS) at Q/A 148 (citing CDX-2410C)).

iii. Public Interest Comments from Others

3M: 3M submitted a public interest statement in response to the RD. Specifically, 3M contends that “[b]ased on the current posture of this Investigation, a Commission remedy is neither necessary nor appropriate.” 3M explains that “the Commission instituted this investigation against consumer power tools, their lithium-ion batteries (“LIBs”), and cathode materials from which LIBs can be made” and that “Makita, the only respondent importing the exemplary infringing product, a power drill with an LIB, settled with Complainants.” Thus, according to 3M, “Complainants have already, by agreement, obtained a complete remedy against the only consumer products identified in the Complaint.”

3M argues that “all that remains for the Commission to consider, and the only activities that a potential remedy would impact, are Umicore’s sale for importation, importation, and/or sale after importation of research-level quantities of specific formulations of excess Lithium type

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nickel-manganese-cobalt oxide materials – i.e., powder forms of its MX and TX materials (Umicore’s “NMC Powders”).” 3M explains that “the NMC Powders that Umicore imports into the United States are not subsequently used in the United States for consumer products” but that “the limited quantities of NMC Powders that Umicore imports are used for research, development, and testing in the United States.” 3M states that “[s]uch testing is vital to advancing LIB technology, particularly in the rapidly growing fields of Plug-in Hybrid Electric Vehicles (“PHEVs”) and Hybrid Electric Vehicles (“HEVs”))” and that “[b]y issuing a remedy directed to Umicore’s NMC Powders, the Commission risks disrupting this work – a result contrary to the public interest.”

[[]] also submitted public interest comments. Specifically, [[]] states that it [[]] According to [[]], “Umicore is widely known within the industry as a supplier of cathode materials, and the Umicore cathode materials are known to have applicability for [[]]” and that “[r]obust access to a variety of lithium-ion battery materials in the research and development process facilitates advancement of those technologies and U.S. research and development activities.” [[]] states that “[a]n order precluding any Umicore cathode materials from the U.S. market would have an adverse impact on U.S. research and development activities and the public interest.

Belgian Ambassador: The Belgian Ambassador also submitted public interest comments. The Ambassador states that Umicore “is a global materials technology company that is headquartered in Belgium and has operations in ten states in the U.S.” and that Umicore has “created jobs and technical innovations in both of our countries.” According to the Ambassador,

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“Umicore is recognized globally as a leader in clean technology and sustainability and has been the recipient of numerous prestigious honors and awards.” The Ambassador states that “Umicore was designated as one of the world’s most ethical companies by Ethisphere in 2012.” The Ambassador urges the Commission to “give due regard in its review of the matter to the well-founded arguments of Umicore regarding negative impact an exclusion order would have on the public interest in the U.S.”

On November 9, 2016, the Commission received a letter from a member of Congress, Jim Bridenstine of the first district of Oklahoma. Mr. Bridenstine states that “[a]s a member of the House Armed Services Committee,” he urges the Commission to consider the significant national security implications of this investigation into the advanced battery materials technology and that “[a]ssured access to critical battery materials—in a competitive market—is increasingly important for national defense as well as industry.”

C. Commission Hearing

In response to the Commission’s notice inviting government agencies, public interest groups, and interested members of the public to appear and testify as to the effects of an exclusion order on the public interest, the entities listed below appeared and participated in a panel on the public interest.²²

²² Jeff Dahn, Ph.D., FRSC, Professor of Physics and Atmospheric Science, Dalhousie University, Halifax, N.S., Canada, submitted comments but did not appear to testify.

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1) **Opposing Issuance of Exclusion Order (primarily on the grounds that an exclusion order will disrupt research and development efforts using Umicore's products):**²³

- 3M Corporation (represented by Kevin Eberman, Product Development Manager at 3M and Deanna Okun, Counsel). 3M testified regarding the nature of testing of cathode materials, the negative impacts an exclusion order would have on research, development, and testing of NMC materials in the United States, and the risk that research entities would move such activities to other countries.²⁴
- Ruth Cox, VP of Power Marketing, Centuari Energy LLC. Ms. Cox testified about the importance of battery storage for clean power projects, such as electric vehicles and wind and solar power generation, and the risks that an exclusion order would reduce available options for such storage.²⁵
- Kip A. Frey, Professor of the Practice of Law and Public Policy and Director of the Law and Entrepreneurship Program, Duke University, School of Law. Mr. Frey testified about issues related to investment in lithium-ion batteries and electric vehicles, including the risk that an exclusion order could discourage investment and stall current progress in innovation.²⁶
- Ashish Arora, P.E., CFEI, Principal Engineer, Exponent, Engineering and Scientific Consulting. Mr. Arora testified about the differences among various cathode materials, the impossibility of simply substituting one material for another, and the delays to validation, qualification, and testing of cells that result from such substitutions.²⁷
- Robert D. Hormats, Vice Chairman, Kissinger Associates. Mr. Hormats testified on the Federal Government's policies encouraging adoption of hybrid and electric vehicles and renewable energy technologies, the related efforts to increase domestic manufacturing of

²³ The Commission notes that most of these witnesses offered information that was in ways repetitive of what was previously offered before the ALJ; and that several appeared at the behest of Umicore and were compensated for their time. *See* Commission Hearing Tr. at 63, 194.

²⁴ Commission Hearing Tr. at 98-104; Request to Appear at Hearing of 3M, EDIS Doc. No. 594147, at Ex. A.

²⁵ Commission Hearing Tr. at 140-47; Request to Appear at Hearing of Ruth Cox, EDIS Doc. No. 594132, at Ex. B.

²⁶ Commission Hearing Tr. at 134-39; Request to Appear at Hearing of Kip Frey, EDIS Doc. No. 594135, at Ex. B.

²⁷ Commission Hearing Tr. at 119-27; Request to Appear at Hearing of Ashish Arora, EDIS Doc. No. 594131, at Ex. B.

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lithium-ion batteries, and the harm that an exclusion order could impose on such manufacturing capability.²⁸

- Major General (Ret) Robert H. Latiff, President, RLatiff Associates, LLC. Maj. Gen. Latiff testified about the national security applications of lithium-ion batteries, the military's need to procure technology from private industry, and the resultant potential national security implications of an exclusion order.²⁹
- Christophe Pillot, Ph.D., Avicenne Energy, France. Dr. Pillot, who was Umicore's expert witness before the ALJ regarding the on public interest, testified (as he did before the ALJ) that Umicore was one of the few viable global suppliers of NMC cathode materials of sufficient quality and in sufficient quantities, and that an exclusion order would hinder the ability of U.S. companies and universities to innovate in such fields as electric vehicles and energy storage systems.³⁰
- Robert Rubino, Director of R&D, Greatbatch Inc., Clarence, New York. Mr. Rubino testified about the importance of lithium-ion batteries for implantable medical devices and medical equipment, the advantages of Umicore's NMC cathode materials for medical device applications, and the harm that an exclusion order would impose on future research, development, and commercialization efforts.³¹
- Michael Sanders, Senior Advisor, Avicenne Energy, France. Mr. Sanders testified, based on over 35 years of experience at DuPont, on the nature of research and development in battery technology, and that because Umicore is a known market leader and its products have commercial viability, an exclusion order would set back efforts to develop and produce lithium-ion batteries in the United States.³²
- Charles Wessner, Ph.D., Research Professor, Global Innovation Policy, Georgetown University, Washington, DC. Dr. Wessner testified about the importance of lithium-ion technologies to innovation in the United States, including with respect to electric vehicles, renewable energy systems, and national security, and the negative effects that an exclusion order would have on domestic research and manufacturing in this field.³³

²⁸ Commission Hearing Tr. at 170-76; Request to Appear at Hearing of Robert Hormats, EDIS Doc. No. 594138, at Ex. B.

²⁹ Commission Hearing Tr. at 163-69; Request to Appear at Hearing of Maj. Gen. Robert H. Latiff, EDIS Doc. No. 594140, at Ex. B.

³⁰ Commission Hearing Tr. at 127-34; Request to Appear at Hearing of Christophe Pillot, EDIS Doc. No. 594142, at 4.

³¹ Commission Hearing Tr. at 112-19; Request to Appear at Hearing of Robert Rubino, EDIS Doc. No. 594137, at Ex. B.

³² Commission Hearing Tr. at 104-11, Request to Appear at Hearing of Michael Sanders, EDIS Doc. No. 594144, at Ex. B.

³³ Commission Hearing Tr. at 155-63; Request to Appear at Hearing of Charles Wessner, EDIS Doc. No. 596145, at Ex. B.

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- Jennifer Hillman, Counsel, Cassidy Levy Kent (USA) LLP. Ms. Hillman provided background information about the statutory public interest test and the Commission's application of it, the importance of the research at issue in this investigation, and the need to limit any exclusion order to batteries for power tools, which were the focus of the investigation.³⁴

2) Supporting Issuance of Exclusion Order (primarily on the grounds that not issuing an exclusion order will be a disincentive to investing in R&D in the United States, noting the significant investments Complainants and DOE have made in the patented technology):

- Kenan Sahin, Ph.D, President of TIAX, LLC and CAMX Power LLC. Mr. Sahin testified about the significant investments in time and money that are required to develop battery materials, the need to protect the investments made by ANL and BASF, the chilling effect on future research and development that would result from denial of a remedy in this investigation, and the availability of alternative, high performance materials from suppliers other than Umicore.³⁵
- Department of Energy ("DOE") (represented by Steven P. Croley, General Counsel; John T. Lucas, Deputy General Counsel for Transactions, Technology & Contractor Human Resources; and Brian J. Lally, Acting Assistant General Counsel for Technology Transfer and Intellectual Property). The DOE testified about the development of its NMC material and its licensing to several companies, including BASF, the importance of such licensing to enable transfer of technology into the marketplace, the key part patent protection plays in DOE's innovation pipeline, how failure to enforce patents such as those at issue would undermine this innovation pipeline and DOE's ability to partner with universities and private entities to commercialize DOE-developed technologies, and the availability of alternate cathode materials and licenses to the patents at issue.³⁶

D. Analysis

We agree with the RD that "none of the public interest factors weighs against the issuance of a limited exclusion order." RD at 7. As the RD observes, the evidence shows that

³⁴ Commission Hearing Tr. at 148-55; Request to Appear at Hearing of Jennifer Hillman, EDIS Doc. No. 594124, at 2.

³⁵ Commission Hearing Tr. at 176-83; Request to Appear at Hearing of Kenan Sahin, EDIS Doc. No. 594073, at 2.

³⁶ Commission Hearing Tr. at 184-93; Request to Appear at Hearing of Department of Energy, EDIS Doc. No. 594149, at 3.

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there are several alternative suppliers of NMC materials including Nichia Chemical, Tanaka Chemical, L&F Corporation, Hunan Reshine, Toda Kogyo, and BASF. RD at 8. The evidence further shows that there are several alternative cathode materials including LCO, NCA, LFP, and LMO. *Id.* Witnesses testifying at the Commission hearing confirmed this evidence. *See, e.g.,* Commission Hearing Tr. at 248-49. *See also* CX-8C, Mulhern WS at Q/As 148-49; CX-688 at 38.

Umicore's principal public interest argument is that an exclusion order will be harmful to domestic R&D. Indeed, almost all of the witnesses that appeared at the Commission hearing to oppose issuance of an exclusion order offered testimony to address this argument. Commission Hearing Tr. at 98-176. Similarly, in his testimony at the hearing before the ALJ, Dr. Pillot explained that "R&D is a lengthy process which lasts on average from three to five years," and "[i]f researchers were forced to switch cathode material, they would generally need to restart their R&D efforts from scratch, given that cathode materials are not substitutable in the R&D process." RX-738C at 46:11-16, RX-748C at Q42, 46-47. But in response to repeated questioning from the Commission, neither Dr. Pillot nor any other person appearing before the Commission could identify any particular ongoing research effort that would be impacted by an exclusion order against the Umicore MX and TX articles at issue in this investigation. Commission Hearing Tr. at 197-200; 204. Notably, none of Umicore's four main customers, who together import about 97% of Umicore's domestic NMC material, appeared before the Commission, or at any time during this investigation, to complain about disruptions to their research efforts. Commission Hearing Tr. at 194-95; CX-201; CX-207. In addition, Complainants made clear that they are willing to license the asserted patents to other entities. Commission Hearing Tr. at 71 ("BASF is willing, has offered and would offer a license to folks .

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..”).

Moreover, the DOE witness noted that “Protecting the two patents in question here would not impede the development of lithium-ion cathode technology in general, nor would it impede consumer choice among products that employ that technology, because the two products here constitute just a subset of the lithium-ion battery family, as recognized by OUII and also Judge Pender here.” Commission Hearing Tr. at 189. For universities and entities performing basic science research, the DOE witness explained that since the patents at issue originated from Argonne, one of the country’s national laboratories, “the entire government retains rights to use it for university research, defense research or any government research or government-funded research whatsoever.” Commission Hearing Tr. at 193. He added that “[i]t’s our understanding that Umicore’s customers are not engaged in basic research at all . . . but rather in what some would call product qualification or . . . performance research.” *Id.* at 192-93.

Umicore relies heavily on *Inclined-Field Acceleration Tubes*, in which the Commission declined to issue an exclusion order because of its impacts on basic scientific research using the imported tubes. But as the RD finds, unlike in *Inclined-Field Acceleration Tubes*, “Umicore’s accused materials are not used for basic scientific research but for performance testing, along with several other competitive materials, for potential use in commercial downstream products.” RD at 8; RX-748C, Pillot WS at Q/A 48 (“Since different suppliers’ cathode materials have different characteristics, battery manufacturers and OEMS generally conduct research and development on samples from various suppliers to evaluate and test the specific attributes and performance characteristics of each difference material.”).

The situation in this investigation is different than that in *Inclined-Field Acceleration*

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Tubes. In that investigation, the evidence showed that “research programs would have to be modified and some may have to be dropped” because “[t]he users consider the [accused product] to be greatly superior in performance to the [domestic product]—not to mention substantially less expensive—and therefore indispensable to their research efforts.” *Inclined-Field Acceleration Tubes*, 0080 WL 594319 at *14. As the RD in this investigation finds, in contrast, “there is no evidence that Umicore’s accused materials are indispensable to basic scientific research or that they are superior to alternative cathode materials (*i.e.*, other cathode materials such as LCO, NCA, LFP, and LMO” or to other NMC cathode materials that are available from other suppliers such as Nichia Chemical, Tanaka Chemical, L&F Corporation, Hunan Reshine, Toda Kogyo, and BASF. RD at 8. Testimony offered at the Commission hearing confirmed the RD’s finding that no basic research is being conducted with respect to the Umicore MX and TX articles. Commission Hearing Tr. at 244. Testimony at the Commission hearing revealed that there are several alternative suppliers of NMC materials, including BASF and Nichia. Commission Hearing Tr. at 206, 218. In addition, Toda and LG Chem have obtained licenses from ANL to produce NMC material. Commission Hearing Tr. at 70. Indeed, counsel for Umicore suggested that NMC material from other suppliers could be adequate substitutes for Umicore’s NMC. Commission Hearing Tr. at 77-78. Moreover, Umicore’s counsel admitted the record did not contain any direct comparison of Umicore MX and TX material to BASF material in terms of a specific attribute or performance characteristic. *Id.* at 80.

The expressed concern instead, according to Umicore, boils down to a question of whether the other suppliers could provide enough material to supply the U.S. market. *Id.* at 66-67, 77-79. No evidence in the record suggests that they cannot. To the contrary, ample evidence

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in the record, as well as testimony at the hearing, demonstrates that supplies of NMC powders competitive with the Umicore materials at issue here, including domestic sources such as BASF and foreign sources such as Nichia, are available in commercial volumes. *See, e.g.*, RD at 6, 9; Commission Hearing Tr. at 71, 88, 205-06. The evidence shows that [[
]]. *See* Commission Hearing Tr. (Pillot) at 204.

Some of those appearing before the Commission expressed concerns that an exclusion order in this investigation might be harmful to national security. *See, e.g.*, Commission Hearing Tr. (Lattiff, Wessner) at 163-169. However, under 19 U.S.C. § 1337(l) the proposed exclusion order in this investigation states that “the provisions of this Order shall not apply to infringing lithium metal oxide cathode materials that are imported by or for the use of the United States, or imported for and to be used for, the United States with the authorization or consent of the Government.” In addition, the DOE witness explained that since the patents at issue originated from Argonne, one of the country’s national laboratories, “the entire government retains rights to use it for university research, defense research or any government research or government-funded research whatsoever,” and “[t]hat would be true notwithstanding an exclusion order.” Commission Hearing Tr. (Croley) at 193, 233-34.

Some witnesses argued that any exclusion order should be limited to power tools because this investigation allegedly from inception was focused on power tools and accessories. Commission Hearing Tr. (Hillman) at 148-155. But as both Umicore and Ms. Hillman acknowledge (Commission Hearing Tr. at 148, 17), Makita, the entity accused of importing power tools, was terminated from the investigation based upon settlement, and the investigation continued as to the Umicore NMC cathode materials that were within the scope of the

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investigation, with Umicore's full participation.

There was also concern expressed about the availability of NMC material for the medical industry. However, Mr. Rubino from Greatbatch, the only representative from the medical industry to appear, admitted that an exclusion order will have no bearing on its ongoing research because Greatbatch does not use the Umicore MX and TX cathode materials that are subject to exclusion in this investigation. Commission Hearing Tr. at 115:13-15, 75-76.

In contrast to those who opposed issuance of an exclusion order, some witnesses testified that the public interest would be harmed if an exclusion order is *not* issued. In particular, there is testimony that the U.S. government's efforts to promote domestic economic growth in the area of clean energy and to license the patented technology, which was developed with taxpayer funds, would be harmed if the Commission were to decline to issue an exclusion order in this investigation. Commission Hearing Tr. at 92, 187-188. The DOE witnesses testified that through its aggressive public licensing efforts concerning the two patents in question here, "dozens of millions of dollars" were invested to build plants in the United States to make NMC material and batteries using those materials. *Id.* If the patent rights asserted here "were not secure, the brute fact is that companies like BASF will be disinclined to make investments like those made here." *Id.* at 188, 192. Further, they stated that such a result would retard rather than promote competition. "Competition requires allowing those who license and who take new technologies to market to protect their investments." *Id.*

As to other general public interest concerns raised by the witnesses appearing at the Commission hearing, the IA aptly observed that such expressed concerns "relate to batteries generally or any materials for making batteries, rather than specifically about the products at

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issue in this investigation. Overly broad concerns, such as concerns about products that are beyond the scope of the requested relief, do not weigh against entry of an [exclusion] order that is directed only to Respondents' cathode material that infringe these patents." Commission Hearing Tr. at 24:8-15.

In sum, the record of the investigation shows that NMC materials covered by the patents are available in the United States from several sources, for both research and commercial production, and that there are also numerous alternative cathode materials. The record does not support Umicore's contention that any research project in the United States utilizing Umicore MX and TX material will be impeded or delayed by an exclusion order. Further, pursuant to DOE's technology transfer program, licenses to the patented technology ensure that all government sponsored and government funded research may continue, notwithstanding an exclusion order, and that, under existing licenses and potential future licenses, users have access to Umicore material. As counsel for Complainants explained, despite Complainants' willingness to offer a license, Umicore "has steadfastly refused" to take a license to practice the asserted patents. Commission Hearing Tr. (LoCascio) at 71 ("And so the U.S. industry and the U.S. businesses that may be doing R&D around this have access both from other suppliers, including BASF, [and] the potential for license, which Umicore has steadfastly refused . . .").

Thus, based on the evidence in this investigation, the Commission finds that none of the public interest factors would be adversely affected by an exclusion order directed to the subject articles found to infringe the asserted patents in violation of Section 337.

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IV. BOND

During the 60-day period of Presidential review, imported articles otherwise subject to remedial orders are entitled to conditional entry under bond. 19 U.S.C. § 1337(j)(3). The amount of the bond is specified by the Commission and must be an amount sufficient to protect the complainant from any injury. *Id.*; 19 C.F.R. § 210.50(a)(3). The Commission frequently sets the bond by attempting to eliminate the difference in sales prices between the patented domestic product and the infringing product. *Certain Microsphere Adhesives, Process For Making Same, and Products Containing Same, Including Self-Stick Repositionable Notes*, Inv. No. 337-TA-366, Comm'n Op. at 24, USITC Pub. No. 2949 (Jan. 1996). In other cases, the Commission has turned to alternative approaches, especially when the level of a reasonable royalty rate could be ascertained. *See, e.g., Certain Integrated Circuit Telecommunication Chips and Products Containing Same, Including Dialing Apparatus*, Inv. No. 337-TA-337, Comm'n Op. at 41 (1995). In cases where the Commission does not have sufficient evidence upon which to base a determination of the appropriate amount of the bond, the Commission has set a 100 percent bond. *See Certain Sortation Systems, Parts Thereof, and Products Containing Same*, Inv. No. 337-TA-460, Comm'n Op. at 21 (Mar. 2003). Complainants bear the burden of establishing the need for a bond amount in the first place. *Certain Rubber Antidegradants, Components Thereof, and Prods. Containing Same*, Inv. No. 337-TA-533, Comm'n Op. at 39-40 (July 21, 2006).

The RD recommends that a bond be set in the amount of three percent of entered value of infringing Umicore products imported during the period of Presidential review. RD at 5. The three percent bond is based upon Argonne's past licensing practices. *See* RD at 4-6.

Complainants and the IA agree with the RD regarding the bond amount. *See* Compl.

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Sub. at 49-50; IA Sub. at 36. Umicore argues that no bond should issue because “Complainants presented no such evidence showing need, such as establishing the price differential between the accused and domestic products, or otherwise showing that they had both suffered harm due to Umicore’s imports.” Umicore Sub. at 50.

We disagree with Umicore. As the RD finds, the evidence shows that Umicore and BASF are competitors in the marketplace for NMC material and have several customers in common. *See* RD at 5-6. Thus, we agree with the RD that a bond is necessary during the period of Presidential review. The Commission has set bonds based on reasonable royalty rates. *See Integrated Circuit Telecommunication Chips*, Inv. No. 337-TA-337, Comm’n Op. at 41. Thus, as the RD recommends, the Commission hereby sets a bond in the amount of three percent of entered value for infringing products imported during the period of Presidential review.

By order of the Commission.



Lisa R. Barton
Secretary to the Commission

Issued: January 26, 2017

**CERTAIN LITHIUM METAL OXIDE CATHODE
MATERIALS, LITHIUM-ION BATTERIES FOR POWER
TOOL PRODUCTS CONTAINING SAME, AND POWER
TOOL PRODUCTS WITH LITHIUM-ION BATTERIES
CONTAINING SAME**

Inv. No. 337-TA- 951

PUBLIC CERTIFICATE OF SERVICE

I, Lisa R. Barton, hereby certify that the attached **COMMISSION OPINION** has been served by hand upon the Commission Investigative Attorney, Vu Bui, Esq., and the following parties as indicated, on **January 26, 2017**.



Lisa R. Barton, Secretary
U.S. International Trade Commission
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UNITED STATES INTERNATIONAL TRADE COMMISSION
Washington, D.C.

In the Matter of

**CERTAIN LITHIUM METAL OXIDE
CATHODE MATERIALS, LITHIUM-
ION BATTERIES FOR POWER TOOL
PRODUCTS CONTAINING SAME, AND
POWER TOOL PRODUCTS WITH
LITHIUM-ION BATTERIES
CONTAINING SAME**

Investigation No. 337-TA-951

**NOTICE OF COMMISSION DETERMINATION TO REVIEW IN PART A FINAL
INITIAL DETERMINATION FINDING A VIOLATION OF SECTION 337; TO DENY
MOTIONS FOR INTERVENTION AND TO REOPEN THE RECORD; AND,
PURSUANT TO COMMISSION RULE 210.45, TO GRANT RESPONDENTS'
REQUEST FOR A COMMISSION HEARING; SCHEDULE FOR FILING WRITTEN
SUBMISSIONS ON THE ISSUES UNDER REVIEW AND ON REMEDY, THE PUBLIC
INTEREST AND BONDING**

AGENCY: U.S. International Trade Commission.

ACTION: Notice.

SUMMARY: Notice is hereby given that the U.S. International Trade Commission has determined to review in part the final initial determination ("ID") issued by the presiding administrative law judge ("ALJ") on February 29, 2016, finding a violation of section 337 of the Tariff Act of 1930, as amended (19 U.S.C. § 1337), as to the asserted patent claims in this investigation. The Commission has also determined to deny motions for intervention and to reopen the record. Pursuant to Commission Rule 210.45 (19 C.F.R. § 210.45), Respondents' request for a Commission hearing has been granted. A notice providing the scope and details of the hearing will be forthcoming.

FOR FURTHER INFORMATION: Panyin A. Hughes, Office of the General Counsel, U.S. International Trade Commission, 500 E Street, S.W., Washington, D.C. 20436, telephone 202-205-3042. Copies of non-confidential documents filed in connection with this investigation are or will be available for inspection during official business hours (8:45 a.m. to 5:15 p.m.) in the Office of the Secretary, U.S. International Trade Commission, 500 E Street, S.W., Washington, D.C. 20436, telephone 202-205-2000. General information concerning the Commission may also be obtained by accessing its Internet server (<http://www.usitc.gov>). The public record for this investigation may be viewed on the Commission's electronic docket (EDIS) at

<http://edis.usitc.gov>. Hearing-impaired persons are advised that information on this matter can be obtained by contacting the Commission's TDD terminal on 202-205-1810.

SUPPLEMENTARY INFORMATION: The Commission instituted this investigation on March 30, 2015, based on a complaint filed by BASF Corporation of Florham Park, New Jersey and UChicago Argonne LLC of Lemont, Illinois (collectively, "Complainants"). 80 *Fed. Reg.* 16696 (Mar. 30, 2015). The complaint alleges violations of section 337 of the Tariff Act of 1930, as amended (19 U.S.C. § 1337), in the importation into the United States, the sale for importation, and the sale within the United States after importation of certain lithium metal oxide cathode materials, lithium-ion batteries for power tool products containing same, and power tool products with lithium-ion batteries containing same by reason of infringement of one or more of claims 1-4, 7, 13, and 14 of U.S. Patent No. 6,677,082 ("the '082 patent") and claims 1-4, 8, 9, and 17 of U.S. Patent No. 6,680,143 ("the '143 patent"). *Id.* The notice of investigation named the following respondents: Umicore N.V. of Brussels, Belgium; Umicore USA Inc. of Raleigh, North Carolina (collectively, "Umicore"); Makita Corporation of Anjo, Japan; Makita Corporation of America of Buford, Georgia; and Makita U.S.A. Inc. of La Mirada, California (collectively, "Makita"). *Id.* The Office of Unfair Import Investigations is a party to the investigation.

On November 5, 2015, the ALJ granted a joint motion by Complainants and Makita to terminate the investigation as to Makita based upon settlement. *See* Order No. 32 (Nov. 5, 2015). The Commission determined not to review. *See* Notice (Nov. 23, 2015).

On December 1, 2015, the ALJ granted an unopposed motion by Complainants to terminate the investigation as to claim 8 of the '082 patent. *See* Order No. 35 (Dec. 1, 2015). The Commission determined not to review Order No. 35. *See* Notice (Dec. 22, 2015).

On February 29, 2016, the ALJ issued his final ID, finding a violation of section 337 by Umicore in connection with claims 1-4, 7, 13, and 14 of the '082 patent and claims 1-4, 8, 9, and 17 of the '143 patent. Specifically, the ID found that the Commission has subject matter jurisdiction, *in rem* jurisdiction over the accused products, and *in personam* jurisdiction over Umicore. ID at 10-11. The ID found that Complainants satisfied the importation requirement of section 337 (19 U.S.C. § 1337(a)(1)(B)). *Id.* at 9-10. The ID found that the accused products directly infringe asserted claims 1-4, 7, 13, and 14 of the '082 patent; and asserted claims 1-4, 8, 9, and 17 of the '143 patent, and that Umicore contributorily infringes those claims. *See* ID at 65-71, 83-85. The ID, however, found that Complainants failed to show that Umicore induces infringement of the asserted claims. *Id.* at 79-83. The ID further found that Umicore failed to establish that the asserted claims of the '082 or '143 patents are invalid for lack of enablement or incorrect inventorship. ID at 118-20. The ID also found that Umicore's laches defense fails as a matter of law (ID at 122-124) and also fails on the merits (ID at 124-126). Finally, the ID found that Complainants established the existence of a domestic industry that practices the asserted patents under 19 U.S.C. § 1337(a)(2). *See* ID at 18, 24.

On March 14, 2016, Umicore filed a petition for review of the ID. Also on March 14, 2016, the Commission investigative attorney ("IA") petitioned for review of the ID's finding that a laches defense fails as a matter of law in section 337 investigations. Further on March 14,

2016, Complainants filed a contingent petition for review of the ID. That same day, Umicore filed a motion under Commission Rules 210.15(a)(2) and 210.38(a) (19 C.F.R. §§ 210.15(a)(2) and 210.38(a)), for the Commission to reopen the record in this investigation to admit a paper published on October 29, 2015, and a press release issued that day (collectively, “documents”). On March 22, 2016, the parties filed responses to the petitions for review. On March 24, 2016, Complainants and the IA filed oppositions to Umicore’s motion to reopen the record. On April 5, 2016, Umicore moved for leave to file a reply. The Commission has determined to grant Umicore’s motion for leave to file a reply.

On April 8, 2016, 3M Corporation (“3M”) filed a motion to intervene under Commission Rule 210.19. 3M requests that the Commission grant it “with full participation rights in this Investigation in order to protect its significant interests in the accused materials.”

Having examined the record of this investigation, including the final ID, the petitions for review, and the responses thereto, the Commission has determined to review the final ID in part. Specifically, the Commission has determined to review (1) the ID’s contributory and induced infringement findings; (2) the ID’s domestic industry findings under 19 U.S.C. § 1337(a)(3)(C); and (3) the ID’s findings on laches.

The Commission has determined to deny Umicore’s motion to reopen the record to admit the documents. The Commission notes that the documents that Umicore seeks to introduce into evidence were available as of October 29, 2015, the last day of the hearing before the ALJ. Thus, Umicore could not have presented them prior to the hearing. Nothing, however, prevented Umicore from filing a timely motion under Commission Rule 210.42(g) requesting the ALJ to reopen the record and consider the documents prior to issuance of the final ID. The Commission notes that the final ID did not issue until February 29, 2016, four months after the documents were published. Yet, Umicore made no attempt to request the ALJ to consider the documents in the final ID. Thus, the Commission has determined to deny Umicore’s motion to reopen the record at this late stage.

The Commission has determined to deny 3M’s motion to intervene. The Commission notes that 3M filed a public interest statement on April 8, 2016, making substantially the same arguments it makes in its motion to intervene. The Commission will consider 3M’s comments in considering remedy, bonding and the public interest this investigation if a violation of Section 337 is found.

The parties are requested to brief their positions on the issues under review with reference to the applicable law and the evidentiary record. In connection with its review, the Commission is interested in responses to the following questions:

1. Please discuss whether laches should be an available defense in a Section 337 investigation. In your response, please address how *SCA Hygiene Products v. First Quality Baby Prod.*, 807 F.3d 1311 (Fed. Cir. 2015), *cert. granted*, 578 U.S. – (May 2, 2016), applies and any statutory support for your position.

2. Please discuss whether a good faith belief of non-infringement negates a contributory infringement finding, where the accused products have no substantial non-infringing uses. In your response, please address the impact of the following cases: *Commil USA, LLC v. Cisco Sys., Inc.*, 135 S. Ct. 1920 (2015); *Global-Tech Appliances, Inc. v. SEB S.A.*, 131 S. Ct. 2060, 2068 (2011); *Spansion, Inc. v. International Trade Comm'n*, 629 F.3d 1331, 1359 (Fed. Cir. 2010); *Golden Blount, Inc. v. Robert H. Peterson Co.*, 438 F.3d 1354 (Fed. Cir. 2006).
3. Please point to evidence (or lack of evidence) showing that Umicore had a good faith belief of non-infringement, including evidence showing that Umicore relied upon that belief.
4. Please discuss in detail the extent to which an exclusion order would affect research and development efforts with respect to lithium ion batteries by universities and private companies. *See* Statement of Umicore S.A. And Umicore USA Inc. Regarding the Public Interest at 1(Apr. 4, 2016). In your response, identify each university and private company engaged in such research and development efforts.
5. Please provide a detailed discussion of the record evidence as to whether Umicore's NMC material is uniquely suited for specific applications in energy saving technology, cutting-edge research and development, including identifying those specific areas and volumes involved and whether any other material can be used in such applications. *See* Statement of Umicore S.A. And Umicore USA Inc. Regarding the Public Interest at 1-2.
6. Please discuss whether each of the research companies and universities currently using Umicore NMC material (*See* Statement of Umicore S.A. And Umicore USA Inc. Regarding the Public Interest at 1-2) may also use materials from other sources for each of their specific research projects.
7. Please discuss whether NMC materials produced by other suppliers have lower performance characteristics and consistency. *See* Statement of Umicore S.A. And Umicore USA Inc. Regarding the Public Interest at 2-3.
8. Please discuss how the Umicore NMC material relates to 3M's research and whether other suppliers provide comparable material that 3M can use in its research. *See* 3M Company's Comments on the Effect on the Public Interest of the Proposed Remedy in the Recommended Determination (Apr. 8, 2016).
9. Please identify the suppliers of NMC to the U.S. market and the percentage of the market held by each.

Pursuant to Commission rule 210.45 (19 C.F.R. § 210.45), Umicore's request for a Commission hearing has been granted. A notice providing the scope and details of the hearing will be forthcoming.

In connection with the final disposition of this investigation, the Commission may (1) issue an order that could result in the exclusion of the subject articles from entry into the United States, and/or (2) issue one or more cease and desist orders that could result in the respondent being required to cease and desist from engaging in unfair acts in the importation and sale of such articles. Accordingly, the Commission is interested in receiving written submissions that address the form of remedy, if any, that should be ordered. If a party seeks exclusion of an article from entry into the United States for purposes other than entry for consumption, the party should so indicate and provide information establishing that activities involving other types of entry either are adversely affecting it or likely to do so. For background, see *Certain Devices for Connecting Computers via Telephone Lines*, Inv. No. 337-TA-360, USITC Pub. No. 2843 (December 1994) (Commission Opinion).

If the Commission contemplates some form of remedy, it must consider the effects of that remedy upon the public interest. The factors the Commission will consider include the effect that an exclusion order and/or cease and desist orders would have on (1) the public health and welfare, (2) competitive conditions in the U.S. economy, (3) U.S. production of articles that are like or directly competitive with those that are subject to investigation, and (4) U.S. consumers. The Commission is therefore interested in receiving written submissions that address the aforementioned public interest factors in the context of this investigation.

If the Commission orders some form of remedy, the U.S. Trade Representative, as delegated by the President, has 60 days to approve or disapprove the Commission's action. See Presidential Memorandum of July 21, 2005. 70 *Fed. Reg.* 43251 (July 26, 2005). During this period, the subject articles would be entitled to enter the United States under bond, in an amount determined by the Commission and prescribed by the Secretary of the Treasury. The Commission is therefore interested in receiving submissions concerning the amount of the bond that should be imposed if a remedy is ordered.

WRITTEN SUBMISSIONS: The parties to the investigation are requested to file written submissions on the issues identified in this notice. Parties to the investigation, interested government agencies, and any other interested parties are encouraged to file written submissions on the issues of remedy, the public interest, and bonding. Such submissions should address the recommended determination by the ALJ on remedy and bonding. Complainants and the IA are requested to submit proposed remedial orders for the Commission's consideration. Complainants are also requested to state the date that the patents expire and the HTSUS numbers under which the accused products are imported. Complainants are further requested to supply the names of known importers of the Umicore products at issue in this investigation. The written submissions and proposed remedial orders must be filed no later than close of business on May 23, 2016. Reply submissions must be filed no later than the close of business on June 2, 2016. Opening submissions are limited to 50 pages. Reply submissions are limited to 25 pages. Such submissions should address the ALJ's recommended determinations on remedy and bonding. No further submissions on any of these issues will be permitted unless otherwise ordered by the Commission.

Persons filing written submissions must file the original document electronically on or before the deadlines stated above and submit eight true paper copies to the Office of the Secretary by noon the next day pursuant to section 210.4(f) of the Commission's Rules of Practice and Procedure (19 C.F.R. 210.4(f)). Submissions should refer to the investigation number ("Inv. No. 337-TA-951") in a prominent place on the cover page and/or the first page. (See Handbook for Electronic Filing Procedures, http://www.usitc.gov/secretary/fed_reg_notices/rules/handbook_on_electronic_filing.pdf). Persons with questions regarding filing should contact the Secretary (202-205-2000).

Any person desiring to submit a document to the Commission in confidence must request confidential treatment. All such requests should be directed to the Secretary to the Commission and must include a full statement of the reasons why the Commission should grant such treatment. See 19 C.F.R. § 201.6. Documents for which confidential treatment by the Commission is properly sought will be treated accordingly. A redacted non-confidential version of the document must also be filed simultaneously with any confidential filing. All non-confidential written submissions will be available for public inspection at the Office of the Secretary and on EDIS.

The authority for the Commission's determination is contained in section 337 of the Tariff Act of 1930, as amended (19 U.S.C. § 1337), and in Part 210 of the Commission's Rules of Practice and Procedure (19 C.F.R. Part 210).

By order of the Commission.



Lisa R. Barton
Secretary to the Commission

Issued: May 11, 2016

**CERTAIN LITHIUM METAL OXIDE CATHODE
MATERIALS, LITHIUM-ION BATTERIES FOR POWER
TOOL PRODUCTS CONTAINING SAME, AND POWER
TOOL PRODUCTS WITH LITHIUM-ION BATTERIES
CONTAINING SAME**

Inv. No. 337-TA- 951

PUBLIC CERTIFICATE OF SERVICE

I, Lisa R. Barton, hereby certify that the attached **NOTICE** has been served by hand upon the Commission Investigative Attorney, **James Wiley, Esq.**, and the following parties as indicated, on 5/11/2016.



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PUBLIC VERSION

UNITED STATES INTERNATIONAL TRADE COMMISSION

Washington, D.C.

In the Matter of

**CERTAIN LITHIUM METAL OXIDE CATHODE
MATERIALS, LITHIUM-ION BATTERIES FOR
POWER TOOL PRODUCTS CONTAINING SAME,
AND POWER TOOL PRODUCTS WITH LITHIUM-
ION BATTERIES CONTAINING SAME**

Inv. No. 337-TA-951

INITIAL DETERMINATION ON VIOLATION OF SECTION 337

Administrative Law Judge Thomas B. Pender

(February 29, 2016)

Pursuant to the Notice of Investigation and Rule 210.42(a) of the Rules of Practice and Procedure of the United States International Trade Commission, this is my Initial Determination in the matter of *Certain Lithium Metal Oxide Cathode Materials, Lithium-Ion Batteries for Power Tool Products Containing Same, and Power Tool Products with Lithium-Ion Batteries Containing Same*, Investigation No. 337-TA-951.

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TABLE OF ABBREVIATIONS

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CIB	Complainants' Corrected Initial Post-Hearing Brief filed February 19, 2016
Co	Cobalt
CPB	Complainants' Pre-Hearing Brief filed October 5, 2015
CPX	Complainants' Physical Exhibit
CRB	Complainants' Corrected Reply Post-Hearing Brief filed February 19, 2016
CX	Complainants' Exhibit
Dep.	Deposition
DWS	Direct Witness Statement (Including Revised Direct Witness Statements)
Hearing Tr.	Corrected Hearing Transcript filed January 13, 2016
JX	Joint Exhibit
Li	Lithium
Mn	Manganese
NCM	Nickel Cobalt Manganese
Ni	Nickel
NMC	Nickel Manganese Cobalt
RDX	Respondents' Demonstrative Exhibit
RIB	Respondents' Corrected Initial Post-Hearing Brief filed February 22, 2016
RPB	Respondents' Corrected Pre-Hearing Brief filed October 5, 2015
RPX	Respondents' Physical Exhibit
RRB	Respondents' Corrected Reply Post-Hearing Brief filed February 22, 2016
RWS	Rebuttal Witness Statement

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RX	Respondents' Exhibit
SIB	Staff's Corrected Initial Post-Hearing Brief filed February 22, 2016
SPB	Staff's Pre-Hearing Brief filed October 15, 2015
SRB	Staff's Corrected Reply Post-Hearing Brief filed February 22, 2016
SWS	Supplemental Witness Statement
TM	Transition Metal
Tr.	Transcript
WS	Witness Statement

I. INTRODUCTION

A. Procedural Background

Complainants BASF Corporation (“BASF”) and UChicago Argonne LLC (“UChicago”) filed a complaint on February 20, 2015, asserting a violation of Section 337 based on the alleged infringement of U.S. Patents 6,677,082 (“the ’082 patent”) and 6,680,143 (“the ’143 patent”) (collectively, “the Asserted Patents”), against Respondents Umicore N.V. and Umicore USA Inc. (collectively, “Umicore”) and against Respondents Makita Corporation, Makita Corporation of America, and Makita U.S.A. Inc. (collectively, “Makita”).

By publication in the Federal Register, on March 30, 2015, the Commission instituted Investigation No. 337-TA-951, naming BASF, UChicago, Umicore, Makita, and the Office of Unfair Import Investigations (“Staff”) as parties,

to determine whether there is a violation [by Umicore and Makita] of subsection (a)(1)(B) of section 337 in the importation into the United States, the sale for importation, or the sale within the United States after importation of certain lithium metal oxide cathode materials, lithium-ion batteries for power tool products containing same, and power tool products with lithium-ion batteries containing same by reason of infringement of one or more of claims 1-4, 7, 8, 13, and 14 of the ’082 patent and claims 1-4, 8, 9, and 17 of the ’143 patent, and whether an industry in the United States exists as required by subsection (a)(2) of section 337.

80 Fed. Reg. 16696 (Mar. 30, 2015). The Commission also directed the presiding Administrative Law Judge to “take evidence or other information and hear arguments from the parties and other interested persons with respect to the public interest in this investigation, as appropriate, and provide the Commission with findings of fact and a recommended determination on this issue” *Id.*

On October 27, 2015, Complainants and Makita reached a settlement agreement and filed a joint motion to terminate the Makita Respondents from the investigation, which I granted on

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November 5, 2015. *See* Order No. 32, Inv. No. 337-TA-951 (U.S.I.T.C. Nov. 5, 2015). The Umicore Respondents remained in the investigation and an evidentiary hearing was held during the week of October 26, 2015.

On December 1, 2015, Complainants filed an unopposed motion for partial termination of the investigation as to claim 8 of the '082 patent, which I granted on December 1, 2015. *See* Order No. 35, Inv. No. 337-TA-951 (U.S.I.T.C. Dec. 1, 2015). Claims 1-4, 7, 13, and 14 of the '082 patent and claims 1-4, 8, 9, and 17 of the '143 patent remain at issue in this investigation (“Asserted Claims”).

B. The Parties

Complainant BASF is a Delaware corporation with a principal place of business at 100 Campus Drive, Florham Park, New Jersey 07932. *See* Complaint at ¶ 9, Inv. No. 337-TA-951 (U.S.I.T.C. Feb. 20, 2015). BASF is the exclusive licensee of the Asserted Patents. *See id.*

Complainant Argonne is an Illinois corporation with a principal place of business at 9700 S. Cass Avenue, Lemont, Illinois 60439. *See id.* at ¶ 10. Argonne is the assignee and owner of the Asserted Patents. *See id.*

Respondent Umicore S.A.¹ is a company organized under the laws of Belgium, with a principal place of business at Broekstraat 31, 1000 Brussels, Belgium. (*See* Umicore’s Response to Complaint at ¶ 16, Inv. No. 337-TA-951 (U.S.I.T.C. Apr. 24, 2015).)

Respondent Umicore USA Inc. is a Delaware corporation with a principal place of business at 3600 Glenwood Avenue, Suite 250, Raleigh, North Carolina 27612. *See id.* at ¶ 17.

¹ Umicore S.A. and Umicore N.V. “refer to the same entity.” *See* Umicore’s Response to Complaint at ¶ 16, Inv. No. 337-TA-951 (U.S.I.T.C. Apr. 24, 2015).

C. The Asserted Patents

The Asserted Patents² are related and share substantially similar specifications. The title of the Asserted Patents is: “Lithium Metal Oxide Electrodes for Lithium Cells and Batteries.” The asserted patents disclose lithium metal oxide positive electrodes having a general formula $x\text{LiMO}_2 \cdot (1-x)\text{Li}_2\text{M}'\text{O}_3$ wherein Li is lithium, O is oxygen, and M and M' are transition metals. The named inventors are: Michael M. Thackeray, Christopher S. Johnson, Khalil Amine, and Jaekook Kim.

The '082 patent was filed on January 21, 2001 and issued on January 13, 2004. The '082 patent claims priority to U.S. provisional patent application serial number 60/213,618, filed on June 22, 2000. The '082 patent was also the subject of reexamination proceedings, U.S. Patent Application Serial No. 90/012,243, before the United States Patent and Trademark Office (“USPTO”). A reexamination certificate was issued on July 19, 2013.

The '143 patent issued from a continuation-in-part application to the patent application which issued as the '082 patent. The '143 patent was filed on November 21, 2001 and issued on January 20, 2004. No *ex parte* reexamination proceedings were filed against the '143 patent and the claims were not amended after they originally issued on January 20, 2004 (except to delete an unnecessary semicolon, as stated in the Certificate of Correction dated July 6, 2004). See JX-2, '143 patent, Certificate of Correction.

Claim 1 of the '082 patent is representative of the Asserted Claims and recites:

A lithium metal oxide positive electrode for a non-aqueous lithium cell prepared in its initial discharged state having a general formula $x\text{LiMO}_2 \cdot (1-x)\text{Li}_2\text{M}'\text{O}_3$ in which $0 < x < 1$, and where M is one or more ions having an average oxidation state of three with at least

² The effective date of the Asserted Patents pre-dates the America Invents Act (“AIA”) enacted by Congress on September 16, 2011.

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one ion being Ni, and where M' is one or more ions with an average oxidation state of four with at least one ion being Mn, with both the LiMO_2 and $\text{Li}_2\text{M}'\text{O}_3$ components being layered and the ratio of Li to M and M' being greater than one and less than two; and wherein domains of the LiMO_2 and $\text{Li}_2\text{M}'\text{O}_3$ components exist side by side.

See JX-1, '082 patent, Reexamination Certificate.

Claim 1 of the '143 patent is similar and recites:

A lithium metal oxide positive electrode for a non-aqueous lithium cell prepared in its initial discharged state having a general formula $x\text{LiMO}_2 \cdot (1-x)\text{Li}_2\text{M}'\text{O}_3$ in which $0 < x < 1$, and where M is one or more ions with an average oxidation state of three with at least one ion being Mn, and where M' is one or more ions with an average oxidation state of four, with both the LiMO_2 and $\text{Li}_2\text{M}'\text{O}_3$ components being layered and the ratio of Li to M and M' being greater than one and less than two.

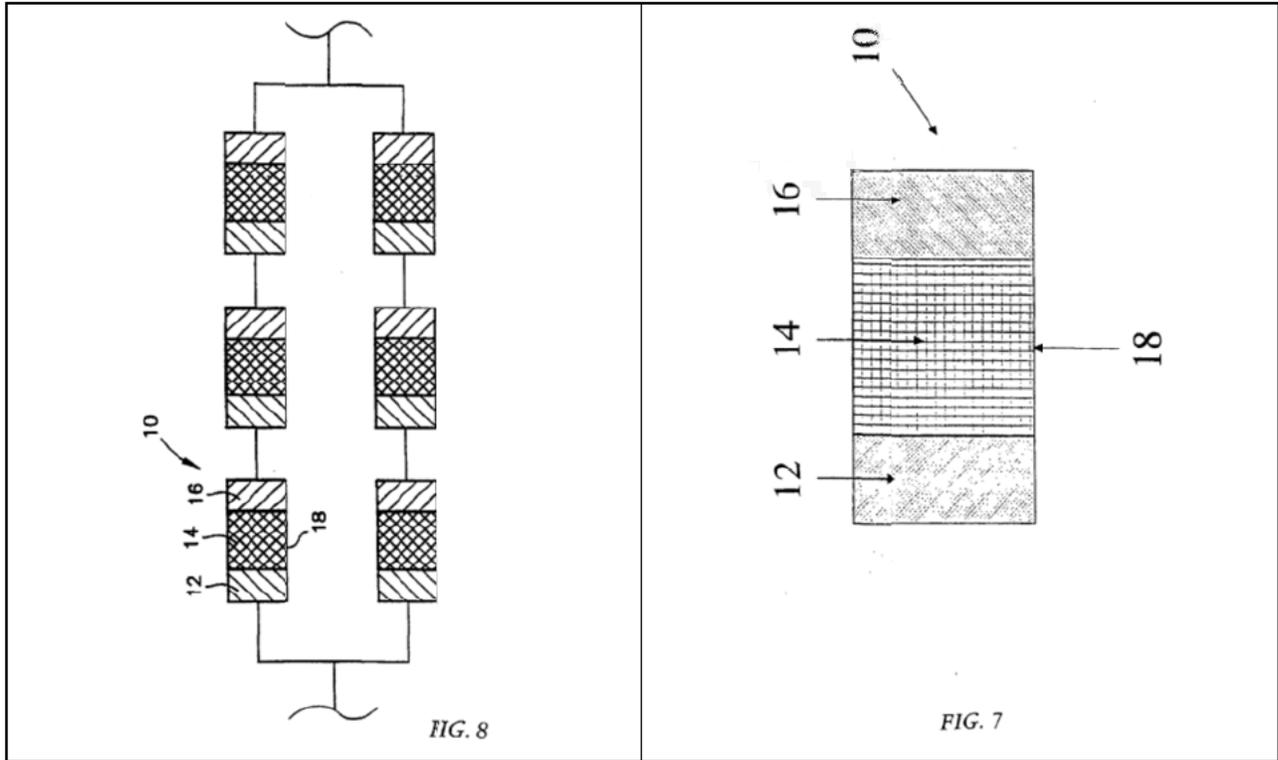
See JX-2, '143 patent at 10:18-26, Certificate of Correction.

D. Technical Overview

The Asserted Patents relate to lithium metal oxide electrodes for lithium cells and batteries. As explained in the Asserted Patents:

This invention, therefore, relates to a lithium-metal oxide positive electrode for a non-aqueous electrochemical lithium cell as shown schematically in FIG. 7, the cell represented by the numeral 10 having a negative electrode 12 separated from a positive electrode 16 by an electrolyte 14, all contained in an insulating housing 18 with suitable terminals (not shown) being provided in electronic contact with the negative electrode 12 and the positive electrode 16. . . . FIG. 8 shows a schematic illustration of one example of a battery in which two strings of electrochemical lithium cells, described above, are arranged in parallel, each string comprising three cells arranged in series.

See JX-1, '082 patent at 7:10-25; JX-2, '143 patent at 9:60-10:8. See also JX-1, '082 patent at Figs. 7 and 8 (or JX-2, '143 patent at Figs. 13 and 14), reproduced below.



See also CX-4C, Kirchheim DWS at Q/A 54; CDX-317C, reproduced below:

Battery

Individual electrochemical cells connected in series or in parallel make up a battery

'082 Patent, Fig. 8

CDX-317C

Prior art lithium metal oxide electrodes were structurally unstable and were degrading over time. See JX-1, '082 patent at 1:63-2:11:

A major problem of layered LiMO_2 compounds containing either Co or Ni (or both) is that the trivalent transition metal cations, M, are oxidized during charge of the cells to a metastable tetravalent oxidation state. Such compounds are highly oxidizing materials and can react with the electrolyte or release oxygen. These electrode materials can, therefore, suffer from structural instability in charged cells when, for example, more than 50% of the lithium is extracted from their structures; they require stabilization to combat such chemical degradation.

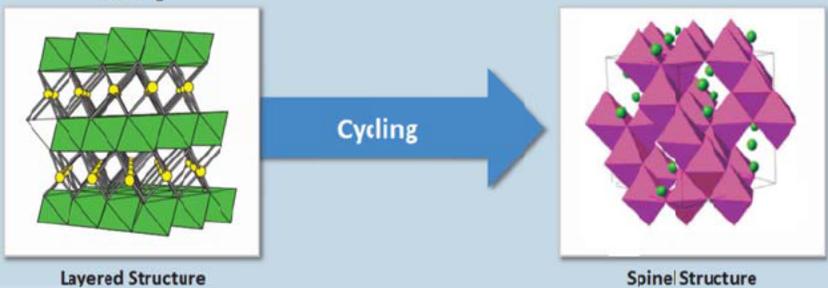
Although the layered manganese compound LiMnO_2 has been successfully synthesized in the laboratory, it has been found that delithiation of the structure and subsequent cycling of the Li_xMnO_2 electrode in electrochemical cells causes a transition from the layered MnO_2 configuration to the configuration of a spinel-type $[\text{Mn}_2]\text{O}_4$ structure.”).

See also CX-1C, Thackeray WS at Q/A 49; CDX-21, reproduced below:

Structural Instability of LiMO_2 Compounds

Structure may change during cycling

LiMO_2



Layered Structure

Spinel Structure

'082 and '143 patents describe this problem

Although the layered manganese compound LiMnO_2 has been successfully synthesized in the laboratory, it has been found that delithiation of the structure and subsequent cycling of the Li_xMnO_2 electrode in electrochemical cells causes a transition from the layered MnO_2 configuration to the configuration of a spinel-type $[\text{Mn}_2]\text{O}_4$ structure. This

'082 patent, 2:6-11

CDX-0021

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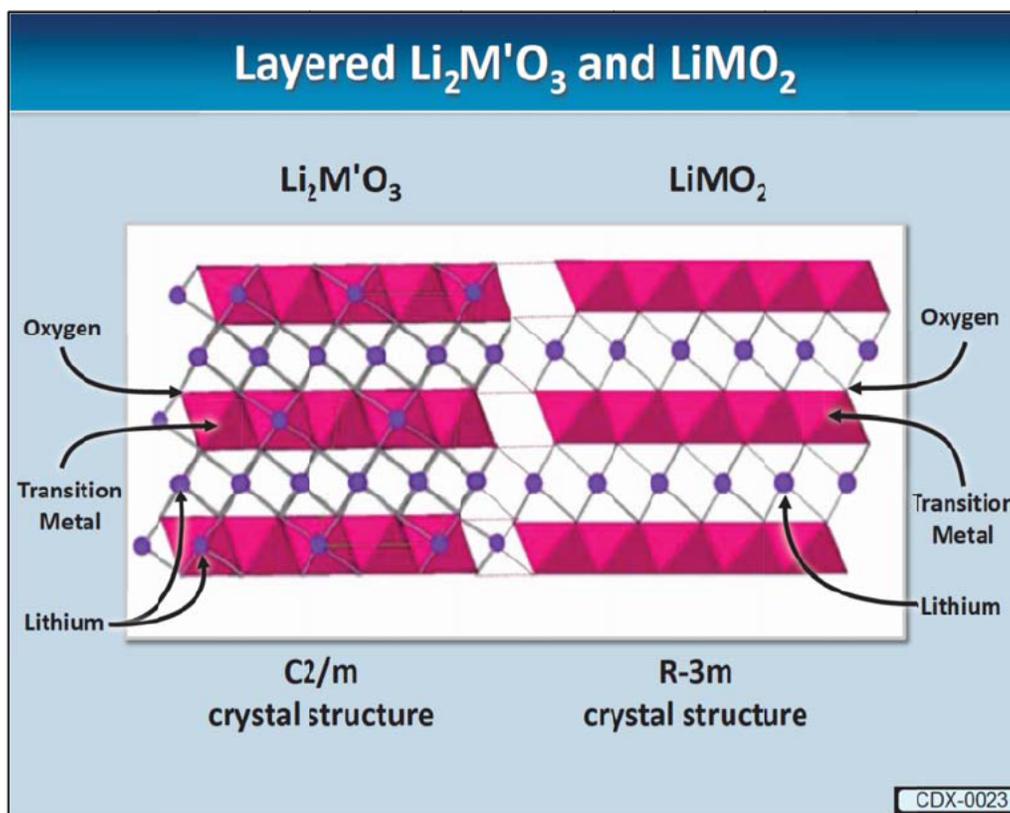
The Asserted Patents solved the prior art issues by using an integrated two-component structure to stabilize the lithium metal oxide electrodes. *See* JX-1, '082 patent at 2:63-3:8.

This invention relates to stabilized LiMO_2 electrodes whereby an electrochemically inert rocksalt phase Li_2MO_3 is introduced as a component to the overall electrode structure as defined, in its initial state, by the general formula $x\text{LiMO}_2 \cdot (1-x)\text{Li}_2\text{M}'\text{O}_3$ alternatively $\text{Li}_{2-x}\text{M}_x\text{M}'_{1-x}\text{O}_{3-x}$ in which $0 < x < 1$, preferably $0.8 \leq x < 1$, and more preferably $0.9 \leq x < 1$, and where M is one or more trivalent ions having at least one ion selected from Mn and where M' is one or more tetravalent ion selected preferably from Mn, Ti and Zr, or alternatively, where M is one or more trivalent ions having at least one ion selected from Ni and where M' one or more tetravalent ions having at least one ion selected from Mn.

See also JX-4 at 550, '082 Patent Reexamination History, Dr. Thackeray's Presentation dated April 15, 2013 at slide 13 (stating that “[c]laim 1 unambiguously defines the formula in terms of a specific structure (*i.e.*, an integrated two-component structure).”), slide 18 (stating that the empirical formula, *i.e.* $\text{Li}_{2-x}\text{M}_x\text{M}'_{1-x}\text{O}_{3-x}$, conveys stoichiometric information but not structural information, unlike the two-component formula, *i.e.* $x\text{LiMO}_2 \cdot (1-x)\text{Li}_2\text{M}'\text{O}_3$).

The Asserted Patents further explain that “[t]he $x\text{LiMO}_2 \cdot (1-x)\text{Li}_2\text{M}'\text{O}_3$ structure can be regarded essentially as a compound with a common oxygen array for both the LiMO_2 and Li_2MnO_3 components, but in which the cation distribution can vary such that domains of the two components exist side by side.” *See* JX-1, '082 patent at 3:26-31. Dr. Thackeray exemplified such a structure, reproduced below, in his witness statement. (*See* CX-1C, Thackeray WS at Q/A 63; CDX-23.³)

³ C2/m and R-3m correspond to, respectively, monoclinic and rhombohedral crystal structures. (*See* CX-4C, Kirchheim DWS at Q/A 100; CDX-326C.)



See also JX-4 at 551, '082 Patent Reexamination History, Dr. Thac eray's Presentation dated April 15, 2013 at slide 14.

1. **Products at Issue**

The products at issue are lithium metal oxide cathode materials, lithium-ion batteries containing the same, and products with lithium-ion batteries containing the same, such as power tools. (See Complaint at ¶ 29, Inv. No. 337-TA-951 (U.S.I.T.C. Feb. 20, 2015).)

More specifically, both the domestic industry products and the accused products are NCM (Nickel Cobalt Manganese) or NMC (Nickel Manganese Cobalt) materials,⁴ *i.e.*, the metal element in the lithium metal oxide cathode material is nickel, cobalt, and manganese. The approximate ratio of each of nickel, cobalt, and manganese in the lithium metal oxide cathode

⁴ NCM and NMC refer to the same type of material.

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material is further expressed by a three-digit number that appears in the product's name. For example, NCM 111 corresponds to a ratio of nickel to cobalt to manganese of about 1:1:1. (*See* CX-4C, Kirchheim DWS at Q/A 850.)

1. Domestic Industry Products

Complainants identify five of BASF's cathode materials as their domestic industry products: NCM 111, NCM 424, NCM 523, NCM 622, and NCM 811. (*See* CIB at 103.)

2. Accused Products

The accused products in this Investigation include Umicore's Cellcore® MX (NMC 111) and TX products (NMC 532). (*See* CIB at 24; CX-221 at 13; RIB at 49.) Complainants assert that Umicore indirectly infringes the Asserted Claims when Umicore's customers use Umicore's Accused Products in a positive electrode, electrochemical cell, or battery in the United States. (*See* CIB at 24-25.)

II. JURISDICTION AND IMPORTATION

In order to have the power to decide a case, a court or agency must have both subject matter jurisdiction and jurisdiction over either the parties or the property involved. 19 U.S.C. § 1337; *Certain Steel Rod Treating Apparatus and Components Thereof*, Inv. No. 337-TA-97, Commission Memorandum Opinion, 215 U.S.P.Q. 229, 231 (U.S.I.T.C. 1981). Umicore does not dispute the Commission has subject matter jurisdiction over this investigation as well as personal jurisdiction over Umicore. (*See* RIB at 51.)

A. Importation and In Rem Jurisdiction

Umicore does not dispute that importations into the United States of the accused NMC materials have occurred. (*See* RIB at 51.) *See also* CX-0262C (Umicore's importation records of MX and TX products); CX-201C (U.S. Sales and Shipments of MX and TX Products); CX-207C (U.S. Sales and Shipments of TX Products). Accordingly, the Commission has *in rem*

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jurisdiction over the Accused Products. *See Sealed Air Corp. v. United States Int'l Trade Comm'n*, 645 F.2d 976, 985 (C.C.P.A. 1981).

B. Subject Matter Jurisdiction

Section 337 confers subject matter jurisdiction on the International Trade Commission to investigate, and if appropriate, to provide a remedy for, unfair acts and unfair methods of competition in the importation, the sale for importation, or the sale after importation of articles into the United States. *See* 19 U.S.C. §§ 1337(a)(1)(B) and (a)(2).

Complainants alleged that Umicore has violated Section 337 in the importation and sale of products that indirectly infringe the Asserted Patents. (*See, e.g.*, Complaint at ¶¶ 44-51, Inv. No. 337-TA-951 (U.S.I.T.C. Feb. 20, 2015).) Complainants have alleged sufficient facts that, if proven, would demonstrate that Umicore imports articles that indirectly infringe Umicore's patents. *See Certain Elec. Devices with Image Processing Sys., Components Thereof, & Assoc. Software*, Inv. No. 337-TA-724, Comm'n Op., 2012 WL 3246515, *7 (U.S.I.T.C. Dec. 21, 2011) (citing *Amgen, Inc. v. ITC*, 902 F.2d 1532, 1536 (Fed. Cir. 1990)). *See also Suprema, Inc. v. International Trade Comm'n*, 796 F.3d 1338, 1352-53 (Fed. Cir. 2015) (“[T]he Commission’s interpretation that the phrase ‘articles that infringe’ covers goods that were used by an importer to directly infringe post-importation as a result of the seller’s inducement is reasonable.”).

Accordingly, I find the Commission has subject matter jurisdiction over this Investigation under Section 337 of the Tariff Act of 1930.

C. Personal Jurisdiction

The Umicore Respondents fully participated in this Investigation by, among other things, participating in discovery, participating in the evidentiary hearing, and filing pre-hearing and post-hearing briefs. Accordingly, I find that Umicore submitted to the jurisdiction of the

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Commission. *See Certain Miniature Hacksaws*, Inv. No. 337-TA-237, Pub. No. 1948, Initial Determination at 4, 1986 WL 379287 (U.S.I.T.C. Oct. 15, 1986) (unreviewed by Commission in relevant part).

III. DOMESTIC INDUSTRY - ECONOMIC PRONG

The main dispute between the private parties is whether Complainants' domestic industry investments are quantitatively significant. As discussed below, I find that each of Complainants BASF and Argonne independently satisfies the economic prong of the domestic industry requirement.

A. Legal Standards

In a patent-based complaint, a violation of Section 337 can be found “only if an industry in the United States, relating to the articles protected by the patent ... concerned, exists or is in the process of being established.” 19 U.S.C. § 1337(a)(2). Under Commission precedent, this “domestic industry requirement” of section 337 consists of an economic prong and a technical prong. *Certain Stringed Musical Instruments and Components Thereof*, Inv. No. 337-TA-586, Comm’n Op. at 12-14 (U.S.I.T.C. May 16, 2008). The complainant bears the burden of establishing that the domestic industry requirement is satisfied. *See Certain Set-Top Boxes and Components Thereof*, Inv. No. 337-TA-454, Initial Determination at 294 (U.S.I.T.C. June 21, 2002) (unreviewed by Commission in relevant part).

The economic prong of the domestic industry requirement is defined in subsection (a)(3) of Section 337 as follows:

- (3) For purposes of paragraph (2), an industry in the United States shall be considered to exist if there is in the United States, with respect to the articles protected by the patent, copyright, trademark or mask work concerned --
 - (A) Significant investment in plant and equipment;

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- (B) Significant employment of labor or capital; or
- (C) Substantial investment in its exploitation, including engineering, research and development, or licensing.

19 U.S.C. § 1337(a)(3). The economic prong of the domestic industry requirement is satisfied by meeting the criteria of any one of the three factors listed above.

Pursuant to Section 337(a)(3)(A) and (B), “a complainant’s investment in plant and equipment or employment of labor or capital must be shown to be “significant” in relation to the articles protected by the intellectual property right concerned.” *Certain Printing and Imaging Devices and Components Thereof*, Inv. No. 337-TA-690, Comm’n Op. at 26 (February 17, 2011). The Commission has emphasized that “there is no threshold test for what is considered ‘significant’ within the meaning of the statute.” *Certain Kinesiotherapy Devices and Components Thereof*, Inv. No. 337-TA-823, Comm’n Op. at 33 (July 12, 2013). Instead, the determination is made by “an examination of the facts in each investigation, the article of commerce, and the realities of the marketplace.” *Certain Male Prophylactic Devices*, Inv. No. 337-TA-546, Comm’n Op. at 39 (U.S.I.T.C. Aug. 1, 2007). Qualitative and quantitative factors must both be considered in evaluating whether the economic prong is satisfied. *See Lelo Inc. v. ITC*, 786 F.3d 879, 883-85 (Fed. Cir. 2015).

Section 337(a)(3)(C) provides for domestic industry based on “substantial investment” in the enumerated activities, including licensing of a patent. *See Certain Digital Processors and Digital Processing Systems, Components Thereof, and Products Containing Same*, Inv. No. 337-TA-559, Initial Determination at 88 (U.S.I.T.C. May 11, 2007). Mere ownership of the patent is insufficient to satisfy the domestic industry requirement. *See id.* at 93 (citing the Senate and House Reports on the Omnibus Trade and Competitiveness Act of 1988, S. Rep. No. 71). However, entities that are actively engaged in licensing their patents in the United States can

meet the domestic industry requirement. *See id.* In addition, “under subparagraph (C), the complainant must establish that there is a nexus between the claimed investment and the asserted patent” *See Certain Integrated Circuit Chips and Products Containing Same*, 337-TA-859, Comm’n Op. at 38 (U.S.I.T.C. Aug. 22, 2014).

B. BASF Satisfies the Economic Prong of the Domestic Industry Requirement Under 19 U.S.C. § 1337(a)(3)(A), (B), and (C).

1. BASF’s NCM Products Qualify as Investments “With Respect To” Articles Protected by the Asserted Patents As Required Under 19 U.S.C. § 1337(a)(3).

BASF identifies five of BASF’s cathode materials as their domestic industry products: NCM 111, NCM 424, NCM 523, NCM 622, and NCM 811. (*See* CIB at 103.) BASF acknowledges that its NCM material is not the patented article (*i.e.*, the positive electrode⁵) but only a component of the patented electrode. Complainants argue that BASF’s NCM cathode materials are specifically designed for use in the patented NCM cathode. (*See* CRB at 89-90; CIB at 139-40 (citing *Motorola Mobility, LLC v. Int’l Trade Comm’n*, 737 F.3d 1345, 1351 (Fed. Cir. 2013) (“An investment directed to a specifically tailored, significant aspect of the article is still directed to the article.”))).)

I agree that BASF’s investments relating to its NCM materials qualify as investments “with respect to the articles protected by the patent” as required under Section 337(a)(3). *See* 19 U.S.C. § 1337(a)(3) (“[A]n industry in the United States shall be considered to exist if there is in

⁵ During the *Markman* phase of this investigation, Complainants argued that the claim term “positive electrode” referred to the “active material” (*e.g.*, the NCM material) rather than to an element of an electrochemical cell or battery. I disagreed with Complainants and construed “positive electrode” in accordance with its plain and ordinary meaning as “an electrical element from which lithium ions are released during charging.” *See* Order No. 14, Inv. No. 337-TA-951, at 12-15 (U.S.I.T.C. July 31, 2015).

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the United States, *with respect to* the articles protected by the patent”) (emphasis added).

The Federal Circuit explained that:

[N]othing in § 337 precludes a complainant from relying on investments or employment directed to significant components, specifically tailored for use in an article protected by the patent. The investments or employment must only be “with respect to the articles protected by the patent.” 19 U.S.C. § 1337(a)(3). An investment directed to a specifically tailored, significant aspect of the article is still directed to the article.

Motorola Mobility, 737 F.3d at 1351.

The NCM material is the most important component of the claimed positive electrode.

For example, claim 1 of the '082 patent recites:

A lithium metal oxide positive electrode for a non-aqueous lithium cell prepared in its initial discharged state having a general formula $x\text{LiMO}_2 \cdot (1-x)\text{Li}_2\text{M}'\text{O}_3$ in which $0 < x < 1$, and where M is one or more ions having an average oxidation state of three with at least one ion being Ni, and where M' is one or more ions with an average oxidation state of four with at least one ion being Mn, with both the LiMO_2 and $\text{Li}_2\text{M}'\text{O}_3$ components being layered and the ratio of Li to M and M' being greater than one and less than two; and wherein domains of the LiMO_2 and $\text{Li}_2\text{M}'\text{O}_3$ components exist side by side.

See JX-1, '082 patent, Reexamination Certificate. The underlined claim language above reads on BASF's NCM material. In fact, the active material (*e.g.*, the NCM material) is the only component of the claimed positive electrode that is expressly recited in claim 1 of the '082 patent. Other inactive components may be included but are not expressly recited in that claim. Indeed, as explained in the specification of the Asserted Patents, “[b]inders and other materials normally associated with both the electrolyte and the negative and positive electrodes are well known in the art and are not described herein, but are included as is understood by those of ordinary skill in this art.” See JX-1, '082 patent at 7:17-22; JX-2, '143 patent at 9:67-10:5.

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Umicore does not dispute that the NCM material is a critical component of the patented electrode. (See RRB at 114.) Likewise, the Staff agrees with BASF's reliance on the NCM material and argues that "the patented articles (positive electrodes, electrochemical cells, and batteries) will not function without it." (See SIB at 66 (citing CX-3C, Fetcenko WS at Q/A 39).)

Accordingly, I find that BASF's reliance on its NCM materials satisfies Section 337(a)(3)'s requirement that the investments or employment be "with respect to the articles protected by the patent." See *Motorola Mobility*, 737 F.3d at 1351 (citing 19 U.S.C. § 1337(a)(3)).

2. BASF's Investments

a. BASF's Investment in Plant and Equipment Under 19 U.S.C. § 1337(a)(3)(A)

BASF owns and operates five facilities in the United States in which BASF manufactures, engineers, tests, and develops its NCM materials: Elyria, Ohio; Troy, Michigan; Louisville, Kentucky; Beachwood, Ohio; and Rochester Hills, Michigan. (See CIB at 140-42; CX-3C, Fetcenko WS at Q/A 54.)

Between 2012 and February 2015, BASF spent \$50 million to build an NCM production plant in Elyria and another \$10 million to add a second kiln and double the plant's production capacity. (See CIB at 141-42 (citing CX-3C, Fetcenko WS at Q/As 72-78).)

BASF also invested approximately \$[] between 2012 and February 2015 in equipment for research and testing of BASF's NCM products at the Beachwood facility. (See CIB at 141; CX-3C, Fetcenko WS at Q/As 94-101.) Furthermore, BASF invested \$[] to upgrade the Troy facility and \$[] to modify the Louisville facility to enable drying of the wet cake precursor for NCM production. (See CIB at 141; CX-3C, Fetcenko WS at Q/As 81-7.) BASF also spent over \$[] in operating expenses, excluding labor and depreciation costs,

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at the Elyria and Troy facilities between 2012 and February 2015. (See CIB at 141; CX-3C, Fetcenko WS at Q/As 103-27.)

Neither Umicore nor the Staff disputes any of these investments, except that the Staff argues that BASF’s \$[] expenses at the Beachwood facility “relate more directly to prong (C).” (See RIB at 194; SIB at 63 n.8.) I find that BASF’s \$[] investment may qualify under either subsection (A) or (C) of Section 337(a)(3). See 19 U.S.C. § 1337(a)(3); *Certain Silicon Microphone Packages & Prods. Containing Same*, Inv. No. 337-TA-888, Order No. 47, 2014 WL 2738540, *5-7 (U.S.I.T.C. May 8, 2014) (finding that investments in labor and capital under section 337(a)(3)(B) also qualified as investments for engineering and research and development under section 337(a)(3)(C)).

Accordingly, I find that BASF’s expenses in plant and equipment under 19 U.S.C. § 1337(a)(3)(A), between 2012 and February 2015, exceed \$[] dollars.

BASF’S SUBSECTION (A) INVESTMENTS 2012 - February 2015		
Type	Plant and Equipment Investments	Operating Expenses
Elyria	[]	[]
Louisville	[]	-
Troy	[]	[]
Beachwood	[]	-
TOTAL:	[]	[]

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b. BASF's Employment of Labor or Capital Under 19 U.S.C. § 1337(a)(3)(B)

Between 2012 and February 2015, BASF spent about \$[] in labor costs at its Elyria facility and about \$[] in labor costs at its Troy facility. (See CIB at 142; CX-3C, Fetcenko WS at Q/A 104.)

Neither Umicore nor the Staff disputes any of these costs. (See RIB at 194; SIB at 64.) Accordingly, I find that BASF spent about \$[] in employment of labor or capital under 19 U.S.C. § 1337(a)(3)(B), between 2012 and February 2015.

BASF'S SUBSECTION (B) INVESTMENTS 2012 - February 2015	
Elyria Labor Costs	[]
Troy Labor Costs	[]
TOTAL:	[]

c. BASF's Investment in Engineering and Research and Development Under 19 U.S.C. § 1337(a)(3)(C)

BASF conducts its NCM research and development and product testing in the United States at its Beachwood and Rochester Hills facilities. (See CIB at 142.)

BASF spent approximately \$[] between 2012 and February 2015 on equipment and facility upgrades in its Beachwood plant for NCM pilot production and NCM research and development. (See CIB at 143-44; CX-3C, Fetcenko WS at Q/As 94-101.) As discussed above, these expenses also qualify under 19 U.S.C. § 1337(a)(3)(C). See *supra* p. 16. Neither Umicore nor the Staff disputes BASF's \$[] investment. (See RIB at 194; SIB at 65.)

BASF also invested over \$[] between 2012 and February 2015 on research and development projects related to its NCM material production. (See CIB at 144-45; CX-3C,

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Fetcenko WS at Q/A 129; accord SIB at 65.) Umicore neither concedes nor disputes BASF's \$[] investment. (See RIB at 194.)

Accordingly, I find that BASF established that it invested over \$[] in engineering and research and development under 19 U.S.C. § 1337(a)(3)(C), between 2012 and February 2015. I also find there is a nexus between BASF's investments under 19 U.S.C. § 1337(a)(3)(C) and the Asserted Patents. Indeed, as explained, *supra* pp. 14-15, the NCM material is the most important component of the claimed positive electrode and is directly related to the patented electrode.

BASF'S SUBSECTION (C) INVESTMENTS 2012 - February 2015	
R&D Equipment and Facility Upgrades	[]
R&D Projects	[]
TOTAL:	[]

3. Significance of BASF's Investments

Umicore does not dispute that BASF invested approximately \$[] on plants and equipment in the United States, \$[] on investments related to labor or capital in the United States, and \$[] on engineering and R&D activities in the United States. (See RIB at 194.) Umicore also does not dispute that BASF's investments are qualitatively significant. But Umicore argues that BASF failed to establish the quantitative significance of its investments. (See *id.* at 193-94.)

Specifically, Umicore reasons that BASF cannot satisfy the economic prong of the domestic industry requirement because BASF only presented evidence of a domestic industry with respect to BASF's NCM material, a component of an article protected by the Asserted

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Patents rather than with respect to the patented electrode. (See RIB at 195-96.) Umicore also asserts that BASF failed to provide a comparative analysis of its investments in the context of the patented electrode or in the context of BASF’s global NMC operations.⁶ (See *id.* at 30, 197-99 (“Complainants submitted no evidence from which the ALJ could quantitatively adduce ‘how its activities were important to the articles protected by the Asserted Patents in the context of the company’s operations, the marketplace, or the industry in question.’”) (citing *Certain Printing and Imaging Devices and Components Thereof*, Inv. No. 337-TA-690, Comm. Op., 2011 WL 1303160, *17 (U.S.I.T.C. Feb. 17, 2011)).)

BASF responds that neither the Commission nor the Federal Circuit requires a comparative analysis for the domestic industry, economic prong. (See CIB at 147.) The Staff argues that “[w]hile domestic expenditures related to a component of a protected article routinely qualify as domestic industry expenses, the significance of the component in the context of the entire protected article could be (but is not required to be) one way to determine the significance of domestic industry expenses related to that component.” (See SIB at 66 n.17.) The Staff asserts that BASF’s investments are quantitatively and qualitatively significant because all of BASF’s commercial scale manufacturing of the [NCM material that Complainants have

⁶ I agree with Umicore that BASF waived the comparative analysis arguments set forth at pages 149-151 of Complainants’ initial post-hearing brief. See Ground Rule 11.2 (contentions not set forth in the pre-hearing brief are deemed abandoned or withdrawn). Complainants did not make those arguments in their pre-hearing brief and expressly stated that they would not be making such arguments in their response to Umicore’s Motion *In Limine* No. 1. See Complainants’ Opposition to Umicore’s Motion *In Limine* No. 1, Inv. No. 337-TA-951, at 1 (U.S.I.T.C. Oct. 15, 2015) (“Umicore’s Motion *In Limine* No. 1 . . . which seeks to exclude evidence or arguments regarding a quantitative comparison of Complainant BASF’s investments in NCM cathode materials to the costs or investments to produce an electrode, should be denied because Complainants have not offered or relied on any such evidence.”).

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identified as] DI Products occurs exclusively in the U.S., and the bulk of BASF's pilot scale production of NCM materials occurs in the U.S.” (*See id.* at 65-66.)

I agree with BASF that a comparative analysis is not required here. While a comparative analysis may be indicative of the quantitative significance of a party's investments, it is not required under *Lelo*. Rather, the test is “whether there is a ‘significant’ increase or attribution by virtue of the claimant's asserted commercial activity in the United States.” *See Lelo*, 786 F.3d at 883. In addition, the Commission has emphasized that there is no threshold test for what is considered “significant,” as it is not expressly defined in the statute. *See Certain Male Prophylactic Devices*, Inv. No. 337-TA-546, Comm'n Op. at 39 (U.S.I.T.C. Aug. 1, 2007). From the perspective of an extremely large business like BASF,⁷ the percentage of capital, labor, and other domestic investments may be relatively small when compared to its global sales. However, such expenditures may still have a significant effect on the relevant domestic industry in the United States. In that context, I find that BASF's commercial activity in the United States is quantitatively significant. *See also Certain Handheld Electronic Computing Devices, Related Software, & Components Thereof*, Inv. No. 337-TA-769, Order No. 34, 2012 WL 594700, *10 (U.S.I.T.C. Feb. 6, 2012) (disregarding respondent's argument that complainant “ha[d] not provided information regarding its foreign investments and foreign employment.”).

Indeed, as explained, *supra* pp. 14-15, the NCM material is the most important component of the claimed positive electrode and is directly related to the patented electrode. As such, 100% of BASF's NCM expenses are attributable to the patented invention. In contrast, in *Certain Printing and Imaging Devices and Components Thereof*, Complainant “relie[d] strictly

⁷ I take notice of the fact that BASF is the largest chemical corporation in the world, with *e.g.*, more than €74 billion in sales for 2013 alone.

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on the service and repair of its C200 series printers and MFPs to meet the economic prong,” and “failed to submit evidence to substantiate the nature and significance of its activities with respect to the articles protected by the patent.” *See Certain Printing and Imaging Devices and Components Thereof*, Inv. No. 337-TA-690, Comm. Op., 2011 WL 1303160, *16-17.

BASF’s investments are also quantitatively significant when compared to the NCM industry in the United States. BASF pioneered the NCM industry in the United States and invested more than \$70 million to develop and produce the NCM material. (*See* CRB at 89-90.) In addition, as recognized by Umicore, NCM producers are primarily located in Asia while BASF is one of the few major producers in the United States. (*See* RIB at 214; CRB at 90.) BASF’s Elyria plant is operating at full capacity and its production is “oversold.” (*See* Hearing Tr. at 276:15-18, 257:25-258:2 (October 26, 2015) (Fetcenko); CRB at 91.) In that context, BASF’s \$70 million investment in the United States is quantitatively significant investment under any standard.

Thus, I find that BASF has made both qualitatively and quantitatively significant investments in plant and equipment and employment of labor or capital, as well as substantial investments in research and development related to the domestic industry products. Accordingly, I find that BASF satisfied the economic prong of the domestic industry requirement under 19 U.S.C. § 1337(a)(3)(A), (B), and (C).

C. Argonne Satisfies the Economic Prong of the Domestic Industry Requirement Under 19 U.S.C. § 1337(a)(3)(C).

1. Argonne’s Investment in Engineering and Research and Development

Relying on Dr. Anthony Burrell (the Department Head of the Electrochemical Energy Storage, Chemical Sciences, and Engineering Division at Argonne), Complainants estimated that Argonne invested over \$[] in the United States in the past three years in engineering and

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research and development projects relating to NCM materials with excess lithium, *i.e.*, with a lithium-to-metal ratio greater than 1. (*See* CIB at 154.) Umicore does not dispute the \$[] investment amount or the substantiality of such amount, but argues that the use of “excess lithium” to estimate the relevant domestic industry investments is “completely untethered from the Asserted Patents” and is not a “reasonable proxy.” (*See* RIB at 199-200.) Umicore also takes issue with Dr. Burrell’s reliance on conversations with Principal Investigators to allocate the share of the investments relating to the Asserted Patents. Umicore argues that such reliance “without any supporting documentation . . . cannot stand as the basis for [Argonne’s] alleged domestic industry.” (*See id.* at 200-01.) In essence, Umicore disputes the nexus between Argonne’s investments and the Asserted Patents. The Staff argues that “Argonne’s allocation method is sufficient to show that its investments cited in support of its domestic industry claims properly relate to articles protected by the Asserted Patents.” (*See* SRB at 20.)

I find Dr. Burrell’s reliance on “excess lithium” and on conversations with Principal Investigators to estimate the relevant domestic industry expenses is proper. First, it is undisputed that excess lithium is a key aspect of the patented technology. (*See* CIB at 158 (“[E]xcess lithium is a fundamental part of the patents’ claims, and every patent-practicing NCM material will have excess lithium.”); RIB at 100 (explaining that “excess lithium, [] undisputedly is required to form a second phase” and that “the MX5h Umicore product therefore lacks the excess lithium required for the claimed chemical formula”).) *See also* CX-4C, Kirchheim DWS at Q/A 488:

In order to have both a LiMO_2 and a $\text{Li}_2\text{M}'\text{O}_3$ domain, the material must have “excess lithium.” This is a necessary, but not sufficient, requirement for two domains. In other words, the lithium to metal ratio in the material must be between 1 and 2. As you increase the

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fraction of the $\text{Li}_2\text{M}'\text{O}_3$ domain, the lithium to metal ratio gets closer to 2. When it decreases, it gets closer to 1.

Thus, the use of “excess lithium” is sufficiently related to the patented technology and qualifies as relevant domestic industry. *See Certain Integrated Circuit Chips and Products Containing the Same*, 337-TA-859, Comm’n Op. at 40 (U.S.I.T.C. Aug. 22, 2014) (finding that ALJ recognized principle guiding the analysis of the nexus requirement when he noted that “the more closely related the domestic activities are to the patented technology, the greater may be the weight of the activities in determining whether they constitute a domestic industry.”). In fact, it would be unreasonable to expect the parties “to keep research and development records on a patent-by-patent basis, as opposed to a project-by-project basis.” *See id.* at 41-42:

[N]o patent-by-patent allocation is required for research and development investment under subparagraph (C). First, requiring such an allocation is an unduly narrow interpretation of “exploitation” and risks freezing cognizable investment at the point at which the patented technology is reduced to practice. Second, most firms have little reason to keep research and development records on a patent-by-patent basis, as opposed to a project-by-project basis (to the extent that project-by-project records are kept).

Second, Dr. Burrell explained at the Hearing that he relied on the Principal Investigators to identify the percentage of project costs relating to excess lithium NCM because “that’s their job.” *See* Hearing Tr. at 240:6-10 (October 26, 2015) (Burrell). *See also id.* at 240:11-19.

Umicore presented no evidence contradicting or undermining Argonne’s estimations.

Accordingly, I find that Argonne established that it invested over \$[] in engineering and research and development under 19 U.S.C. § 1337(a)(3)(C), between 2013 and February 2015. I also find there is a nexus between Argonne’s investments and the Asserted Patents as explained above. Thus, I find that Argonne made substantial investments in

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engineering and research and development under 19 U.S.C. § 1337(a)(3)(C) and therefore satisfies the economic prong of the domestic industry requirement.

ARGONNE'S SUBSECTION (C) INVESTMENTS 2013 - February 2015	
Fiscal Year 2013	[]
Fiscal Year 2014	[]
Fiscal Year 2015 (through February)	[]
TOTAL:	[]

2. Argonne's Investment in Licensing

With respect to Argonne's alleged licensing efforts, Complainants argued that Argonne licensed the Asserted Patents to six companies (NanoExa (2006); Toda (2008, amendments in 2011 and 2014); BASF (2009, amendment in 2014); Envia (2010); LG Chem (2010); and General Motors (2010)), and received \$[] since 2008 in licensing revenue from at least five of those companies.

However, as noted by the Staff, Argonne did not identify "how much money it has spent licensing the Asserted Patents." (See SIB at 71.) Argonne's licensing revenues are not expenses and do not constitute investments within the meaning of Section 337(a)(3)(C). See *Certain Multimedia Display & Navigation Devices & Sys., Components Thereof, & Prods. Containing Same*, Inv. No. 337-TA-694, Comm'n Opinion, 2011 WL 3813121, *11 (U.S.I.T.C. July 22, 2011) ("Although royalties received by a complainant can be circumstantial evidence that an investment was made, they do not constitute the investment itself.").

In addition, the licenses upon which Argonne relies, were signed in 2010 or earlier and do not establish that a domestic industry exists *at the time of the filing of the Complaint*. See *Motiva, LLC v. Int'l Trade Comm'n*:

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We also affirm the Commission’s use of the date of the filing of Motiva’s complaint in this case as the relevant date at which to determine if the domestic industry requirement of Section 337 was satisfied. Although Motiva may have been fully engaged in developing a domestic industry for its patented technology until early 2007, there is no evidence in the record relating that development activity to Motiva’s efforts to establish a domestic industry *at the time Motiva chose to file its complaint* three years later.

716 F.3d 596, 601 n.6 (Fed. Cir. 2013) (citations omitted) (emphasis added).

Accordingly, I find that Argonne’s licensing efforts do not qualify as investments under 19 U.S.C. § 1337(a)(3)(C).

IV. LEVEL OF ORDINARY SKILL IN THE ART

In Order No. 14, I found that:

[T]he person having ordinary skill in the art has:

- a master’s degree in chemistry, chemical engineering, physics, or materials science, and at least three years of experience in research, design or development of lithium-ion batteries; or
- a Ph.D. degree in chemistry, chemical engineering, physics, or materials science, and at least one year of experience in research, design or development of lithium-ion batteries.

See Order No. 14, Inv. No. 337-TA-951, at 9-11 (U.S.I.T.C. July 31, 2015).

V. CLAIM CONSTRUCTION

A *Markman* hearing was held in this investigation on July 13 and 14, 2015, and on July 31, 2015, I issued Order No. 14 construing the disputed terms of the Asserted Patents as follows:

Term	Construction
positive electrode (’082 patent, claims 1, 13, 14; ’143 patent, claims 1, 17)	an electrical element from which lithium ions are released during charging

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Term	Construction
$x\text{LiMO}_2 \cdot (1-x)\text{Li}_2\text{M}'\text{O}_3$ ('082 patent, claims 1, 13, 14; '143 patent, claims 1, 17)	a structurally integrated two-component material having an empirical formula $\text{Li}_{2-x}\text{M}_x\text{M}'_{1-x}\text{O}_{3-x}$, with crystallographically distinct LiMO_2 and $\text{Li}_2\text{M}'\text{O}_3$ components
both the LiMO_2 and $\text{Li}_2\text{M}'\text{O}_3$ components being layered ('082 patent, claims 1, 13, 14; '143 patent, claims 1, 17)	the LiMO_2 and $\text{Li}_2\text{M}'\text{O}_3$ components each have a layered-type crystalline structure that are distinct but structurally compatible
wherein domains of the LiMO_2 and $\text{Li}_2\text{M}'\text{O}_3$ components exist side by side ('082 patent, claims 1, 13, 14)	No construction necessary
the ratio of Li to M and M' ('082 patent, claims 1, 13, 14; '143 patent, claims 1, 17)	the ratio of Li to (M plus M') within the general formula $x\text{LiMO}_2 \cdot (1-x)\text{Li}_2\text{M}'\text{O}_3$

See Order No. 14, Inv. No. 337-TA-951, at 28 (U.S.I.T.C. July 31, 2015). In addition, the parties agreed on claim constructions for the following terms:

Term	Construction
partially replaced [by] ('082 patent, claim 7; '143 patent, claims 8, 9)	substituted in part
domains ('082 patent, claims 1, 13, 14)	crystallographically distinguishable regions
components ('082 patent, claims 1-4, 7, 13-14; '143 patent, claims 1-4, 8-9, 17)	plain and ordinary meaning

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Term	Construction
one or more ions having / with an average oxidation state of three (’082 patent, claims 1, 13, 14; ’143 patent, claims 1, 17)	the average of the oxidation states of M is 3
one or more ions having / with an average oxidation state of four (’082 patent, claims 1, 13, 14; ’143 patent, claims 1, 17)	the average of the oxidation states of M’ is 4
M and M’ are disordered (’082 patent, claim 4; ’143 patent, claim 4)	one or more of M and M’ occupy cation sites other than those designated in $\text{LiMO}_2 \cdot \text{Li}_2\text{M}'\text{O}_3$
$\text{Li}^+\text{Mg}^{2+}$ (’143 patent, claim 9)	Li^+ , Mg^{2+}
whether the preamble is limiting	The preambles are limiting.
prepared in its initial discharged state / having in its initial discharged state (’082 patent, claims 1, 13, 14; ’143 patent, claims 1, 17)	that when prepared, is lithiated but has not been electrically charged, / that when prepared, is lithiated but has not been electrically charged, having
electrode structure (’082 patent, claim 4; ’143 patent, claim 4)	electrode material

See id. at 2; Revised Joint Claim Construction Chart, Attachment B, Inv. No. 337-TA-951 (U.S.I.T.C. June 12, 2015).

VI. INFRINGEMENT

A. Legal Standards

“An infringement analysis entails two steps. The first step is determining the meaning and scope of the patent claims asserted to be infringed. The second step is comparing the

properly construed claims to the device accused of infringing.” *Markman*, 52 F.3d at 976 (citations omitted).

1. Direct Infringement

A complainant must prove either literal infringement or infringement under the doctrine of equivalents. Infringement must be proven by a preponderance of the evidence. *SmithKline Diagnostics, Inc. v. Helena Labs. Corp.*, 859 F.2d 878, 889 (Fed. Cir. 1988). A preponderance of the evidence standard “requires proving that infringement was more likely than not to have occurred.” *Warner-Lambert Co. v. Teva Pharm. USA, Inc.*, 418 F.3d 1326, 1341 n.15 (Fed. Cir. 2005).

a. Literal Infringement

Literal infringement is a question of fact. *Finisar Corp. v. DirecTV Group, Inc.*, 523 F.3d 1323, 1332 (Fed. Cir. 2008). Literal infringement requires the patentee to prove that the accused device contains each and every limitation of the asserted claim(s). *Frank’s Casing Crew & Rental Tools, Inc. v. Weatherford Int’l, Inc.*, 389 F.3d 1370, 1378 (Fed. Cir. 2004). If any claim limitation is absent, there is no literal infringement of that claim as a matter of law. *Bayer AG v. Elan Pharm. Research Corp.*, 212 F.3d 1241, 1247 (Fed. Cir. 2000).

b. Doctrine of Equivalents⁸

Where literal infringement is not found, infringement can still be found under the doctrine of equivalents. Determining infringement under the doctrine of equivalents “requires an intensely factual inquiry.” *Vehicular Techs. Corp. v. Titan Wheel Int’l, Inc.*, 212 F.3d 1377, 1381 (Fed. Cir. 2000). According to the Federal Circuit:

⁸ Complainants do not assert infringement under the doctrine of equivalents.

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Infringement under the doctrine of equivalents may be found when the accused device contains an “insubstantial” change from the claimed invention. Whether equivalency exists may be determined based on the “insubstantial differences” test or based on the “triple identity” test, namely, whether the element of the accused device “performs substantially the same function in substantially the same way to obtain the same result.” The essential inquiry is whether “the accused product or process contain elements identical or equivalent to each claimed element of the patented invention[.]”

TIP Sys., LLC v. Phillips & Brooks/Gladwin, Inc., 529 F.3d 1364, 1376-77 (Fed. Cir. 2008)

(citations omitted).

2. Indirect Infringement

a. Induced Infringement

Section 271(b) of the Patent Act prohibits inducement: “[w]hoever actively induces infringement of a patent shall be liable as an infringer.” 35 U.S.C. § 271(b). *See DSU Med. Corp. v. JMS Co.*, 471 F.3d 1293, 1305 (Fed. Cir. 2006) (*en banc*) (“To establish liability under section 271(b), a patent holder must prove that once the defendants knew of the patent, they actively and knowingly aided and abetted another’s direct infringement.”) (citations omitted). “The mere knowledge of possible infringement by others does not amount to inducement; specific intent and action to induce infringement must be proven.” *Id.* (citations omitted).

b. Contributory Infringement

Section 271(c) of the Patent Act prohibits contributory infringement. *See* 35 U.S.C. § 271(c). “Under 35 U.S.C. § 271(c), a party who sells a component with knowledge that the component is especially designed for use in a patented invention, and is not a staple article of commerce suitable for substantial noninfringing use, is liable as a contributory infringer.” *Wordtech Sys., Inc. v. Integrated Networks Solutions, Inc.*, 609 F.3d 1308, 1316 (Fed. Cir. 2010).

B. Direct Infringement

Complainants assert that Umicore's Cellcore® MX (NMC 111) and TX products (NMC 532) indirectly infringe claims 1-4, 7, 13, and 14 of the '082 patent and claims 1-4, 8, 9, and 17 of the '143 patent. (*See* CIB at 33-75, 137-38.) As construed, the Asserted Claims of the '082 patent and the '143 patent require the presence of a positive electrode.⁹ Because Umicore does not sell positive electrodes, Complainants argue that infringement occurs when Umicore's third party customers "put the accused MX and TX products into positive electrodes and electrochemical cells in the United States." (*See* CIB at 87-90.) Umicore responds that Complainants cannot prove direct infringement by Umicore's customers because Complainants "have no evidence of the existence of a positive electrode in the United States made from Umicore's NMC material that practices each and every limitation of the asserted claims." (*See* RIB at 150.)

Complainants provide an element-by-element infringement analysis for Umicore's MX5h and TX7 materials. In addition, Complainants argue that MX5h and TX7 are representative of their respective MX and TX product families.¹⁰ (*See id.* at 80-87.) Complainants conclude that the entire MX and TX product lines infringe the Asserted Claims. (*See id.* at 87.) Umicore disputes that the MX5h and TX7 materials are representative of other MX and TX products. (*See* RIB at 146-50.) Umicore argues that particle size and cooling rate can affect the crystal

⁹ During the *Markman* phase of this investigation, Complainants argued that the claim term "positive electrode" referred to the "active material" (*e.g.*, the NCM material) rather than to an element of an electrochemical cell or battery. I disagreed with Complainants and construed "positive electrode" in accordance with its plain and ordinary meaning as "an electrical element from which lithium ions are released during charging." *See* Order No. 14, Inv. No. 337-TA-951, at 12-15 (U.S.I.T.C. July 31, 2015).

¹⁰ The number following the MX or TX product designation indicates the average particle size of the material. (*See* RIB at 49; CX-3329C, Levasseur Dep. Tr. at 37:4-6, 38:13-18.) For example, TX7 has an average particle size of 7 μm . (*See* RIB at 49.)

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structure and that Complainants should have offered infringement evidence for all the accused products within the MX and TX families (*i.e.*, MX3, MX5, MX6, MX7, MX10, TX7, TX9, TX10, TX12). (*See id.*)

The Staff agrees with Complainants that MX5h and TX7 infringe the asserted claims of the '082 patent when used in a positive electrode. (*See SIB at 10-31.*) However, the Staff disagrees that Complainants satisfy their burden to prove that MX5h and TX7 are representative of other products within their respective product families. (*See id.* at 31-34.)

1. The '082 Patent

a. Claim 1

Claim 1 of the '082 patent recites:

- [i] A lithium metal oxide positive electrode for a non-aqueous lithium cell
- [ii] prepared in its initial discharged state
- [iii] having a general formula $x\text{LiMO}_2 \cdot (1-x)\text{Li}_2\text{M}'\text{O}_3$ in which $0 < x < 1$, and
- [iv] where M is one or more ions having an average oxidation state of three with at least one ion being Ni, and
- [v] where M' is one or more ions with an average oxidation state of four with at least one ion being Mn,
- [vi] with both the LiMO_2 and $\text{Li}_2\text{M}'\text{O}_3$ components being layered and
- [vii] the ratio of Li to M and M' being greater than one and less than two; and
- [viii] wherein domains of the LiMO_2 and $\text{Li}_2\text{M}'\text{O}_3$ components exist side by side.

Complainants argue that MX5h and TX7, when incorporated in a positive electrode, satisfy each element of claim 1 of the '082 patent. (*See CIB at 33-75, 87-90.*) Complainants rely on their technical expert, Dr. Reiner Kirchheim, and on the analytical data and conclusions

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generated by three other experts, Dr. Xinwei Wang (ICP¹¹ analysis), Dr. William David (XRD¹² analysis), and Dr. John Bradley (TEM¹³ analysis). (*See id.* (citing CX-4C, Kirchheim DWS; CX-7C, Wang DWS; CX-6C, David DWS; CX-5C, Bradley DWS).)

Umicore denies infringement and responds that Complainants failed to carry their burden to prove infringement with respect to each element of claim 1. (*See* RIB at 54-131.)

Specifically, relying on their technical experts, Dr. Claude Delmas and Dr. Gerbrand Ceder, Umicore argues that its accused NMC materials do not infringe claim 1 of the '082 patent because: (1) Complainants did not prove the existence of a claimed positive electrode prepared in its initial discharged state, using Umicore's NMC material (claim elements 1(i) and 1(ii)); (2) Umicore's NMC material does not include the claimed $\text{Li}_2\text{M}'\text{O}_3$ component and Complainants' evidence does not show structural integration of the LiMO_2 and $\text{Li}_2\text{M}'\text{O}_3$ components (claim elements 1(iii) and 1(vi)-1(viii)); (3) Complainants did not calculate the average oxidation states of the constituent metal ions of the accused M (claim element 1(iv)); and (4) the average oxidation state of the accused M' is not 4 (claim element 1(v)). (*See id.* (citing RX-753C, Delmas RWS; RX-752C, Ceder RWS).)

The Staff contends Complainants have proven by a preponderance of the evidence that the MX5h and TX7 products have been incorporated in a positive electrode in the United States

¹¹ ICP means "Inductively Coupled Plasma" and is a technique used to measure the elemental composition of the samples. (*See* CIB at xxi, 26.)

¹² XRD means "X-ray Diffraction" and is a technique used to obtain information about the atomic and molecular structures of crystals. (*See* CIB at xxii, 28.)

¹³ TEM means "Transmission Electron Microscopy" and is a technique used to obtain information about the composition or crystallography of the examined material. (*See* CIB at xxii, 29.)

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and that such positive electrode satisfies all the limitations of claim 1 of the '082 patent. (*See* SIB at 10-24.)

(i) **A lithium metal oxide positive electrode for a non-aqueous lithium cell**

The crux of the parties' dispute is whether Umicore's NMC materials have been incorporated in a positive electrode (*i.e.*, an electrical element from which lithium ions are released during charging (*see supra* p. 25)) that meets the elements of the Asserted Claims. Umicore argues that "[n]o third party positive electrode was compared to the claim language to assess direct infringement." (*See* RIB at 56.)

However, as noted by Complainants, direct evidence from a third-party direct infringer is not required and circumstantial evidence may be sufficient to prove direct infringement. For example, in *Lucent Technologies, Inc. v. Gateway, Inc.*, the Federal Circuit did not disturb the jury's finding of direct infringement which was based on "the extensive sales of Microsoft products and the dissemination of instruction manuals for the Microsoft products" as well as "corresponding testimony from Lucent's infringement expert." 580 F.3d 1301, 1318 (Fed. Cir. 2009). The Federal Circuit reasoned that "the jury . . . could have reasonably concluded that, sometime during the relevant period from 2003 to 2006, more likely than not one person somewhere in the United States had performed the claimed method using the Microsoft products." *Id.* *See also Toshiba Corp. v. Imation Corp.*, 681 F.3d 1358, 1365 (Fed. Cir. 2012) ("[W]here an alleged infringer designs a product for use in an infringing way and instructs users to use the product in an infringing way, there is sufficient evidence for a jury to find direct infringement.").

Similarly, in this case, there is no dispute that Umicore's NMC products are designed for use in a positive electrode and that Umicore's customers make batteries or electrochemical cells

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which necessarily include positive electrodes. (*See* RIB at 55 (“Umicore does not dispute that its NMC materials are designed to be used in batteries or that they are tested by its customers in the United States. Nor does Umicore dispute that testing performed by its customers using a battery cell would contain a positive electrode (though not one with the patented structure if made with Umicore’s material.”) (citations omitted); CX-3214C at 13; CX-535C (listing rechargeable lithium batteries as the main use for Umicore’s Cellcore® MX).)

In addition, contrary to Umicore’s claims, I find that the accused NMC materials were incorporated in a positive electrode that satisfies the limitations of claim 1 of the ’082 patent. Indeed, as discussed *supra* p. 14, the active material (*e.g.*, the NMC material, provided it satisfies the limitations relating to the active material) is the only component of the claimed positive electrode that is expressly recited in claim 1 of the ’082 patent. Other inactive components may be included even if they are not expressly recited in that claim. As explained in the specification of the Asserted Patents, “[b]inders and other materials normally associated with both the electrolyte and the negative and positive electrodes are well known in the art and are not described herein, but are included as is understood by those of ordinary skill in this art.” *See* JX-1, ’082 patent at 7:17-22; JX-2, ’143 patent at 9:67-10:5. *See also* Order No. 14, Inv. No. 337-TA-951, at 13 (U.S.I.T.C. July 31, 2015); CIB at 33 (“[T]he act of making a positive electrode that uses Umicore’s material as the active material would not change its structure or composition.”); CX-4C, Kirchheim DWS at Q/A 63 (“Binders and current collectors are applied to optimize the performance of a battery but do not affect the electrochemical reactions of the electrode material.”), Q/A 131 (“A positive electrode contains an active material and can also include binder and a carbon element, such as graphite. It may also be coated on an aluminum substrate current collector. But only the active material can release lithium ions during

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charging.”); CX-161C at 49 (“[T]here is no modification of the structure of the MX materials upon cycling or storage in harsh voltage conditions.”); CX-3329C, Levasseur¹⁴ Dep. Tr. at 21:7-14 (testifying that the “[NMC] products were able to sustain the cycling without modifying their structure.”). The active material is essential “to impart greater structural stability to these electrode materials during electrochemical cycling in lithium cells and batteries.” (See CX-4C, Kirchheim DWS at Q/A 1637 (citing JX-1, ’082 patent at 2:24-29); Hearing Tr. 564:15-25 (Oct. 27, 2015) (Kirchheim) (“[I]ncorporating the MX or whatever, one of the MX family products, in the electrode means combine it with a binder with carbon and then press it -- make slurry out of it and press it on an electrode. During this procedure you don't change the structure of the metal oxide, this metal oxide.”).) Thus, the presence of other components such as binders or other inactive materials¹⁵ and electrode preparation would not take the resulting positive electrode outside the scope of the Asserted Claims. I find Dr. Kirchheim’s testimony on this issue essentially un rebutted and Umicore’s unsupported and conclusory denials insufficient to undermine his testimony. Umicore faults Complainants for not testing an actual positive electrode but fails to address Complainants’ argument that electrode preparation does not alter structure or composition. (See RIB at 57, 112; RX-753C, Delmas RWS at Q/A 210.) See also *Centricut, LLC v. Esab Group, Inc.*, 390 F.3d 1361, 1370 (Fed. Cir. 2004) (“[T]ypically expert testimony will be necessary in cases involving complex technology.”) (citations omitted).

Complainants have provided more than ample evidence showing Umicore and its customers have tested and evaluated positive electrodes that include the accused NMC material

¹⁴ Stephane Levasseur is Umicore’s Head of Business Venturing. (See CX-3329C, Levasseur Dep. Tr. at 6:16-18.)

¹⁵ I also found in Order No. 19, that the claim term “general formula” could be construed to allow the electrode composition to include minor fractions of unrecited active materials. See Order No. 19, Inv. No. 337-TA-951, at 8-11 (U.S.I.T.C. Sept. 14, 2015).

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as the only active material. (See CIB at 33, 89-90 (citing CX-204C (meeting notes discussing process development for [] using [] and showing [] including the []); CX-483C at 6-20 (Umicore presentation showing half cell¹⁶ tests with MX6 and MX10); CX-533C at 35-42, 51-56 (Umicore presentation showing full cell¹⁷ evaluation of MX6, MX7h, MX10, and TX10); CX-155C at 13 ([] coin cell¹⁸ evaluation of [] CX-3337, tab 2014_1_6 [] testing with [], tab 2014_5_5 (showing [] testing [] and []), tab 2015_5_11 (showing [] using []; CX-154C [] testing []; CX-516C ([] testing with [] and [] materials); CX-521C [] testing []; CX-519C ([] testing [] as []); CX-520C ([] testing [] as []); CX-522C ([] presentation [] (binder, see JX-1, '082 patent at 6:25-26) as the cathode); CX-543C ([] testing []); CX-205C ([] testing the []); CX-1048C at 6-7 (showing [] testing a battery using [] and [])). See also CX-485C at 2 (describing Argonne's testing of MX10 in a positive electrode including MX10, 5% Acetylene Black (*i.e.*, carbon, see, e.g., JX-1, '082 patent at

¹⁶ "A half cell contains a positive electrode, an electrolyte, and negative electrode made of a sheet of lithium." (CX-4C, Kirchheim DWS at Q/A 199.)

¹⁷ "A full cell is a cell with a positive electrode, a negative electrode, an electrolyte, and a separator." (CX-4C, Kirchheim DWS at Q/A 422.)

¹⁸ "This coin cell had a positive electrode, where the TX was, an electrolyte, and a negative electrode in the form of a sheet of lithium." (CX-4C, Kirchheim DWS at Q/A 437.)

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Example 4, column 6, lines 26-28), and 5% SFG6 (*i.e.*, carbon, *see, e.g.*, JX-1, '082 patent at Example 4, column 6, lines 26-28)).

Umicore does not dispute that it has sold the accused NMC materials to battery makers and/or companies doing research on electrochemical cells. (*See* RIB at 55; CX-3214C at 13.) There is also ample evidence that the accused NMC material is used as the active material in positive electrodes. Accordingly, I find that it is far more likely than not, that at least one of Umicore's customers in the United States used the accused NMC materials (including MX5h and TX7) in a positive electrode that meets the limitations of claim 1 of the '082 patent (provided, as discussed *infra*, the accused NMC material satisfies the limitations relating to the active material). *See Lucent Techs.*, 580 F.3d at 1318.

Complainants also established by at least a preponderance of the evidence (and Umicore does not dispute) that the positive electrode is a "lithium metal oxide" positive electrode and that the positive electrode is "for a non-aqueous lithium cell." (*See* CIB at 33; *supra* p. 8; CX-4C, Kirchheim DWS at Q/A 202 ("Lithium transition metal oxides like Umicore's MX products would not be used in an aqueous cell because lithium is highly reactive with water and would form lithium hydroxide and the positive electrode would become inactive, *i.e.* not release lithium ions."); *see also* SIB at 10-11 and 17-18.)

Accordingly, I find that Complainants fully carried their burden to prove that claim element 1(i) ("A lithium metal oxide positive electrode for a non-aqueous lithium cell") is satisfied.

(ii) **prepared in its initial discharged state**

As with claim element 1(i), Umicore argues that it “does not make or sell electrodes in any context,” and therefore “it certainly cannot prepare them in an ‘initial discharged state.’”¹⁹ (See RIB at 59, 112.) Umicore also argues that “batteries are cycled before being imported” which “takes the electrode out of its ‘initial discharged state.’” (See *id.* (citing RX-753C, Delmas RWS at Q/A 255).) But those arguments are unavailing because, as explained *supra* pp. 33-36, Complainants are asserting *indirect* infringement against Umicore. Indeed, as discussed above, there is ample evidence that at least one of Umicore’s customers *in the United States* has used the accused NMC materials in a positive electrode. See also CRB at 16 (“This has no relevance to whether Umicore’s NMC that is incorporated into a positive electrode in the United States is ‘prepared in its initial discharged state.’”).

The parties agreed on a construction for the term “prepared in its initial discharged state,” namely, “that when prepared, [the positive electrode is] lithiated but has not been electrically charged.” See *supra* p. 27. In other words, the positive electrode must be lithiated in its initial discharged state, *i.e.*, before any electrical cycling. (See CIB at 34 (“Umicore MX5h, when prepared, is lithiated but has not been electrically charged.”), 61-62 (“Umicore TX7, when prepared, is lithiated but has not been electrically charged.”); CRB at 17 (“The construction thus looks at the state of the electrode when it was made; whether a battery is subsequently cycled is not relevant to its ‘initial state.’”); RPB at 91 (“In particular, before Rossen performs any electrical cycling, Rossen's positive electrodes are fully lithiated and have not been electrically charged.”).)

¹⁹ Complainants argue that “Umicore did not contest this limitation in its Pre-Hearing Brief” and “cannot challenge this limitation now.” (See CRB at 16.) But I find Umicore did contest claim element 1(ii) (“prepared in its initial discharged state”) in its pre-hearing brief. (See RPB at 57.)

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Complainants' expert, Dr. Kirchheim, testified that [

] (*See* CX-4C, Kirchheim DWS at Q/As 237-49, 452-64; *see also* CX-221 (Umicore presentation on “the Development of Lithiated Metal-Oxide Cathodes”); CX-151C (Umicore presentation describing manufacturing process of NMC cathode materials); CIB at 34, 61-62.) As discussed above, Dr. Kirchheim also explained that the process of making an electrode would not change the structure or performance of the electrode material. (*See supra* pp. 34-35; CX-4C, Kirchheim DWS at Q/As 62-64; CIB at 34, 61-62.) Dr. Kirchheim concluded that “any positive electrode made from MX (or TX) would also be prepared in its initial discharged state,” *i.e.*, “lithiated when prepared, before being electrically charged.” (*See* CX-4C, Kirchheim DWS at Q/As 237, 249, 452, 464.) I find Dr. Kirchheim’s testimony on this issue credible and essentially unrebutted. Umicore’s expert, Dr. Delmas, faults Complainants’ experts for not testing an actual positive electrode, but critically, fails to address Dr. Kirchheim’s testimony that any positive electrode made from MX (or TX) would be prepared in its initial discharged state, *i.e.*, lithiated when prepared, before being electrically charged. (*See, e.g.*, RX-753C, Delmas RWS at Q/A 255; *see also* CX-3326C, Zhou²⁰ Dep. Tr. at 140:5-9 (confirming that []); CX-3329C, Levasseur Dep. Tr. at 72:11-15, 18-19 (confirming that []); SIB at 11-12, 18-19.)

Accordingly, I find that Complainants carried their burden to prove that claim element 1(ii) (“prepared in its initial discharged state”) is satisfied.

²⁰ Wendy Zhou is Umicore’s Head of Business Development for Rechargeable Battery Materials in North America. (*See* CIB at 90.)

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(iii) **having a general formula $x\text{LiMO}_2 \cdot (1-x)\text{Li}_2\text{M}'\text{O}_3$ in which $0 < x < 1$**

During the Markman hearing, I construed the claim element “ $x\text{LiMO}_2 \cdot (1-x)\text{Li}_2\text{M}'\text{O}_3$ ” as “a structurally integrated two-component material having an empirical formula $\text{Li}_{2-x}\text{M}_x\text{M}'_{1-x}\text{O}_{3-x}$, with crystallographically distinct LiMO_2 and $\text{Li}_2\text{M}'\text{O}_3$ components.” See *supra* p. 26. Thus, to satisfy this claim element, Complainants must prove that: (1) the accused NMC materials have an empirical formula $\text{Li}_{2-x}\text{M}_x\text{M}'_{1-x}\text{O}_{3-x}$ in which $0 < x < 1$; (2) the accused NMC materials include crystallographically distinct LiMO_2 and $\text{Li}_2\text{M}'\text{O}_3$ components; and (3) the LiMO_2 and $\text{Li}_2\text{M}'\text{O}_3$ components are structurally integrated.

(1) **Empirical formula $\text{Li}_{2-x}\text{M}_x\text{M}'_{1-x}\text{O}_{3-x}$ in which $0 < x < 1$**

Complainants have persuasively established that the accused NMC materials have an empirical formula $\text{Li}_{2-x}\text{M}_x\text{M}'_{1-x}\text{O}_{3-x}$. Relying on ICP analysis, Complainants’ expert, Dr. Wang, measured the elemental composition of various samples, including Umicore’s MX5h, TX7, TX9, and TX10 materials. (See CIB at 35, 62-63; CX-7C, Wang DWS at Q/As 93-94.) Based on Dr. Wang’s analysis, Complainants’ Dr. Kirchheim determined a [] for x as to MX5h which corresponds to an empirical formula of $\text{Li}_{[]}\text{M}_{[]}\text{M}'_{[]}\text{O}_{[]}$, and a []

[] for x as to TX7 which corresponds to an empirical formula of $\text{Li}_{[]}\text{M}_{[]}\text{M}'_{[]}\text{O}_{[]}$.²¹ (See CIB at 36, 63; CX-4C, Kirchheim DWS at Q/As 252-64, 467-79.)

Umicore and the Staff do not dispute Complainants’ testing and conclusions with respect to the empirical formulae of MX5h and TX7. Accordingly, I find that Complainants carried their

²¹ The formulae for MX5h and TX7 can be rearranged, respectively, into the following two-component formulae: [] $\text{LiMO}_2 \cdot$ [] $\text{Li}_2\text{M}'\text{O}_3$ and [] $\text{LiMO}_2 \cdot$ [] $\text{Li}_2\text{M}'\text{O}_3$. (See CX-4C, Kirchheim DWS at Q/As 357, 547.)

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burden to prove that MX5h and TX7 have an empirical formula $\text{Li}_{2-x}\text{M}_x\text{M}'_{1-x}\text{O}_{3-x}$ in which $0 < x < 1$.

(2) **The accused NMC materials include crystallographically distinct LiMO_2 and $\text{Li}_2\text{M}'\text{O}_3$ components.**

Umicore does not dispute that the accused NMC materials have a LiMO_2 component. But Umicore disputes that they include a $\text{Li}_2\text{M}'\text{O}_3$ component. Umicore argues that “there is no $\text{Li}_2\text{M}'\text{O}_3$ in any Umicore NMC material because the transition metals in the accused M' do not have an average oxidation state of 4” and “the forensic evidence generated by Dr. David, Dr. Bradley, and Dr. Wang confirms that $\text{Li}_2\text{M}'\text{O}_3$ is not present in any Umicore NMC material.” (See RIB at 61.)

Umicore is attempting an end-run around this claim element (*i.e.*, the presence of a $\text{Li}_2\text{M}'\text{O}_3$ component) by arguing the alleged impossibility of a separate claim element (*i.e.*, the average oxidation state of four). Although this will be discussed more fully *infra* section VI(B)(1)(a)(v), I note that Umicore also uses circular reasoning to argue that the claim element requiring an average oxidation state of four is not satisfied. Indeed, Umicore first argues that $\text{Li}_2\text{M}'\text{O}_3$ does not exist because its average oxidation state is not four, but Umicore then argues that the “average oxidation state of four” element is not satisfied “because the Umicore NMC materials do not contain $\text{Li}_2\text{M}'\text{O}_3$.” (See RIB at 109.) In fact, as discussed *infra* p. 59, Umicore’s own experts agree that if the $\text{Li}_2\text{M}'\text{O}_3$ component exists, the average oxidation state of M' is necessarily four. (See RX-753C, Delmas RWS at Q/A 142 (“For $\text{Li}_2\text{M}'\text{O}_3$, the average oxidation state of M' is 4+ whatever the nature of various M' elements.”); RX-752C, Ceder RWS at Q/A 46 (“In order to balance the compound, the average oxidation state of M', and its constituent metals, has to be +4.”); see also Hearing, Tr. 1008:8-12 (Oct. 29, 2015) (Delmas).)

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Umicore's arguments are flawed and based on the false premise that M' must include Mn (manganese), Ni (nickel), and Co (cobalt), and that the average oxidation state of those three transition metals cannot be four. Indeed, there is ***no requirement in the claim*** for M' to include all three transition metals, *i.e.*, Mn, Ni, and Co. Rather, as discussed *infra*, claim 1 of the '082 patent requires only that M' include Mn (*i.e.*, the $\text{Li}_2\text{M}'\text{O}_3$ component could be all Li_2MnO_3). (See SRB at 4; CIB at 55 (citing Hearing Tr. at 681:3-7 (Oct. 28, 2015) (Kirchheim)).) Further, contrary to Umicore's assertion, I find that Complainants' Pre-Hearing Brief and Complainants' experts' witness statements sufficiently support a theory that $\text{Li}_2\text{M}'\text{O}_3$ is Li_2MnO_3 (*i.e.*, M' is Mn only). (See Hearing Tr. at 677:11-21 (Oct. 28, 2015); CPB at 27-28; CX-4C, Kirchheim DWS at Q/A 311 ("It is my opinion that in Umicore's MX the average of the oxidation states of M' is 4 and includes at least manganese."); CX-5C, Bradley DWS at Q/As 588, 675 ("[M]y opinion is limited to whether M' includes manganese as required by the '082 patent."))

Complainants' expert, Dr. Kirchheim, also testified in connection with Umicore's presentation²² on MX10 (*see* CX-161C at 28-29; CX-162C) that Mn in $\text{Li}_2\text{M}'\text{O}_3$ can be partially replaced by Co or Ni. (See CX-4C, Kirchheim DWS at Q/As 176-78 ("According to CX-0161C.0028-29, the NMR indicated that [] did not include Li_2MnO_3 (lithium surrounded by six manganese) but did include [])); CIB at 56 ("In Li_2MnO_3 —a compound everyone seems to agree exists—a lithium is surrounded by six manganese. If a cobalt or nickel replaces a manganese, lithium could be surrounded by, for example, 5 manganese and 1 cobalt.") (citations

²² Umicore's presentation (*see* CX-161C; CX-162C) relates to a study of the crystal structure of Umicore's MX10 product in partnership with the University of Bordeaux (sometimes referred to as the "Bordeaux Study"). (See RRB at 91-95.)

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omitted).²³ I find credible Dr. Kirchheim’s testimony that higher oxidation states for Mn, Ni, and Co are possible so as to accommodate the required charge neutrality of the $\text{Li}_2\text{M}'\text{O}_3$ material.²⁴ (See CX-4C, Kirchheim DWS at Q/A 177 (“The structure observed with NMR [(in CX-161C)] is not Li_2MnO_3 , which is not required by the patents, but is [] or []); Hearing Tr. at 672:4-14 (Oct. 28, 2015) (Kirchheim) (testifying that Ni, Co, and Mn can have higher oxidation states).) Whether this is explained by hybridization, non-integer oxidation states, or some other property does not change the weakness of Umicore’s assumption.²⁵ Notwithstanding, whether M’ corresponds to Mn alone or to Mn, Ni, and/or Co, as explained below, I find that Complainants have established by a preponderance of the evidence that the accused NMC materials include both a LiMO_2 component and a $\text{Li}_2\text{M}'\text{O}_3$ component.

The Evidence: First, the accused NMC material is not pure LiMO_2 . Indeed, there is [] while a pure LiMO_2 material would include equimolar amounts of lithium and transition metal. See *supra* p. 40 (finding that MX5h has an empirical formula of $\text{Li}_{[]}\text{M}_{[]}\text{M}'_{[]}\text{O}_{[]}$ and TX7 has an empirical formula of $\text{Li}_{[]}\text{M}_{[]}\text{M}'_{[]}\text{O}_{[]}$) Umicore argues that []

²³ The [] if any, of Mn with Ni or Co in the $\text{Li}_2\text{M}'\text{O}_3$ component appears to be []

²⁴ Umicore’s own presentation (CX-161C) suggests that the oxidation state of nickel is not always +2, which further undermines Umicore’s assumption that the oxidation state of Mn is +4, the oxidation state of Ni is +2, and the oxidation state of Co is +3 for MX10 under its manufacturing conditions. (See CX-161C at 6, 18, 21, 24 [] *i.e.*, [] see also RX-305, Weill et al. (2007) at 2 (article also authored by Umicore’s own expert, Dr. Delmas, suggesting the presence of Ni^{3+} in the overlithiated $\text{Li}_{1.12}(\text{Ni}_{0.425}\text{Mn}_{0.425}\text{Co}_{0.15})_{0.88}\text{O}_2$ material).)

²⁵ Umicore argues that “hybridization” and “non-integer oxidation states” are impermissible new theories. (See RRB at 22-26.) Because I do not rely on either theory in reaching my decision, Umicore’s “new theory” argument is moot.

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] and that “Dr. Kirchheim determined the purported amount of excess lithium for the MX5h sample to be [] which is within the 1% degree of uncertainty identified by Dr. Wang.” (See RIB at 100 (citing CX-4C, Kirchheim DWS at Q/As 257-59).) With respect to TX7, Umicore argues that “Dr. Kirchheim’s calculations confirm that the amount of lithium in the TX7, TX9, and TX10 samples are [] i.e., the level of lithium for each is [] (See RIB at 125 (citing CX-4C, Kirchheim DWS at Q/As 472-74).) Umicore’s arguments are misleading. Umicore relies on the level of lithium Li in normalized formulae (normalized to two (2) atoms of oxygen) for MX5h [] and TX7 [] instead of relying on the ratio of lithium to transition metal to determine whether excess lithium is present. (See CRB at 37-38; CX-4C, Kirchheim DWS at Q/As 259, 474; CX-565C at 3.) See also *supra* pp. 22-23. While lithium in those normalized formulae is [] for MX5h and [] for TX7, the transition metal is [] for MX5h (the sum of [] of nickel, [] of cobalt, and [] of manganese) and [] (the sum of [] of nickel, [] of cobalt, and [] of manganese) for TX7, such that the ratio of lithium to metal is [] for MX5h and [] for TX7. (See CRB at 37-38, 38 n.19.) Thus, there is [] in both MX5h [] and TX7 [] and [] (See CRB at 39; JX-2, ’143 patent at 8:45-59 (showing electrode material with 5% excess lithium); RX-729C, Amine Dep. Tr. at 74:13-19 (Dr. Amine testified that he tested compositions with 2% excess lithium).)

Second, Complainants established persuasively that the accused NMC materials (MX5h and TX7) include a bulk material consisting of a rhombohedral R-3m crystal structure which is indicative of the LiMO_2 component and a monoclinic C2/m crystal structure which is indicative of the $\text{Li}_2\text{M}'\text{O}_3$ component. (See CIB at 41-48, 64-68; CX-5C, Bradley DWS at Q/As 347, 604,

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691 (“[T]he LiMO_2 regions are marked by R-3m (rhombohedral) symmetry and the $\text{Li}_2\text{M}'\text{O}_3$ regions are marked by C2/m (monoclinic) symmetry with elevated manganese in comparison to the bulk material.”); RX-753C, Delmas RWS at Q/A 169 (“R-3m is characteristic of a LiMO_2 -type phase while the C2/m shows the existence of a superstructure similar to that observed in Li_2MnO_3 .”); RX-752C, Ceder RWS at Q/A 64 (“In contrast to the R-3m phase of LiMO_2 , the monoclinic C2/m phase of $\text{Li}_2\text{M}'\text{O}_3$ or $\text{Li}(\text{Li}_{1/3}\text{M}_{2/3})\text{O}_2$ compound shows the $\sqrt{3}$ or honeycomb ordering between Li and TM ions in the TM layer, as illustrated in RDX-1118, because the $1/3$ excess Li and the $2/3$ TM ions coexist in the TM layer.”.)

Dr. Bradley²⁶ testified that TEM imaging, EDS mapping, and electron diffraction indexing show compositional variations with areas having elevated manganese levels in MX5h and TX7 (manganese hot spots) corresponding to $\text{Li}_2\text{M}'\text{O}_3$ -type C2/m (monoclinic) crystal structure while the bulk material corresponds to LiMO_2 -type R-3m (rhombohedral) crystal symmetry. (See CX-5C, Bradley DWS at Q/As 55, 81-85, 537-41, 546-49, 574-79, 644, 662-67.) Dr. Bradley also testified that the “[a]rea count EDS spectra (right) show that [

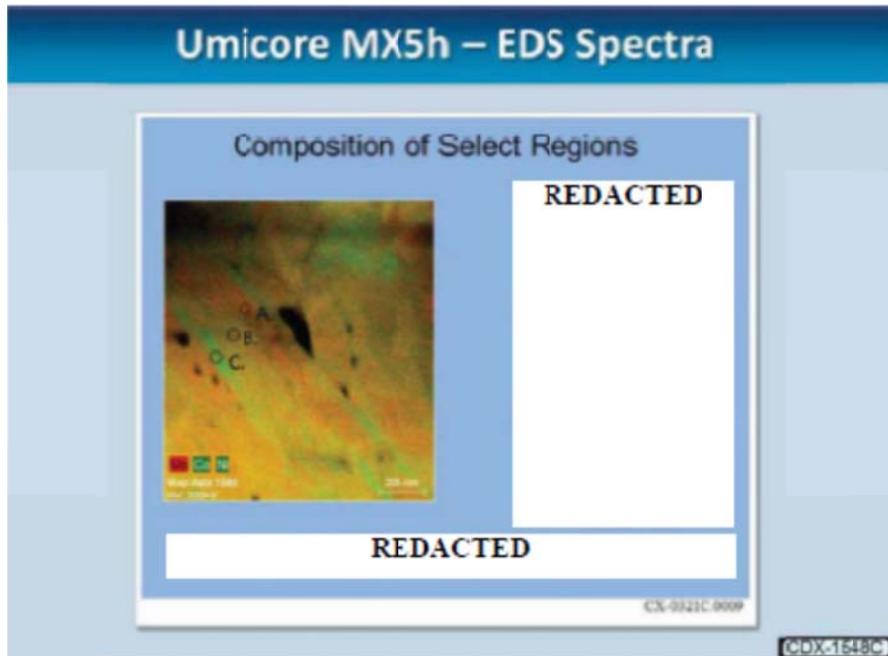
]

²⁷ See *id.* at Q/As 550-52 (discussing CX-321C at 9; CDX-1548C

reproduced below):

²⁶ Dr. Bradley’s unique, extensive, and relevant qualifications are paramount for purposes of this investigation and the subject matter of the Asserted Patents.

²⁷ “Tm . . . stands for ‘transition metal.’” (See CX-5C, Bradley DWS at Q/A 66.)

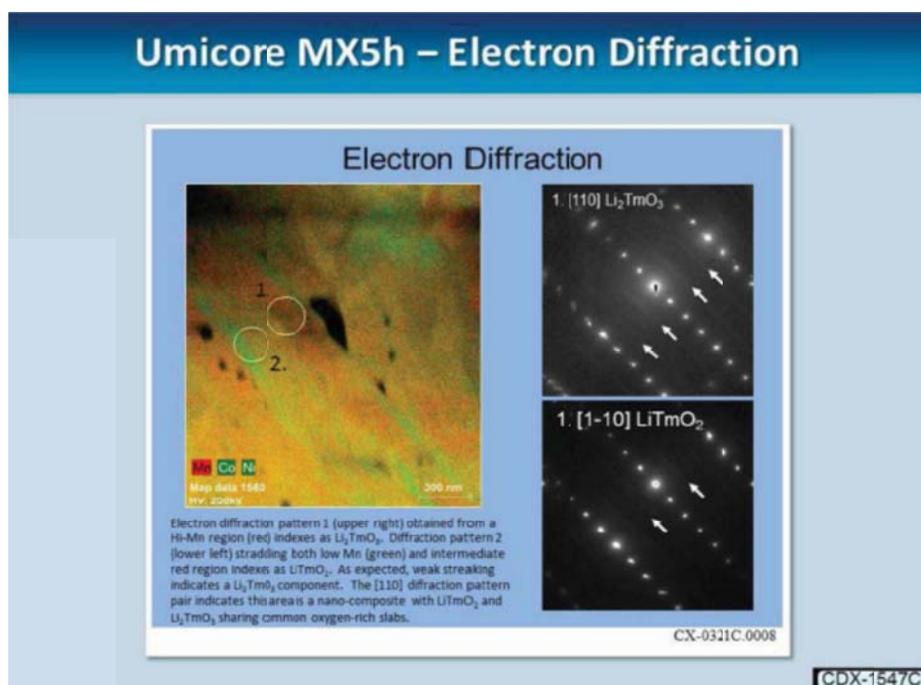


See also *id.* at Q/As 528-29.

Dr. Bradley also testified that the electron diffraction patterns for the manganese hot spots exhibit streaking and super lattice reflections which are characteristic of the C2/m monoclinic structure. (*See id.* at Q/As 549, 632, 640.) Dr. Bradley interpreted the electron diffraction patterns as follows:

Electron diffraction pattern 1 (upper right) obtained from a Hi-Mn region (red) indexes as Li_2TmO_3 . Diffraction pattern 2 (lower left) straddling both low Mn (green) and intermediate red region indexes as LiTmO_2 . As expected, weak streaking indicates a Li_2TmO_3 component. The [110] diffraction pattern pair indicates this area is a nano-composite with LiTmO_2 and Li_2TmO_3 sharing common oxygen-rich slabs.

See *id.* at Q/A 548 (discussing CX-321C at 8; CDX-1547C, reproduced below):

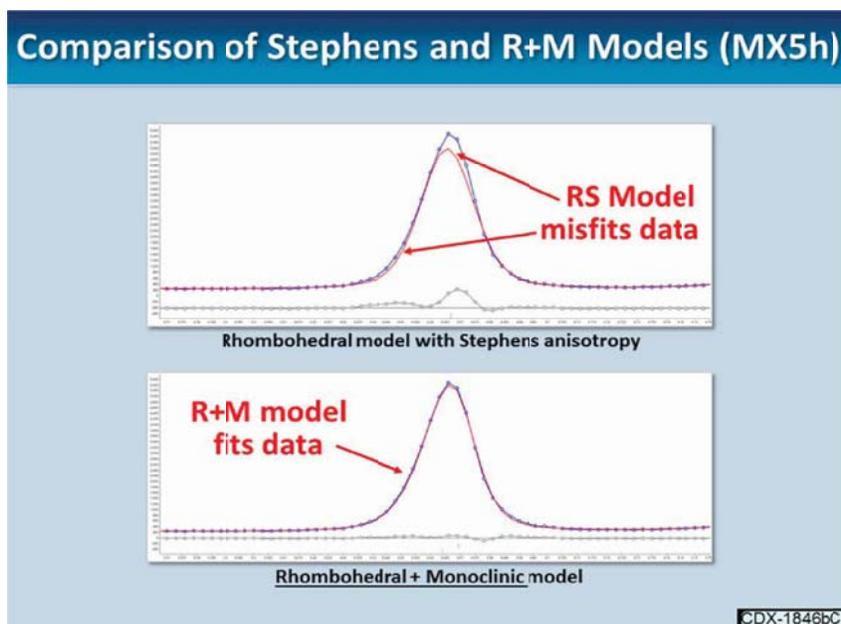


See also *id.* at Q/A 632. Dr. Bradley concluded that Umicore’s MX5h and TX7 have crystallographically distinct LiMO_2 and $\text{Li}_2\text{M}'\text{O}_3$ components.²⁸ (*See id.* at Q/As 574, 662.)

Dr. David confirmed that MX5h and TX7 contain crystallographically distinct LiMO_2 and $\text{Li}_2\text{M}'\text{O}_3$ components. Using synchrotron XRD and neutron powder diffraction, Dr. David determined that a model that included both rhombohedral and monoclinic components (rather

²⁸ As discussed *infra* section VI(B)(3), Dr. Bradley reached a similar conclusion with respect to TX9. (*See* CX-5C, Bradley DWS at Q/As 718-26.) Dr. Bradley also testified that the Bordeaux Study [] in MX10 with monoclinic and rhombohedral crystal structures, as well as diffuse lines which are characteristic of the Li_2TmO_3 phase. (*See id.* at Q/As 554-63, 580 (citing CX-161C; CX-162C).) The Bordeaux study also shows that MX10 exhibits [] Compare CX-161C at 98 (“There is clear evidence that there is [] upon cycling.”) and IX-1, ’082 patent at 2:23-29 (“[F]urther improvements must be made to LiMO_2 electrodes, . . . , to impart greater structural stability to these electrode materials during electrochemical cycling in lithium cells and batteries. This invention addresses the stability of LiMO_2 electrode structures, . . . , and makes use of a $\text{Li}_2\text{M}'\text{O}_3$ component to improve their stability.”).

than a rhombohedral-only model) provided the best fit for the MX5 and TX7 materials' asymmetrical peaks. See, e.g., CX-6C 186-91, 230-37, 245-48; CDX-1846bC.



The Literature: The testimony of Dr. Bradley and Dr. David is also consistent with the literature in the field. See CIB at 39-40. For example, Vang et al.²⁹ (2013) interprets compositional variations in a $\text{Li}_{1.2}\text{Mn}_{0.6}\text{Ni}_{0.2}\text{O}_2$ sample³⁰ as including areas of LiMO_2 (R-3m phase) and areas of Li_2MnO_3 (C2/m phase). See CX-299 at 3-4, reproduced below:

EDS analysis shows that the atomic percentage of nickel relative to manganese increases significantly in the brighter areas (Figure 4b). We, therefore, conclude that the brighter contrast of Figure 4a results from an increase in nickel and a decrease in lithium content. These changes in composition result in different phases (Figure 4c,d). In particular, regions with higher nickel content (brighter contrast) show no lithium ordering in the transition metal layer, which results in an R-3m phase with some interlayer mixing

²⁹ Dr. Ferreira who previously submitted a declaration in support of Respondents' opening claim construction brief in this investigation, is one of the authors of the Vang et al. (CX-299) article.

³⁰ As discussed *supra* p. 44, the excess lithium compositions can also be expressed as a normalized formula (normalized to two (2) atoms of oxygen). Those compositions, however, are distinct from pure LiMO_2 which has equimolar (not excess) amounts of lithium and transition metal.

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(Figure 4c), while the areas with more lithium (darker contrast) exhibit a C2/m phase (Figure 4d). . . . It can, therefore, be concluded that the shoulder present on the 44.8° peak in the 1000°C sample results from areas of LiMO₂ (R-3m phase), and the sharp peak at 44.8° results from areas of Li₂MnO₃ (C2/m phase).

See also CX-247, Jarvis et al.³¹ (2014) at 9 (“[C]ompositions lying between Li[Mn_{0.5}Ni_{0.5}]O₂ and Li[Li_{1.2}Mn_{0.6}Ni_{0.2}]O₂ contain both R-3m and C2/m phases. On the other hand, Li[Mn_{0.5}Ni_{0.5}]O₂ contains the R-3m phase and a small amount of lithium ordering in the transition metal layer due to interlayer mixing between Li and Ni, and Li[Li_{1.2}Mn_{0.6}Ni_{0.2}]O₂ has a pure C2/m phase.”); CX-246, Boulineau³² et al. (2012) at 5 (“[O]ur material microstructure is in good agreement with the 0.6·Li[Li_{1/3}Mn_{2/3}]O₂–0.4·LiNi_{0.45}Mn_{0.525}Mg_{0.025}O₂ notation that is the formula of the material Li_{1.2}Mn_{0.6}Ni_{0.18}Mg_{0.01}O₂ when rewritten as a two-component material. In this way, according to previous studies, this material should thus be considered as a composite rather than a solid solution material.”), *id.* (identifying domains of ordered slabs (in the C2/m space group) and disordered slabs (in the R-3m space group)).

The literature also confirms that streaking and super lattice reflections in electron diffraction patterns are characteristic of the presence of a Li₂M'O₃ component. (*See, e.g.,* CX-245, Boulineau et al.³³ (2009) at 7 (“[D]iffuse scattering lines, parallel to the c* monoclinic axis and running through the nodes which are characteristic of the monoclinic symmetry, do exist.”).)

See also infra pp. 51-52.

Umicore’s arguments do not undermine Complainants’ conclusions: Umicore admits that “[w]ith a few exceptions, [it] does not take issue with the manner in which Complainants’

³¹ Dr. Ferreira (*see supra* p. 48 n.29) is one of the authors of the Jarvis et al. (CX-247) article.

³² Adrien Boulineau is Dr. Delmas’ former student. *See* Hearing Tr. at 987:6-16 (Oct. 29, 2015) (Delmas).

³³ Dr. Delmas is one of the authors of the Boulineau et al. (CX-245) article.

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experts generated their test data or the reliability of the data.” (See RRB at 40.) But Umicore disputes the interpretation of the test data. (See *id.*)

Umicore argues that the presence of Ni and Co peaks in the EDS maps of the high-Mn regions (manganese hot spots) disproves the presence of a $\text{Li}_2\text{M}'\text{O}_3$ component. (See RIB at 63-64.) I disagree. As discussed *supra* p. 47, Dr. Bradley persuasively testified that the accused NMC materials are “nano-composites” of LiMO_2 and $\text{Li}_2\text{M}'\text{O}_3$ domains. (See also CX-5C, Bradley DWS at Q/As 582 (“In the case of []”), 631 (“[T]he high manganese region [

]); RX-302, Gu et al.³⁴ (2013) at 6 (“For pristine $\text{Li}_{1.2}\text{Ni}_{0.2}\text{Mn}_{0.6}\text{O}_2$ material, the lattice parameter and crystal structure similarity of the layered LiMO_2 R-3m phase and the Li_2MO_3 C2/m phase allows for the structural integration of both components in even one single nanoparticle, forming a nanoscale composite cathode.”).) Thus, it is not surprising that the EDS maps for the high-Mn regions also include Ni and Co peaks as those peaks can relate to the partial replacement of Mn within the $\text{Li}_2\text{M}'\text{O}_3$ -like structure or merely to the pervasive occurrence of the LiMO_2 material.

In addition, while I agree with Umicore that the claim element requiring M' to have an *average* oxidation state of four is not merely satisfied by “some amount of Li_2MnO_3 ” in the NMC material when M' can be something other than Mn alone (such as Mn partially substituted by Co or Ni) (see RRB at 17-18), I disagree with Umicore’s conclusion that there is no $\text{Li}_2\text{M}'\text{O}_3$ in Umicore’s NMC materials. Umicore disputes that $\text{Li}_2\text{M}'\text{O}_3$ exists at all, either as Li_2MnO_3 or as $\text{Li}_2\text{M}'\text{O}_3$ where M' can be Mn partially replaced by Co or Ni. But, as Dr. Bradley testified,

³⁴ Dr. Amine, one of the named inventors, is also an author of the Gu et al. (RX-302) article.

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the monoclinic C2/m (Li_2MnO_3 -like) phase of the NMC material corresponds to manganese hot spots. It is difficult to conceive that Li_2MnO_3 does not occur at all in those regions. Rather, it is more credible as Complainants contend, that either Li_2MnO_3 occurs by itself (*i.e.*, $\text{Li}_2\text{M}'\text{O}_3$ phase corresponds to Li_2MnO_3) or the Li_2MnO_3 -like phase corresponds to $\text{Li}_2\text{M}'\text{O}_3$ where M' is Mn partially replaced by Ni and/or Co (in both cases, as discussed *supra* p. 41 and *infra* section VI(B)(1)(v), M' necessarily has an average oxidation state of four). But Umicore's assertion that neither $\text{Li}_2\text{M}'\text{O}_3$ nor Li_2MnO_3 exists, without any testing and in the face of Complainants' extensive contrary evidence, is simply not credible.

Umicore also mischaracterizes Dr. Bradley's testimony with respect to the "streaks" he observed in the electron diffraction patterns. Umicore argues that "streaking is not unique to $\text{Li}_2\text{M}'\text{O}_3$ " and "Dr. Bradley's own [electron diffraction] results show similar streaking for LiMO_2 ." (*See* RRB at 44 (citing 321C at 8, reproduced *supra* p. 47); *see also* RIB at 90 ("[A]ccording to Dr. Delmas, the presence of a superstructure can result in the electron diffraction pattern that is purely LiMO_2 and without an $\text{Li}_2\text{M}'\text{O}_3$ component.")) However, Dr. Bradley testified that the caption makes clear that streaking was observed for a "mixture of the Li_1 phase and the Li_2 phase" not a pure LiMO_2 (*i.e.*, Li_1) phase. *See* Hearing Tr. at 431:23-25 (Oct. 27, 2015) (Bradley). Dr. Bradley also testified that the streaks are, as expected, "more prominent in the upper pattern of Li_2 and less prominent in the lower pattern on the mixture." *See id.* at 434:6-10. *See also id.* at 428:12-15 ("As you transition towards the Li_1 phase, which is the image on the left, you start to get the streaks fading, and that's what I wanted to show."). Thus, even if streaks appear in the LiMO_2 region as Umicore contends (*see, e.g.*, RIB at 89-90 (arguing that streaks may be caused by $\text{Li}^+/\text{Ni}^{2+}$ exchange in LiMO_2 material); RRB at 62), such streaks appear to be less prominent than the streaks that can be associated with the $\text{Li}_2\text{M}'\text{O}_3$

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region, which is consistent with Dr. Bradley's testimony. For instance, in Boulineau et al. (2010), the authors explain that "a higher intensity is observed at the positions where the C2/m reflexions of Li_2MnO_3 are located which means that the stacking of the ordered plane tends to be that observed in this former compound." (See CX-295, Boulineau et al. (2010) at 7.) See also *id.* at Fig. 9 & caption ("In b) the arrows underline the reflections appearing in the diffuse lines and located as in c).").

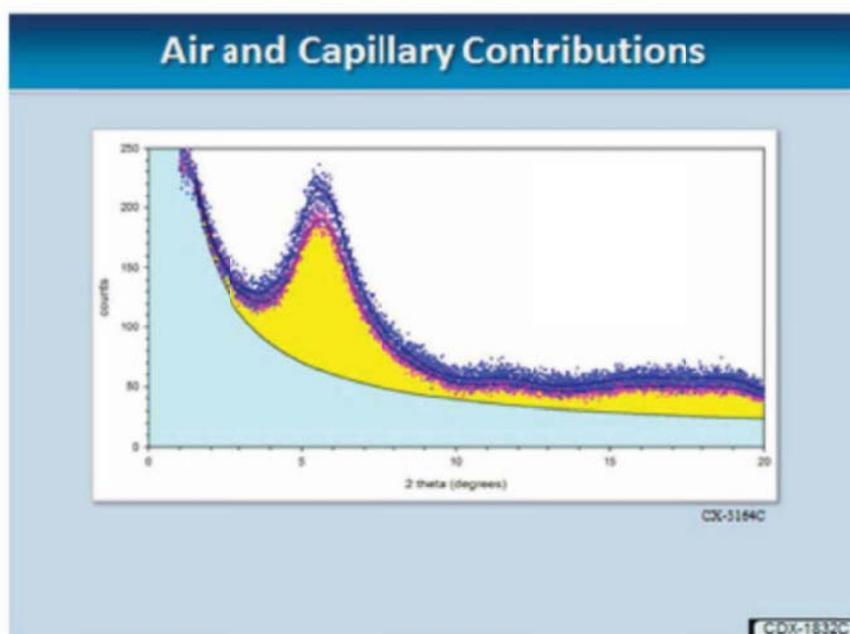
Thus, Umicore's argument that "Boulineau therefore shows that streaks could be caused by stacking faults in the material or result in materials that have non- $\text{Li}_2\text{M}'\text{O}_3$ compounds such as LiMO_2 " is misplaced.³⁵ (See RRB at 62 (citing RX-753C, Delmas RWS at Q/A 133; CX-295, Boulineau et al. (2010).) No do I find credible Umicore's argument that "one would see sharp dots, not streaks, in $\text{Li}_2\text{M}'\text{O}_3$ materials." (See RRB at 62.) Indeed, Umicore's expert, Dr. Delmas admits that Li_2MnO_3 would also exhibit streaking. (See RX-753C, Delmas RWS at Q/A 89 ("[T]he presence of stacking faults in Li_2MnO_3 leads to streaking lines (only dots in the ideal phase without any stacking faults)."); see also CX-295, Boulineau et al. (2010) at 8 ("We have studied various Li_2MnO_3 samples obtained via two synthesis routes and different annealing treatments. X-ray and electron diffraction revealed that it was not possible to synthesize the ideal compound, *i.e.* free of stacking faults, via these syntheses.").)

Furthermore, Umicore argues that Dr. David's failure to observe the signature $\text{Li}_2\text{M}'\text{O}_3$ peak at 5-6 degrees demonstrates that "his testing was inconclusive as to the presence of

³⁵ The Weill et al. article also does not help Umicore as the article states that "the superstructure reflections observed in the X-ray diffraction pattern of $\text{LiNi}_{0.425}\text{Mn}_{0.425}\text{Co}_{0.15}\text{O}_2$ were much weaker than those observed for $\text{Li}_{1.12}(\text{LiNi}_{0.425}\text{Mn}_{0.425}\text{Co}_{0.15})_{0.88}\text{O}_2$." (See RX-305, Weill et al. (2007) at 5.) Similarly, the Yabuuchi et al. article observes that "[m]ost of the electron diffraction patterns show very weak and extra diffraction spots." (See RX-330, Yabuuchi et al. (2005) at 3.)

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Li₂M'O₃ in the Umi more materials.” (See RRB at 44.) While I agree that the peak observed at 5-6 degrees is barely distinguishable from the air (light blue) and capillary (yellow) contributions (see CD X-1832C, reproduced below), I also find Dr. David’s explanation thereon credible.³⁶ See Hearing Tr. at 339:16-23 (Oct. 27, 2015) (David) (“[I]t’s far better to use electron diffraction to study these features than -- because as you see these are very weak features here so I have not brought them in my analysis because it is not appropriate to actually tackle these features, it’s actually you go to electron diffraction to get that information.”).



³⁶ RX-315, Weill et al. (2007) at 2, Figure 1, also confirms the weakness of the signature peak at 5-6 degrees (which [w]ith Cu-K α radiation [i]s in the 0-21 degree range,” see RX-752C, Ceder RWS at Q/A 54) and attributes it to a Li₂MnO₃-type structure (“[T]he small lines observed between 19.5° and 26° (2 θ_{Cu}) are probably due to an ordering of the Li, Ni, Mn and Co ions in the transition metal layers, by analogy to the Li₂MnO₃ structure, thus leading to the occurrence of a superlattice.”). (See also CRB at 28.)

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As discussed *supra* p. 47, Dr. Bradley conducted such electron diffraction analysis and credibly established the presence of a crystallographically distinct region that “indexes as Li_2TmO_3 .”³⁷

Still further, I do not find Umicore’s argument that its NMC materials are single-phase solid solutions credible. (*See, e.g.*, RIB at 81.) In fact, Umicore’s expert, Dr. Delmas, agreed that the Umicore materials have crystallographically distinct regions with R-3m and C2/m crystal symmetries. *See* Hearing Tr. at 1017:12-19, 1017:25-1018:6 (Oct. 29, 2015) (Delmas):

Q In the Umicore and BASF NCM materials that are at issue in this case, you agree, don’t you, that there’s [R-3m] symmetry observed in the domains with relatively lower manganese content; right?

A Yes.

Q That’s what Dr. Bradley’s TEM results showed; right?

A Yes.

Q In the Umicore and BASF NCM materials that are at issue in this investigation, you agree that there’s C2/m symmetry observed in the domains with relatively higher manganese content; right?

A Yes.

Q That’s what Dr. Bradley’s results showed; right?

A Yes.

Lastly, Umicore argues that “Complainants’ experts acknowledged at the hearing that their test data is inconclusive as to the presence of $\text{Li}_2\text{M}'\text{O}_3$ in the Umicore materials.” (*See* RRB at 44). Umicore attacks each of Complainants’ testing data *individually*. (*See id.* at 65 (“Your analysis *by itself* is inconclusive as to the $\text{Li}_2\text{M}'\text{O}_3$?”) (emphasis added); RIB at 92 (“So

³⁷ Umicore also takes issue with Dr. David’s conclusion that the Umicore MX5h product contained []. (*See* RIB at 79-80.) But as explained by Dr. David, definitive numbers require another characterization technique such as electron microscopy. *See* Hearing Tr. at 331:3-6 (Oct. 27, 2015) (David). *See also id.* at 493:6-10 (Kirchheim) (“If it comes to composition, you can use the electron microscope, and if you want to get accurate number you have to go to chemical analytical techniques like ICP, for instance.”).

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is it your testimony, though, as I understand what you just said in this line of questioning, ***that from the streaks alone, you cannot conclude that there is $\text{Li}_2\text{M}'\text{O}_3$ in the material***, correct?") (emphasis in original.) However, it is the ***sum total*** of the evidence (including the excess lithium and the high-Mn regions with monoclinic C2/m crystal symmetry), not the individual evidentiary elements, that makes it more likely than not that the $\text{Li}_2\text{M}'\text{O}_3$ component exists in Umicore's accused materials.

Accordingly, I find Complainants' theory of the case more credible and more consistent with the evidence and the literature. In contrast, Umicore's position that their NMC material includes [] and that it is a solid solution (rather than a composite with crystallographically distinct components) is **not** persuasive.

Hence, I find that Complainants carried their burden to prove that MX5h and TX7 include crystallographically distinct LiMO_2 and $\text{Li}_2\text{M}'\text{O}_3$ components.

(3) The LiMO_2 and $\text{Li}_2\text{M}'\text{O}_3$ components are structurally integrated.

The Complainants have persuasively established that MX5h and TX7 include structurally integrated LiMO_2 and $\text{Li}_2\text{M}'\text{O}_3$ components. (See CIB at 48-52, 68-71; accord SIB at 12-14, 19-21.)

As discussed *supra* p. 47, Dr. Bradley credibly testified that the accused NMC materials are "nano-composites" of LiMO_2 and $\text{Li}_2\text{M}'\text{O}_3$ domains. (See CX-5C, Bradley DWS at Q/A 582 ("In the case of [

]"), Q/A 631 ("[T]he high manganese region [

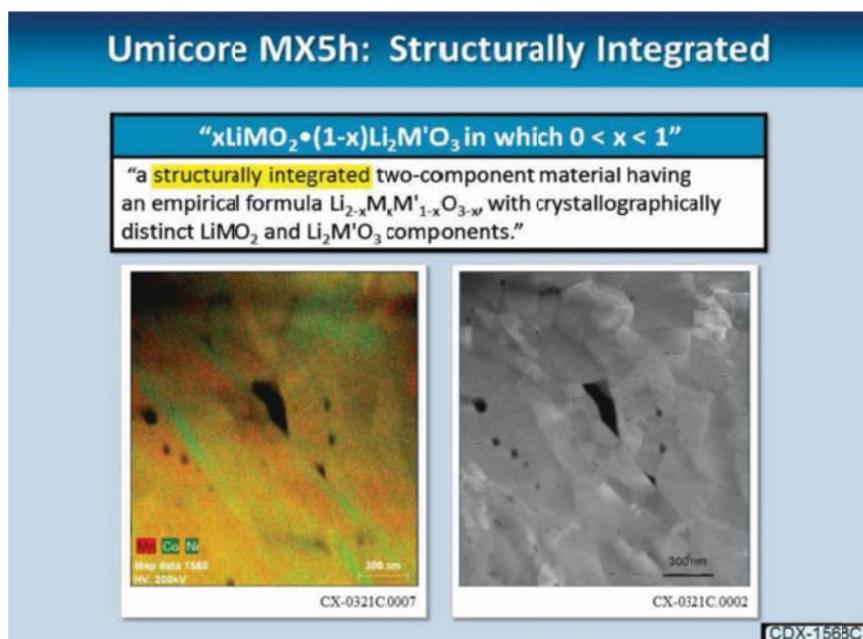
]").) See also RX-302,

Gu et al. (2013) at 6 ("For pristine $\text{Li}_{1.2}\text{Ni}_{0.2}\text{Mn}_{0.6}\text{O}_2$ material, the lattice parameter and crystal structure similarity of the layered LiMO_2 R-3m phase and the Li_2MO_3 C2/m phase allows for the

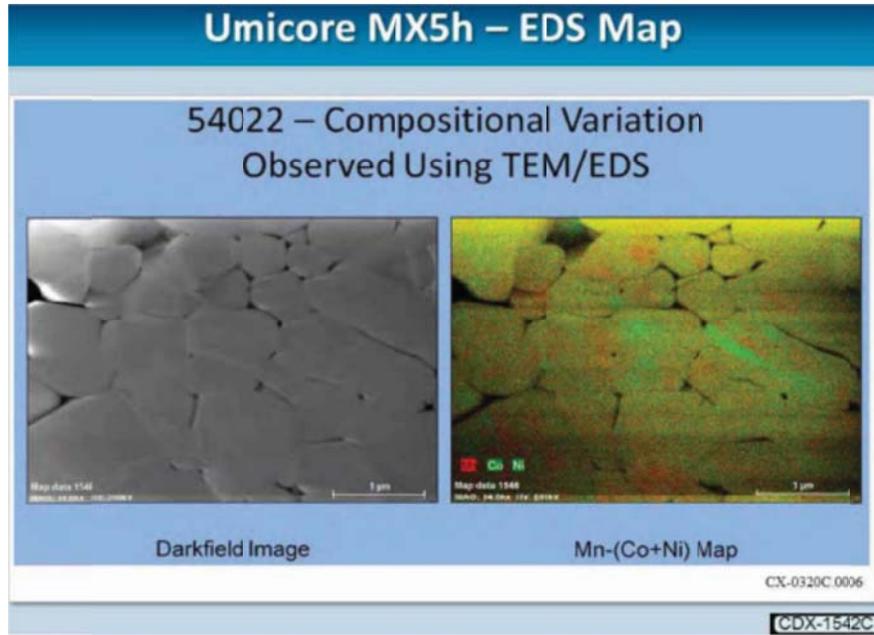
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structural integration of both components in even one single nanoparticle, forming a nanoscale composite cathode.”).

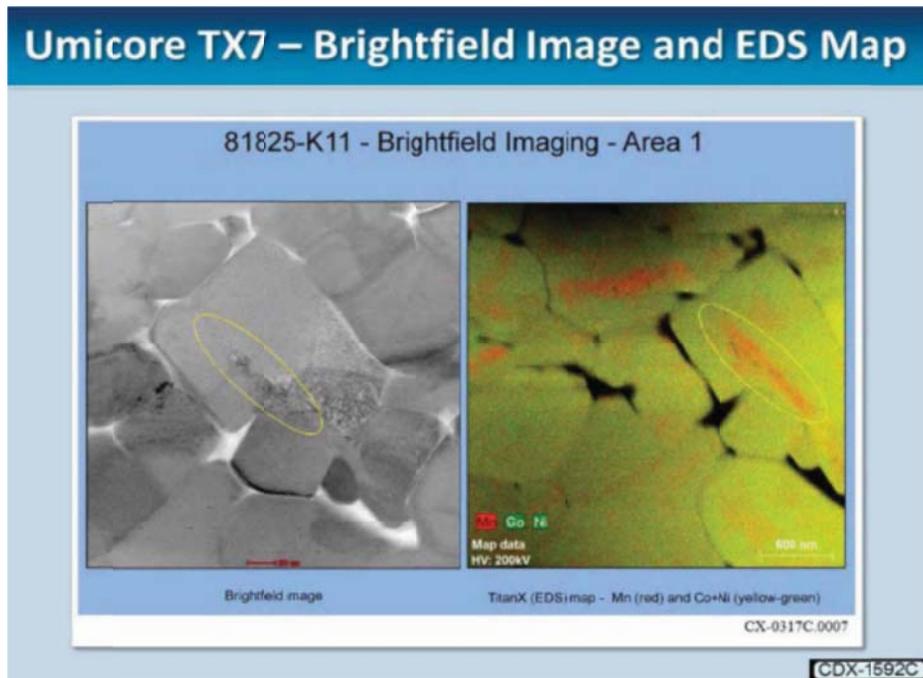
In addition, Dr. Bradley credibly testified that Brightfield and/or Darkfield images and EDS maps show chemical bonding between crystals in single powder particle through direct contact of the atomic planes. (See CX-5C, Bradley DWS at Q/As 536-42, 582, 630-31, 638-39, 669 (“For example, in each of the darkfield/brightfield images and EDS maps, what is observed is that the LiMO_2 and $\text{Li}_2\text{M}'\text{O}_3$ components have adjacent atomic planes in adjacent crystals. There is chemical bonding between these crystals, that exist within the same particle and these components are therefore structurally integrated.”); CX-321C at 2; CDX-1568C (reproduced below); see also *id.* at Q/A 234 (“... If this were not the case, the powder particles would fall apart.”)).



See also CX-320C at 6; CDX-1542C (reproduced below).



See also CX-5C, Bradley DWS at Q/As 625-32, 669; CX-317C at 7, CDX-1592C (reproduced below).



Dr. Bradley further testified that “LiTmO₂ and Li₂TmO₃ tend to structurally integrate by sharing a common oxygen lattice.” (See CX-5C, Bradley DWS at Q/As 542, 630.)

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Umicore argues that “[i]dentifying structural integration requires atomic level imaging to see a common oxygen array or chemical bonding between the two components.” (*See* RIB at 103 (citing JX-1, the ’082 Patent at 4:24-27 (“[T]he applicants believe that the structures of the electrode materials of the present invention are significantly different from those of the prior art and will be unequivocally distinguished from one another by high-resolution transmission electron microscopy.”).) Umicore also argues that “structural integration requires coherency, or continuous crystallographic layers between the two components without interruption or discontinuity.” (*See id.* at 107.) But Umicore acknowledges that “while a common oxygen array is not a limitation of the claims and is not necessary to find structural integration, its presence would be sufficient to show coherency and structural integration.” (*See id.* at 102.)

I disagree that atomic level imaging is required to identify structural integration. The Asserted Patents recommend high-resolution TEM but that does not necessarily mean atomic level imaging. Indeed, Dr. Bradley testified that he used high-resolution TEM. (*See* CX-5C, Bradley DWS at Q/As 58, 87; Hearing Tr. at 479:21-480:4 (Oct. 27, 2015) (Bradley).) Dr. Bradley also testified that he used the appropriate scale because “the two phases are not integrated in one or two angstroms across, they are integrated on a scale of hundreds of nanometers.” *See* Hearing Tr. at 453:25-454:10 (Oct. 27, 2015) (Bradley)). (*See also* CIB at 51 (“[T]he appropriate scale is one where the domains and crystals of LiMO_2 and $\text{Li}_2\text{M}'\text{O}_3$ are visible such that their integration can be observed.”).)

I find Dr. Bradley’s testimony that EDS maps and Brightfield/Darkfield images showing compositional variations (and therefore variations in crystal symmetries, *see supra* p. 45) within a single crystal and chemical bonding between crystals in a single powder particle, reliably establishes that the two components LiMO_2 and $\text{Li}_2\text{M}'\text{O}_3$ are structurally integrated.

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Accordingly, I find that Complainants established that Umicore's MX5h and TX7 are structurally integrated two-component materials. Hence, I find that Complainants carried their burden to prove that claim element 1(iii) ("having a general formula $x\text{LiMO}_2 \cdot (1-x)\text{Li}_2\text{M}'\text{O}_3$ in which $0 < x < 1$ ") is satisfied by MX5h and TX7.

(iv) **where M is one or more ions having an average oxidation state of three with at least one ion being Ni**

The parties agreed that the claim term "where M is one or more ions having an average oxidation state of three" should be construed as "the average of the oxidation states of M is 3." *See supra* p. 27.

Complainants persuasively established that MX5h and TX7 satisfy the claim element requiring that M is one or more ions having an average oxidation state of three with at least one ion being Ni. (*See* CIB at 53, 71; *accord* SIB at 14-15, 21-22.) Umicore did not dispute this limitation in its pre-hearing brief (other than a conclusory argument in a footnote, see RPB at 25 n.11, that "Complainants also neglected to offer sufficient evidence concerning the limitation "M is one or more ions having an average oxidation state of three.""). I find that Umicore waived any arguments with respect to this limitation. *See* Ground Rule 11.2 (contentions not set forth in the pre-hearing brief are deemed abandoned or withdrawn).

Regardless, Dr. Bradley testified that EDS mapping shows LiMO_2 regions containing at least nickel. (*See* CX-5C, Bradley DWS at Q/As 586, 673.) Dr. Wang's ICP analysis also confirmed that MX5h and TX7 contain nickel. (*See* CX-7C, Wang DWS at Q/As 93-94.) *See also* CX-486C, SpecTable (Umicore spreadsheet including specifications for MX materials); CX-491C (internal specification form for TX7).

With respect to the average oxidation state of M, Umicore's own experts admit that it must be three. (*See* RX-752C, Ceder RWS at Q/A 45 ("In order to balance the Li and O

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oxidation states, the M, and its constituent metals, must have an average oxidation state equal to +3 (*i.e.*, $1 + 3 - 4 = 0$)."); RX-753C, Delmas RWS at Q/A 143 (“[T]he oxidation state of the M element is equal to 3+.”.)

Accordingly, I find that Complainants carried their burden to prove that claim element 1(iv) (“where M is one or more ions having an average oxidation state of three with at least one ion being Ni”) is satisfied by MX5h and TX7.

(v) **where M’ is one or more ions with an average oxidation state of four with at least one ion being Mn**

The parties agreed that the claim term “where M’ is one or more ions with an average oxidation state of four” should be construed as “the average of the oxidation states of M’ is 4.” *See supra* p. 27.

As discussed *supra* p. 41, Umicore’s own experts agree that if the $\text{Li}_2\text{M}'\text{O}_3$ component exists, the average oxidation state of M’ is necessarily four. (*See* RX-753C, Delmas RWS at Q/A 142 (“For $\text{Li}_2\text{M}'\text{O}_3$, the average oxidation state of M’ is 4+ whatever the nature of various M’ elements.”); RX-752C, Ceder RWS at Q/A 46 (“In order to balance the compound, the average oxidation state of M’, and its constituent metals, has to be +4.”); *see also* Hearing, Tr. 1008:8-12 (Oct. 29, 2015) (Delmas). Indeed, the average oxidation state of four for M’ is a direct result of the charge neutrality (*i.e.*, a zero sum of the charges) of the $\text{Li}_2\text{M}'\text{O}_3$ component (*i.e.*, $(\text{Li}^+)_2(\text{M}'^{4+})(\text{O}^{2-})_3$). (*See* RX-753C, Delmas RWS at Q/A 143.)

Because I found (*see supra* section VI(B)(1)(a)(iii)) that Complainants proved by a preponderance of the evidence that Umicore’s MX5h and TX7 products include a $\text{Li}_2\text{M}'\text{O}_3$ component (where M’ is one or more ions with at least one ion being Mn, *see supra* section VI(B)(1)(a)(iii)), I also find that Complainants carried their burden to prove that claim element

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1(v) (“where M’ is one or more ions with an average oxidation state of four with at least one ion being Mn”) is satisfied by MX5h and TX7.

(vi) **with both the LiMO₂ and Li₂M’O₃ components being layered**

As discussed above, the claim term “with both the LiMO₂ and Li₂M’O₃ components being layered” was construed as “the LiMO₂ and Li₂M’O₃ components each have a layered-type crystalline structure that are distinct but structurally compatible.” *See supra* p. 26.

Complainants persuasively established that MX5h and TX7 include LiMO₂ and Li₂M’O₃ components that have a layered-type crystalline structure and that are distinct but structurally compatible. (*See* CIB at 57-58, 73; *accord* SIB at 16-17, 23.)

As discussed *supra* section VI(B)(1)(a)(iii)(2), Umicore’s MX5h and TX7 products include LiMO₂ and Li₂M’O₃ components that are crystallographically distinct. In addition, Umicore’s experts do not dispute that the LiMO₂ and Li₂M’O₃ components have layered structures. *See* Hearing Tr. at 866:20-24 (Oct. 28, 2015) (Ceder); *id.* at 1013:14-16, 1013:24-1014:1 (Oct. 29, 2015) (Delmas). Furthermore, I find that Umicore waived any arguments with respect to the “structurally compatible” requirement because Umicore failed to make such arguments in its pre-hearing brief. *See* Ground Rule 11.2 (contentions not set forth in the pre-hearing brief are deemed abandoned or withdrawn). In any event, Complainants credibly established that the LiMO₂ and Li₂M’O₃ components are structurally compatible because: (1) they both have an interlayer spacing of about 4.7 Å; and (2) they are structurally integrated as demonstrated by Dr. Bradley’s testing. (*See* CX-5C, Bradley DWS at Q/As 256-57; *supra* pp. 55-58; *see also* RPB at 104 (“One of ordinary skill in the art would know that LiMO₂ and Li₂M’O₃ are structurally compatible because of the similarity of their interlayer spacing.”).)

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Accordingly, I find that Complainants carried their burden to prove that claim element 1(vi) (“with both the LiMO_2 and $\text{Li}_2\text{M}'\text{O}_3$ components being layered”) is satisfied by MX5h and TX7.

(vii) **the ratio of Li to M and M' being greater than one and less than two**

As discussed above, the claim term “the ratio of Li to M and M'” was construed as “the ratio of Li to (M plus M') within the general formula $x\text{LiMO}_2 \cdot (1-x)\text{Li}_2\text{M}'\text{O}_3$.” See *supra* p. 26.

Complainants persuasively established that the ratio of Li to M and M' in MX5h and TX7 is greater than one and less than two. (See CIB at 58-60, 74; accord SIB at 17, 24.) As discussed *supra* p. 40, Complainants' Dr. Kirchheim, based on Dr. Wang's ICP analysis, determined a value of [] for x as to MX5h which corresponds to an empirical formula of $\text{Li}_{[]}\text{M}_{[]}\text{M}'_{[]}\text{O}_{[]}$ and a value of [] for x as to TX7 which corresponds to an empirical formula of $\text{Li}_{[]}\text{M}_{[]}\text{M}'_{[]}\text{O}_{[]}$. (See CIB at 36, 63; CX-4C, Kirchheim DWS at Q/As 252-64, 467-79.) As discussed *supra* p. 40 n.21, the empirical formulae for MX5h and TX7 can be rearranged, respectively, into the following two-component formulae:

[] $\text{LiMO}_2 \cdot$ [] $\text{Li}_2\text{M}'\text{O}_3$ and [] $\text{LiMO}_2 \cdot$ [] $\text{Li}_2\text{M}'\text{O}_3$. (See CX-4C, Kirchheim DWS at Q/As 357, 547.) Dr. Kirchheim determined that the lithium-to-metal ratio was [] for MX5h and [] for TX7. (See CX-4C, Kirchheim DWS at Q/As 327, 525.)

Umicore argues that Complainants cannot prove that MX5h and TX7 “have the claimed ratio because they do not contain an $\text{Li}_2\text{M}'\text{O}_3$ component.” (See RIB at 110, 131.) However, I disagreed with Umicore's position that its MX5h and TX7 products lacked the $\text{Li}_2\text{M}'\text{O}_3$ component. See *supra* section VI(B)(1)(a)(iii)(2).

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Accordingly, I find that Complainants carried their burden to prove that claim element 1(vii) (“the ratio of Li to M and M’ being greater than one and less than two”) is satisfied by MX5h and TX7.

(viii) wherein domains of the LiMO₂ and Li₂M’O₃ components exist side by side.

The parties agreed that the claim term “domains” should be construed as “crystallographically distinguishable regions.” *See supra* p. 26. As discussed *supra* section VI(B)(1)(a)(iii)(2), I found that Complainants carried their burden to prove that Umicore’s MX5h and TX7 include crystallographically distinguishable regions of LiMO₂ and Li₂M’O₃ components.

In addition, Complainants persuasively established that MX5h and TX7 include domains of LiMO₂ and Li₂M’O₃ components that exist side by side. (*See* CIB at 60, 74-75; *accord* SIB at 17, 24.) Complainants rely on Dr. Bradley’s testimony that the domains are structurally integrated and exist side by side within a single powder particle. (*See* CX-5C, Bradley DWS at Q/As 609-10, 696-97 (citing CX-320C; CX-321C; CX-317C; CX-318C at 7; CDX-1651C reproduced below).)



I find Dr. Bradley's testimony credible. *See also supra* pp. 55-58 (finding that Dr. Bradley's testimony credibly establishes that the two components LiMO_2 and $\text{Li}_2\text{M}'\text{O}_3$ are structurally integrated).

Umicore argues that "the scale and resolution of the images in Dr. Bradley's witness statement do not allow a determination of whether the labeled regions are side by side." (*See* RIB at 111, 131.) However, as discussed *supra* pp. 58- 9, I disagree that atomic level imaging is required to identify structural integration or to conclude that the domains of LiMO_2 and $\text{Li}_2\text{M}'\text{O}_3$ components exist side by side.

Accordingly, I find that Complainants carried their burden to prove that claim element 1(viii) ("wherein domains of the LiMO_2 and $\text{Li}_2\text{M}'\text{O}_3$ components exist side by side") is satisfied by MX5h and TX7.

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(ix) **Conclusion**

Complainants carried their burden to prove that Umicore's MX5h and TX7 satisfy each element of claim 1. Accordingly, I find that claim 1 is infringed by MX5h and TX7.

b. **Claim 2**

Claim 2 of the '082 patent recites "[a] lithium metal oxide positive electrode according to claim 1 in which $0.8 \leq x < 1$." As discussed *supra* section VI(B)(1)(a)(iii)(1), Complainants' Dr. Kirchheim credibly determined, based on Dr. Wang's ICP analysis, that x had a value of [] for MX5h and a value of [] for TX7. (*See also* SIB at 24-25.) Thus, MX5h and TX7 satisfy the claim element $0.8 \leq x < 1$.

Umicore argues that MX5h and TX7 "do[] not contain a $\text{Li}_2\text{M}'\text{O}_3$ component" and "[t]he inconsistent compositions identified by Complainants' experts make it unlikely the claim is infringed." (*See* RIB at 140-41.) I disagree. As discussed *supra* section VI(B)(1)(a)(iii)(2), I found that Complainants carried their burden to prove that Umicore's MX5h and TX7 include a $\text{Li}_2\text{M}'\text{O}_3$ component. In addition, I do not find an inconsistency in Complainants' experts' determinations with respect to composition. Indeed, as discussed *supra* p. 54 n.37, Dr. David credibly testified that definitive numbers for the percentages of rhombohedral phase and monoclinic phase require another characterization technique such as electron microscopy. *See* Hearing Tr. at 331:3-6 (Oct. 27, 2015) (David). With respect to composition, Dr. Kirchheim credibly testified that "chemical analytical techniques like ICP" are required. *See id.* at 493:6-10 (Kirchheim) ("If it comes to composition, you can use the electron microscope, and if you want to the get accurate number you have to go to chemical analytical techniques like ICP, for instance.").

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Accordingly, I find that Complainants carried their burden to prove that Umicore's MX5h and TX7 satisfy the elements of claim 2. Accordingly, I find that claim 2 is infringed by MX5h and TX7.

c. Claim 3

Claim 3 of the '082 patent recites "[a] lithium metal oxide positive electrode according to claim 1 in which $0.9 \leq x < 1$." As discussed *supra* section VI(B)(1)(a)(iii)(1), Complainants' Dr. Kirchheim credibly determined, based on Dr. Wang's ICP analysis, that x had a value of [] for MX5h and a value of [] for TX7. (*See also* SIB at 26-27.) Thus, MX5h and TX7 satisfy the claim element $0.9 \leq x < 1$.

Umicore argues that MX5h and TX7 do not infringe claim 3 "[f]or the same reasons as stated" in connection with claim element 1(iii) ("having a general formula $x\text{LiMO}_2 \cdot (1-x)\text{Li}_2\text{M}'\text{O}_3$ in which $0 < x < 1$ "). (*See* RIB at 142.) Umicore's arguments that claim 3 of the '082 patent is not infringed fail for the same reasons discussed in connection with claim element 1(iii). *See supra* section VI(B)(1)(a)(iii). *See also supra* section VI(B)(1)(b).

Therefore, I find that Complainants carried their burden to prove that Umicore's MX5h and TX7 satisfy the elements of claim 3 and that claim 3 is infringed by MX5h and TX7.

d. Claim 4

Claim 4 of the '082 patent recites "[a] lithium metal oxide positive electrode according to claim 1 in which M and M' are disordered in the electrode structure." The parties agreed that the claim term "M and M' are disordered" should mean "one or more of M and M' occupy cation sites other than those designated in $\text{LiMO}_2 \cdot \text{Li}_2\text{M}'\text{O}_3$ " and "electrode structure" should mean "electrode material." *See supra* p. 27.

Complainants persuasively established that M and M' are disordered in the electrode structure. (*See* CIB at 76-77; *accord* SIB at 27-28.) Specifically, Dr. David credibly testified

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that nickel occupies cation sites designated for lithium in both the monoclinic ($\text{Li}_2\text{M}'\text{O}_3$) and rhombohedral (LiMO_2) components of MX5h and TX7. (See CX-6C, David DWS at Q/As 157-61, 230, 238, 239, 250.)

Umicore argues that MX5h and TX7 do not infringe claim 4 of the '082 patent because claim 4 depends from claim 1 (which according to Umicore is not infringed). (See RIB at 143.) Umicore's argument that claim 4 of the '082 patent is not infringed because claim 1 is not infringed, fails for the same reasons as discussed in connection with claim 1. See *supra* section VI(B)(1)(a). (See also RPB at 106 ("This necessarily occurs in all lithium nickel-cobalt-manganese oxide cathode materials. In particular, some fraction of the transition metals enters the lithium layer, resulting in disorder in the electrode structure."); CX-161C at 15 (stating that [] MX10³⁸ are [])).)

Accordingly, I find that Complainants carried their burden to prove that Umicore's MX5h and TX7 satisfy the elements of claim 4 and that claim 4 is infringed by MX5h and TX7.

e. Claim 7

Claim 7 of the '082 patent recites "[a] lithium metal oxide positive electrode according to claim 1 in which M and M' are partially replaced by mono- or multivalent cations."

As discussed *supra* section VI(B)(1)(d) in connection with claim 4, Complainants persuasively established that M and M' are disordered in the electrode structure and that nickel occupies cation sites designated for lithium in both the monoclinic ($\text{Li}_2\text{M}'\text{O}_3$) and rhombohedral (LiMO_2) components of MX5h and TX7. Because lithium is monovalent (*see, e.g.*, CX-4C,

³⁸ The MX10 product is further addressed *infra* section VI(B)(3) in connection with the issue whether MX5h is representative of other products within its product family.

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Kirchheim DWS at Q/A 373), Complainants also persuasively established M and M' are partially replaced by mono- or multivalent cations, as required by claim 7.

Umicore argues that MX5h and TX7 do not infringe claim 7 of the '082 patent because claim 7 depends from claim 1 (which according to Umicore is not infringed). (*See* RIB at 143-44.) Umicore's argument that claim 7 of the '082 patent is not infringed because claim 1 is not infringed, fails for the same reasons as discussed in connection with claim 1. *See supra* section VI(B)(1)(a).

Accordingly, I find that Complainants carried their burden to prove that Umicore's MX5h and TX7 satisfy the elements of claim 7. Accordingly, I find that claim 7 is infringed by MX5h and TX7.

f. Claim 13

Claim 13 of the '082 patent recites:

- [i] An electrochemical cell having a negative electrode and a non-aqueous electrolyte and a positive electrode, said positive electrode having
- [ii] in its initial discharged state
- [iii] a general formula $x\text{LiMO}_2 \cdot (1-x)\text{Li}_2\text{M}'\text{O}_3$ in which $0 < x < 1$, and
- [iv] where M is one or more ions having an average oxidation state of three with at least one ion being Ni, and
- [v] where M' is one or more ions with an average oxidation state of four with at least one ion being Mn,
- [vi] with both the LiMO_2 and $\text{Li}_2\text{M}'\text{O}_3$ components being layered and
- [vii] the ratio of Li to M and M' being greater than one and less than two; and
- [viii] wherein domains of the LiMO_2 and $\text{Li}_2\text{M}'\text{O}_3$ components exist side by side.

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Claim 13 includes the same limitations as claim 1, except that the preamble further recites “[a]n electrochemical cell having a negative electrode and a non-aqueous electrolyte and a positive electrode.”

Umicore provides similar arguments to deny infringement with respect to the claimed electrochemical cell as it did with the positive electrode of claim 1. (*See* RIB at 144-45 (“Similar to the ‘positive electrode’ limitation of claim 1, Complainants have provided no evidence of a positive electrode, including MX5h [and TX7], within an electrochemical cell with the claimed chemical formula $x\text{LiMO}_2 \cdot (1-x)\text{Li}_2\text{M}'\text{O}_3$ and the other claim limitations.”).)

Nevertheless, as discussed above, there is no dispute that Umicore’s NMC products are designed for use in a positive electrode and that Umicore’s customers make batteries or electrochemical cells. *See supra* section VI(B)(1)(a)(i). In addition, Umicore does not dispute that it has sold the accused NMC materials to battery makers and/or companies doing research on electrochemical cells. *See id.* Furthermore, Complainants also established that the positive electrode is “for a non-aqueous lithium cell.” *See id.* Still further, Complainants provided more than ample evidence showing that Umicore and its customers have evaluated positive electrodes with the accused NMC materials in half cell, full cell, and coin cell testing.³⁹ *See id.*

Accordingly, I find that it is far more likely than not, that at least one of Umicore’s customers in the United States used the accused NMC materials (including MX5h and TX7) in an electrochemical cell that meets the limitations of claim 13 of the ’082 patent. *See Lucent Techs.*, 580 F.3d at 1318. (*See also* SIB at 29-30.)

³⁹ “A half cell contains a positive electrode, an electrolyte, and negative electrode made of a sheet of lithium.” (CX-4C, Kirchheim DWS at Q/A 199.) “A full cell is a cell with a positive electrode, a negative electrode, an electrolyte, and a separator.” (*See id.* at Q/A 422.) “This coin cell had a positive electrode, where the TX was, an electrolyte, and a negative electrode in the form of a sheet of lithium.” (*See id.* at Q/A 437.)

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Hence, I find that Complainants carried their burden to prove that Umicore's MX5h and TX7 satisfy the elements of claim 13. Accordingly, I find that claim 13 is infringed by MX5h and TX7.

g. Claim 14

Claim 14 of the '082 patent recites:

- [i] A battery consisting of a plurality of cells, at least some cells including a negative electrode and a non-aqueous electrolyte and a positive electrode, said positive electrode having
- [ii] in its initial discharged state
- [iii] a general formula $x\text{LiMO}_2 \cdot (1-x)\text{Li}_2\text{M}'\text{O}_3$ in which $0 < x < 1$, and
- [iv] where M is one or more ions having an average oxidation state of three and at least one ion being Ni, and
- [v] where M' is one or more ions with an average oxidation state of four and at least one ion being Mn,
- [vi] with both the LiMO_2 and $\text{Li}_2\text{M}'\text{O}_3$ components being layered and
- [vii] the ratio of Li to M and M' being greater than one and less than two; and
- [viii] wherein domains of the LiMO_2 and $\text{Li}_2\text{M}'\text{O}_3$ components exist side by side.

Claim 14 includes the same limitations as claim 1, except that the preamble further recites “[a] battery consisting of a plurality of cells, at least some cells including a negative electrode and a non-aqueous electrolyte and a positive electrode.”

Umicore provides similar arguments to deny infringement with respect to the claimed battery as it did with the positive electrode of claim 1. (See RIB at 145-46 (“Similar to the ‘positive electrode’ limitation of claim 1, Complainants have provided no evidence of a positive electrode, including MX5h [and TX7], within a battery with the claimed chemical formula $x\text{LiMO}_2 \cdot (1-x)\text{Li}_2\text{M}'\text{O}_3$ and the other claim limitations.”).)

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Yet, as discussed above, there is no dispute that Umicore's NMC products are designed for use in a positive electrode and that Umicore's customers make batteries or electrochemical cells. *See supra* section VI(B)(1)(a)(i). In addition, Umicore does not dispute that it has sold the accused NMC materials to battery makers and/or companies doing research on electrochemical cells. *See id.*

Accordingly, I find that it is far more likely than not, that at least one of Umicore's customers in the United States used the accused NMC materials (including MX5h and TX7) in a battery that meets the limitations of claim 14 of the '082 patent. *See Lucent Techs.*, 580 F.3d at 1318. (*See also* SIB at 30-31.)

Accordingly, I find that Complainants carried their burden to prove that Umicore's MX5h and TX7 satisfy the elements of claim 14 and that claim 14 is infringed by MX5h and TX7.

2. The '143 Patent

The parties agree that the asserted claims of the '143 Patent and the '082 Patent are substantially similar. (*See* CIB at 137-38; RIB at 192; SIB at 61.) The only relevant difference between the asserted claims of the '082 patent and the '143 patent that requires further analysis, is that the '143 patent claims recite that M is one or more ions, with at least one ion being Mn. (*See* CIB at 137-38; JX-1, '082 patent claims; JX-2, '143 patent claims.)

Complainants persuasively established (and Umicore does not dispute) that MX5h and TX7 satisfy the claim element requiring that M is one or more ions, with at least one ion being Mn. (*See* CIB at 53 (“Using EDS mapping and point-count measurements, Dr. Bradley also confirmed that the LiMO₂ regions contain at least nickel and manganese. Dr. Wang's testing of the Umicore Accused Products confirmed that MX5h contains nickel and manganese.”) (citations omitted); *see also id.* at 71 (TX7).) Dr. Bradley credibly testified that EDS mapping

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shows LiMO₂ regions containing at least manganese. (See CX-5C, Bradley DWS at Q/As 586, 673.) In addition, Dr. Wang's ICP analysis also confirmed that MX5h and TX7 contain manganese. (See CX-7C, Wang DWS at Q/As 93-94.) See also CX-486C, SpecTable (Umicore spreadsheet including specifications for MX materials); CX-491C (internal specification form for TX7).

Umicore argues that MX5h and TX7 do not infringe the asserted claims of the '143 patent for the same reasons as for the asserted claims of the '082 patent. (See RIB at 192.) Umicore's arguments that the asserted claims of the '143 patent are not infringed fail for the same reasons as discussed in connection with the '082 patent. See *supra* section VI(B)(1).

Accordingly, I find that Complainants carried their burden to prove that the asserted claims of the '143 patent are infringed by MX5h and TX7.

3. Are MX5h and TX7 Representative of Their Respective Product Families?

Complainants argue that the MX5h and TX7 products are representative of other products within their respective product families (*i.e.*, MX3, MX5, MX6, MX7, MX10, TX7, TX9, TX10, TX12). (See CIB at 80-87.) Both Umicore and the Staff disagree. (See RIB at 146-50; SIB at 31-34.)

As explained *supra* section I(E)(2), all the MX products have a ratio of nickel, manganese, and cobalt of about 1:1:1 and all the TX products have a ratio of nickel, manganese, and cobalt of about 5:3:2. (See CIB at 33, 61; CX-221 at 13; RIB at 49.) In addition, the number in the product designation (MX5 or TX7) indicates the average particle size of the material. (See RIB at 49; CX-3329C, Levasseur Dep. Tr. at 37:4-6, 38:13-18.) For example, TX7 has an average particle size of 7 μm. (See RIB at 49.)

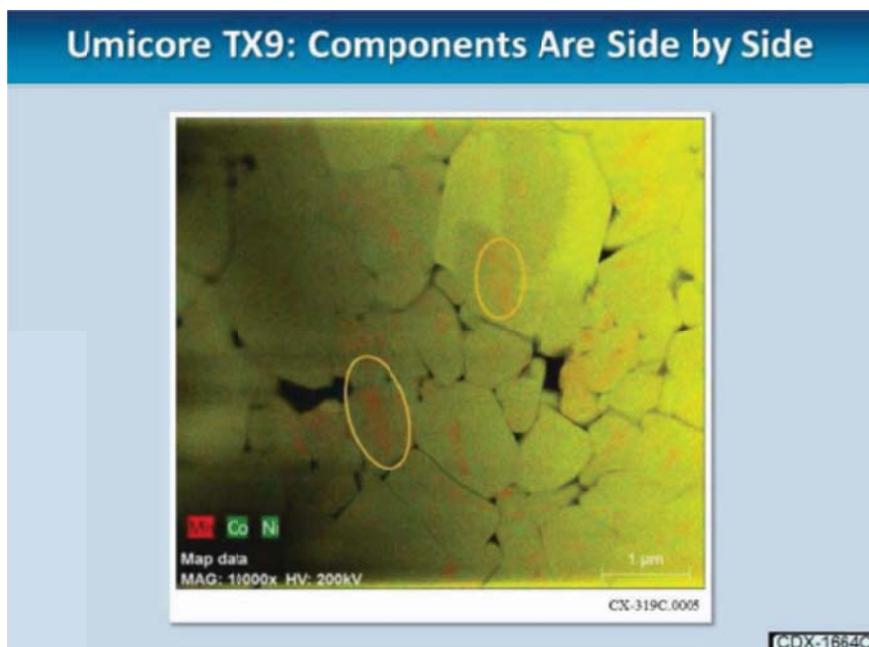
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Complainants persuasively showed that particle size does not affect product composition, crystal structure, or performance. *See* Hearing Tr. 641:1-10 (Oct. 28, 2015) (Kirchheim) (testifying that “the crystallite size not the particle size determines the structure”). Complainants explained that the average particle size of the MX and TX products ranges from [] (*See* CIB at 83.) Within that range, Complainants fully tested MX5h [] and TX7 [] as discussed *supra* sections VI(B)(1) and (2). In addition, as discussed below, Complainants conducted some testing with TX9 [] and presented evidence and/or expert testimony with respect to MX10 [] and TX10 [] based on testing conducted by or on behalf of Umicore.

Specifically, Dr. Wang’s ICP testing showed that TX9 had an empirical formula of $\text{Li}_{[]}\text{M}_{[]}\text{M}'_{[]}\text{O}_{[]}$, as required by the asserted claims.⁴⁰ (*See* CX-4C, Kirchheim DWS at Q/A 479; CX-7C, Wang DWS at Q/A 94.) In addition, Dr. Bradley’s TEM analysis of TX9 showed compositionally distinguishable domains and high manganese regions as with TX7. (*See* CX-5C, Bradley DWS at Q/As 712-740.) Dr. Bradley concluded that TX9 was a structurally integrated two-component material with domains of the LiMO_2 and $\text{Li}_2\text{M}'\text{O}_3$ components existing side by side, as required by the asserted claims. (*See id.* (citing CX-319C at 5; CDX-1664C, reproduced below).)

⁴⁰ Umicore’s argument that [] reasons as discussed *supra* pp. 43-44.

[] (*see* RIB at 136) fails for the same



See also *id.* at Q/A 738:

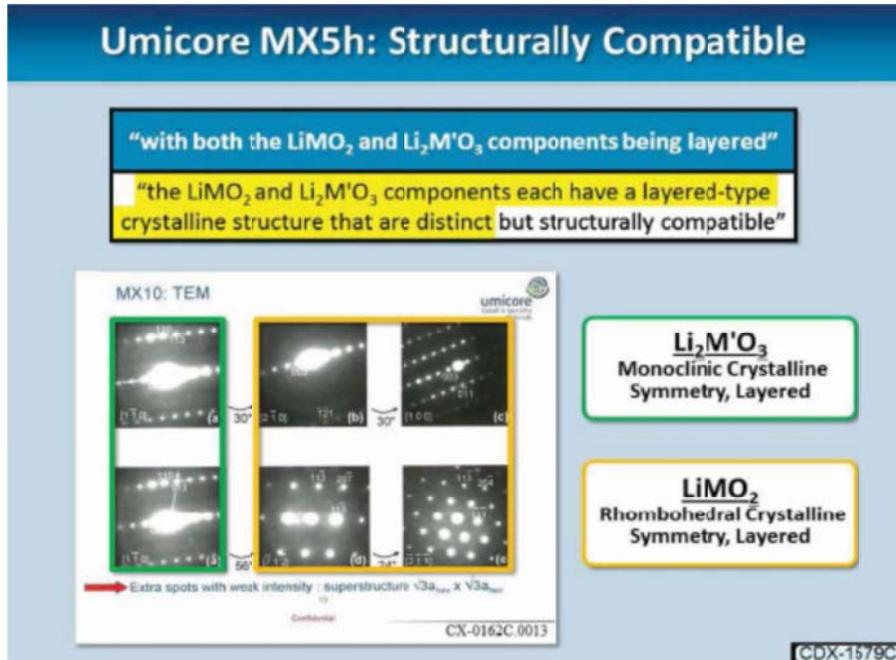
[T]he regions of LiMO_2 and $\text{Li}_2\text{M}'\text{O}_3$ are structurally integrated together as crystals of each with a range of orientations relative to one another and in direct contact with one another at grain boundaries and as composite crystals with domains of LiMO_2 and $\text{Li}_2\text{M}'\text{O}_3$ sharing common oxygen-rich sheets at domain boundaries.

With respect to MX10, Dr. Bradley reviewed the Bordeaux study documents and testified that it shows the presence of a superstructure in MX10 with monoclinic and rhombohedral crystal structures, as well as diffuse lines which are characteristic of the Li_2TmO_3 phase. (*See id.* at Q/As 554-63, 580 (citing CX-161C; CX-162C at 13; CDX-1579C, reproduced below).)⁴¹ Dr. Kirchheim also testified that the Bordeaux study [

] accordance with the $\text{Li}_2\text{M}'\text{O}_3$ structure. (*See*

CX-4C, Kirchheim DWS at Q/As 176-78.)

⁴¹ Umicore argues that “[t]here is simply no evidence linking the ten-year old MX10 research samples of the Bordeaux Study to the present-day commercial Umicore materials.” (*See* RRB at 95.) But Umicore’s corporate representative did not identify [] from the time of the Bordeaux Study. (*See* CX-3329C, Levasseur Dep. Tr. at 128:23-129:4.)



The Bordeaux study also shows that the MX10 material exhibits [] as the claimed two-component material. Compare CX-16 C at 98 (“There is clear evidence that there is []”), JX-1, ’082 patent at 2:23-29 (“[F]urther improvements must be made to LiMO₂ electrodes, . . . , to impart greater structural stability to these electrode materials during electrochemical cycling in lithium cells and batteries. This invention addresses the stability of LiMO₂ electrode structures, . . . , and makes use of a Li₂M’O₃ component to improve their stability.”). Similarly, TX10M and TX10L exhibited []

[] (See CX-155C at 3; Hearing Tr. at 755:21-756:13 (Oct. 28, 2015) (Goffaux).)

Complainants also persuasively showed that all the MX and TX products include [], which “un disputedly is required to form a second phase.” (See RIB at 100; CIB at 80; CX-495 C (showing []) with a Li/Me ratio of []; CX-552C (showing []) with a Li/Me ratio of []; CX-480C (showing []) with a Li/Me ratio of []; CX-498C

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(showing [] with a Li/Me ratio of []; CX-479C (showing [] with a Li/Me ratio of []; CX-492C (showing [] with a Li/Me ratio of [] CX-482C (showing [] with a Li/Me ratio of []; CX-500C (showing [] with a Li/Me ratio of []; CX-503C (showing [] with a Li/Me ratio of [])).)

Umicore argues that “absent testing all the products (which Complainants failed to do) to discover a common feature, . . . , Complainants must show that the crystal structure of MX5h is representative of all MX products and that the crystal structures of TX7 is representative of all TX products.” (See RIB at 147 (citing *L & W, Inc. v. Shertech, Inc.*, 471 F.3d 1311, 1317-18 (Fed. Cir. 2006).) But unlike *L & W*, Complainants did not simply “assume” that all the accused products were the same. Rather, Complainants presented sufficient evidence and testimony establishing by at least a preponderance of the evidence that MX5h and TX7 are representative of their respective product families. Complainants identified common features, including the ratio of nickel to manganese to cobalt, the presence of excess lithium in [

[], the compositional variations with high manganese regions [], the two distinct crystal structures (for []), and the performance similarities [] In view of these common features and in the absence of contrary evidence from Umicore, Complainants were not required to test all the accused products. See *TiVo, Inc. v. EchoStar Communications Corp.*, 516 F.3d 1290, 1308 (Fed. Cir. 2008) (“[T]here is nothing improper about an expert testifying in detail about a particular device and then stating that the same analysis applies to other allegedly infringing devices that operate similarly, without discussing each type of device in detail.”). In fact, Umicore’s corporate representative could not identify a [

[] (See CX-3329C, Levasseur Dep. Tr. at 37:7-10, 39:4-7.) See also Hearing

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Finally, I also disagree with Umicore's assertion that Complainants' "new approaches to its representative products theory are waived." (*See* RRB at 106.) Indeed, Complainants' arguments relating to the representative products were raised in Complainants' pre-hearing brief and/or during the hearing.

Accordingly, I find that Complainants carried their burden to prove that the MX5h and TX7 products are representative of their respective product families.

C. Indirect Infringement

1. Acts of Direct Infringement

As discussed above, Complainants persuasively established direct infringement of the Asserted Patents. *See supra* section VI(B)(1); *see also* *DSU*, 471 F.3d at 1303 ("[T]he patentee always has the burden to show direct infringement for each instance of indirect infringement.") (citations omitted). Indeed, as discussed *supra* sections VI(B)(1)(a)(i), VI(B)(1)(f), and VI(B)(1)(g), there is ample evidence that at least one of Umicore's customers in the United States has used the accused NMC materials in a positive electrode, electrochemical cell, or battery as claimed in the Asserted Patents.

2. Knowledge of Asserted Patents

Umicore does not dispute that it has known about the Asserted Patents since late 2004 or early 2005. (*See* RX-750C, Goffaux WS at Q/As 28, 42-43, 52-54; Hearing Tr. at 702:9-703:14 (Oct. 28, 2015) (Goffaux); RIB at 33-34.) *See also* *Global-Tech Appliances, Inc. v. SEB S.A.*, 563 U.S. 754, 131 S. Ct. 2060, 2068 (2011) ("[W]e proceed on the premise that [contributory infringement under] § 271(c) requires knowledge of the existence of the patent that is infringed. Based on this premise, it follows that the same knowledge is needed for induced infringement under § 271(b).").

3. Induced Infringement under 35 U.S.C. § 271(b)

Umicore argues that it lacks the requisite intent to induce infringement and cannot be encouraging the manufacture of infringing positive electrodes because “it has no control over, or detailed knowledge of the design and manufacturing process or the specific models of products in which its NMC material is used.” (*See* RIB at 153; RRB at 90-91.) “To establish liability under section 271(b), a patent holder must prove that once the defendants knew of the patent, they actively and knowingly aided and abetted another’s direct infringement.” *DSU*, 471 F.3d at 1305 (citations omitted). In addition, “[t]he mere knowledge of possible infringement by others does not amount to inducement; specific intent and action to induce infringement must be proven.” *See id.* While Umicore knew about the Asserted Patents and actively and knowingly encouraged others to use the accused NMC materials in positive electrodes, I find that Complainants failed to carry their burden to prove that Umicore had the requisite intent to induce infringement of the Asserted Patents.

There is no dispute that Umicore’s NMC products are designed for use in a positive electrode and that Umicore’s customers make batteries or electrochemical cells which necessarily include positive electrodes. (*See supra* section VI(B)(1)(a)(i) (citing RIB at 55).) Complainants also provided more than ample evidence showing Umicore and its customers have tested and evaluated positive electrodes that include the accused NMC material as the active material. (*See id.*; *see also* CIB at 89-90, 99-101; *accord* SIB 34-36.) In addition, Complainants showed that [

]. (*See, e.g.*, CX-203C at 1 [

]; CX-851C

at 1 [

]; CX-855C at 1

[

]; CX-856C at 1 [

]; CX-862C at 1 [

].)

Furthermore, Umicore communicates with customers and receives customer feedback about its products. (*See*, CX-544C at 1 [

]; CX-155C at 3 [

]; CX-3337C (spreadsheet compiling

information relating to customer testing with Umicore’s MX and TX products); Hearing Tr. at 737:10-738:5 (Oct 28, 2015) (Goffaux); CX-1048C at 5 (reporting results of performance testing with MX5, MX6, and ZX3); CX-154C at 1 [

]; CX205C [

].)

Still further, Complainants showed that Umicore has an entire business unit, namely, “Rechargeable Battery Materials,” dedicated to the development, marketing, and sales of NMC materials including the MX and TX products. *See* Hearing Tr. at 701:6-20 (Oct. 28, 2015) (Goffaux). And Umicore advertises its MX and TX products for “Rechargeable Lithium Batteries” and as “provid[ing] excellent cycle life, thermal stability, high volumetric energy density and good power performances.” (*See* CX-535C (listing rechargeable lithium batteries as

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the main use for Umicore's Cellcore® MX6 and MX10); *see also* CX-213C; CX-527C; CX-545C; CX-546C.)

Nevertheless, there is insufficient evidence to support a finding that Umicore had the specific intent to induce others to infringe the Asserted Patents. First, when Umicore commissioned the Bordeaux study to characterize the composition and crystal structure of the MX10 product, Umicore concluded that there was no Li_2MnO_3 and believed that it did not infringe the Asserted Patents. (*See* RRB at 91-95; CX-161C at 29.) *See also* *DSU*, 471 F.3d at 1307 (“[T]he record contains evidence that ITL did not believe its Platypus infringed. Therefore, it had no intent to infringe. Accordingly, the record supports the jury’s verdict based on the evidence showing a lack of the necessary specific intent.”). While I agreed with Complainants that a superstructure in the context of excess lithium materials, more likely than not, indicates the presence of a $\text{Li}_2\text{M}'\text{O}_3$ component (*see supra* p. 94), Umicore’s opposing view that a superstructure can be seen with LiMO_2 materials (*see* RIB at 90; RRB 91-94) negates a specific intent to induce infringement of the Asserted Patents.

Second, in 2010, after [] shared a document from [] with Umicore stating that NMC 111, NMC 622, and NMC 523 compositions with excess lithium are within the scope of the Asserted Patents, Umicore conducted Xray analysis and concluded there was no infringement and “[n]o evidence (by Xray) for LiM ordering in any of the investigated products.” (*See* Hearing Tr. at 797:19-798:4 (Oct. 28, 2015) (Goffaux); CX-123C at 5; CX-122C at 1.) Complainants argue that Umicore should have conducted TEM analysis and that “Umicore knew from the Bordeaux Study that TEM confirms infringement for its products.” (*See* CIB at 95-96.) But Complainants provide no evidence to support their allegation and I do not discern any in the

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record. In fact, Umicore had already commissioned a TEM analysis of MX10 in the Bordeaux Study but reached a non-infringement conclusion from such analysis. (*See* RRB at 95.)

Third, I do not find the 3M license agreement with Umicore was a “smokescreen,” as suggested by Complainants. (*See* CIB at 96.) Rather, I find the 3M license agreement could also be construed as further evidence that Umicore credibly believed it practiced the 3M patents rather than the Asserted Patents. (*See* Hearing Tr. 796:7-17 (Oct. 28, 2015) (Goffaux) [.)

Complainants argue that willful blindness is sufficient to prove intent. (*See* CIB at 99 (citing *Global-Tech*, 131 S. Ct. at 2070).) But willful blindness requires a showing that: “(1) [Respondents] must subjectively believe that there is a high probability that a fact exists and (2) [Respondents] must take deliberate actions to avoid learning of that fact.” *See Global-Tech*, 131 S. Ct. at 2070; *see also Info-Hold, Inc. v. Muzak LLC*, 783 F.3d 1365, 1373 (Fed. Cir. 2015) (considering “whether [Defendant] may have subjectively believed there was a high probability it infringed the [asserted] patent and took deliberate actions to avoid learning whether it actually did”). As discussed above, Complainants failed to show that Umicore subjectively believed that there was a high probability that the Asserted Patents were infringed, and that Umicore took deliberate actions to avoid learning of that fact. Thus, Complainants failed to carry their burden to prove willful blindness.

Complainants also argue that in the context of the Commission’s “purely prospective relief,” they should not be required to prove intent. (*See* CIB at 99 (citing *Bose Corp. v. SDI Techs., Inc.*, 558 F. App’x 1012, 1023 (Fed. Cir. 2014) (reversing summary judgment of noninfringement for lack of requisite intent for indirect infringement because Defendant “could not credibly argue that it maintained its good-faith belief of invalidity following a verdict to the

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contrary”).) Such an argument runs against USITC jurisprudence and would erase the requirement to prove specific intent entirely. *See In re Certain Semiconductor Chips With Minimized Chip Package Size and Products Containing Same*, Inv. No. 337-TA-605, Comm’n Op. at 54 (U.S.I.T.C. May 20, 2009) (finding against induced infringement on the basis that Respondents lacked the requisite specific intent), *aff’d*, *Spansion, Inc. v. International Trade Comm’n*, 629 F.3d 1331, 1355 (Fed. Cir. 2010).

Accordingly, I find that Complainants failed to carry their burden to prove induced infringement by Umicore under 35 U.S.C. § 271(b).

4. Contributory Infringement

With respect to contributory infringement, intent can be presumed when the accused products do not have any substantial noninfringing uses. *See In re Certain Semiconductor Chips With Minimized Chip Package Size and Products Containing Same*, Inv. No. 337-TA-605, Comm’n Op. at 55 (U.S.I.T.C. May 20, 2009), *aff’d*, *Spansion, Inc. v. International Trade Comm’n*, 629 F.3d 1331, 1355 (Fed. Cir. 2010) (citing *Metro-Goldwyn-Mayer Studios Inc. v. Grokster, Ltd.*, 545 U.S. 913, 932 (2005) (“One who makes and sells articles which are only adapted to be used in a patented combination will be presumed to intend the natural consequences of his acts; he will be presumed to intend that they shall be used in the combination of the patent.”)).

To prevail on contributory infringement, Complainants must show that: (1) Umicore made and sold the accused NMC materials; (2) that the accused NMC materials have no substantial non-infringing uses; (3) and that Umicore engaged in conduct within the United States that contributed to another's direct infringement. *DSU*, 471 F.3d at 1303. Once Complainants make a *prima facie* case that the accused NMC materials have no substantial non-infringing uses, the burden shifts to Umicore to rebut Complainants’ evidence. *See Golden*

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Blount, Inc. v. Robert H. Peterson Co., 438 F.3d 1354, 1363 (Fed. Cir. 2006) (“[T]he district court had ample basis to conclude that Golden Blount had made out a *prima facie* showing that Peterson’s product was not ‘suitable for substantial non-infringing use,’ thus shifting the burden of production to Peterson.”); *In re Certain Semiconductor Chips With Minimized Chip Package Size and Products Containing Same*, Inv. No. 337-TA-605, Comm’n Op. at 55 (U.S.I.T.C. May 20, 2009).

In this case, Umicore does not dispute that it makes and sells the accused NMC materials for use in positive electrodes. *See supra* section VI(C)(3). Complainants also persuasively established that Umicore’s accused NMC materials are designed for use in a positive electrode and have no substantial non-infringing uses. *See id.* I find Umicore failed to rebut Complainants’ evidence and Umicore’s own witnesses (its employees) failed to identify any use for the accused NMC products other than for positive electrodes in batteries. *See, e.g.*, CX-3329C, Levasseur Dep. Tr. at 280:23-281:1. Thus, I find that Umicore’s accused NMC materials have no substantial non-infringing use. Consequently, I also find that Umicore had the requisite intent for contributory infringement. *See Grokster*, 545 U.S. at 932 (“One who makes and sells articles which are only adapted to be used in a patented combination will be presumed to intend the natural consequences of his acts.”).

Furthermore, there is also ample evidence that Umicore engaged in conduct within the United States that contributed to direct infringement by its customers. *See supra* section VI(C)(3). Accordingly, I find that Complainants carried their burden to prove contributory infringement by Umicore under 35 U.S.C. § 271(c).

VII. DOMESTIC INDUSTRY - TECHNICAL PRONG

A. Legal Standards

The technical prong of the domestic industry requirement is satisfied when the complainant in a patent-based section 337 investigation establishes that it is practicing or exploiting the patents at issue. *See* 19 U.S.C. §1337 (a)(2) and (3); *Certain Microsphere Adhesives, Process for Making Same and Prods. Containing Same, Including Self-Stick Repositionable Notes*, Inv. No. 337-TA-366, Comm'n Op. at 8 (U.S.I.T.C. Jan. 16, 1996). "In order to satisfy the technical prong of the domestic industry requirement, it is sufficient to show that the domestic industry practices any claim of that patent, not necessarily an asserted claim of that patent." *Certain Ammonium Octamolybdate Isomers*, Inv. No. 337-TA-477, Comm'n Op. at 55 (U.S.I.T.C. Aug. 28, 2003).

The test for claim coverage for the purposes of the technical prong of the domestic industry requirement is the same as that for infringement. *See Certain Doxorubicin and Preparations Containing Same*, Inv. No. 337-TA-300, Initial Determination at 109, (U.S.I.T.C. May 21, 1990), *aff'd*, Views of the Commission at 22 (U.S.I.T.C. Oct. 31, 1990); *Alloc, Inc. v. Int'l Trade Comm'n*, 342 F.3d 1361, 1375 (Fed. Cir. 2003). "First, the claims of the patent are construed. Second, the complainant's article or process is examined to determine whether it falls within the scope of the claims." Inv. No. 337-TA-300, Initial Determination at 109. To prevail, the patentee must establish by a preponderance of the evidence that the domestic product practices one or more claims of the patent. The technical prong of the domestic industry can be satisfied either literally or under the doctrine of equivalents. *Certain Dynamic Sequential Gradient Devices and Component Parts Thereof*, Inv. No. 337-TA-335, Initial Determination at 44, Pub. No. 2575 (U.S.I.T.C. May 15, 1992).

B. Asserted Patents

1. The '082 Patent

a. Claim 1

Claim 1 of the '082 patent recites:

- [i] A lithium metal oxide positive electrode for a non-aqueous lithium cell
- [ii] prepared in its initial discharged state
- [iii] having a general formula $x\text{LiMO}_2 \cdot (1-x)\text{Li}_2\text{M}'\text{O}_3$ in which $0 < x < 1$, and
- [iv] where M is one or more ions having an average oxidation state of three with at least one ion being Ni, and
- [v] where M' is one or more ions with an average oxidation state of four with at least one ion being Mn,
- [vi] with both the LiMO_2 and $\text{Li}_2\text{M}'\text{O}_3$ components being layered and
- [vii] the ratio of Li to M and M' being greater than one and less than two; and
- [viii] wherein domains of the LiMO_2 and $\text{Li}_2\text{M}'\text{O}_3$ components exist side by side.

(i) A lithium metal oxide positive electrode for a non-aqueous lithium cell

The crux of the parties' dispute is whether BASF's NCM materials (NCM 111, NCM 424, NCM 523, NCM 622, and NCM 811) have been incorporated in a positive electrode (*i.e.*, an electrical element from which lithium ions are released during charging (*see supra* p. 25)) that meets the elements of the Asserted Claims. Umicore argues that “[n]one of Complainants’ experts examined any third party positive electrode or compared any third party positive electrode to the claims of the patents.” (*See* RIB at 155.)

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However, Complainants' internal documents show that BASF's active materials have been incorporated in positive electrodes, electrochemical cells, and batteries. (*See, e.g.*, CX-381C (NCM 111); CX-390C (NCM 111, NCM 424, NCM 523); CX-391C (NCM 622, NCM 811); CX-393C (NCM 622, NCM 811); *accord* SIB at 37-38.) *See also* Hearing Tr. at 279:3-7, 280:17-281:10 (Oct. 26, 2015) (Fetcenko) (testifying that BASF's NCM materials are used in positive electrodes and batteries, including batteries manufactured by [] in the United States).

In addition, I find that BASF's NCM materials were incorporated in a positive electrode that satisfies the limitations of claim 1 of the '082 patent. Indeed, as discussed *supra* pp. 34-35 n.15, the active material (*e.g.*, BASF's NCM material, provided it satisfies the limitations relating to the active material) is the only component of the claimed positive electrode that is expressly recited in claim 1 of the '082 patent. Other inactive components may be included even if they are not expressly recited in that claim. *See supra* pp. 34, 35 n.15. Complainants provided evidence that BASF's NCM material is used as the active material in a positive electrode. (*See, e.g.*, CX-388C at 8 (NCM 111); CX-415C at tab Cell level (NCM 424); CX-405C (NCM 111, NCM 424, NCM 523); CX-394C at 16 (NCM 424, NCM 523, NCM 622); CX-400C at tab Electrode Formulation.) As discussed *supra* section VI(B)(1)(a)(i), the presence of other components such as binders or other inactive materials and electrode preparation would not take the resulting positive electrode outside the scope of the Asserted Claims.

BASF markets the domestic industry products as "cathode materials." (*See* CX-382C; CX-386.) *See also* Hearing Tr. at 279:3-7, 280:17-281:10 (Oct. 26, 2015) (Fetcenko) (testifying that BASF's NCM materials are used in positive electrodes and batteries, including batteries manufactured by [] in the United States). Accordingly, I find that it is much more likely than not, that at least one of BASF's customers in the United States used the domestic industry NCM

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materials in a positive electrode that meets the limitations of claim 1 of the '082 patent (provided, as discussed *infra*, the domestic industry NCM material satisfies the limitations relating to the active material). *See Lucent Techs.*, 580 F.3d at 1318.

Complainants also established by *at least* a preponderance of the evidence that the positive electrode is a “lithium metal oxide” positive electrode and that the positive electrode is “for a non-aqueous lithium cell.” (*See* CIB at 104-05; CX-4C, Kirchheim DWS at Q/A 872 (“Lithium transition metal oxides like BASF’s NCM 111 products would not be used in an aqueous cell because lithium is highly reactive with water and would form lithium hydroxide and the positive electrode would become inactive, *i.e.* not release lithium ions.”).)

Accordingly, I find that Complainants carried their burden to prove that claim element 1(i) (“A lithium metal oxide positive electrode for a non-aqueous lithium cell”) is satisfied.

(ii) prepared in its initial discharged state

As with claim element 1(i), Umicore argues that Complainants failed to “test a single electrode, prepared in its initial discharged state that incorporated a BASF product.” (*See* RIB at 156.) But those arguments are unavailing for the same reasons as discussed *supra* section VII(B)(1)(a)(i).

The parties agreed on a construction for the term “prepared in its initial discharged state,” namely, “that when prepared, [the positive electrode is] lithiated but has not been electrically charged.” *See supra* p. 27. Complainants’ expert, Dr. Kirchheim, credibly testified that any positive electrode made from BASF’s NCM materials would be prepared in its initial discharged state. (*See* CX-4C Q/As 885 (NCM 111), 1040 (NCM 424), 1182 (NCM 523), 1327 (NCM 622), 1464 (NCM 811).) (*See also* CIB at 105-106; *accord* SIB at 38-39.)

Dr. Kirchheim testified that BASF lithiates its NCM materials during the manufacturing process by heating precursors with oxygen (or air) and a lithium source. (*See* CX-4C, Kirchheim

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DWS at Q/As 885-90 (NCM 111), 1040-44 (NCM 424), 1182-86 (NCM 523), 1327-31 (NCM 622), 1464-68 (NCM 811).) Dr. Kirchheim confirmed, based on Dr. Wang's ICP analysis, that BASF's NCM materials are lithiated and contain excess lithium at the end of the manufacturing process. (*See id.* at Q/As 904 (NCM 111), 1058 (NCM 424), 1200 (NCM 523), 1345 (NCM 622), 1482 (NCM 811); CX-7C, Wang DWS at Q/As 91-92.) In addition, Dr. Kirchheim credibly testified that the process of making an electrode would not change the structure or performance of the electrode material. (*See supra* pp. 34-35.)

Accordingly, I find that Complainants carried their burden to prove that claim element 1(ii) ("prepared in its initial discharged state") is satisfied.

(iii) **having a general formula $x\text{LiMO}_2 \cdot (1-x)\text{Li}_2\text{M}'\text{O}_3$ in which $0 < x < 1$**

During the Markman hearing, I construed the claim element " $x\text{LiMO}_2 \cdot (1-x)\text{Li}_2\text{M}'\text{O}_3$ " as "a structurally integrated two-component material having an empirical formula $\text{Li}_{2-x}\text{M}_x\text{M}'_{1-x}\text{O}_{3-x}$, with crystallographically distinct LiMO_2 and $\text{Li}_2\text{M}'\text{O}_3$ components." *See supra* p. 26. Thus, to satisfy this claim element, Complainants must prove that: (1) BASF's NCM materials have an empirical formula $\text{Li}_{2-x}\text{M}_x\text{M}'_{1-x}\text{O}_{3-x}$ in which $0 < x < 1$; (2) BASF's NCM materials include crystallographically distinct LiMO_2 and $\text{Li}_2\text{M}'\text{O}_3$ components; and (3) the LiMO_2 and $\text{Li}_2\text{M}'\text{O}_3$ components are structurally integrated.

(1) **Empirical formula $\text{Li}_{2-x}\text{M}_x\text{M}'_{1-x}\text{O}_{3-x}$ in which $0 < x < 1$**

Complainants have persuasively established that BASF's NCM materials have an empirical formula $\text{Li}_{2-x}\text{M}_x\text{M}'_{1-x}\text{O}_{3-x}$. Relying on ICP analysis, Complainants' expert, Dr. Wang, measured the elemental composition of BASF's NCM materials. (CX-7C, Wang DWS at Q/As 91-92.) Based on Dr. Wang's analysis, Complainants' expert, Dr. Kirchheim, determined: (1) a value of [] for x as to NCM 111 which corresponds to an empirical formula of

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$\text{Li}_{1-x}\text{M}_x\text{M}'_{1-x}\text{O}_3$; (2) a value of [] for x as to NCM 424 which corresponds to an empirical formula of $\text{Li}_{1-x}\text{M}_x\text{M}'_{1-x}\text{O}_3$; (3) a value of [] for x as to NCM 523 which corresponds to an empirical formula of $\text{Li}_{1-x}\text{M}_x\text{M}'_{1-x}\text{O}_3$; (4) a value of [] for x as to NCM 622 which corresponds to an empirical formula of $\text{Li}_{1-x}\text{M}_x\text{M}'_{1-x}\text{O}_3$; and (5) a value of [] for x as to NCM 811 which corresponds to an empirical formula of $\text{Li}_{1-x}\text{M}_x\text{M}'_{1-x}\text{O}_3$.⁴³ (See CIB at 106-07; CX-4C, Kirchheim DWS at Q/As 904 (NCM 111), 1058 (NCM 424), 1200 (NCM 523), 1345 (NCM 622), 1482 (NCM 811).)

Umicore and the Staff do not dispute Complainants' testing and conclusions with respect to the empirical formulae of BASF's NCM materials. Accordingly, I find that Complainants carried their burden to prove that BASF's domestic industry products have an empirical formula $\text{Li}_{2-x}\text{M}_x\text{M}'_{1-x}\text{O}_{3-x}$ in which $0 < x < 1$.

(2) **The accused NMC materials include crystallographically distinct LiMO_2 and $\text{Li}_2\text{M}'\text{O}_3$ components.**

Umicore uses the same logic as before (in connection with MX5h and TX7) to argue that "Complainants have failed to prove the existence of $\text{Li}_2\text{M}'\text{O}_3$ in the BASF domestic industry products." (See RIB at 156.) Umicore's arguments fail for the same reasons. See *supra* section VI(B)(1)(a)(iii)(2).

Umicore argues that " $\text{Li}_2\text{M}'\text{O}_3$ does not exist in the BASF products because, if it did exist, the average oxidation state of M' would have to equal 4+" while the oxidation state of M' cannot average 4+ because M' consists of nickel (2+), manganese (4+), and cobalt (3+). (See

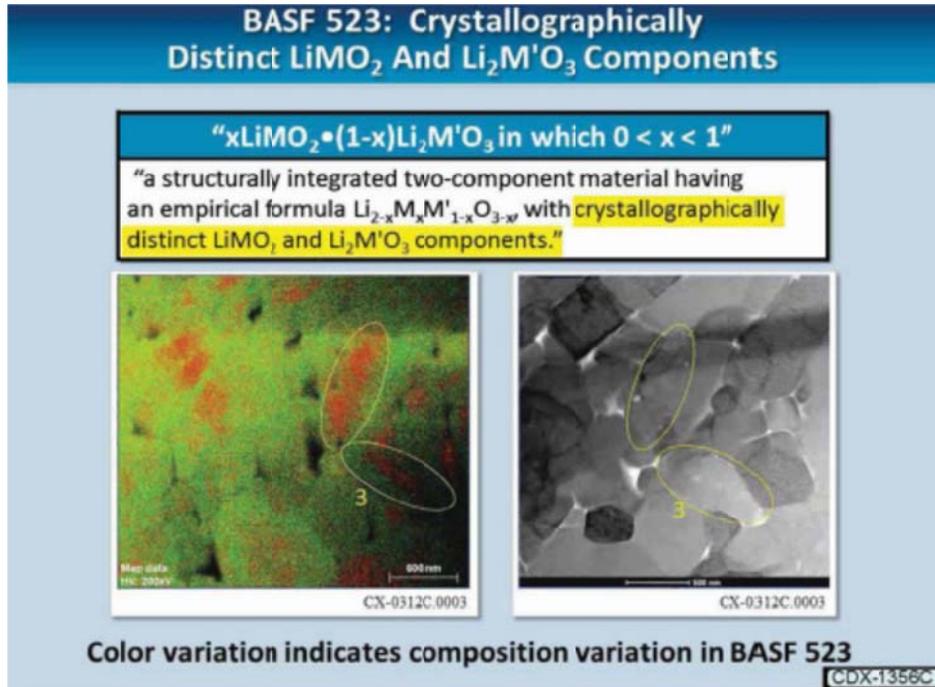
⁴³ The formulae for BASF's NCM materials can be rearranged into the following two-component formulae: (1) [] $\text{LiMO}_2 \cdot$ [] $\text{Li}_2\text{M}'\text{O}_3$ (NCM 111); (2) [] $\text{LiMO}_2 \cdot$ [] $\text{Li}_2\text{M}'\text{O}_3$ (NCM 424); (3) [] $\text{LiMO}_2 \cdot$ [] $\text{Li}_2\text{M}'\text{O}_3$ (NCM 523); (4) [] $\text{LiMO}_2 \cdot$ [] $\text{Li}_2\text{M}'\text{O}_3$ (NCM 622); and (5) [] $\text{LiMO}_2 \cdot$ [] $\text{Li}_2\text{M}'\text{O}_3$ (NCM 811). (See CX-4C, Kirchheim DWS at Q/As 974, 1121, 1264, 1401, 1533.)

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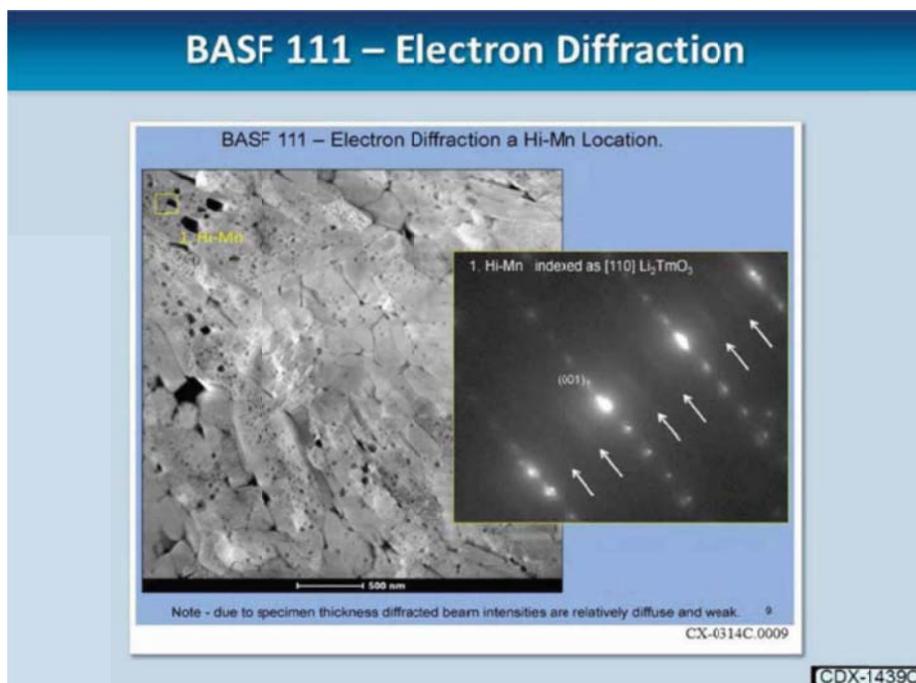
RIB at 158.) As discussed *supra*, Umicore's arguments are based on the false premise that M' must include Mn (manganese), Ni (nickel), and Co (cobalt), and that the average oxidation state of those three transition metals cannot be four. *See supra* section VI(B)(1)(a)(iii)(2). In addition, claim 1 of the '082 patent requires only that M' include Mn (*i.e.*, the $\text{Li}_2\text{M}'\text{O}_3$ component could be all Li_2MnO_3). (*See id.*; *see also* Hearing Tr. At 681:3-7 (Oct. 28, 2015) (Kirchheim).) Furthermore, I find credible Dr. Kirchheim's testimony that higher oxidation states for Mn, Ni, and Co are possible so as to accommodate the required charge neutrality of the $\text{Li}_2\text{M}'\text{O}_3$ material. *See supra* section VI(B)(1)(a)(iii)(2). Notwithstanding whether M' corresponds to Mn alone or to Mn, Ni, and/or Co, as explained below, I find that Complainants have established by a preponderance of the evidence that BASF's domestic industry products include both a LiMO_2 component and a $\text{Li}_2\text{M}'\text{O}_3$ component.

First, BASF's NCM material is not pure LiMO_2 . Indeed, there is excess lithium in BASF's NCM materials while a pure LiMO_2 material would include equimolar amounts of lithium and transition metal. *See supra* section VII(B)(1)(a)(iii)(1). Second, Complainants established persuasively that BASF's NCM materials (NCM 111, NCM 424, and NCM 523) include a bulk material consisting of a rhombohedral R-3m crystal structure which is indicative of the LiMO_2 component and a monoclinic C2/m crystal structure which is indicative of the $\text{Li}_2\text{M}'\text{O}_3$ component. (*See* CIB at 107-13.) Dr. Bradley testified that TEM imaging, EDS mapping, and electron diffraction indexing show compositional variations with areas having elevated manganese levels (manganese hot spots) corresponding to $\text{Li}_2\text{M}'\text{O}_3$ -type C2/m (monoclinic) crystal structure while the bulk material corresponds to LiMO_2 -type R-3m (rhombohedral) crystal symmetry. (*See* CX-5C, Bradley DWS at Q/As 222 (citing CX-312C at

3; CDX-1356C reproduced below), 227-29 (NCM 523), 315-19 (NCM 424) (citing CX-313C), 394-404 (NCM 111) (citing CX-314C).)

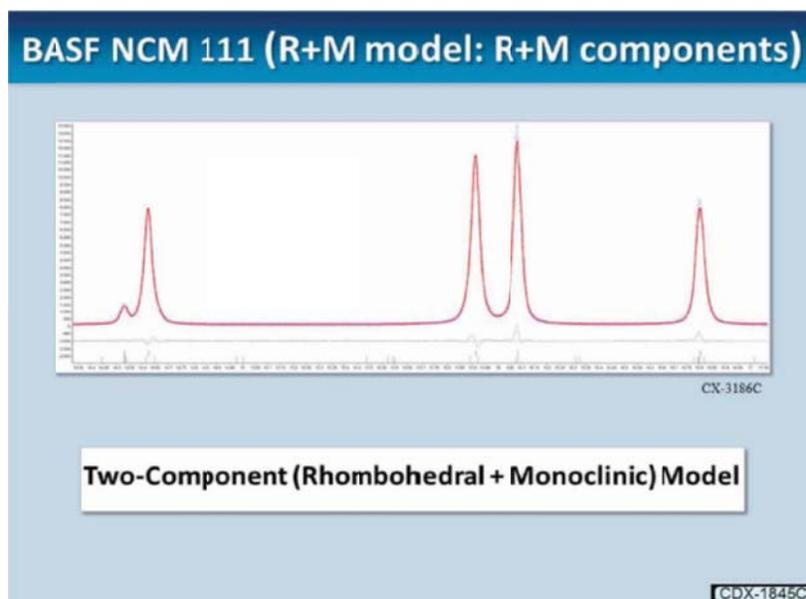


Dr. Bradley also testified that the electron diffraction patterns for the manganese hot spots exhibit streaking which is characteristic of the C2/m monoclinic structure. (*See id.* at Q/As 183 (NCM 523), 29 (NCM 424), 373-74 (NCM 111) (citing CX-314C at 9; CDX-1439C, reproduced below).) *See also supra* section VI(B)(1)(a)(iii)(2).



Dr. Bradley concluded that BASF's NCM 111, NCM 424, and NCM 523 have crystallographically distinct LiMO_2 and $\text{Li}_2\text{M}'\text{O}_3$ components. (See CX-5C, Bradley DWS at Q/As 227-29 (NCM 523), 315-19 (NCM 424), 397-404 (NCM 111).)

Dr. David confirmed that NCM 111, NCM 424, and NCM 523 contain crystallographically distinct LiMO_2 and $\text{Li}_2\text{M}'\text{O}_3$ components. Using synchrotron XRD and neutron powder diffraction, Dr. David determined that a model that included both rhombohedral and monoclinic components (rather than a rhombohedral-only model) provided the best fit for BASF's NCM materials. (See CX-6C, David DWS at Q/As 177 ("[T]he R+M model fits the Bragg peaks like a glove.") (citing CX-3186C; CDX-1845C, reproduced below) (NCM 111), 202-04 (NCM 424), 210-212 (NCM 523), 218-20 (NCM 622), 226-228 (NCM 811).)



Dr. David testified that Dr. David failed to show the signature $\text{Li}_2\text{M}'\text{O}_3$ peak at 5-6 degrees. (See RIB at 158-59 (citing RDX-1153C).) But it is not clear what scale was used in RDX-1153C and whether it should have been magnified given the weakness of the signature peak. See *supra* pp. 53-54; see also Hearing Tr. at 336:7-21 (Oct. 27, 2015) (David) (testifying that the XRD pattern was magnified 1,000 times to observe the peak at 5-6 degrees). In fact, Dr. David testified that he observed the characteristic $\text{Li}_2\text{M}'\text{O}_3$ peak for all the samples. See Hearing Tr. at 351:7-11 (Oct. 27, 2015) (David).

Thus, I find that Complainants fully carried their burden to prove that BASF's NCM 111, NCM 424, and NCM 523 material include crystallographically distinct LiMO_2 and $\text{Li}_2\text{M}'\text{O}_3$ components. With respect to BASF's NCM 622 and NCM 811, Dr. Bradley did not collect electron diffraction patterns and did not index those patterns to identify crystal structure. (Cf. SIB at 309 n.1.) Nevertheless, Dr. Bradley's TEM and EDS imaging for BASF's NCM 622 and NCM 811 (showing compositional variations, see CX-50, Bradley DWS at Q/As 471 (NCM 622), 517 (NCM 811)), Dr. Wang's ICP analysis (showing excess lithium, see *supra* section VII(B)(1)(a)(iii)(1)), and Dr. David's XRD testing (showing two distinct crystal symmetries, (see

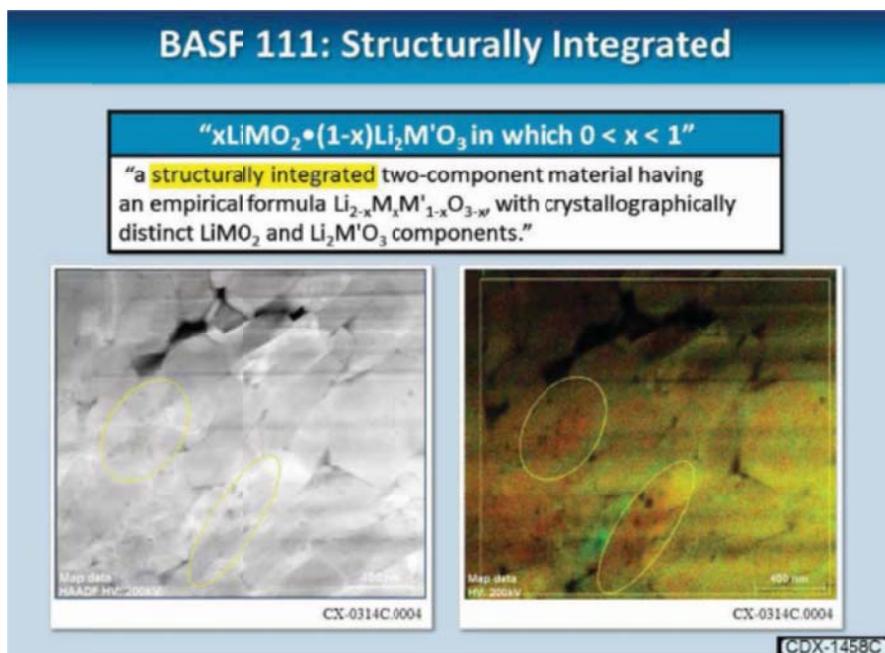
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CX-6C, David DWS at Q/As 218-20 (NCM 622), 226-228 (NCM 811)), are very consistent with the data collected with BASF's NCM 111, NCM 424, and NCM 523 materials. Accordingly, I find that Complainants also carried their burden to show that BASF's NCM 622 and NCM 811 include crystallographically distinct LiMO_2 and $\text{Li}_2\text{M}'\text{O}_3$ components.

(3) **The LiMO_2 and $\text{Li}_2\text{M}'\text{O}_3$ components are structurally integrated.**

The Complainants also cogently established that BASF's NCM materials include structurally integrated LiMO_2 and $\text{Li}_2\text{M}'\text{O}_3$ components. (See CIB at 113-117; accord SIB at 39-41.)

Dr. Bradley credibly testified that Brightfield and/or Darkfield images and EDS maps show chemical bonding between crystals in a single powder particle through direct contact of the atomic planes. (See CX-5C, Bradley DWS at Q/As 174, 212 (NCM 528), 287, 322 (NCM 424), 371, 406 (“For example, in each of the brightfield images, what is observed is that the LiMO_2 and $\text{Li}_2\text{M}'\text{O}_3$ components have adjacent atomic planes in adjacent crystals. There is chemical bonding between these crystals, that exist within the same particle and these components are therefore structurally integrated.”) (citing CX-314C at 4; CDX-1458C, reproduced below) (NCM 111), 460, 471 (NCM 622), 506, 517 (NCM 811); see also *id.* at Q/A 234 (“... If this were not the case, the powder particles would fall apart.”).)



Dr. Bradley further testified that LiTmO_2 and Li_2TmO_3 tend to structurally integrate by sharing a common oxygen lattice. (See CX-5C, Bradley DWS at Q/As 174 (NCM 523), 287 (NCM 424), 371 (NCM 111), 460 (NCM 622), 506 (NCM 811).)

Imicore argues that "Complainants have not provided TEM images with atomic level resolution for the BASF products, except for BASF NCM 523" and that "[a]tomic level resolution images are necessary to even attempt to identify structural resolution." (See RIB at 159-60.) As discussed *supra* section VI(B)(1)(a)(iii)(3), I disagree that atomic level imaging is required to identify structural integration. The Asserted Patents recommend high-resolution TEM but that does not necessarily mean atomic level imaging. Indeed, Dr. Bradley testified that he used high-resolution TEM. (See CX-5C, Bradley DWS at Q/As 58, 87; Hearing Tr. at 479:21-480:4 (Oct. 17, 2015) (Bradley).) Dr. Bradley also testified that he used the appropriate scale because "the two phases are not integrated in one or two angstroms across, they are integrated on a scale of hundreds of nanometers." See Hearing Tr. at 453:25-454:10 (Oct. 27, 2015) (Bradley)).

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I find Dr. Bradley's testimony that EDS maps and Brightfield/Darkfield images showing compositional variations (and therefore variations in crystal symmetries) within a single crystal and chemical bonding between crystals in a single powder particle, reliably establishes that the two components LiMO_2 and $\text{Li}_2\text{M}'\text{O}_3$ are structurally integrated.

Consequently, I find that Complainants established that BASF's NCM 111, NCM 424, NCM 523, NCM 622, and NCM 811 are structurally integrated two-component materials. Hence, I find that Complainants carried their burden to prove that claim element 1(iii) ("having a general formula $x\text{LiMO}_2 \cdot (1-x)\text{Li}_2\text{M}'\text{O}_3$ in which $0 < x < 1$ ") is satisfied by BASF's NCM 111, NCM 424, NCM 523, NCM 622, and NCM 811.

(iv) **where M is one or more ions having an average oxidation state of three with at least one ion being Ni**

The parties agreed that the claim term "where M is one or more ions having an average oxidation state of three" should be construed as "the average of the oxidation states of M is 3." *See supra* p. 27.

Complainants persuasively established that BASF's NCM 111, NCM 424, NCM 523, NCM 622, and NCM 811 satisfy the claim element requiring that M is one or more ions having an average oxidation state of three with at least one ion being Ni. (*See* CIB at 117-18; *accord* SIB at 41-43.) Dr. Bradley credibly testified that EDS mapping shows LiMO_2 regions containing at least nickel. (*See* CX-5C, Bradley DWS at Q/As 241-42 (NCM 523), 326-27 (NCM 424), 412-13 (NCM 111), 475-76 (622), 521-22 (811).) Dr. Wang's ICP analysis also confirmed that BASF's NCM 111, NCM 424, NCM 523, NCM 622, and NCM 811 contain nickel. (*See* CX-7C, Wang DWS at Q/As 91-92.)

With respect to the average oxidation state of M, Umicore's own experts admit that it must be three. (*See* RX-752C, Ceder RWS at Q/A 45 ("In order to balance the Li and O

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oxidation states, the M, and its constituent metals, must have an average oxidation state equal to +3 (*i.e.*, $1 + 3 - 4 = 0$)."); RX-753C, Delmas RWS at Q/A 143 (“[T]he oxidation state of the M element is equal to 3+.”.)

Therefore, I find that Complainants carried their burden to prove that claim element 1(iv) (“where M is one or more ions having an average oxidation state of three with at least one ion being Ni”) is satisfied by BASF’s NCM 111, NCM 424, NCM 523, NCM 622, and NCM 811.

(v) **where M’ is one or more ions with an average oxidation state of four with at least one ion being Mn**

The parties agreed that the claim term “where M’ is one or more ions with an average oxidation state of four” should be construed as “the average of the oxidation states of M’ is 4.” *See supra* p. 27.

As discussed *supra* p. 41, Umicore’s own experts agree that if the $\text{Li}_2\text{M}'\text{O}_3$ component exists, the average oxidation state of M’ is necessarily four. (*See* RX-753C, Delmas RWS at Q/A 142 (“For $\text{Li}_2\text{M}'\text{O}_3$, the average oxidation state of M’ is 4+ whatever the nature of various M’ elements.”); RX-752C, Ceder RWS at Q/A 46 (“In order to balance the compound, the average oxidation state of M’, and its constituent metals, has to be +4.”); *see also* Hearing, Tr. 1008:8-12 (Oct. 29, 2015) (Delmas).) Indeed, the average oxidation state of four for M’ is a direct result of the charge neutrality (*i.e.*, a zero sum of the charges) of the $\text{Li}_2\text{M}'\text{O}_3$ component (*i.e.*, $(\text{Li}^+)_2(\text{M}'^{4+})(\text{O}^{2-})_3$). (*See* RX-753C, Delmas RWS at Q/A 143.)

Because I found (*see supra* pp. 93-94) that Complainants proved by a preponderance of the evidence that BASF’s NCM 111, NCM 424, NCM 523, NCM 622, and NCM 811 include a $\text{Li}_2\text{M}'\text{O}_3$ component (where M’ is one or more ions with at least one ion being Mn, *see supra* pp. 90-91), I also find that Complainants carried their burden to prove that claim element 1(v) (“where M’ is one or more ions with an average oxidation state of four with at least one ion

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being Mn”) is satisfied by BASF’s NCM 111, NCM 424, NCM 523, NCM 622, and NCM 811. (Accord SIB at 43-46.)

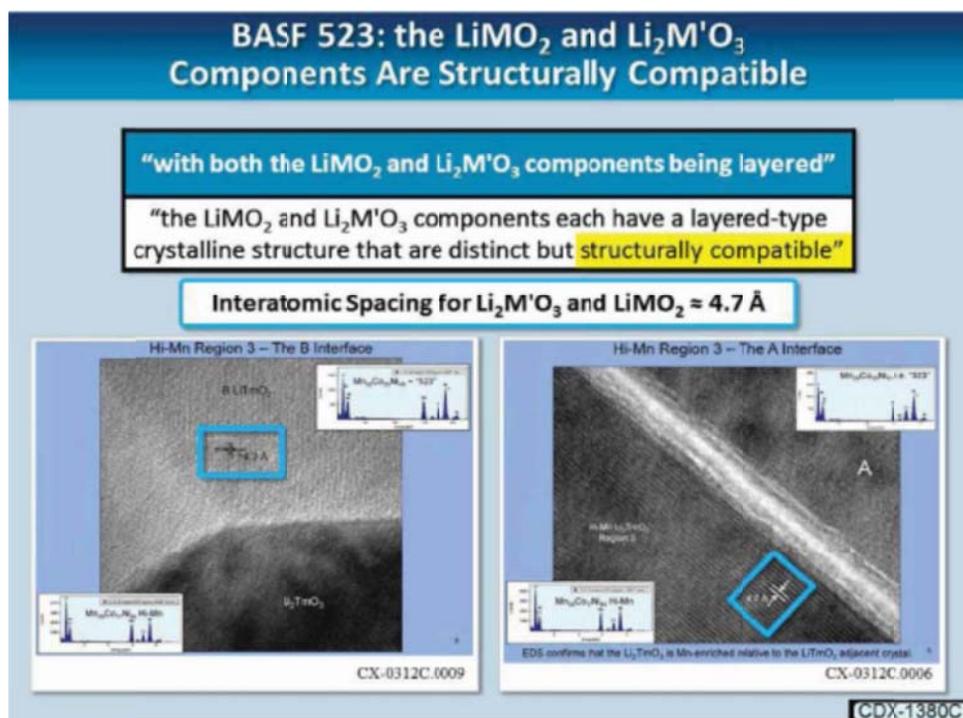
(vi) **with both the LiMO₂ and Li₂M’O₃ components being layered**

As discussed above, the claim term “with both the LiMO₂ and Li₂M’O₃ components being layered” was construed as “the LiMO₂ and Li₂M’O₃ components each have a layered-type crystalline structure that are distinct but structurally compatible.” *See supra* p. 26.

Complainants cogently established that BASF’s NCM 111, NCM 424, NCM 523, NCM 622, and NCM 811 include LiMO₂ and Li₂M’O₃ components that have a layered-type crystalline structure and that are distinct but structurally compatible. (*See* CIB at 119-20; *accord* SIB at 46-48.)

As discussed *supra* section VII(B)(1)(a)(iii)(2), BASF’s NCM 111, NCM 424, NCM 523, NCM 622, and NCM 811 include LiMO₂ and Li₂M’O₃ components that are crystallographically distinct. In addition, Umicore’s experts do not dispute that the LiMO₂ and Li₂M’O₃ components have layered structures. *See* Hearing Tr. at 866:20-24 (Oct. 28, 2015) (Ceder); *id.* at 1013:14-16, 1013:24-1014:1 (Oct. 29, 2015) (Delmas). Furthermore, I find that Umicore waived any arguments with respect to the “structurally compatible” requirement because Umicore failed to make such arguments in its pre-hearing brief. *See* Ground Rule 11.2 (contentions not set forth in the pre-hearing brief are deemed abandoned or withdrawn).

In any event, Complainants credibly proved the LiMO₂ and Li₂M’O₃ components are structurally compatible because: (1) they both have an interlayer spacing of about 4.7 Å; and (2) they are structurally integrated as demonstrated by Dr. Bradley’s testing. (*See* CX-5C, Bradley DWS at Q/As 257 (citing CX-312C at 6, 9; CDX-1380C (NCM 523), reproduced below), 338 (NCM 424), 424 (NCM 111); *supra* section VII(B)(1)(a)(iii)(3).)



See also RPB at 104 (“One of ordinary skill in the art would know that LiMO_2 and $\text{Li}_2\text{M}'\text{O}_3$ are structurally compatible because of the similarity of their interlayer spacing.”).

Thus, I find that Complainants carried their burden to prove that claim element 1(vi) (“with both the LiMO_2 and $\text{Li}_2\text{M}'\text{O}_3$ components being layered”) is satisfied by BASF’s NCM 111, NCM 424, NCM 523, NCM 622, and NCM 811.

(vii) **the ratio of Li to M and M’ being greater than one and less than two**

As discussed above, the claim term “the ratio of Li to M and M’” was construed as “the ratio of Li to (M plus M’) within the general formula $x\text{LiMO}_2 \cdot (1-x)\text{Li}_2\text{M}'\text{O}_3$.” See *supra* p. 26.

Complainants further persuasively established the ratio of Li to M and M’ in BASF’s NCM 111, NCM 424, NCM 523, NCM 622, and NCM 811 is greater than one and less than two.

(See CI at 120-21; accord SIB at 48.) As discussed *supra* section VII(B)(1)(a)(iii)(1),

Complainants’ Dr. Kirchheim, based on Dr. Wang’s ICP analysis, determined: (1) a value of []

for x as to NCM 111 which corresponds to an empirical formula of $\text{Li}_{1.1}\text{M}_{0.9}\text{M}'_{0.1}\text{O}_2$

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(2) a value of [] for x as to NCM 424 which corresponds to an empirical formula of $\text{Li}_{[]}\text{M}_{[]}\text{M}'_{[]}\text{O}_{[]}$; (3) a value of [] for x as to NCM 523 which corresponds to an empirical formula of $\text{Li}_{[]}\text{M}_{[]}\text{M}'_{[]}\text{O}_{[]}$; (4) a value of [] for x as to NCM 622 which corresponds to an empirical formula of $\text{Li}_{[]}\text{M}_{[]}\text{M}'_{[]}\text{O}_{[]}$; and (5) a value of [] for x as to NCM 811 which corresponds to an empirical formula of $\text{Li}_{[]}\text{M}_{[]}\text{M}'_{[]}\text{O}_{[]}$. (See CIB at 106-07; CX-4C, Kirchheim DWS at Q/As 904 (NCM 111), 1058 (NCM 424), 1200 (NCM 523), 1345 (NCM 622), 1482 (NCM 811).) Dr. Kirchheim credibly determined that the lithium-to-metal ratio was [] for NCM 111, [] for NCM 424, [] for NCM 523, [] for NCM 622, and [] for NCM 811. (See CX-4C, Kirchheim DWS at Q/As 952, 1103, 1243, 1383, 1519.)

Umicore argues that Complainants cannot prove that BASF's NCM 111, NCM 424, NCM 523, NCM 622, and NCM 811 have the claimed ratio because they do not contain an $\text{Li}_2\text{M}'\text{O}_3$ component. (See RIB at 164.) However, I disagreed with Umicore's position that BASF's NCM 111, NCM 424, NCM 523, NCM 622, and NCM 811 lacked the $\text{Li}_2\text{M}'\text{O}_3$ component. See *supra* section VII(B)(1)(a)(iii)(2).

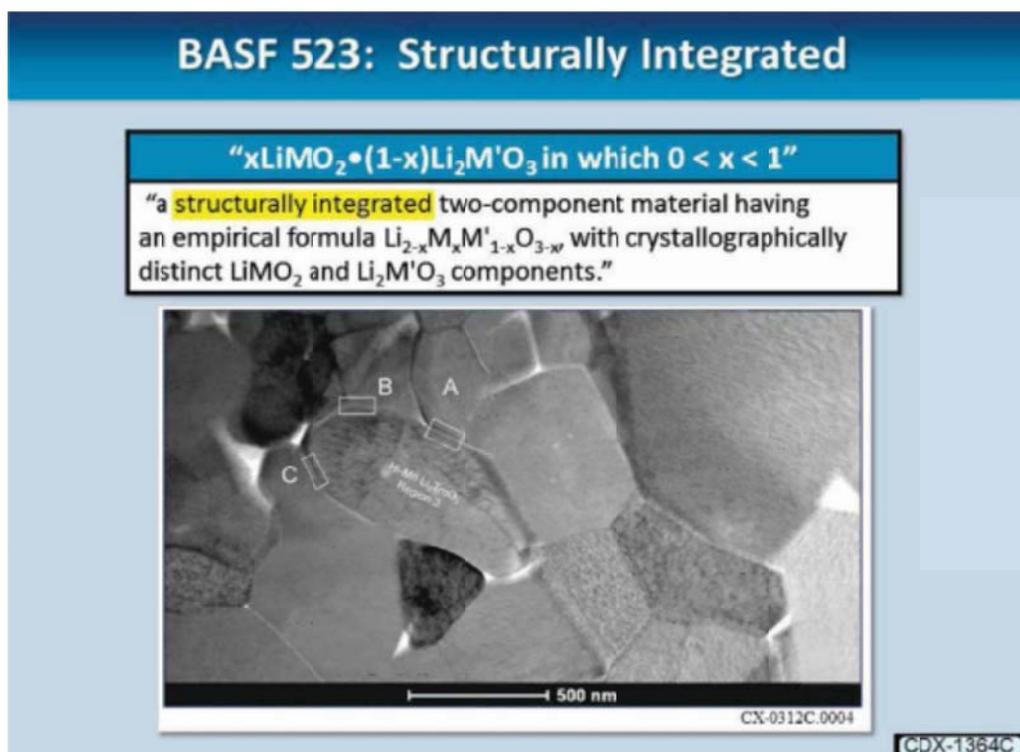
Accordingly, I find that Complainants carried their burden to prove that claim element 1(vii) ("the ratio of Li to M and M' being greater than one and less than two") is satisfied by BASF's NCM 111, NCM 424, NCM 523, NCM 622, and NCM 811.

(viii) wherein domains of the LiMO_2 and $\text{Li}_2\text{M}'\text{O}_3$ components exist side by side.

The parties agreed the claim term "domains" should be construed as "crystallographically distinguishable regions." See *supra* p. 26. As discussed *supra* section VII(B)(1)(a)(iii)(2), I found that Complainants carried their burden to prove that BASF's NCM 111, NCM 424, NCM 523, NCM 622, and NCM 811 include crystallographically distinguishable regions of LiMO_2 and $\text{Li}_2\text{M}'\text{O}_3$ components.

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In addition, Complainants persuasively established that BASF's NCM 111, NCM 424, NCM 523, NCM 622, and NCM 811 include domains of LiMO_2 and $\text{Li}_2\text{M}'\text{O}_3$ components that exist side by side. (See CIB at 121-22; accord SIB at 48-49.) Complainants rely on Dr. Bradley's testimony that the domains are structurally integrated and exist side by side within a single powder particle. (See CX-5C, Bradley DWS at Q/As 234 ("For example, in each of the brightfield images, what is observed is that the LiMO_2 and $\text{Li}_2\text{M}'\text{O}_3$ components have adjacent atomic planes in adjacent crystals. There is chemical bonding between these crystals at grain boundaries, that exist within the same particle and these components are therefore structurally integrated. If this were not the case, the powder particles would fall apart.") (citing CX-312C at 3-4; CDX-1364C, reproduced below) (NCM 523), 322 (NCM 424), 406-08 (NCM 111), 471 (NCM 622), 517 (NCM 811).)



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I find Dr. Bradley's testimony to be very credible. *See also supra* section VII(B)(1)(a)(iii)(3) (finding that Dr. Bradley's testimony credibly establishes that the two components LiMO_2 and $\text{Li}_2\text{M}'\text{O}_3$ are structurally integrated).

Umicore argues that "atomic resolution imaging is required to discern domains formed 'side by side.'" (*See RIB* at 164.) However, as discussed *supra* p. 95, I disagree that atomic level imaging is required to identify structural integration or to conclude that the domains of LiMO_2 and $\text{Li}_2\text{M}'\text{O}_3$ components exist side by side.

Based on the foregoing, I find that Complainants carried their burden to prove that claim element 1(viii) ("wherein domains of the LiMO_2 and $\text{Li}_2\text{M}'\text{O}_3$ components exist side by side") is satisfied by BASF's NCM 111, NCM 424, NCM 523, NCM 622, and NCM 811.

(ix) Conclusion

Complainants carried their burden to prove that BASF's NCM 111, NCM 424, NCM 523, NCM 622, and NCM 811 meet the elements of claim 1. Accordingly, I find that Complainants satisfy the technical prong of the domestic industry requirement with respect to claim 1.

b. Claim 2

Claim 2 of the '082 patent recites "[a] lithium metal oxide positive electrode according to claim 1 in which $0.8 \leq x < 1$." As discussed *supra* section VII(B)(1)(a)(iii)(1), based on Dr. Wang's ICP analysis, Complainants' expert, Dr. Kirchheim, credibly determined: (1) a value of [] for x as to NCM 111 which corresponds to an empirical formula of $\text{Li}_{[]}\text{M}_{[]}\text{M}'_{[]}\text{O}_{[]}$; (2) a value of [] for x as to NCM 424 which corresponds to an empirical formula of $\text{Li}_{[]}\text{M}_{[]}\text{M}'_{[]}\text{O}_{[]}$; (3) a value of [] for x as to NCM 523 which corresponds to an empirical formula of $\text{Li}_{[]}\text{M}_{[]}\text{M}'_{[]}\text{O}_{[]}$; (4) a value of [] for x as to NCM 622 which corresponds to an empirical formula of $\text{Li}_{[]}\text{M}_{[]}\text{M}'_{[]}\text{O}_{[]}$; and (5) a value of [] for x as

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to NCM 811 which corresponds to an empirical formula of $\text{Li}_{1-x}\text{M}_x\text{M}'_{1-x}\text{O}_2$. (See CIB at 106-07; CX-4C, Kirchheim DWS at Q/As 904 (NCM 111), 1058 (NCM 424), 1200 (NCM 523), 1345 (NCM 622), 1482 (NCM 811); *see also* CIB at 122; *accord* SIB at 49-50.) Thus, BASF's NCM 111, NCM 424, NCM 523, NCM 622, and NCM 811 satisfy the claim element $0.8 \leq x < 1$.

Umicore argues “the BASF products do not contain a $\text{Li}_2\text{M}'\text{O}_3$ component” and “[t]he inconsistent compositions identified by Complainants’ experts [] make it unlikely the claimed range ($0.8 \leq x < 1$) is practiced.” (See RIB at 165.) I disagree. As discussed *supra* section VII(B)(1)(a)(iii)(2), I found that Complainants carried their burden to prove that BASF’s NCM 111, NCM 424, NCM 523, NCM 622, and NCM 811 include a $\text{Li}_2\text{M}'\text{O}_3$ component. In addition, I do not find any inconsistency in Complainants’ experts’ determinations with respect to composition. Indeed, as discussed *supra* p. 54 n.37, Dr. David credibly testified that definitive numbers for the percentages of rhombohedral phase and monoclinic phase require another characterization technique such as electron microscopy. *See* Hearing Tr. at 331:3-6 (Oct. 27, 2015) (David). With respect to composition, Dr. Kirchheim credibly testified that “chemical analytical techniques like ICP” are required. *See id.* at 493:6-10 (Kirchheim) (“If it comes to composition, you can use the electron microscope, and if you want to the get accurate number you have to go to chemical analytical techniques like ICP, for instance.”).

Hence, I find that Complainants carried their burden to prove that BASF’s NCM 111, NCM 424, NCM 523, NCM 622, and NCM 811 meet the elements of claim 2. Accordingly, I find that Complainants satisfy the technical prong of the domestic industry requirement with respect to claim 2.

c. Claim 3

Claim 3 of the '082 patent recites “[a] lithium metal oxide positive electrode according to claim 1 in which $0.9 \leq x < 1$.” As discussed *supra* section VII(B)(1)(b), Complainants’ expert,

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Dr. Kirchheim, credibly determined, based on Dr. Wang's ICP analysis: (1) a value of [] for x as to NCM 111 which corresponds to an empirical formula of $\text{Li}_{[]}\text{M}_{[]}\text{M}'_{[]}\text{O}_{[]}$; (2) a value of [] for x as to NCM 424 which corresponds to an empirical formula of $\text{Li}_{[]}\text{M}_{[]}\text{M}'_{[]}\text{O}_{[]}$; (3) a value of [] for x as to NCM 523 which corresponds to an empirical formula of $\text{Li}_{[]}\text{M}_{[]}\text{M}'_{[]}\text{O}_{[]}$; (4) a value of [] for x as to NCM 622 which corresponds to an empirical formula of $\text{Li}_{[]}\text{M}_{[]}\text{M}'_{[]}\text{O}_{[]}$; and (5) a value of [] for x as to NCM 811 which corresponds to an empirical formula of $\text{Li}_{[]}\text{M}_{[]}\text{M}'_{[]}\text{O}_{[]}$. (See also CIB at 122; accord SIB at 50.) Thus, BASF's NCM 111, NCM 424, NCM 523, NCM 622, and NCM 811 satisfy the claim element $0.9 \leq x < 1$.

Umicore argued BASF's NCM 111, NCM 424, NCM 523, NCM 622, and NCM 811 do not practice claim 3 "[f]or the same reasons as stated" in connection with claim element 1(iii) ("having a general formula $x\text{LiMO}_2 \cdot (1-x)\text{Li}_2\text{M}'\text{O}_3$ in which $0 < x < 1$ "). (See RIB at 165.) Umicore's arguments that claim 3 of the '082 patent is not practiced fail for the same reasons discussed in connection with claim element 1(iii). See *supra* section VII(B)(1)(a)(iii). See also *supra* section VII(B)(1)(b).

Therefore, I find that Complainants carried their burden to prove that BASF's NCM 111, NCM 424, NCM 523, NCM 622, and NCM 811 meet the elements of claim 3. Accordingly, I find that Complainants satisfy the technical prong of the domestic industry requirement with respect to claim 3.

d. Claim 4

Claim 4 of the '082 patent recites "[a] lithium metal oxide positive electrode according to claim 1 in which M and M' are disordered in the electrode structure." The parties agreed that the claim term "M and M' are disordered" means "one or more of M and M' occupy cation sites

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other than those designated in $\text{LiMO}_2 \cdot \text{Li}_2\text{M}'\text{O}_3$ ” and “electrode structure” means “electrode material.” *See supra* p. 27.

Complainants persuasively established that M and M' are disordered in the electrode structure. (*See* CIB at 122-23; *accord* SIB at 51-52.) Specifically, Dr. David credibly testified that nickel occupies cation sites designated for lithium in both the monoclinic ($\text{Li}_2\text{M}'\text{O}_3$) and rhombohedral (LiMO_2) components of BASF's NCM 111, NCM 424, NCM 523, NCM 622, and NCM 811. (*See* CX-6C, David DWS at Q/As 157-63, 168, 196, 197.)

Umicore argues that BASF's NCM 111, NCM 424, NCM 523, NCM 622, and NCM 811 do not practice claim 4 of the '082 patent because claim 4 depends from claim 1 (which according to Umicore is not practiced). (*See* RIB at 165-66.) Umicore's argument that claim 4 of the '082 patent is not practiced because claim 1 is not practiced, fails for the same reasons as discussed in connection with claim 1. *See supra* section VII(B)(1)(a). (*See also* RPB at 106 (“This necessarily occurs in all lithium nickel-cobalt-manganese oxide cathode materials. In particular, some fraction of the transition metals enters the lithium layer, resulting in disorder in the electrode structure.”).)

Accordingly, I find that Complainants carried their burden to prove that BASF's NCM 111, NCM 424, NCM 523, NCM 622, and NCM 811 meet the elements of claim 4 and that the technical prong is satisfied with respect to claim 4.

e. Claim 7

Claim 7 of the '082 patent recites “[a] lithium metal oxide positive electrode according to claim 1 in which M and M' are partially replaced by mono- or multivalent cations.”

As discussed *supra* section VII(B)(1)(d) in connection with claim 4, Complainants persuasively established that M and M' are disordered in the electrode structure and that nickel occupies cation sites designated for lithium in both the monoclinic ($\text{Li}_2\text{M}'\text{O}_3$) and rhombohedral

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(LiMO₂) components of BASF's NCM 111, NCM 424, NCM 523, NCM 622, and NCM 811.

Because lithium is monovalent (*see, e.g.*, CX-4C, Kirchheim DWS at Q/A 373), Complainants also persuasively established M and M' are partially replaced by mono- or multivalent cations, as required by claim 7.

Umicore argues that BASF's NCM 111, NCM 424, NCM 523, NCM 622, and NCM 811 do not practice claim 7 of the '082 patent because claim 7 depends from claim 1 (which according to Umicore is not practiced). (*See* RIB at 166.) Umicore's argument that claim 7 of the '082 patent is not practiced because claim 1 is not practiced, fails for the same reasons as discussed in connection with claim 1. *See supra* section VII(B)(1)(a).

Accordingly, I find that Complainants carried their burden to prove that BASF's NCM 111, NCM 424, NCM 523, NCM 622, and NCM 811 meet the elements of claim 7.

Accordingly, I find that the technical prong is satisfied with respect to claim 7.

f. Claim 13

Claim 13 of the '082 patent recites:

- [i] An electrochemical cell having a negative electrode and a non-aqueous electrolyte and a positive electrode, said positive electrode having
- [ii] in its initial discharged state
- [iii] a general formula $x\text{LiMO}_2 \cdot (1-x)\text{Li}_2\text{M}'\text{O}_3$ in which $0 < x < 1$, and
- [iv] where M is one or more ions having an average oxidation state of three with at least one ion being Ni, and
- [v] where M' is one or more ions with an average oxidation state of four with at least one ion being Mn,
- [vi] with both the LiMO₂ and Li₂M'O₃ components being layered and
- [vii] the ratio of Li to M and M' being greater than one and less than two; and

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[viii] wherein domains of the LiMO_2 and $\text{Li}_2\text{M}'\text{O}_3$ components exist side by side.

Claim 13 includes the same limitations as claim 1, except that the preamble further recites “[a]n electrochemical cell having a negative electrode and a non-aqueous electrolyte and a positive electrode.”

Umicore provides similar arguments with respect to the claimed electrochemical cell as it did with the positive electrode of claim 1. (*See* RIB at 166-67 (“Complainants have provided no evidence of a third party positive electrode in the United States made using BASF NMC material, within an electrochemical cell that practices all of the limitations of the asserted claim.”).) However, as discussed above, there is no dispute that BASF’s NMC products are designed for use in a positive electrode and that BASF’s customers (including []) make batteries or electrochemical cells. *See supra* section VII(B)(1)(a)(i). Thus, I find that it is far more likely than not, that at least one of BASF’s customers in the United States used BASF’s NMC materials (including BASF’s NCM 111, NCM 424, NCM 523, NCM 622, and NCM 811) in an electrochemical cell that meets the limitations of claim 13 of the ’082 patent. *See Lucent Techs.*, 580 F.3d at 1318. (*See also* SIB at 52-53.)

Hence, I find that Complainants carried their burden to prove that BASF’s NCM 111, NCM 424, NCM 523, NCM 622, and NCM 811 meet the elements of claim 13. Accordingly, I find that the technical prong is satisfied with respect to claim 13.

g. Claim 14

Claim 14 of the ’082 patent recites:

- [i] A battery consisting of a plurality of cells, at least some cells including a negative electrode and a non-aqueous electrolyte and a positive electrode, said positive electrode having
- [ii] in its initial discharged state

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- [iii] a general formula $x\text{LiMO}_2 \cdot (1-x)\text{Li}_2\text{M}'\text{O}_3$ in which $0 < x < 1$, and
- [iv] where M is one or more ions having an average oxidation state of three and at least one ion being Ni, and
- [v] where M' is one or more ions with an average oxidation state of four and at least one ion being Mn,
- [vi] with both the LiMO_2 and $\text{Li}_2\text{M}'\text{O}_3$ components being layered and
- [vii] the ratio of Li to M and M' being greater than one and less than two; and
- [viii] wherein domains of the LiMO_2 and $\text{Li}_2\text{M}'\text{O}_3$ components exist side by side.

Claim 14 includes the same limitations as claim 1, except that the preamble further recites “[a] battery consisting of a plurality of cells, at least some cells including a negative electrode and a non-aqueous electrolyte and a positive electrode.”

Umicore provides similar arguments with respect to the claimed battery as it did with the positive electrode of claim 1. (*See* RIB at 167 (“Complainants have provided no evidence of a third party positive electrode in the United States made using BASF material, within a battery that practices all of the limitations of the asserted claim.”).)

Yet, as discussed above, there is no dispute that BASF’s NCM 111, NCM 424, NCM 523, NCM 622, and NCM 811 products are designed for use in a positive electrode and that BASF’s customers make batteries or electrochemical cells. *See supra* section VII(B)(1)(a)(i).

Accordingly, I find that it is far more likely than not, that at least one of BASF’s customers in the United States used BASF’s NMC materials (including BASF’s NCM 111, NCM 424, NCM 523, NCM 622, and NCM 811) in a battery that meets the limitations of claim 14 of the ’082 patent. *See Lucent Techs.*, 580 F.3d at 1318. (*See also* SIB at 53.)

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Consequently, I find that Complainants carried their burden to prove that BASF's NCM 111, NCM 424, NCM 523, NCM 622, and NCM 811 meet the elements of claim 14.

Accordingly, I find that the technical prong is satisfied with respect to claim 14.

2. The '143 Patent

The parties agree that the asserted claims of the '143 Patent and the '082 Patent are substantially similar. (*See* CIB at 137-38; RIB at 192; SIB at 61-62.) The only relevant difference between the asserted claims of the '082 patent and the '143 patent that requires further analysis, is that the '143 patent claims recite that M is one or more ions, with at least one ion being Mn. (*See* CIB at 137-38; JX-1, '082 patent claims; JX-2, '143 patent claims.)

Complainants persuasively established (and Umicore does not dispute) that BASF's NCM 111, NCM 424, NCM 523, NCM 622, and NCM 811 satisfy the claim element requiring that M is one or more ions, with at least one ion being Mn. (*See* CIB at 117 (“This testing data confirms that the LiMO₂ regions of the BASF Products contain at least nickel and manganese.”).) Dr. Bradley credibly testified that EDS mapping shows LiMO₂ regions containing at least manganese. (*See* CX-5C, Bradley DWS at Q/As 241 (NCM 523), 326 (NCM 424), 412 (NCM 111), 475 (NCM 622), 521 (NCM 811).) In addition, Dr. Wang's ICP analysis also confirmed that BASF's NCM 111, NCM 424, NCM 523, NCM 622, and NCM 811 contain manganese. (*See* CX-7C, Wang DWS at Q/As 91-92.)

Umicore argues that Complainants' technical prong evidence, with respect to the '143 patent, has the same deficiencies as Complainants' infringement evidence. (*See* RIB at 192.) Umicore's arguments fail for the same reasons as discussed *supra* section VI(B)(2). *See also* section VII(B)(1).

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Accordingly, I find that Complainants carried their burden to prove that BASF's domestic industry products practice the asserted claims of the '143 patent and that the technical prong is satisfied with respect to the '143 patent.

VIII. INVALIDITY

A. Legal Standards

It is Respondents' burden to prove invalidity, and the burden of proof never shifts to the patentee to prove validity. *Scanner Techs. Corp. v. ICOS Vision Sys. Corp. N.V.*, 528 F.3d 1365, 1380 (Fed. Cir. 2008). "Under the patent statutes, a patent enjoys a presumption of validity, *see* 35 U.S.C. § 282, which can be overcome only through facts supported by clear and convincing evidence[.]" *SRAM Corp. v. AD-II Eng'g, Inc.*, 465 F.3d 1351, 1357 (Fed. Cir. 2006).

The clear and convincing evidence standard placed on the party asserting the invalidity defense requires a level of proof beyond the preponderance of the evidence. Although not susceptible to precise definition, "clear and convincing" evidence has been described as evidence which produces in the mind of the trier of fact "an abiding conviction that the truth of a factual contention is 'highly probable.'" *Price v. Symsek*, 988 F.2d 1187, 1191 (Fed. Cir. 1993) (citing *Buildex, Inc. v. Kason Indus., Inc.*, 849 F.2d 1461, 1463 (Fed. Cir. 1988)).

B. Enablement

Umicore argues that the Asserted Claims of the '082 and '143 patents are invalid because they do not satisfy the enablement requirement of 35 U.S.C. § 112. As explained below, I find Umicore failed to carry its burden to prove lack of enablement by clear and convincing evidence.

Umicore argues the Asserted Claims do not satisfy the enablement requirement of 35 U.S.C. § 112 ¶ 1 because "the specifications of the '082 and '143 patents do not disclose to a person having ordinary skill in the art at the time of the filing date how to make and use the claimed two-component $x\text{LiMO}_2 \cdot (1-x)\text{Li}_2\text{M}'\text{O}_3$ material across the full claimed range of

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0<x<1.” (RIB at 168 (citing RX-746C, Ceder DWS at Q/A 27).) Umicore asserts that “Dr. Ceder testified regarding the inadequacy of the written description contained in the specifications of the Asserted Patents” and that “his testimony was not rebutted by Complainants.” (RIB at 168.) According to Umicore, Dr. Ceder explained that “whether a composition having the claimed general formula would form as a solid solution, as distinct compounds, or as the integrated ‘side-by-side’ microstructure the inventors envisioned would depend significantly on the energetics, the phase diagram, and processing conditions of the system.” (*Id.* (citing RX-746C, Ceder DWS at Q/A 28).) In this regard, Umicore argues:

there is nothing in the specification or the drawings of the Asserted Patents that would enable one of ordinary skill in the art at the time of the filing date to make and use the claimed two-component $x\text{LiMO}_2 \cdot (1-x)\text{Li}_2\text{M}'\text{O}_3$ material — as opposed to a single-phase, or solid solution, material — across the full claimed range of $0 < x < 1$.

(*Id.* (citing RX-746C, Ceder DWS at Q/A 28).)

Umicore also argues that the Asserted Patents are “silent as to which compositions have the potential to form domains (distinct phases) or how to form them.” (RIB at 168 (citing RX-746C, Ceder DWS at Q/A 29).) According to Umicore, “to generate the synergy of domains that is alleged in the patents, very particular processing would have to be applied, and that is unlikely to be possible in much of the composition range claimed.” (RIB at 169 (citing RX-746C, Ceder DWS at Q/A 29).) Umicore argues that whether the resulting cathode material is “a single phase ‘solid solution’ or something else, hinges very much on the process used to synthesize the material and on its specific composition.” (*Id.*) Umicore further asserts that “the ’082 and ’143 patents are completely silent regarding the quenching rate that would be required to form the claimed two-component material.” (RIB at 169 (citing RX-746C, Ceder DWS at Q/A 30).) Nor, according to Umicore, do the Asserted Patents provide “any guidance regarding what other steps

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must be taken to ensure that [the] claimed two-component structure is formed.” (*Id.*) Umicore notes that even “Dr. Thackeray subsequently recogniz[ed] the difficulty in forming and controlling such domain structures” and that “the scientific community was *still* trying to determine when and why such domain structure might form more than 12 years after the alleged date of invention of the Asserted Patents.” (RIB at 170 (citing RX-746C, Ceder DWS at Q/As 30, 31) (emphasis in original).) Umicore argues both Asserted Patents are “critically lacking in describing” how one would control domain separation. (*Id.*)

Additionally, Umicore argues “the Asserted Patents say nothing about the length scales of the alleged ‘domains’ that are allegedly integrated together in the same material.” (*Id.* (citing RX-746C, Ceder DWS at Q/A 32).) Umicore argues that such information would be “critical in achieving the stated goal of the patents.” (RIB at 171 (citing RX-746C, Ceder DWS at Q/A 32).) Umicore argues that even Complainants’ expert, Dr. Kirchheim, agrees the size of the alleged domains is critical to achieving the claimed invention. (*Id.* (citing RX-777C, Ceder SWS at Q/A 45).)

Further, Umicore argues that “for values of x very close to either 0 or 1, there will not be any domain structures at all due to the complete solubility of any secondary component in the primary phase, thereby resulting in a single-phase material.” (*Id.* (citing RX-746C, Ceder DWS at Q/A 33).) Umicore argues that “there is nothing in the disclosure of the Asserted Patents to even remotely suggest that the inventors knew how to make the claimed two-component cathode material across the full claimed range of $0 < x < 1$.” (RIB at 171.)

Complainants respond that Umicore has failed to show a lack of enablement by clear and convincing evidence. (CIB at 125.) In particular, Complainants argue that Umicore has failed to show by clear and convincing evidence that one of ordinary skill in the art would be unable to

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practice the Asserted Claims without undue experimentation. (*Id.*) Complainants argue that although Dr. Ceder testifies the Asserted Patents leave us “with the need to experiment,” he does not contend that the experimentation would be undue. (*Id.* (citing RX-746C, Ceder DWS at Q/A 42).)

Complainants contend that “nothing Dr. Ceder purportedly relies on is actually part of the evidentiary record.” (*Id.* (citing RX-746C, Ceder DWS at Q/As 29-31, 35-42; *UpJohn Co. v. Mova Pharm. Corp.*, 225 F.3d 1306, 1311 (Fed. Cir. 2000)).) Complainants argue that Umicore’s claim that any experimentation would be undue because 15 years after the invention there is still debate whether there are domains or not in the high Li-excess content materials, is insufficient to establish a lack of enablement because “inventions require further development” and “additional inventive work does not alone show nonenablement.” (CIB at 126 (citing RX-746C, Ceder DWS at Q/A 37; *CFMT, Inc. v. Yieldup Int’l Corp.*, 349 F.3d 1333, 1340 (Fed. Cir. 2003)).) Complainants also argue that Dr. Ceder’s reliance on a statement by Dr. Thackeray that “much work remains to find an *optimal* composition and synthesis protocol for these [materials]” is insufficient to establish a lack of enablement because a patent specification is “not required to enable the most optimized configuration.” (CIB at 126-27 (citing RDX-108; RX-746C, Ceder DWS at Q/A 30; *Transocean Offshore Deepwater Drilling, Inc. v. Maersk Contractors USA, Inc.*, 617 F.3d 1296, 1306-07 (Fed. Cir. 2010)) (emphasis in original).)

Complainants also argue that “Dr. Ceder’s claim of undue experimentation is further belied by his discussion of all the information a person of skill in the art would use to make the claimed invention.” (CIB at 127.) Complainants further argue that Dr. Ceder “ignores the disclosure of the [Asserted Patents], which describe[s] several ways to make the claimed two-component materials.” (*Id.* (citing JX-001 at 5:48-6:10; JX-002 at 7:1-63, 8:45-59).)

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Complainants assert that because the Asserted Patents provide “guidance in selecting the operating parameters that would yield the claimed result” any experimentation that would be required cannot be considered undue. (CIB at 128 (citing *PPG Indus., Inc. v. Guardian Indus. Corp.*, 75 F.3d 1558, 1565 (Fed. Cir. 1996)).) Additionally, Complainants argue that Dr. Ceder’s argument that the Asserted Patents do not disclose the “length scale” or size of the domains is “irrelevant,” because the length scale is not claimed. (CIB at 128.) Complainants further argue that Dr. Ceder’s assertion that at extremely low or extremely high values of x , there would not be a second phase is unsupported and that the Asserted Patents disclose two-component materials with an x value “close to 1.” (*Id.* (citing JX-001 at 7:6; JX-002 at 8:45).)

The Staff argues that Umicore presented only the “conclusory” testimony of their technical expert, Dr. Ceder, in support of their lack of enablement defense and not “any evidence that clearly and convincingly establishes a lack of enablement.” (SIB at 54.) The Staff contends, contrary to Umicore’s argument, that “the specification of the Asserted Patents provides ample guidance for one of ordinary skill in the art to make and use the claimed components across the full range of $0 < x < 1$.” (*Id.* (citing JX-1 at 5:48-6:10; CX-3299C, Kirchheim RWS at Q/A 754-55, 778).)

To prove that the Asserted Claims are not enabled, Umicore must show by “clear and convincing evidence that a person of ordinary skill in the art would not be able to practice the claimed invention without ‘undue experimentation.’” *Alcon Research Ltd. v. Barr Labs., Inc.*, 745 F.3d 1180, 1188 (Fed. Cir. 2014). “The fact that some experimentation is necessary does not preclude enablement; what is required is that the amount of experimentation ‘must not be unduly extensive.’” *PPG Indus., Inc. v. Guardian Indus. Corp.*, 75 F.3d 1558, 1564 (Fed. Cir. 1996) (quoting *Atlas Powder Co. v. E.I. DuPont De Nemours & Co.*, 750 F.2d 1569, 1576 (Fed. Cir.

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1984)). On this point, it is well-established that “[a] claim is sufficiently enabled even if a considerable amount of experimentation is necessary, so long as the experimentation is merely routine, or if the specification in question provides a reasonable amount of guidance with respect to the direction in which the experimentation should proceed.” *Vasudevan Software, Inc. v. MicoStrategy, Inc.*, 782 F.3d 671, 684 (Fed. Cir. 2015); *see also In re Wands*, 858 F.2d 731, 737 (Fed. Cir. 1988).

I note at the outset that Umicore improperly relies on evidence that I have not admitted and thus is not part of the record in this investigation. Such evidence includes RX-182 (McCalla), CX-717C (Dr. Kirchheim’s rebuttal expert report), and CX-3299C (Dr. Kirchheim’s rebuttal witness statement). Additionally, Umicore relies on testimony from Dr. Kirchheim’s deposition (RX-779C) which also was not admitted at the hearing. (*See* RIB at 171.) Evidence that has not been admitted shall be given no consideration.

Umicore relies extensively on the testimony of its technical expert, Dr. Ceder, in support of its lack of enablement argument. Dr. Ceder opines that

given the asserted patents’ complete lack of disclosure on the protocols or methodology required to make the claimed two component material, one of ordinary skill in the art would have been unable to make and use the full scope of the claimed invention without having to perform undue experimentation.

(*See* RX-746C, Ceder DWS at Q/A 34.) In general, I find Dr. Ceder’s testimony to be mostly conclusory. (*See id.* at Q/As 34-42.) Dr. Ceder provides only a modicum of factual evidence to support his opinion and some of that evidence, as discussed above, is not even of record. (*Id.*) Thus, I give Dr. Ceder’s testimony little weight.

Dr. Ceder attempts to support his claim of undue experimentation by pointing out that “15 years after the invention, the scientific community is still debating whether there are

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domains or not in the high Li-excess content materials.” (*Id.* at Q/A 37.) But, as noted by Complainants, this is insufficient to establish lack of enablement as “additional inventive work does not alone show nonenablement.” (*See* CIB at 126 (citing *CFMT, Inc. v. Yield Int’l Corp.*, 349 F.3d 1333, 1340 (Fed. Cir. 2003)).) Dr. Ceder also relies on a statement from an article by Dr. Thackeray that “much work remains to find an optimal composition and synthesis protocol for these [materials].” (RX-746C, Ceder DWS at Q/A 30.) But, “[a] patent specification only must enable one of ordinary skill in the art to practice the claimed invention without undue experimentation. It is not required to enable the most optimized configuration, unless this is an explicit part of the claims.” *Transocean Offshore Deepwater Drilling, Inc. v. Maersk Contractors USA, Inc.*, 617 F.3d 1296, 1306-07 (Fed. Cir. 2010). Moreover, Dr. Ceder admits “one could potentially experiment with different cooling arrays to see how to achieve domain structures” and that “[i]t is generally understood in materials engineering that the temperature-time trajectory (i.e., how fast you cool and which temperatures one anneals or holds a sample at) influences the microstructure.” (RX-746C, Ceder DWS at Q/A 37, 39.) Such experimentation is not undue.

Further, I agree with Complainants that Dr. Ceder’s assertion about the “length scale”, *see id.* at Q/A 32, is irrelevant as the Asserted Claims do not require a particular length scale. Dr. Ceder also asserts that at extremely low or extremely high values of x , the smaller second phase would be “soluble” in the first phase and thus would not exist as a second phase. But, Dr. Ceder cites no support for this proposition and, contrary to Dr. Ceder’s testimony, the Asserted Patents disclose two-component materials with an x value of 0.95 (which is close to 1) and the evidence shows both Umicore and BASF have produced two-component materials with x values

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as high as [] and [] respectively. (*See* JX-2 at 8:45-59; *supra* sections VI(B)(1)(b), VII(B)(1)(b).)

Contrary to Umicore’s argument that the Asserted Claims are not enabled, the Asserted Patents disclose several ways to make the claimed two-component materials. (JX-1 at 5:48-6:10 (Examples 1-3); JX-2 at 7:1-63, 8:45-58 (Examples 1-5, 7); *accord* SIB at 54.) In light of this “guidance in selecting the operating parameters that would yield the claimed result, it is fair to conclude that the experimentation required to make a particular embodiment is not undue.” *PPG Indus., Inc. v. Guardian Indus. Corp.*, 75 F.3d 1558, 1565 (Fed. Cir. 1996) (citations omitted).

Accordingly, I find Umicore has failed to prove by clear and convincing evidence that the Asserted Claims are invalid for lack of enablement.

C. Inventorship

Umicore challenges the validity of the Asserted Patents based on alleged incorrect inventorship. As explained below, I find that Umicore failed to carry its burden to prove incorrect inventorship by clear and convincing evidence.

“The inventors as named in an issued patent are presumed to be correct.” *See Hess v. Advanced Cardiovascular Sys., Inc.*, 106 F.3d 976, 980 (Fed. Cir. 1997) (citations omitted). The presumption is strong and “the burden of showing misjoinder . . . of inventors is a heavy one and must be proved by clear and convincing evidence.” *See id.* (citations omitted). *See also Falana v. Kent State University*, 669 F.3d 1349, 1356 (Fed. Cir. 2012) (“[T]he burden of showing misjoinder or nonjoinder of inventors is a heavy one and must be proved by clear and convincing evidence.”).

Umicore argues that Drs. Amine and Kim are misjoined as inventors and that the Asserted Patents should be held unenforceable at the Commission until the misjoinder is

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corrected by the USPTO or a district court. (See RIB at 173-74 (citing *Certain EPROM, EPROM, Flash Memory, & Flash Microcontroller Semiconductor Devices, & Products Containing Same*, Inv. No. 337-TA-395, 1998 WL 35428257, at *11 (U.S.I.T.C. Oct. 1998) (Comm'n Op.); *Certain Electronic Imaging Devices*, 337-TA-850, 2013 WL 5956227, *110 n.6 (U.S.I.T.C. Sept. 30, 2013) (Initial Determination)).)⁴⁴

Specifically, Umicore contends Drs. Thackeray and Johnson (who are also named as inventors) (1) worked independently from Drs. Amine and Kim and conceived lithium titanium oxide (which, according to Umicore, is “Dr. Amine’s singular alleged contribution”); (2) prepared an invention report and provisional patent identifying only Drs. Thackeray and Johnson as inventors; and (3) filed a provisional patent application at the USPTO identifying only Drs. Thackeray and Johnson as inventors. (See RIB at 174-76.) Umicore also argues that a book, *The Powerhouse*, proves Drs. Amine and Kim did not contribute lithium titanium oxide. (See RIB at 179.) Umicore further argues Dr. Johnson’s laboratory notebook indicates that he invented lithium titanium oxide before the provisional patent application was filed. (See RIB at 177-78 (citing RX-114C at 23).) Finally, Umicore argues Complainants did not provide documentary evidence of collaboration between Dr. Thackeray’s research group (which includes Dr. Johnson) and Dr. Amine’s research group (which includes Dr. Kim). (See RIB at 174-83.)

Complainants respond that there is documentary evidence of collaboration, including the oath signed by all four named inventors in the non-provisional patent application. (See CIB at 129; CRB at 67 (citing JX-3 at 144-45).) Complainants further state that Umicore ignores the

⁴⁴ Umicore also cites *Advanced Magnetic Closures, Inc. v. Rome Fastener Corp.*, 607 F.3d 817, 832 (Fed. Cir. 2010) but that case is inapposite as it relates to unenforceability in the context of inequitable conduct based on a false claim of inventorship. Umicore did not allege inequitable conduct in its initial post-hearing brief and Umicore’s improper inventorship allegation is an invalidity not unenforceability defense. (See RIB at 173-83, 193.)

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inventors' testimony regarding collaboration, including that "they worked in the same lab, with the same equipment, and discuss[ed] experiments." (See CIB at 131 (citing RX-740C, Johnson Dep. Tr. at 53:22-54:14, 99:3-100:13, 101:5-9, 102:8-12); see also CIB at 130 (citing RX-729C, Amine Dep. Tr. at 180:7-15 (testifying that Drs. Amine and Kim's inventive contribution related to Li_2TiO_3)); RX-733C, Thackeray Dep. Tr. at 178:21-179:2 ("[T]here is a legal aspect to this, right, that you have to contribute and that's what he did do."); RX-740C, Johnson Dep. Tr. at 109:22-110:3 ("Well, I had mentioned the lithium and titanium, extra lithium in the system, was an example of a contribution that I believe was made.")) Still further, Complainants argue that *The Powerhouse* recognizes Drs. Amine and Kim contributed the concept of using titanium to the Asserted Patents. (See CRB at 71 (citing RX-111 at 35 ("I have this theory about titanium—that you can add a little bit of extra lithium to it' and produce a higher-capacity battery, Kim said. It was the same thesis as Thackeray and Johnson's but advanced the use of titanium rather than manganese.")))).

The Staff also argues that Umicore "failed to meet their burden of presenting clear and convincing evidence that inventorship is incorrect." (See SIB at 55-57.) I agree. First, I find the inventors' oath (see JX-3 at 144-45) in the non-provisional patent application to be compelling documentary evidence of joint inventorship. The failure to list Drs. Amine and Kim from the invention report and the provisional patent application was corrected when Dr. Thackeray learned of Drs. Amine's and Kim's contributions. (See, e.g., CX-1C, Thackeray WS at Q/A 76.)

Second, I disagree with Umicore that there is no evidence of collaboration. Dr. Johnson testified that he shared lab space and equipment with Dr. Kim and that they discussed their respective experiments. (See RX-740C, Johnson Dep. Tr. at 53:22-54:14, 99:3-100:13, 101:5-9, 102:8-12.) And the testifying inventors agreed that the contribution of Drs. Amine and Kim

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related to lithium titanium oxide. (See RX-729C, Amine Dep. Tr. at 180:7-15; RX-733C, Thackeray Dep. Tr. at 178:21-179:2; RX-740C, Johnson Dep. Tr. at 109:22-110:3.) I find the testimony of the inventors credible. In addition, the single reference in Dr. Johnson's lab notebook to Li_2TiO_3 , does not amount to clear and convincing evidence of misjoinder, particularly in view of Dr. Johnson's testimony that Drs. Amine and Kim contributed the Li_2TiO_3 component and in view of the oath of inventorship for the non-provisional patent application, signed by all four named inventors and declaring that they are "the original, first, and joint inventor of the [claimed] subject matter." (See JX-3 at 144-45.)

Third, I also disagree with Umicore that *The Powerhouse* proves Drs. Amine and Kim did not contribute lithium titanium oxide to the Asserted Patents. As stated by the Staff, it appears to be a "sensationalized account" of the circumstances surrounding the invention. (See SIB at 55.) Thus, I find the reliability of *The Powerhouse* questionable and give it only minimal weight. Moreover, *The Powerhouse* itself suggests Dr. Kim discussed the use of lithium titanium oxide with Dr. Johnson. (See RX-111 at 35.)

Accordingly, for the reasons above, I find Umicore has failed to prove incorrect inventorship or misjoinder by clear and convincing evidence.

IX. LACHES

Umicore's laches defense against Complainants' infringement claims fails as a matter of law and fact.

A. Parties' Arguments

Umicore argues that "[t]he Federal Circuit recently held that laches can now bar prospective relief, and thus laches should bar Complainants' requested exclusion order." (See RIB at (citing *SCA Hygiene Products Aktiebolag v. First Quality Baby Products, LLC*, 807 F.3d 1311, 1331 (Fed. Cir. 2015) (en banc)).) Umicore also argues that "[l]aches should be presumed

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because Complainants knew or should have known of the allegedly infringing characteristics of Umicore's NMC products -- for over ten years -- Argonne since 2005, and BASF since 2009." (See RIB at 186.)

Complainants respond that "laches is not a defense at the ITC in a section 337 Investigation." (See CIB at 132 (citing *Certain Coaxial Cable Connectors & Components Thereof & Prods. Containing Same*, 337-TA-650, Order No. 19, 2009 WL 1070783, at *4 (U.S.I.T.C. Apr. 10, 2009); *Certain EPROM, EEPROM, Flash Memory & Flash Microcontroller Semiconductor Devices & Prods. Containing Same*, 337-TA-395 (Comm'n Op., Supp. Views of Chairman Bragg, at 6-11) (U.S.I.T.C. July 9, 1998)).) Complainants also state that Umicore cannot establish the elements of laches because there is "no delay between the time Complainants knew Umicore was infringing and the time Complainants filed their complaint." (See CIB at 134.) Further, Complainants argue that "Umicore has not been materially prejudiced or harmed by the delay." (See *id.* at 136.)

The Staff argues that "the Federal Circuit's *SCA Hygiene* decision may provide a basis under some circumstances to assert laches before the Commission." (See SIB at 59.) But the Staff states that "the evidence does not support [Umicore's] laches defense." (See *id.* at 60.)

B. Discussion

1. The Laches Defense Fails as a Matter of Law

I agree with Complainants that, in the context of a Section 337 exclusion order, *SCA Hygiene* does not alter the principle that "laches does not provide a respondent accused of patent infringement with any meaningful defense in a Section 337 investigation." See *Certain Coaxial Cable Connectors & Components Thereof & Prods. Containing Same*, 337-TA-650, Order No. 19, 2009 WL 1070783, at *4 (U.S.I.T.C. Apr. 10, 2009) (citing *Certain EPROM, EEPROM, Flash Memory & Flash Microcontroller Semiconductor Devices & Prods. Containing Same*,

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337-TA-395 (Comm'n Op., Supp. Views of Chairman Bragg, at 16 n.65) (U.S.I.T.C. July 9, 1998); *Certain Personal Watercraft and Components Thereof*, Inv. No. 337-TA-452, Order No. 54 at 2 (U.S.I.T.C. Sept. 19, 2001); *Certain Bearings and Packaging Thereof*, Inv. No. 337-TA-469, Initial Determination at 27 (U.S.I.T.C. Apr. 10, 2003)).

In *SCA Hygiene*, the Federal Circuit considered (*en banc*) the availability of laches as a defense to “ongoing relief” in view of the *Petrella* and *eBay* Supreme Court decisions. *See SCA Hygiene*, 807 F.3d at 1331 (citing *Petrella v. Metro–Goldwyn–Mayer, Inc.*, --- U.S. ---, 134 S. Ct. 1962 (2014); *eBay Inc. v. MercExchange, L.L.C.*, 547 U.S. 388 (2006)). The Federal Circuit held that “laches in combination with the *eBay* factors may in some circumstances counsel against an injunction” but that “absent extraordinary circumstances, laches does not preclude an ongoing royalty.” *See id.* at 1333. The Federal Circuit reasoned that “laches fits naturally into the [*eBay* four-factor test] framework” which requires the party seeking an injunction to demonstrate:

(1) that it has suffered an irreparable injury; (2) that remedies available at law, such as monetary damages, are inadequate to compensate for that injury; (3) that, considering the balance of hardships between the plaintiff and defendant, a remedy in equity is warranted; and (4) that the public interest would not be disserved by a permanent injunction.

See id. at 1331 (citing *eBay*, 547 U.S. at 391). Specifically, the Federal Circuit stated that “[m]any of the facts relevant to laches . . . fall under the balance of the hardships factor” and “[u]nreasonable delay in bringing suit may also be relevant to a patentee’s claim that continued infringement will cause it irreparable injury.” *See id.* (citing *Petrella*, 134 S. Ct. at 1978).

But injunctive relief before a district court is distinct from a Section 337 exclusion order and “*eBay* does not apply to Commission remedy determinations under Section 337.” *See Spanion, Inc. v. International Trade Comm’n*, 629 F.3d 1331, 1359 (Fed. Cir. 2010); *see also id.*

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(“Unlike the equitable concerns at issue in *eBay*, the Commission’s issuance of an exclusion order is based on the statutory criteria set forth in Section 337.”). The Federal Circuit noted that, “[b]y statute, the Commission is required to issue an exclusion order upon the finding of a Section 337 violation absent a finding that the effects of one of the statutorily-enumerated public interest factors counsel otherwise.” *See id.* at 1358 (citing 19 U.S.C. § 1337(d)(1)). The Federal Circuit also noted that “a showing of irreparable harm is not required to receive the Commission’s relief.” *See id.*

Thus, *SCA Hygiene* applies to laches in the context of injunctive relief before a district court, but not to Section 337 exclusion orders.⁴⁵ Accordingly, I find that Umicore’s laches defense against Complainants’ infringement claims fails as a matter of law.

2. The Laches Defense Fails as a Matter of Fact

Even if laches is found to be applicable in the context of a Section 337 exclusion order, I find that Umicore’s laches defense, with respect to the ’082 patent and ’143 patent, fails as a matter of fact.

“To prove laches, a defendant must show that the plaintiff delayed filing suit an unreasonable and inexcusable length of time after the plaintiff knew or reasonably should have known of its claim against the defendant; and the delay resulted in material prejudice or injury to the defendant.” *See Wanlass v. General Elec. Co.*, 148 F.3d 1334, 1337 (Fed. Cir. 1998) (citations omitted).

⁴⁵ The laches defense may apply in the context of a motion for temporary relief under 19 C.F.R. § 210.52 which states that “the Commission will apply the standards the U.S. Court of Appeals for the Federal Circuit uses in determining whether to affirm lower court decisions granting preliminary injunctions.” *See* 19 C.F.R. § 210.52(a).

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While I agree with Umicore that a Complainant's delay in bringing suit may "raise[] a presumption that it is unreasonable, inexcusable, and prejudicial," I do not find any evidence of delay in this case. *See id.* (citations omitted). Indeed, "[t]he period of delay begins at the time the patentee has actual or constructive knowledge of the defendant's potentially infringing activities." *See id.* (citations omitted). "[C]onstructive knowledge of the infringement may be imputed to the patentee even where he has no actual knowledge of the sales, marketing, publication, public use, or other conspicuous activities of potential infringement if these activities are sufficiently prevalent in the inventor's field of endeavor." *See id.* at 1338.

But between 2005, when Umicore provided Argonne with 1 kg of its Cellcore® MX10 product for performance testing, and the time Complainants filed their complaint against Umicore in this investigation, there is no evidence that Complainants knew that Umicore had launched its NMC products *in the United States*. In fact, the evidence suggests that Umicore's NMC activities were not prevalent in the United States and "the importation records Umicore provided in this Investigation go back only to 2014." (*See* CIB at 136 (citing CX-262C).) Nor does the evidence show that BASF knew Umicore was selling the accused materials in the *United States* in 2009 when BASF discussed a potential collaboration with Umicore. (*See* RX-633C; RX-320 at 9 ("Li-ion battery market is an exclusively Asian one").) In addition, the evidence suggests that, as of today, Umicore's NMC materials have not been "incorporated in a commercial product" in the United States (*see* SIB at 74) and that [

] (*see* RIB at 209-10). Thus, I find Umicore's alleged infringement was not "open and notorious" such that it triggered the delay period under the laches doctrine. *See Wanlass*, 148 F.3d 1339.

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I am also unaware of any evidence of nexus between Complainants' alleged delay and Umicore's alleged prejudice. In other words, there is no evidence that any alleged delay by Complainants caused Umicore to alter its position or otherwise to act differently, to the prejudice of Umicore. *See Hemstreet v. Computer Entry Systems Corp.*, 972 F.2d 1290, 1294 (Fed. Cir. Aug. 12, 1992) ("But these expenditures have no explicitly proven nexus to the patentee's delay in filing suit, as *Aukerman* requires for a finding of prejudice. It is not enough that the alleged infringer changed his position—i.e., invested in production of the allegedly infringing device. The change must be because of and as a result of the delay, not simply a business decision to capitalize on a market opportunity.") (citing *A.C. Aukerman Co. v. R.L. Chaides Construction Co.*, 960 F.2d 1020, 1033 (Fed. Cir. 1992), *abrogated on other grounds by SCA Hygiene*, 807 F.3d 1311). In addition, as noted herein, (see, e.g., *supra* p. 82) Umicore asserted it made the products at issue pursuant to a license with 3M. Indeed, I even found the 3M license claim mitigated against finding Umicore induced infringement. *See supra* p. 82. Umicore's license claim is inconsistent with any claim of prejudice or changed circumstances by Umicore in the context of laches.

Accordingly, for the reasons above, I find that Umicore's laches defense against Complainants' infringement claims also fails as a matter of fact.

X. CONCLUSIONS OF LAW

1. The Commission has personal jurisdiction over the parties and subject-matter jurisdiction over the accused products.
2. The importation or sale requirement of Section 337 is satisfied.
3. Complainants' domestic industry products practice claims 1-4, 7, 13, and 14 of U.S. Patent No. 6,677,082 ("the '082 patent").
4. The domestic industry requirement is satisfied with respect to the '082 patent.
5. Umicore does not induce infringement of claims 1-4, 7, 13, and 14 of the '082 patent.
6. Umicore contributorily infringes claims 1-4, 7, 13, and 14 of the '082 patent.
7. The asserted claims of the '082 patent have not been shown to be invalid for lack of enablement.
8. The asserted claims of the '082 patent have not been shown to be invalid for incorrect inventorship.
9. Complainants' infringement claims, with respect to the '082 patent, are not barred by the laches doctrine.
10. There is a violation of Section 337 with respect to the '082 patent.
11. Complainants' domestic industry products practice claims 1-4, 8, 9, and 17 of U.S. Patent No. 6,680,143 ("the '143 patent").
12. The domestic industry requirement is satisfied with respect to the '143 patent.
13. Umicore does not induce infringement of claims 1-4, 8, 9, and 17 of the '143 patent.
14. Umicore contributorily infringes claims 1-4, 8, 9, and 17 of the '143 patent.
15. The asserted claims of the '143 patent have not been shown to be invalid for lack of enablement.
16. The asserted claims of the '143 patent have not been shown to be invalid for incorrect inventorship.
17. Complainants' infringement claims, with respect to the '143 patent, are not barred by the laches doctrine.
18. There is a violation of Section 337 with respect to the '143 patent.

XI. INITIAL DETERMINATION AND ORDER

Based on the foregoing,⁴⁶ it is my Initial Determination that there is a violation of Section 337 of the Tariff Act of 1930, as amended, 19 U.S.C. § 1337, in the importation into the United States, the sale for importation, or the sale within the United States after importation of certain lithium metal oxide cathode materials, lithium-ion batteries for power tool products containing same, and power tool products with lithium-ion batteries containing same, in connection with the asserted claims of U.S. Patent Nos. 6,677,082 and 6,680,143.

Furthermore, it is my determination that a domestic industry in the United States exists that practices or exploits U.S. Patent Nos. 6,677,082 and 6,680,143.

The undersigned hereby CERTIFIES to the Commission this Initial Determination, together with the record of the hearing in this investigation consisting of the following: the transcript of the evidentiary hearing, with appropriate corrections as may hereafter be ordered; and the exhibits accepted into evidence in this investigation as listed in the appendices hereto.⁴⁷

Pursuant to 19 C.F.R. § 210.42(h), this Initial Determination shall become the determination of the Commission unless a party files a petition for review pursuant to 19 C.F.R. § 210.43(a) or the Commission, pursuant to 19 C.F.R. § 210.44, orders on its own motion a review of the Initial Determination or certain issues therein.

⁴⁶ The failure to discuss any matter raised by the parties or any portion of the record herein does not indicate that said matter was not considered. Rather, any such matter(s) or portion(s) of the record has/have been determined to be irrelevant, immaterial or meritless. Arguments made on brief which were otherwise unsupported by record evidence or legal precedent have been accorded no weight.

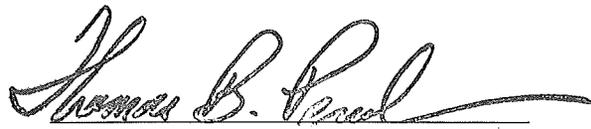
⁴⁷ The pleadings of the parties filed with the Secretary need not be certified as they are already in the Commission's possession in accordance with Commission rules.

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Confidentiality Notice:

This Initial Determination is being issued as confidential, and a public version will be issued pursuant to Commission Rule 210.5(f). Within seven (7) days of the date of this Initial Determination, the parties shall jointly submit: (1) a proposed public version of this opinion with any proposed redactions bracketed in red; and (2) a written justification for any proposed redactions specifically explaining why the piece of information sought to be redacted is confidential and why disclosure of the information would be likely to cause substantial harm or likely to have the effect of impairing the Commission's ability to obtain such information as is necessary to perform its statutory functions.⁴⁸

SO ORDERED.



Thomas B. Pender
Administrative Law Judge

⁴⁸ Under Commission Rules 210.5 and 201.6(a), confidential business information includes:

information which concerns or relates to the trade secrets, processes, operations, style of works, or apparatus, or to the production, sales, shipments, purchases, transfers, identification of customers, inventories, or amount or source of any income, profits, losses, or expenditures of any person, firm, partnership, corporation, or other organization, or other information of commercial value, the disclosure of which is likely to have the effect of either impairing the Commission's ability to obtain such information as is necessary to perform its statutory functions, or causing substantial harm to the competitive position of the person, firm, partnership, corporation, or other organization from which the information was obtained, unless the Commission is required by law to disclose such information.

See 19 C.F.R. § 201.6(a). Thus, to constitute confidential business information the disclosure of the information sought to be designated confidential must *likely have the effect of* either: (1) impairing the Commission's ability to obtain such information as is necessary to perform its statutory functions; or (2) *causing substantial harm* to the competitive position of the person, firm, partnership, corporation, or other organization from which the information was obtained.

**IN THE MATTER OF CERTAIN LITHIUM METAL
OXIDE CATHODE MATERIALS, LITHIUM-ION BATTERIES
FOR POWER TOOL PRODUCTS CONTAINING SAME, AND
POWER TOOL PRODUCTS WITH LITHIUM-ION BATTERIES
CONTAINING SAME**

337-TA-951

CERTIFICATE OF SERVICE

I, Lisa R. Barton, hereby certify that the attached **PUBLIC INITIAL DETERMINATION ON VIOLATION OF SECTION 337** has been served upon the **Commission Investigative Attorney, Vu Bui, Esq.**, and the following parties as indicated on

MAR 18 2016



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