

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

URT Umwelt und Recyclingtechnik GmbH,
Petitioner,

v.

Duesenfeld GmbH,
Patent Owner.

Case No. IPR2024-00887
U.S. Patent 11,050,097

**PETITIONER'S OPPOSITION OF PATENT
OWNER'S CONTINGENT MOTION TO AMEND**

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PETITIONER'S UPDATED EXHIBIT LIST

Exhibit No.	Document
1001	U.S. Patent No. 11,050,097 to Hanisch <i>et al.</i> (the '097 patent")
1002	Prosecution History of U.S. Patent No. 11,050,097 ("Prosecution History")
1003	Declaration of Volker Spies in Support of Petition for <i>Inter Partes</i> Review of U.S. Patent No. 11,050,097 ("Spies Declaration")
1004	Arno Kwade <i>et al.</i> , "LithoRec Recycling of Lithium-Ion Batteries", Culliver Verlag (2012) ("LithoRec")
1005	Declaration of Dr. Sylvia Hall-Ellis Regarding the Authenticity and Public Accessibility of LithoRec, Perry, and Din 28400 ("Ellis Declaration")
1006	"Perry's Chemical Engineers' Handbook 7th Edition". New York: McGraw-Hill, 1997. ("Perry")
1007	"Vacuum Technology; Terms and Definitions; General Terms." DIN 28400-1, German Institute for Standards e.V., 1990. ("DIN 28400")
1008	Curriculum Vitae of Volker Spies
1009	U.S. Patent No. 8,210,456
1010	DE 4 424 825
1011	US 2003/0186110
1012	US 5,632,863
1013	WO 2013/023640 ("Hanisch")
1014	U.S. 2016/0043450

Exhibit No.	Document
1015	CN 102496752
1016	English Translation of LithoRec
1017	Certificate for English Translation of LithoRec
1018	English Translation of DIN 24800
1019	Certificate for English Translation of DIN 24800
1020	English Translation of Hanisch
1021	Certificate for English Translation of Hanisch
1022	Declaration of Volker Spies in Support of Petitioner's Reply to Patent Owner's Preliminary Response
1023	Declaration of Volker Spies in Support of Petitioner's Reply
1024	US 685,287
1025	US 5,575,083
1026	US 2008/0050295
1027	LithoRec Presentation 2013
1028	American Heritage Dictionary Second College Edition
1029	Continuous Dryer
1030	Declaration of Volker Spies in Support of Petitioner's Opposition to Patent Owner's Motion to Amend
1031	JP 2013-4299 ("Mitsubishi")
1032	English translation of JP 2013-4299
1033	Certification of English translation of JP 2013-4299

Exhibit No.	Document
1034	English translation of LithoRec 2013 Presentation
1035	Program for Jahrestagung 2013 „Aufbereitung und Recycling“ conference
1036	Certification of English translation of LithoRec 2013 Presentation
1037	English translation of program for Jahrestagung 2013 „Aufbereitung und Recycling“ conference
1038	Certification of English translation of program for Jahrestagung 2013 „Aufbereitung und Recycling“ conference
1039	Deposition of Vani Dantam

LISTING OF PROPOSED CLAIMS
(NUMBERING ADDED BY PETITIONER FOR EASE OF REFERENCE)

Proposed Substitute Claim 22 (Substitute for Original Claim 1) - bold-underline indicates new language and cross-out indicates deleted language
[22-PRE] - A method for the treatment of used batteries, comprising the steps:
[22-A] - (a) comminuting the batteries such that comminuted material is obtained;
[22-B] - (b) inactivating the comminuted material such that an inactivated comminuted material is obtained, wherein the inactivating step is performed during or after the comminuting step; and
[22-C] - (c) filling a transport container with the inactivated comminuted material
[22-D] - wherein the inactivating step is performed by drying the comminuted material,
[22-E] - wherein the drying occurs at a maximum pressure of 300 hPa, and
[22-F] - <u>wherein the drying uses a drying device operated in batch mode.</u>

Proposed Substitute Claim 23 (Substitute for Original Claim 2) - bold-underline indicates new language and cross-out indicates deleted language

[Original Claim 2] – ~~The method according to claim 1,~~
~~wherein the comminuted material is dried until an electrolyte~~
~~content in the comminuted material is so low that an~~
~~electrochemical reaction is impossible.~~

[23-PRE] - A method for the treatment of used batteries,
comprising the steps:

[23-A] - (a) comminuting the batteries such that comminuted
material is obtained;

[23-B] - (b) inactivating the comminuted material such that
an inactivated comminuted material is obtained, wherein the
inactivating step is performed after the comminuting step;
and

[23-C] - (c) filling a transport container with the inactivated
comminuted material;

[23-D] – wherein the inactivating step is performed by drying
the comminuted material, and

[23-E] - wherein the drying occurs at a maximum pressure of
300 hPa,

[23-F] - wherein the drying uses a drying device operated in
batch mode; and

[23-G] – (d) producing, during the drying, a gaseous
electrolyte component recoverable by condensation.

Proposed Substitute Claim 24 (Substitute for Original Claim 3) - bold-underline indicates new language and cross-out indicates deleted language
[Original claim 3] – The method according to claim 1, wherein the drying occurs under vacuum.
[24-PRE] - <u>A method for the treatment of used batteries, comprising the steps:</u>
[24-A] - <u>(a) comminuting the batteries such that comminuted material is obtained;</u>
[24-B] - <u>(b) inactivating the comminuted material such that an inactivated comminuted material is obtained, wherein the inactivating step is performed after the comminuting step; and</u>
[24-C] - <u>(c) filling a transport container with the inactivated comminuted material, and</u>
[24-D] - <u>wherein the inactivating step is performed by drying the comminuted material, and</u>
[24-E] - <u>wherein the drying occurs at a maximum pressure of 300 hPa,</u>
[24-F] – <u>wherein the drying uses a drying device operated in batch mode, and</u>
[24-G] – <u>wherein the drying is such that the comminuted material is dried until an electrolyte content in the</u>

Proposed Substitute Claim 24 (Substitute for Original Claim 3) - bold-underline indicates new language and cross-out indicates deleted language

comminuted material is so low that an electrochemical reaction is impossible or only to a negligibly small extent.

Proposed Substitute Claim 25 (Substitute for Original Claim 8) - bold-underline indicates new language and cross-out indicates deleted language

[Original Claim 8] – ~~The method according to claim 1,~~
~~wherein the batteries are lithium batteries.~~

[25-PRE] - A method for the treatment of used batteries,
comprising the steps:

[25-A] - (a) comminuting the batteries such that comminuted
material is obtained;

[25-B] - (b) inactivating the comminuted material such that
an inactivated comminuted material is obtained, wherein the
inactivating step is performed after the comminuting step;
and

[25-C] - (c) filling a transport container with the inactivated
comminuted material;

[25-D] - wherein the inactivating step is performed by drying
the comminuted material, and

[25-E] - wherein the drying occurs at a maximum pressure of
300 hPa,

[25-F] – wherein the drying occurs at temperature of 80 °C or
less,

[25-G] – wherein the drying uses a drying device operated in
batch mode; and

[25-H] – (d) producing, during the drying, a gaseous
electrolyte component recoverable by condensation.

Proposed Substitute Claim 26 (Substitute for Original Claim 12) - bold-underline indicates new language and cross-out indicates deleted language
[26-PRE] - A battery processing installation for treatment of used batteries, comprising
[26-A] (a) - a comminution unit configured to comminute the batteries such that comminuted material is obtained;”
[26-B] (b) an inactivation device comprising a drying device <u>operated in batch mode,</u> configured to inactivate the comminuted material,
[26-C] - wherein the inactivation device is configured to perform the inactivating step during or after the comminuting step of the comminution unit;
[26-D] “(c) a filling device configured to fill a transport container with the inactivated comminuted material; and
[26-E] - (d) a vacuum installation connected to the drying device and configured to generate a vacuum in the drying device,
[26-F] - <u>such that the drying device operates with a pressure of 300 hPa or less.</u>

Proposed Substitute Claim 27 (Substitute for Original Claim 13) - bold-underline indicates new language and cross-out indicates deleted language
[Original Claim 13] – The battery processing installation according to claim 12, wherein the drying device is configured to dry the comminuted material until an electrolyte content in the comminuted material is so low that that an electrochemical reaction is impossible.
[27-PRE] - <u>A battery processing installation for treatment of used batteries, comprising:</u>
[27-A] – <u>(a) a comminution unit configured to comminute the batteries such that comminuted material is obtained;</u>
[27-B] - <u>(b) an inactivation device comprising a drying device, operated in batch mode, configured to inactivate the comminuted material,</u>
[27-C] - <u>wherein the inactivation device is configured to perform the inactivating step after the comminuting step of the comminution unit;</u>
[27-D] - <u>(c) a filling device configured to fill a transport container with the inactivated comminuted material;</u>
[27-E] - <u>(d) the drying device configured to produce a gaseous electrolyte component recoverable by condensation;</u> <u>and</u>
[27-F] – <u>(e) a vacuum installation connected to the drying device and configured to generate a vacuum in the drying device,</u>

Proposed Substitute Claim 27 (Substitute for Original Claim 13) - bold-underline indicates new language and cross-out indicates deleted language

[27-G] - **such that the drying device operates with a pressure of 300 hPa or less.**

Proposed Substitute Claim 28 (Substitute for Original Claim 16) - bold-underline indicates new language and cross-out indicates deleted language

[Original Claim 16] – ~~The battery processing installation of claim 15 wherein the carrier fraction are aluminum and copper foils.~~

[28-PRE] - A battery processing installation for treatment of used batteries, comprising:

[28-A] - (a) a comminution unit configured to comminute the batteries such that comminuted material is obtained;

[28-B] - (b) an inactivation device comprising a drying device, operated in batch mode, configured to inactivate the comminuted material, by drying

[28-C] - such that the comminuted material is dried until an electrolyte content in the comminuted material is so low that an electrochemical reaction is impossible or only to a negligibly small extent,

[28-D] - wherein the inactivation device is configured to perform the inactivating step after the comminuting step of the comminution unit;

[28-E] - (c) a filling device configured to fill a transport container with the inactivated comminuted material; and

[28-F] - (d) a vacuum installation connected to the drying device and configured to generate a vacuum in the drying device,

Proposed Substitute Claim 28 (Substitute for Original Claim 16) - bold-underline indicates new language and cross-out indicates deleted language

[28-G] - **such that the drying device operates with a pressure of 300 hPa or less.**

Proposed Substitute Claim 29 (Substitute for Original Claim 19) - bold-underline indicates new language and cross-out indicates deleted language
[Original Claim 19] – The battery processing installation of claim 12 wherein the batteries are lithium batteries.
[29-PRE] - <u>A battery processing installation for treatment of used batteries, comprising:</u>
[29-A] – <u>(a) a comminution unit configured to comminute the batteries such that comminuted material is obtained;</u>
[29-B] - <u>(b) an inactivation device comprising a drying device, operated in batch mode, configured to inactivate the comminuted material by drying</u>
[29-C] - <u>such that the comminuted material is dried until an electrolyte content in the comminuted material is so low that an electrochemical reaction is impossible or only to a negligibly small extent,</u>
[29-D] - <u>wherein the inactivation device is configured to perform the inactivating step after the comminuting step of the comminution unit, and</u>
[29-E] - <u>wherein the drying occurs at temperature of 80 °C or less;</u>
[29-F] – <u>(c) – a filling device configured to fill a transport container with the inactivated comminuted material;</u>

Proposed Substitute Claim 29 (Substitute for Original Claim 19) - bold-underline indicates new language and cross-out indicates deleted language

[29-G] – **(d) the drying device configured to produce a gaseous electrolyte component recoverable by condensation; and**

[29-H] - **(e) a vacuum installation connected to the drying device and configured to generate a vacuum in the drying device,**

[29-I] - **such that the drying device operates with a pressure of 300 hPa or less.**

PO's contingent Motion to Amend ("Motion") should be denied because each of proposed substitute claims 21-29 is obvious under 35 U.S.C. §103, in view of the prior art.

Ground No.	Obviousness Grounds
1	Substitute claims 22-24 and 26-28 would have been obvious based on LithoRec in view of Perry
2	Substitute Claims 22-29 would have been obvious based on LithoRec in view of Uchida
3	Substitute claims 22-29 would have been obvious based on LithoRec in view of Perry and Mitsubishi

I. ARGUMENTS COMMON TO ALL GROUNDS OF REJECTION LISTED IN CHART ABOVE

A. Limitations Unchanged from the Original Claim 1

Limitations [22-PRE], [22-A], [22-C]-[22-E], [23-PRE], [23-A], [23-C]-[23-E], [24-PRE], [24-A], [24-C]-[24-E], and [25-PRE], [25-A], [25-C]-[25-E] of claims 22-25 are recited in original claim 1, remain unchanged, and are taught by LithoRec. Accordingly, for Grounds 1-3 of this Opposition as they relate to the above limitations of claims 22-25, Petitioner relies upon the arguments set forth in Ground 1 of the Petition and the arguments set forth in the Reply. See Pet., §III.A.1.; Reply, §§V.A-C.

B. Limitations Unchanged from the Original Claim 12

Limitations [26-PRE], [26-A], [26-D], [22-E], [27-PRE], [27-A], [27-D], [27-F], [28-PRE], [28-A], [28-E], [28-F], and [29-PRE], [29-A], [29-F], [29-H] of

claims 26-29 are recited in original claim 12, remain unchanged, and are taught by LithoRec. Accordingly, for Grounds 1-3 of this Opposition as they relate to the above limitations of claims 26-29, Petitioner relies upon the arguments set forth in Ground 3 of the Petition and the arguments set forth in the Reply. *See* Pet., §III.C.1.; Reply, §§III.A-D.

C. Limitations [22-B], [23-B], [24-B], and [25-B] (inactivating the comminuted material such that an inactivated comminuted material is obtained, wherein the inactivating step is performed after the comminuting step)

The above limitation is substantially unchanged from original claim 1 except that the claimed drying step (inactivating step) is only performed after the comminuting step. Petitioner already showed that this timing option was met by LithoRec. PO does not advance any new arguments regarding the above limitation. Accordingly, since the above limitation is taught by LithoRec, for Grounds 1-3 of this Opposition as they relate to the above limitation as recited in claims 22-25, Petitioner relies upon the arguments set forth in Ground 1 of the Petition. *See* Pet., §III.A.1.

D. Limitations [26-C], [27-C], [28-D], and [29-D] (wherein the inactivation device is configured to perform the inactivating step after the comminuting step of the comminution unit)

The above limitation is substantially unchanged from original claim 12 except that the claimed inactivation device is configured to only perform the

inactivation step after the comminuting step. As above, Petitioner already showed that this timing option was met by LithoRec. PO does not advance any new arguments regarding the above recited limitation. Accordingly, since the above limitation is taught by LithoRec, for Grounds 1-3 of this Opposition as they relate to the above limitation as recited in claims 26-29, Petitioner relies upon the arguments set forth in Ground 3 of the Petition. *See* Pet., §III.C.1.

E. Limitation [24-G] (wherein the drying is such that the comminuted material is dried until an electrolyte content in the comminuted material is so low that an electrochemical reaction is impossible or only to a negligibly small extent)

The above limitation is substantially unchanged from original claim 2 except that the claimed subject matter is broadened to include “to a negligibly small extent” as an alternative to the “reaction is impossible” claim language. The Petition and Reply already address the “reaction is impossible” language of original claim 2, which is taught by LithoRec. In addition, PO does not advance any new arguments regarding the above limitation. Accordingly, for Grounds 1-3 of this Opposition as they relate to the above limitation of claim 24, Petitioner relies upon the arguments set forth in Ground 1 of the Petition and the arguments set forth in the Reply. *See* Pet., §III.A.2.; Reply §V.E.

F. Limitations [28-C] and [29-C] (such that the comminuted material is dried until an electrolyte content in the comminuted material is so low that an electrochemical reaction is impossible or only to a negligibly small extent)

The above limitations are substantially unchanged from original claim 13 except that the claimed subject matter is broadened to include “to a negligibly small extent” as an alternative to the “reaction is impossible” claim language, which is taught by LithoRec. The Petition and Reply already address the “reaction is impossible” language of original claim 13. In addition, PO does not advance any new arguments regarding the above recited limitation. Accordingly, for Grounds 1-3 of this Opposition as they relate to the above limitations of claims 28 and 29, Petitioner relies upon the arguments set forth in Ground 3 of the Petition and the arguments set forth in the Reply. *See* Pet., §III.C.2.; Reply §III.E.

G. Limitations [23-G] and [25-H] ((d) producing, during the drying, a gaseous electrolyte component recoverable by condensation)

PO does not advance any arguments regarding the above recited limitation. In addition, LithoRec discloses “The dryer gases are circulated in a closed circuit and cleaned using a filter and condenser...The nitrogen to be circulated is freed from the solids through a jet filter and then passed through a condenser in which the solvents contained are separated.” EX1016, 227. A POSITA would understand that in the process discussed above, the solvents being separated are the electrolytes that are evaporated from the comminuted material by way of drying.

Thus, the process discussed above produces a gaseous electrolyte component by way of drying and recovers the gaseous electrolyte component by condensation.

EX1030 ¶¶23-24.

H. Limitations [27-E] and [29-G] ((d) the drying device configured to produce a gaseous electrolyte component recoverable by condensation)

PO does not advance any arguments regarding the above recited limitation.

In addition, LithoRec discloses “The dryer gases are circulated in a closed circuit and cleaned using a filter and condenser...The nitrogen to be circulated is freed from the solids through a jet filter and then passed through a condenser in which the solvents contained are separated.” EX1016, 227. A POSITA would understand that in the system discussed above, the solvents being separated are the electrolytes that are evaporated from the comminuted material by way of drying. Thus, the process discussed above produces a gaseous electrolyte component by way of drying and recovers the gaseous electrolyte component by condensation. EX1030 ¶¶23-24.

II. GROUND 1: LITHOREC IN VIEW OF PERRY

A. [22-F], [23-F], and [24-F] (wherein the drying uses a drying device operated in batch mode)

PO asserts that LithoRec cannot, by itself or in combination with other references, be relied upon to reject the substitute claims because LithoRec

allegedly teaches away from batch drying devices. Motion, 17. PO's assertion is based on the incorrect premise that the selection of the vibratory fluidized bed dryer for the pilot plant illustrated in Fig. G-1 excludes and teaches away from the other types of drying devices discussed in LithoRec. Motion, 17; POR, 17-18, 23-24, 29-34, 42-44. But contrary to PO's assertion, LithoRec does not limit the pilot plant to a vibratory fluidized bed dryer or teach away from the other types of drying devices.

When developing the pilot plant, the authors of LithoRec created a process chain for the pilot plant prior to selecting the equipment for the pilot plant. EX1016, 222-235; EX1030, ¶8. Although the authors discussed using a vibratory fluidized bed dryer for the pilot plant illustrated in Fig. G-1, the arrangement of equipment illustrated in G-1 is not solely and exclusively tailored to that kind of apparatus. EX1016, Fig. G-1; EX1030, ¶10. To the contrary, a POSITA would understand that other dryer types could be used with the Fig. G-1 embodiment.

According to EX2012, a first fan (forced draft fan) is located underneath the material flow bed, which is needed to generate a positive pressure and aerate the material bed. Without this flow of air, the vibratory fluidized bed dryer cannot dry the battery material. In addition, a second fan is located on the outlet side of the dryer and is necessary to overcome the pressure drop of the system above the fluid

bed. EX2012; EX1030, ¶10. However, Fig. G-1 of LithoRec does not show any “forced draft fan”. EX1016, Fig. G-1.

The only “fan” shown in Fig. G-1 is identified as “ventilator 3.08”, which is drawn as a dedusting fan. Furthermore, the ventilator 3.08 supplies gas to various pieces of equipment such as, for example, the pre-shredder, rotary valve, etc., rather than just the dryer as shown in EX2012. If the pilot plant was intended to be used only with a vibratory fluidized bed dryer, Fig. G-1 would have at least included the two fans described above. Moreover, the dryer shown in G-1 is labelled generically as “dryer”. EX1016, Fig. G-1; EX1030, ¶11.

Thus, the process chain for the pilot plant is generic with respect to the type of dryer used to evaporate the electrolytes and is designed to be used with more than one type of dryer system. EX1016, 222-235; EX1030, ¶12. Accordingly, the authors presented different examples of drying conditions and systems to be used with the generic process chain. One such example utilized drying in batch mode. In particular, LithoRec discloses “There is also the question of whether drying should also take place in a batch or continuously.” EX1016, 226; EX1030, ¶12.

Although LithoRec discloses that “batch drying is not used” in one example, a POSITA would understand that the disclosure of LithoRec still includes “batch drying” because the authors of LithoRec qualify their decision to select continuous

drying over batch drying and then explicitly teach how to accommodate the alleged deficiency of batch drying. EX1016, 226; EX1030, ¶14. In particular, LithoRec discloses that the only reason for choosing continuous drying over batch drying (i.e., the longer work cycle associated with batch drying) is based on incomplete data. EX1016, 226. In addition, LithoRec teaches that the longer work cycle can be accommodated when LithoRec discloses “Whereas conventional rotor shredders only work continuously in a throughput, the cross-flow shredders are operated in sets. This batch operation allows the duration and intensity of the load (rotor speed) to be optimally adapted to the desired degree of digestion.” EX1016, 226, EX1030, ¶14.

A POSITA would also be familiar with the benefits and tradeoffs of batch and continuous drying. For example, a POSITA would understand that batch drying offers better control of drying, while continuous drying is used when drying consistency is not necessary. EX1039, 21:14-23. Since LithoRec discloses the need to eliminate the potential hazard of flammable solvents and the need to convert the active mass to dry powder, a POSITA would have recognized the need to better control of drying and would have known that batch drying is the better option for better control of drying. EX1039, 21:14-23; EX1030, ¶15. A POSITA thus would have implemented the well-known and understood alternative of batch drying.

Thus, “drying in batch mode” is within the scope of LithoRec’s disclosure (EX1030, ¶¶12-15), and PO’s “teaching away” argument is not applicable to the “drying in batch mode” limitation. *Celeritas Technologies Ltd. v. Rockwell International Corp.*, 150 F.3d 1354, 1361 (Fed. Cir. 1998) citing *Kalman v. Kimberly-Clark Corp.*, 713 F.2d 760, 772 (Fed. Circ. 1983).

To the extent that PO argues that batch drying is not part of LithoRec’s disclosure (which Petitioner does not concede), PO’s “teaching away” argument is still unpersuasive. In particular, LithoRec’s statement that “batch drying is not used” does not constitute a “teaching away” disclosure.

A reference teaches away from a claimed solution when the reference discourages employing the claimed solution. The mere disclosure of alternatives does not teach away. *In re Fulton*, 391 F.3d 1195, 1201 (Fed. Cir. 2004). As discussed above, LithoRec merely chooses one option (continuous drying) over an alternative (batch drying). Moreover, rather than discouraging the use of batch drying, LithoRec teaches how batch drying could be employed in the generic process chain for the pilot plant, which is the opposite of discouraging the use of batch drying. EX1016, 226; EX1030, ¶14. That is, LithoRec explains why batch could and should be used, and a POSITA would understand how to implement it. EX1016, 226; EX1030, ¶15.

Furthermore, the combined teachings of LithoRec and Perry provide reasons for employing batch drying. In particular, LithoRec discloses that due to the “highly flammable” nature of the solvents being evaporated, vacuum drying is desired so that the drying temperature can be lowered. EX1016, 226. In addition, Perry discloses various types of batch dryers that operate under vacuum. In one example, Perry discloses that batch vacuum rotary dryers are typically employed when low temperatures must be maintained if excess heat will cause oxidation or an explosive condition and/or when materials must be dried to extremely low moisture levels. EX1006, 12-65:12-66. In another example, Perry discloses that vacuum-shelf dryers “are particularly useful for handling small batches of materials wet with toxic or valuable solvents. Recovery of the solvent is easily accomplished without danger of passing through an explosive range.” EX1006, 12-44.

In view of LithoRec's teaching that the evaporation of flammable electrolytes from comminuted battery material should be performed under vacuum to lower the drying temperature, a POSITA would have employed the batch drying method taught by both LithoRec and Perry because Perry teaches that vacuum batch dryers are often employed to dry hazardous materials under lower temperatures. EX1006, 12-44, 12-65:12-66; EX1016, 226; EX1030, ¶¶16-17.

As shown above, a POSITA would understand that not only does not LithoRec **not** teach away from drying in batch mode, drying in batch mode is within the scope of the disclosure of LithoRec—or at least would have been obvious given LithoRec and Perry. EX1030, ¶¶16-17.

B. [22-E], [23-E], and [24-E] (wherein the drying occurs at a maximum pressure of 300 hPa)

LithoRec explicitly teaches vacuum drying but does not specify any particular pressure range under which drying is performed. However, a POSITA would have known to optimize the pressure, temperature, and duration of the drying process for the particular chemicals being dried. EX1039, 15:15-16:13; EX1030, ¶¶18-22.

Furthermore, Perry discloses various pressure ranges at which batch dryers operate. In particular, Perry discloses that, on a commercial scale, vacuum dryers (which includes batch vacuum rotary dryers) typically operate at levels above 5 mmHg (6.7 hPa). EX1006, 12-66. Perry also discloses that vacuum-shelf (batch) dryers operate in the range of 1 to 25 mmHg (1.3 to 33.3 hPa). EX1006, 12-45.

As discussed above, a POSITA would have been motivated to combine the teaching of Perry with the teaching of LithoRec since both references teach batch drying and drying under vacuum conditions in order to lower the drying temperature and avoid the ignition or combustion of the highly flammable solvents

during drying. EX1016, 226; EX1030, ¶¶18-22. In addition, the pressure range taught by Perry (1.3 to 33.3 hPa) is within the claimed pressure range (0 to 300 hPa). Therefore, combining Perry and LithoRec would have resulted in a drying pressure range within the claimed pressure range. At the very least, it would have been obvious to arrive at the claimed pressure range through routine optimization, because pressure and temperature were recognized as being outcome-effective variables. EX1030, ¶22; EX1039, 15:15-16:13. A process engineer would perform this kind of routine optimization at the time of the invention as a standard part of plant setup. EX1030, ¶22; EX1039, 15:15-16:13.

C. [26-B], [27-B], and [28-B] ((b) an inactivation device comprising a drying device operated in batch mode, configured to inactivate the comminuted material)

The above limitation is substantially unchanged from original claim 12 except that the claimed drying device is limited to one operated in batch mode. Petitioner relies upon the arguments set forth above in Section II.A. In addition, given that the remainder of the “inactivation device” limitation remains unchanged from original claim 12, Petitioner relies on the arguments set forth in Ground 3 of the Petition and the arguments set forth in the Reply. *See* Pet., §III.C.1.; Reply §III.B.

D. [26-F], [27-G], and [28-G] (such that the drying device operates with a pressure of 300 hPa or less)

Petitioner relies upon the arguments set forth above in Section II.B.

III. GROUND 2: LITHOREC IN VIEW OF UCHIDA

A. [22-F], [23-F], [24-F], and [25-F] (wherein the drying uses a drying device operated in batch mode)

As discussed above in Section II.A, “drying in batch mode” is within the scope of LithoRec’ disclosure, and PO’s “teaching away” argument is not applicable to the “drying in batch mode” limitation. *See Celeritas Technologies Ltd.* at 1361.

In addition, to the extent that PO argues that batch drying is not part of LithoRec’s disclosure (which Petitioner does not concede), PO’s “teaching away” argument is still unpersuasive. In particular, LithoRec’s statement that “batch drying is not used” does not constitute a “teaching away” disclosure.

As discussed above, the mere disclosure of alternatives does not teach away. *See In re Fulton* at 1201. In addition, LithoRec merely chooses one option (continuous drying) over an alternative (batch drying). Moreover, rather than discouraging the use of batch drying, LithoRec teaches how batch drying could be employed in the generic process chain for the pilot plant, which is the opposite of discouraging the use of batch drying. *See Supra* Section II.A.; EX1016, 226; EX1030, ¶¶14, 25. A POSITA thus would have implemented the well-known and understood alternative of batch drying, particularly because LithoRec explains why

batch could and should be used, and a POSITA would understand how to implement it. EX1030, ¶¶14, 25.

Furthermore, the combined teachings of LithoRec and Uchida provide reasons for employing batch drying. In particular, Uchida discloses a method of recovering valuable materials from lithium batteries. EX1026 [Abstract]. In one embodiment, a spent lithium battery undergoes a vacuum heating process to remove electrolytes (including dimethyl carbonate (DMC) and ethyl methyl carbonate (EMC)) from the battery. EX1026, ¶¶0071, 0075.

During operation, the battery is opened to expose the substances contained within and is then positioned within a treatment chamber (batch drying mode). A vacuum pump is then actuated to reduce the pressure in the treatment chamber to a range of 1 to 500 hPa, and the electrolytes are heated to a temperature near their boiling point.

LithoRec discloses batch drying as a viable option for evaporating electrolytes from battery material and provides guidance regarding how to employ batch drying. EX1016, 226. Uchida discloses a system that employs batch drying to evaporate electrolytes from battery material. Accordingly, based on the guidance provided by LithoRec and Uchida, a POSITA would have been motivated to utilize batch drying as a method to evaporate electrolytes from comminuted battery

material since both references teach batch drying as a viable option for evaporating electrolytes from battery material. EX1016, 98, 226; EX1026, ¶¶0071, 0075.

B. [22-E], [23-E], [24-E], and [25-E] (wherein the drying occurs at a maximum pressure of 300 hPa)

LithoRec does not specify any particular pressure range under which drying is performed. However, a POSITA would have known to optimize the pressure, temperature, and duration of the drying process for the particular chemicals being dried. EX1039, 15:15-16:13; EX1030, ¶29.

Furthermore, Uchida discloses actuating a vacuum pump to reduce the pressure in the treatment chamber to a range of 1 to 500 hPa, and the electrolytes are heated to a temperature near their boiling point. Uchida notes that the vapor pressure of DMC at 24 °C is 24 hPa and that the vapor pressure of EMC at 25 °C is 33 hPa. EX1026, ¶¶0074-75, 0078, Fig. 5.

Accordingly, one of ordinary skill would have applied the pressure range taught by Uchida to the drying process taught by LithoRec in order to keep the drying temperature low and avoid a hazardous chemical reaction during the drying process, as taught by LithoRec. EX1016, 226; EX1030, ¶¶29-33.

In addition, since LithoRec identifies one of the electrolytes as being DMC, one of ordinary skill would have been motivated to evaporate the DMC electrolyte

at the conditions disclosed in Uchida (i.e., 24 hPa), which is within the claimed pressure range. EX1016; 100; EX1030, ¶33.

Alternatively, the 1 to 500 hPa pressure range of Uchida overlaps the claims “maximum pressure of 300 hPa” pressure range. Claimed ranges that overlap or lie inside a range disclosed by the prior art are considered to be obvious over the prior art unless the range produces unexpected results. In re Wertheim, 541 F.2d 257 (CCPA 1976).

PO asserts that the claimed pressure range produces unexpected results, but fails to provide any supporting evidence. PO never challenges that “maximum pressure of 300 hPa” is other than the mere result of routine optimization. In particular, the '097 patent discloses “It is beneficial if the drying occurs at a maximum pressure of 300 hPa, in particular a maximum of 100 hPa. At such low pressures, considerable parts of most electrolytes vaporise, especially dimethyl carbonate and ethyl methyl carbonate, and do so at temperatures of less than 80° C.... The drying preferably occurs at a maximum temperature of 80° C.: this produces almost no hydrogen fluoride.” EX1001, 3:7-12, 5:7-8.

As Petitioner's expert explained, a POSITA would have known to optimize the pressure, temperature, and duration of the drying process for the particular chemicals being dried. EX1039, 15:15-16:13; EX1030, ¶¶29, 33. Thus, the claimed

range (i.e., 300 hPa or less) is merely a workable setting for evaporating dimethyl carbonate (the very electrolyte taught by LithoRec to be evaporated under vacuum) at 80 °C (a reduced temperature that decreases the likelihood of combustion and the release of hydrogen fluoride). EX1030, ¶¶29-33. A process engineer would perform this kind of routine optimization at the time of the invention as a standard part of plant setup, and would arrive at the claimed range, particularly given the disclosures in LithoRec and Uchida. EX1039, 15:15-16:13; EX1030, ¶¶29-33.

C. [25-F] (wherein the drying occurs at temperature of 80 °C or less)

LithoRec does not specify any particular pressure range under which drying is performed. However, a POSITA would have known to optimize the pressure, temperature, and duration of the drying process for the particular chemicals being dried. EX1039, 15:15-16:13; EX1030, ¶35.

As discussed above, Uchida discloses a method of recovering valuable materials from lithium batteries. EX1026 [Abstract]. In one embodiment, a spent lithium battery undergoes a vacuum heating process to remove electrolytes (including dimethyl carbonate (DMC) and ethyl methyl carbonate (EMC)) from the battery. EX1026, ¶¶0071, 0075.

During operation, the battery is opened to expose the substances contained within and is then positioned within a treatment chamber. A vacuum pump is then

actuated to reduce the pressure in the treatment chamber to a range of 1 to 500 hPa, and the electrolytes are heated to a temperature near their boiling point. Uchida notes that the vapor pressure of DMC at 24 °C is 24 hPa and that the vapor pressure of EMC at 25 °C is 33 hPa. EX1026, ¶¶0074-75, 0078.

Accordingly, a POSITA would have understood from Uchida that DMC (one of the electrolytes recognized by LithoRec as being in the battery material) can be safely evaporated at 24 °C and would have reduced the drying pressure to 24 hPa to achieve the 24 °C to safely evaporate the DMC electrolyte from the comminuted battery material. EX1016, 100, 226; EX1030, ¶¶37-38.

Further, Petitioner's expert explained that it was standard practice to optimize temperature, and that temperature and pressure optimization simply tend to follow Boyle's law. Thus, it would have been obvious for a POSITA to arrive at the claimed temperature range via routine experimentation/optimization of this known outcome-effective variable.

D. [26-B], [27-B], [28-B], and [29-B] ((b) an inactivation device comprising a drying device operated in batch mode, configured to inactivate the comminuted material)

The above limitation is substantially unchanged from original claim 12 except that the claimed drying device limited to one operated in batch mode. Petitioner relies upon the arguments set forth above in Section III.A. In addition,

given that the remainder of the “inactivation device” limitation remains unchanged from original claim 12, Petitioner relies on the arguments set forth in Ground 3 of the Petition and the arguments set forth in the Reply. *See* Pet., §III.C.1.; Reply §III.B.

E. [26-F], [27-G], [28-G], and [29-I] (such that the drying device operates with a pressure of 300 hPa or less)

Petitioner relies upon the arguments set forth above in Section III.B.

F. [29-E] (wherein the drying occurs at temperature of 80 °C or less)

Petitioner relies upon the arguments set forth above in Section III.C.

IV. GROUND 3: LITHOREC IN VIEW OF MITSUBISHI AND PERRY

A. [22-F], [23-F], [24-F], and [25-F] (wherein the drying uses a drying device operated in batch mode)

As discussed above in Section II.A., “drying in batch mode” is within the scope of LithoRec’ disclosure, and PO’s “teaching away” argument is not applicable to the “drying in batch mode” limitation. *See Celeritas Technologies Ltd.* at 1361.

In addition, to the extent that PO argues that batch drying is not part of LithoRec’s disclosure (which Petitioner does not concede), PO’s “teaching away” argument is still unpersuasive. In particular, LithoRec’s statement that “batch drying is not used” does not constitute a “teaching away” disclosure.

As discussed above, the mere disclosure of alternatives does not teach away. *See In re Fulton* at 1201. In addition, LithoRec merely chooses one option (continuous drying) over an alternative (batch drying). Moreover, rather than discouraging the use of batch drying, LithoRec teaches how batch drying could be employed in the generic process chain for the pilot plant, which is the opposite of discouraging the use of batch drying. *See Supra* Section II.A.; EX1016, 226; EX1030, ¶14.

B. [22-E], [23-E], [24-E], and [25-E] (wherein the drying occurs at a maximum pressure of 300 hPa)

LithoRec does not specify any particular pressure range under which drying is performed. However, a POSITA would have known to optimize the pressure, temperature, and duration of the drying process for the particular chemicals being dried. EX1039, 15:15-16:13; EX1030, ¶22.

Also, similar to LithoRec, Mitsubishi discloses a system and process for recycling lithium ion batteries (including batteries used in automobiles). EX1032, [Abstract]. Mitsubishi recognizes the need to remove, stabilize, and detoxify the electrolytic solution and fluorine found inside lithium ion batteries by way of drying under vacuum. EX1032, ¶16.

Mitsubishi further discloses that the vacuum pressure should be 100 hPa or less, which is within the claimed pressure range. EX1032, ¶25.

Given that Mitsubishi discloses a particular pressure range for drying electrolytes under vacuum in a lithium ion battery recycling system, a POSITA would have applied the teaching of Mitsubishi to the system of LithoRec, which also teaches drying electrolyte solutions under vacuum in a lithium ion battery recycling system. EX1030, ¶45.

A process engineer would perform this kind of routine optimization at the time of the invention as a standard part of plant setup, and would arrive at the claimed range, particularly given the disclosures in LithoRec and Uchida. EX1039, 15:15-16:13; EX1030, ¶42.

C. [25-F] (wherein the drying occurs at temperature of 80 °C or less)

As discussed above, Mitsubishi discloses a system and process for recycling lithium ion batteries (including batteries used in automobiles). EX1032, ¶24. Mitsubishi recognizes the need to remove, stabilize, and detoxify the electrolytic solution and fluorine found inside lithium ion batteries by way of drying under vacuum. EX1032, ¶16. In addition, Mitsubishi discloses a temperature range (80 °C to 120 °C) associated with the disclosed pressure range (100 hPa or less). EX1032, ¶25.

As discussed above, it would have been obvious for a POSITA to set the vacuum drying of LithoRec to the pressure range disclosed in Mitsubishi. Thus, it

would have also been obvious to set the drying temperature to the temperature range associated with the disclosed pressure range. EX1030, ¶45.

Furthermore, the 80 °C to 120 °C temperature range of Mitsubishi overlaps the claimed “80 °C or less” temperature range. Claimed ranges that overlap or lie inside a range disclosed by the prior art are considered to be obvious over the prior art unless the range produces unexpected results. *In re Wertheim* at 257.

PO asserts that the claimed temperature range produces unexpected results, but fails to provide any supporting evidence. PO never challenges that “80 °C or less” is other than the mere result of routine optimization. In particular, the '097 patent discloses “It is beneficial if the drying occurs at a maximum pressure of 300 hPa, in particular a maximum of 100 hPa. At such low pressures, considerable parts of most electrolytes vaporise, especially dimethyl carbonate and ethyl methyl carbonate, and do so at temperatures of less than 80° C.... The drying preferably occurs at a maximum temperature of 80° C.: this produces almost no hydrogen fluoride.” EX1001, 3:7-12, 5:7-8. Thus, the claimed range (i.e., 80 °C or less) is merely a workable setting for evaporating dimethyl carbonate (the very electrolyte taught by LithoRec to be evaporated under vacuum), and the claimed range would have been obvious over the combined teaching of LithoRec and Mitsubishi. EX1030, ¶¶47-49.

Further, Petitioner's expert explained that it was standard practice to optimize temperature, and that temperature and pressure optimization simply tend to follow Boyle's law. Thus, it would have been obvious for a POSITA to arrive at the claimed temperature range via routine experimentation/optimization of this known outcome-effective variable.

D. [26-B], [27-B], [28-B], and [29-B] ((b) an inactivation device comprising a drying device operated in batch mode, configured to inactivate the comminuted material)

The above limitation is substantially unchanged from original claim 12 except that the claimed drying device limited to one operated in batch mode. Petitioner relies upon the arguments set forth above in Section IV.A. In addition, given that the remainder of the "inactivation device" limitation remains unchanged from original claim 12, Petitioner relies on the arguments set forth in Ground 3 of the Petition and the arguments set forth in the Reply. See Pet., §III.C.1.; Reply §III.B.

E. [26-F], [27-G], [28-G], and [29-I] (such that the drying device operates with a pressure of 300 hPa or less)

Petitioner relies upon the arguments set forth above in Section IV.B.

F. [29-E] (wherein the drying occurs at temperature of 80 °C or less)

Petitioner relies upon the arguments set forth above in Section IV.C.

V. CONCLUSION

For the foregoing reasons, URT requests that the Board deny PO's
contingent motion to amend. The proposed amended claims remain unpatentable.

Respectfully Submitted,

Dated: May 7, 2025

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CERTIFICATE OF PAGE COUNT UNDER 37 C.F.R. § 42.24(b)

I, the undersigned, do hereby certify that the attached petition contains 24 pages, as measured by the Page Count function of Microsoft Word. This is less than the limit of 25 pages as specified by 37 C.F.R. § 42.24(b)(3).

Dated: May 7, 2025

/Brian Kauffman/

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CERTIFICATION OF SERVICE

The undersigned certifies that, pursuant to 37 C.F.R. §§ 42.6(e), a copy of this PETITIONER'S OPPOSITION OF PATENT OWNER'S CONTINGENT MOTION TO AMEND and supporting materials was served on the Patent Owner, via email, at the following addresses:

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