UTILITY PATENT APPLICATION TRANSMITTAL (Only for new nonprovisional applications under 37 CFR § 1.53(b))	Attorney Docket No.	024607-02-5119-US
	First Inventor	Tao TAO, et al.
	Title	LITHIUM-ION BATTERY HAVING DESIRABLE SAFETY PERFORMANCE
	Electronically filed	May 17, 2022

APPLICATION ELEMENTS *See MPEP Chapter 600 concerning utility patent application contents.*	*Address to*: **Commissioner for Patents P.O. Box 1450 Alexandria, VA 22313-1450**
1. ☐ Fee Transmittal Form *(with duplicate for fee processing)*	**ACCOMPANYING APPLICATION PARTS**
2. ☐ Applicant claims Small Entity status, see 37 C.F.R. § 1.27	9. ☐ Assignment Papers *(cover sheet & document(s))*
3. ☒ Specification [Total Pages 23]	Name of Assignee:
4. ☒ Drawing(s) *(35 USC § 113)* [Total Sheets 2]	10. ☒ 37 CFR § 3.73(c) Statement a. ☒ Power of Attorney
5. ☒ Oath or Declaration [Total Pages 2] a. ☐ Newly executed *(original or copy)* b. ☒ Copy from a prior application *(37 CFR § 1.63(d))*	11. ☐ English Translation Document *(if applicable)*
6. ☒ Application Data Sheet, see 37 C.F.R. § 1.76	12. ☐ Information Disclosure Statement and PTO-1449 a. ☐ Copies of citations attached
7. ☐ CD-ROM or CD-R in duplicate, large table or Computer Program *(Appendix)* ☐ Landscape Table on CD	13. ☐ Preliminary Amendment
8. ☐ Nucleotide and/or Amino Acid Sequence Submission *(if applicable, all necessary)* a. ☐ Computer Readable Form (CRF) b. ☐ Specification Sequence Listing on i. ☐ CD-ROM or CD-R (2 copies); or ii. ☐ Paper c. ☐ Statement verifying identity of above copies	14. ☐ Return Receipt Postcard *(MPEP 503)*
	15. ☐ Certified Copy of Priority Document(s) *(if foreign priority is claimed)*
	16. ☐ Non-Publication Request under 35 U.S.C. § 122 (b)(2)(B)(i)
	17. ☒ Other: Authorization for Internet Communication Request for Prioritized Examination (Track 1)

Note: (1) Benefit claims under 37 CFR 1.78 and foreign priority claims under 1.55 **MUST** be included in an Application Data Sheet (ADS).

(2) For applications filed under 35 U.S.C. 111, the application must contain an ADS specifying the applicant if the applicant is an assignee, person to whom the inventor is under an obligation to assign, or person who otherwise shows sufficient proprietary interest in the matter. See 37 CFR 1.46(b).

19. CORRESPONDENCE ADDRESS: Customer Number 24341

Signature	/Yalei Sun/	Date	May 17, 2022
Name (Print/Type)	Yalei Sun	Registration No. (Attorney/Agent)	57,765

Zhuhai CosMX Battery Co. EX1028 (Part 1 of 4)
Zhuhai CosMX Battery Co. v. Ningde Amperex Tech. Ltd.

UTILITY PATENT APPLICATION FEE TRANSMITTAL *(Only for new nonprovisional applications under 37 CFR § 1.53(b))*	Attorney Docket No.	024607-02-5119-US
	First Inventor	Tao TAO, et al.
	Title	LITHIUM-ION BATTERY HAVING DESIRABLE SAFETY PERFORMANCE
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Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

BASIC FILING, SEARCH AND EXAMINATION FEES

Application Type	Filing Fees	Search Fees	Examination Fees	Fees Paid ($)
Utility	$ 320	$ 700	$ 800	$ 1820

EXCESS CLAIM FEES

Type	No. Filed	Less	Extra	Extra Rate ($)	Type
Total Claims	19	- 20		$ 100 each	0
Independent	2	- 3		$ 480 each	0
			Multiple Dependency Fee If Applicable ($860)		0

APPLICATION SIZE FEE (Specification and Drawings)

Total Sheets	Extra Sheets	No. of each add'l 50 or fraction thereof	Fee ($)
25 x .75- 100	/ 50	(round up to whole no.) x $420	0

Sub Total	$1820
Other: Request for Prioritized Examination	$4200
Processing Fee (Track 1)	$140
TOTAL FILING FEE	**$6160**

Please charge the total filing fee and any other additional fees to Morgan, Lewis & Bockius LLP Deposit Account 50-0310 (order no. 024607-02-5119-US).

Respectfully submitted,

Date: May 17, 2022

/Yalei Sun/

Yalei Sun — 57,765 (Reg. No.)

MORGAN, LEWIS & BOCKIUS LLP
1400 Page Mill Road
Palo Alto, CA 94304
(650) 843-4000

Doc Code: TRACK1.REQ
Document Description: TrackOne Request

PTO/AIA/424 (04-14)

CERTIFICATION AND REQUEST FOR PRIORITIZED EXAMINATION UNDER 37 CFR 1.102(e) (Page 1 of 1)

First Named Inventor:	Tao TAO, et al.	Nonprovisional Application Number (if known):	
Title of Invention:	LITHIUM-ION BATTERY HAVING DESIRABLE SAFETY PERFORMANCE		

APPLICANT HEREBY CERTIFIES THE FOLLOWING AND REQUESTS PRIORITIZED EXAMINATION FOR THE ABOVE-IDENTIFIED APPLICATION.

1. The processing fee set forth in 37 CFR 1.17(i)(1) and the prioritized examination fee set forth in 37 CFR 1.17(c) have been filed with the request. The publication fee requirement is met because that fee, set forth in 37 CFR 1.18(d), is currently $0. The basic filing fee, search fee, and examination fee are filed with the request or have been already been paid. I understand that any required excess claims fees or application size fee must be paid for the application.

2. I understand that the application may not contain, or be amended to contain, more than four independent claims, more than thirty total claims, or any multiple dependent claims, and that any request for an extension of time will cause an outstanding Track I request to be dismissed.

3. The applicable box is checked below:

I. ☑ Original Application (Track One) - Prioritized Examination under § 1.102(e)(1)

i. (a) The application is an original nonprovisional utility application filed under 35 U.S.C. 111(a). This certification and request is being filed with the utility application via EFS-Web.

---OR---

(b) The application is an original nonprovisional plant application filed under 35 U.S.C. 111(a). This certification and request is being filed with the plant application in paper.

ii. An executed inventor's oath or declaration under 37 CFR 1.63 or 37 CFR 1.64 for each inventor, **or** the application data sheet meeting the conditions specified in 37 CFR 1.53(f)(3)(i) is filed with the application.

II. ☐ Request for Continued Examination - Prioritized Examination under § 1.102(e)(2)

i. A request for continued examination has been filed with, or prior to, this form.
ii. If the application is a utility application, this certification and request is being filed via EFS-Web.
iii. The application is an original nonprovisional utility application filed under 35 U.S.C. 111(a), or is a national stage entry under 35 U.S.C. 371.
iv. This certification and request is being filed prior to the mailing of a first Office action responsive to the request for continued examination.
v. No prior request for continued examination has been granted prioritized examination status under 37 CFR 1.102(e)(2).

Signature /Yalei Sun/	Date May 17, 2022
Name (Print/Typed) Yalei Sun	Practitioner Registration Number 57,765

Note: *This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. Submit multiple forms if more than one signature is required.**

☑ *Total of 1 forms are submitted.

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Doc Code: ECOMM.AUTH/ECOMM.WTDW
Doc Description: Internet Communications Authorized/Internet Communications Authorization Withdrawn

PTO/SB/439 (11-15)

AUTHORIZATION FOR INTERNET COMMUNICATIONS IN A PATENT APPLICATION OR REQUEST TO WITHDRAW AUTHORIZATION FOR INTERNET COMMUNICATIONS		
	Application No.	To be assigned
	Filing Date	
	First Named Inventor	Tao TAO, et al.
	Art Unit	To be assigned
	Examiner Name	To be assigned
	Practitioner Docket No.	024607-02-5119-US

To: Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

I. To authorize permission for Internet Communications.

☑ Recognizing that Internet communications are not secure, I hereby authorize the USPTO to communicate with the undersigned and practitioners in accordance with 37 CFR 1.33 and 37 CFR 1.34 concerning any subject matter of this application via video conferencing, instant messaging, or electronic mail. I understand that a copy of these communications will be made of record in the application file. (MPEP 502.03)

II. To withdraw authorization for Internet Communications.

☐ The authorization given on _____, to the USPTO to communicate with the undersigned and any practitioner in accordance with 37 CFR 1.33 and 37 CFR 1.34 concerning any subject matter of this application via Internet communications such as video conferencing, instant messaging, or electronic mail is hereby withdrawn. I understand that the withdrawal is effective when approved rather than when received.

I am the

☐ applicant.

☑ attorney or agent of record. Registration number 57,765.

☐ attorney or agent acting under 37 CFR 1.34. Registration number _____.

/Yalei Sun/ — Signature

May 17, 2022 — Date

Yalei Sun — Typed or printed name

650-843-4000 — Telephone Number

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. Juristic entities must be represented by a patent practitioner (see 37 CFR 1.31, which is applicable to any paper filed on or after September 16, 2012, that is presented on behalf of a juristic entity, regardless of application filing date). Submit multiple forms if more than one signature is required, see below*.

☑ * Total of 1 forms are submitted.

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

PTO/AIA/14 (11-15)
Approved for use through 04/30/2017. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	024607-02-5119-US
	Application Number	
Title of Invention	LITHIUM-ION BATTERY HAVING DESIRABLE SAFETY PERFORMANCE	

The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76.
This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.

Secrecy Order 37 CFR 5.2:

☐ Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)

Inventor Information:

Inventor 1 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Tao		TAO	

Residence Information (Select One) ○ US Residency ◉ Non US Residency ○ Active US Military Service

City	Ningde	Country of Residence	CN

Mailing Address of Inventor:

Address 1	No. 1, Xingang Road		
Address 2	Zhangwan Town, Jiaocheng Zone		
City	Ningde	**State/Province**	FJ
Postal Code	352100	**Country**	CN

Inventor 2 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Ming Liang		MO	

Residence Information (Select One) ○ US Residency ◉ Non US Residency ○ Active US Military Service

City	Ningde	Country of Residence	CN

Mailing Address of Inventor:

Address 1	No. 1, Xingang Road		
Address 2	Zhangwan Town, Jiaocheng Zone		
City	Ningde	**State/Province**	FJ
Postal Code	352100	**Country**	CN

All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the **Add** button. Add

Correspondence Information:

PTO/AIA/14 (11-15)
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	024607-02-5119-US
	Application Number	
Title of Invention	LITHIUM-ION BATTERY HAVING DESIRABLE SAFETY PERFORMANCE	

Enter either Customer Number or complete the Correspondence Information section below. For further information see 37 CFR 1.33(a).			
☐ An Address is being provided for the correspondence Information of this application.			
Customer Number	24341		
Email Address		Add Email	Remove Email

Application Information:

Title of the Invention	LITHIUM-ION BATTERY HAVING DESIRABLE SAFETY PERFORMANCE		
Attorney Docket Number	024607-02-5119-US	Small Entity Status Claimed	☐
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	2	Suggested Figure for Publication (if any)	

Filing By Reference:

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☐ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32).
Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Please Select One:	◉ Customer Number	○ US Patent Practitioner	○ Limited Recognition (37 CFR 11.9)
Customer Number	24341		

PTO/AIA/14 (11-15)
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	024607-02-5119-US
	Application Number	
Title of Invention	LITHIUM-ION BATTERY HAVING DESIRABLE SAFETY PERFORMANCE	

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, 365(c), or 386(c) or indicate National Stage entry from a PCT application. Providing benefit claim information in the Application Data Sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.
When referring to the current application, please leave the "Application Number" field blank.

Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
	Continuation of	17407081	2021-08-19
Prior Application Status	Abandoned		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
17407081	Continuation of	16113938	2018-08-27
Prior Application Status	Patented		Remove

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
16113938	Continuation of	14596873	2015-01-14	10541441	2020-01-21

Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the **Add** button.

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55. When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX)[i] the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(i)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

			Remove
Application Number	Country[i]	Filing Date (YYYY-MM-DD)	Access Code[i] (if applicable)
201420030319.4	CN	2014-01-17	

Additional Foreign Priority Data may be generated within this form by selecting the **Add** button.

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

PTO/AIA/14 (11-15)
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	024607-02-5119-US
	Application Number	
Title of Invention	LITHIUM-ION BATTERY HAVING DESIRABLE SAFETY PERFORMANCE	

☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.
NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

PTO/AIA/14 (11-15)
Approved for use through 04/30/2017. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	024607-02-5119-US
	Application Number	
Title of Invention	LITHIUM-ION BATTERY HAVING DESIRABLE SAFETY PERFORMANCE	

Authorization or Opt-Out of Authorization to Permit Access:

When this Application Data Sheet is properly signed and filed with the application, applicant has provided written authority to permit a participating foreign intellectual property (IP) office access to the instant application-as-filed (see paragraph A in subsection 1 below) and the European Patent Office (EPO) access to any search results from the instant application (see paragraph B in subsection 1 below).

Should applicant choose not to provide an authorization identified in subsection 1 below, applicant **must opt-out** of the authorization by checking the corresponding box A or B or both in subsection 2 below.

NOTE: This section of the Application Data Sheet is **ONLY** reviewed and processed with the **INITIAL** filing of an application. After the initial filing of an application, an Application Data Sheet cannot be used to provide or rescind authorization for access by a foreign IP office(s). Instead, Form PTO/SB/39 or PTO/SB/69 must be used as appropriate.

1. Authorization to Permit Access by a Foreign Intellectual Property Office(s)

A. Priority Document Exchange (PDX) - Unless box A in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the State Intellectual Property Office of the People's Republic of China (SIPO), the World Intellectual Property Organization (WIPO), and any other foreign intellectual property office participating with the USPTO in a bilateral or multilateral priority document exchange agreement in which a foreign application claiming priority to the instant patent application is filed, access to: (1) the instant patent application-as-filed and its related bibliographic data, (2) any foreign or domestic application to which priority or benefit is claimed by the instant application and its related bibliographic data, and (3) the date of filing of this Authorization. See 37 CFR 1.14(h)(1).

B. Search Results from U.S. Application to EPO - Unless box B in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the EPO access to the bibliographic data and search results from the instant patent application when a European patent application claiming priority to the instant patent application is filed. See 37 CFR 1.14(h)(2).

The applicant is reminded that the EPO's Rule 141(1) EPC (European Patent Convention) requires applicants to submit a copy of search results from the instant application without delay in a European patent application that claims priority to the instant application.

2. Opt-Out of Authorizations to Permit Access by a Foreign Intellectual Property Office(s)

☐ A. Applicant **DOES NOT** authorize the USPTO to permit a participating foreign IP office access to the instant application-as-filed. If this box is checked, the USPTO will not be providing a participating foreign IP office with any documents and information identified in subsection 1A above.

☐ B. Applicant **DOES NOT** authorize the USPTO to transmit to the EPO any search results from the instant patent application. If this box is checked, the USPTO will not be providing the EPO with search results from the instant application.

NOTE: Once the application has published or is otherwise publicly available, the USPTO may provide access to the application in accordance with 37 CFR 1.14.

PTO/AIA/14 (11-15)
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	024607-02-5119-US
	Application Number	
Title of Invention	LITHIUM-ION BATTERY HAVING DESIRABLE SAFETY PERFORMANCE	

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Applicant 1

If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.

Clear

◉ Assignee	○ Legal Representative under 35 U.S.C. 117	○ Joint Inventor
○ Person to whom the inventor is obligated to assign.	○ Person who shows sufficient proprietary interest	

If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:

Name of the Deceased or Legally Incapacitated Inventor:

If the Applicant is an Organization check here. ☒

Organization Name	NINGDE AMPEREX TECHNOLOGY LIMITED		
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City	Ningde	**State/Province**	FJ
Country	CN	Postal Code	352100
Phone Number		Fax Number	
Email Address			

Additional Applicant Data may be generated within this form by selecting the Add button.

Assignee Information including Non-Applicant Assignee Information:

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PTO/AIA/14 (11-15)
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	024607-02-5119-US
	Application Number	
Title of Invention	LITHIUM-ION BATTERY HAVING DESIRABLE SAFETY PERFORMANCE	

Assignee 1

Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.

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Prefix	**Given Name**	Middle Name	**Family Name**	Suffix

Mailing Address Information For Assignee including Non-Applicant Assignee:

Address 1			
Address 2			
City		**State/Province**	
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Phone Number		Fax Number	
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Signature:

NOTE: This Application Data Sheet must be signed in accordance with 37 CFR 1.33(b). **However, if this Application Data Sheet is submitted with the INITIAL filing of the application and either box A or B is not checked in subsection 2 of the "Authorization or Opt-Out of Authorization to Permit Access" section, then this form must also be signed in accordance with 37 CFR 1.14(c).**

This Application Data Sheet **must** be signed by a patent practitioner if one or more of the applicants is a **juristic entity** (e.g., corporation or association). If the applicant is two or more joint inventors, this form must be signed by a patent practitioner, **all** joint inventors who are the applicant, or one or more joint inventor-applicants who have been given power of attorney (e.g., see USPTO Form PTO/AIA/81) on behalf of **all** joint inventor-applicants.

See 37 CFR 1.4(d) for the manner of making signatures and certifications.

Signature	/Yalei Sun/			Date (YYYY-MM-DD)	2022-05-17
First Name	Yalei	Last Name	Sun	Registration Number	57765

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	024607-02-5119-US
	Application Number	
Title of Invention	LITHIUM-ION BATTERY HAVING DESIRABLE SAFETY PERFORMANCE	

This collection of information is required by 37 CFR 1.76. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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The information provided by you in this form will be subject to the following routine uses:

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2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

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7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Attorney Docket: 057329/457047

DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of Invention	LITHIUM ION BATTERY HAVING DESIRABLE SAFETY PERFORMANCE

As the below named inventor, I hereby declare that:

This declaration is directed to:

☐ The attached application, or

☒ United States application or PCT international application number 14/596,873 filed on January 14, 2015.

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56, including for continuation-in-part applications, material information which became available between the filing date of the prior application and the national or PCT international filing date of the continuation-in-part application.

WARNING: Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

LEGAL NAME OF INVENTOR

Inventor: **Tao Tao**

Signature: Tao Tao Date (Optional): 2015-4-20

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form. Use an additional PTO/AIA/01 form for each additional inventor.

Attorney Docket: 057329/457047

DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of Invention	LITHIUM ION BATTERY HAVING DESIRABLE SAFETY PERFORMANCE

As the below named inventor, I hereby declare that:

This declaration is directed to:

☐ The attached application, or

☒ United States application or PCT international application number 14/596,873 filed on January 14, 2015.

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56, including for continuation-in-part applications, material information which became available between the filing date of the prior application and the national or PCT international filing date of the continuation-in-part application.

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LEGAL NAME OF INVENTOR

Inventor: **Ming liang Mo**

Signature: Ming liang Mo Date (Optional): Apr. 20, 2015

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form. Use an additional PTO/AIA/01 form for each additional inventor.

Electronically filed May 17, 2022

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application of:	Tao TAO, et al.	Confirmation No.:	To be assigned
Serial No.:	To be assigned	Art Unit	To be assigned
Filed:	Filed herewith	Examiner:	To be assigned
For:	*LITHIUM ION BATTERY HAVING DESIRABLE SAFETY PERFORMANCE*	Attorney Docket No.:	024607-02-5119-US

STATEMENT UNDER 37 C.F.R. § 3.73(c)

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Ningde Amperex Technology Limited, a Corporation, states that it is the assignee of the entire right, title and interest in the patent application/patent identified above by virtue of an assignment from the inventor(s) of the parent of the patent application/patent identified above.

The assignment was recorded in the United States Patent and Trademark Office on April 22, 2015 at Reel 035472, Frame 0058, or for which a copy thereof is attached.

The undersigned is authorized to act on behalf of the assignee.

Date: May 17, 2022

/Yalei Sun/ 57,765
Yalei Sun (Reg. No.)

MORGAN, LEWIS & BOCKIUS LLP
1400 Page Mill Road
Palo Alto, CA 94304
(650) 843-4000

POWER OF ATTORNEY TO PROSECUTE APPLICATIONS BEFORE THE UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

I hereby revoke all previous powers of attorney given in the application identified in the attached statement under 37 CFR 3.73(c).

I hereby appoint the practitioners of Morgan, Lewis & Bockius LLP, Customer Number **24341** as attorneys or agents to represent the undersigned and to transact all business before the United States Patent and Trademark Office (USPTO) in connection with any and all patent applications and patents assigned only to the undersigned according to the USPTO assignment records or assignment documents attached to this form in accordance with 37 C.F.R. § 3.73(c), said appointment to be to the exclusion of the inventor(s) and their attorney(s) in accordance with the provisions of 37 C.F.R. § 3.71, provided that, if any one of these attorneys ceases being affiliated with the law firm of Morgan, Lewis & Bockius LLP as partner, counsel, or employee, then the appointment of that attorney and all powers derived therefrom shall terminate on the date such attorney ceases being so affiliated.

Please change the correspondence address for the application identified in the attached statement under 37 CFR 3.73(c) to the address associated with Customer Number **24341**.

Assignee Name and Address: **NINGDE AMPEREX TECHNOLOGY LIMITED**
No. 1, Xingang Road
Zhangwan Town, Jiaocheng Zone
Ningde City, Fujian Province
P.R. China 352100

SIGNATURE of Assignee of Record

The undersigned whose signature and title is supplied below is authorized to act on behalf of the assignee.

Signature Liangxin Yang

Name Liangxin Yang Date Feb. 24th, 2021

Title IP Manager Telephone

A copy of this form, together with a statement under 37 C.F.R. § 3.73(c) (Form PTO/SB96 or equivalent) is required to be filed in each application in which this form is used. The statement under 37 C.F.R. § 3.73(c) may be completed by one of the practitioners appointed in this form if the appointed practitioner is authorized to act on behalf of the assignee and must identify the application in which this Power of Attorney is to be filed.

DB2/ 40409063.1

LITHIUM-ION BATTERY HAVING DESIRABLE SAFETY PERFORMANCE

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application is a continuation of U.S. Patent Application No. 17/407,081, entitled "LITHIUM-ION BATTERY HAVING DESIRABLE SAFETY PERFORMANCE", filed on August 19, 2021, which is a continuation application of U.S. Patent Application No. 16/113,938, entitled "LITHIUM-ION BATTERY HAVING DESIRABLE SAFETY PERFORMANCE", filed August 27, 2018, which is a continuation of U.S. Patent Application No. 14/596,873, entitled "LITHIUM-ION BATTERY HAVING DESIRABLE SAFETY PERFORMANCE", filed January 14, 2015, which claims priority to Chinese Patent Application No. 201420030319.4, entitled "LITHIUM-ION BATTERY HAVING DESIRABLE SAFETY PERFORMANCE", filed January 17, 2014, all of which are hereby incorporated by reference in their entirety.

TECHNICAL FIELD

[0002] The present disclosure generally relates to lithium-ion batteries and, more particularly, relates to a lithium-ion battery having desirable safety performance.

BACKGROUND

[0003] At present, lithium-ion batteries are required to be thinner and thinner as well as have higher and higher energy density, which demands a lithium-ion battery has as much energy as possible in a volume as small as possible.

[0004] In conventional design of a lithium-ion battery, a lead is a component soldered on a current collector to conduct current. Arrangement of the lead will increase the thickness of the lithium-ion battery no matter the lithium-ion battery adopts a Jelly-roll structure or a laminated structure. In other words, the area where the lead is soldered to the current collector has a largest thickness in the lithium-ion battery. The increased thickness due to the lead is

about 1~5% of the thickness of an assembled lithium-ion battery. Therefore, increase of thickness of a lithium-ion battery due to the lead has become one of the key actors which limit the energy density of the lithium-ion battery.

[0005] Chinese patent publication numbers CN 202495523U and CN 201087907Y each discloses a lithium-ion battery which defines a recess on a positive plate and/or the negative plate to receive a lead therein. The arrangement of the recess on the positive plate and/or the negative plate can reduce the thickness of the lithium-ion battery. However, when the recess is defined at one end of the positive plate or the negative plate along a length direction thereof, thickness variation around the recess is much larger than the thickness variation of the film afar from the recess. Particularly, the arrangement of the recess may generate a number of corners. The film around the corners is readily peeled off, especially when the negative active material adopts an expansive substance, such as silicon. The structure as previously described may lead to a high internal resistance of the lithium-ion battery and affect the capacity of the lithium-ion battery. In addition, there is no insulating layer provided on the positive area corresponding to the positive recess or the negative recess, internal short circuit and lithium precipitation may potentially occur to the lithium-ion battery, which will inevitably affect the safety performance of the lithium-ion battery.

[0006] In view of the foregoing, what is needed, therefore, is to provide a lithium-ion battery having desirable safety performance.

SUMMARY

[0007] One object of the present disclosure is to provide a battery which has high energy density and desirable safety performance.

[0008] According to an embodiment of the present disclosure, a battery is provided and the battery includes: a first plate, comprising a first film and a first lead; a first insulating glue layer, disposed on a surface of the first lead; a second plate, comprising a second lead; in which a second insulating glue layer is disposed on a surface of the first film corresponding to the

second lead.

[0009] According to an embodiment of the present disclosure, the first plate includes a first current collector, the first film and the first lead, the first film being disposed on the first current collector, the first lead being electrically connected with the first current collector, the first film includes: a first recess configured to receive the first lead; a second plate, comprising a second current collector, a second film and a second lead, the second film being disposed on the second current collector, the second lead being electrically connected with the second current collector, the second film being provided with a second recess configured to receive the second lead.

[0010] Specifically, the first plate is a positive plate, the first current collector is a positive current collector, the first film is a positive film, the first lead is a positive lead; the second plate is a negative plate, the second current collector is a negative current collector, the second film is a negative film, the second lead is a negative lead.

[0011] According to one embodiment of the present disclosure, a lithium-ion battery having desirable safety performance is provided. The lithium-ion battery includes:

a positive plate, including a positive current collector, a positive film formed on the positive current collector and a positive lead coupled to the positive current collector, the positive film being provided with a first recess and the positive lead being soldered in the first recess;

a negative plate, including a negative current collector, a negative film formed on the negative current collector and a negative lead coupled to the negative current collector, and the negative film being provided with a second recess and the negative lead being soldered in the second recess;

a separator disposed between the positive plate and the negative plate; and

electrolyte,

wherein upper and lower surfaces of the positive lead each is provided with a first

insulating glue layer, a surface of the positive film corresponding to the second recess is pasted with a second insulating glue layer, and the first insulating glue layer formed on the lower surface of the positive lead entirely covers the blank positive current collector in the first recess.

[0012] According to an embodiment of the present disclosure, the positive lead is entirely seated in the first recess and the negative lead is entirely seated in the second recess. Due to the arrangement of the first recess on the positive plate and the second recess on the negative plate, the positive lead and the negative lead can be received in the first recess and the second recess respectively. Along the thickness direction, the thickness of the positive lead (negative lead) is less than the thickness of the positive plate (negative plate). Therefore, the lead will not induce thickness increase of the positive lead or the negative lead. There will be more space for the active material, and energy density of the lithium-ion battery is improved remarkably.

[0013] According to an embodiment of the present disclosure, the first recess or the second recess is defined via mechanical solvent cleaning or laser cleaning.

[0014] According to an embodiment of the present disclosure, the second insulating glue layer has a width larger than a width of the second recess, and the second insulating glue layer has a length larger than a length of the second recess.

[0015] According to an embodiment of the present disclosure, the first insulating glue layer or the second insulating glue layer is one of a green insulating glue layer, a black insulating glue layer, a white insulating glue layer or a yellow insulating glue layer.

[0016] According to an embodiment of the present disclosure, a distance between a center of the first recess and one end of the positive film is 1/4~3/4 of a length of the positive film, and a distance between a center of the second recess and one end of the negative film is 1/4~3/4 of a length of the negative film.

[0017] According to an embodiment of the present disclosure, the first recess and the second recess are defined in a middle portion of the positive plate and the negative plate respectively. Even though the positive plate and/or the negative plate expand, unstable bonding,

large thickness variation or even abscission of the positive film or the negative film around the recess is avoided. At the same time, the internal resistance of the lithium-ion battery is reduced, and capacity and energy density of the lithium-ion battery are improved remarkably in the premise of unchanged battery cell size.

[0018] According to an embodiment of the present disclosure, a distance between a center of the first recess and one end of the positive film is half of a length of the positive film, and a distance between a center of the second recess and one end of the negative film is half of a length of the negative film.

[0019] According to an embodiment of the present disclosure, the first recess has a length 1~100mm less than a length of the positive lead, the first recess has a width 1~10mm larger than a width of the positive lead, the second recess has a length 1~100mm less than a length of the negative lead, and the second recess has a width 1~10mm larger than a width of the negative lead.

[0020] According to an embodiment of the present disclosure, the first recess has a length 1~100mm less than a width of the positive film, and the second recess has a length 1~100mm less than a width of the negative film.

[0021] According to an embodiment of the present disclosure, the first recess has a depth no larger than a thickness of the positive film, and the second recess has a depth no larger than a thickness of the negative film.

[0022] According to an embodiment of the present disclosure, the first recess has a depth 0.005~0.1mm larger than a thickness of the positive lead, and the second recess has a depth 0.005~0.1mm larger than a depth of the negative lead.

[0023] Compared with the prior art, due to the arrangement of the first insulating glue layer formed on the upper and lower surfaces of the positive lead and the second insulating glue layer pasted on the surface of the positive film corresponding to the second recess, occurrence of internal short circuit and lithium precipitation in the lithium-ion battery is remarkably reduced,

and safety performance of the lithium-ion battery is improved remarkably in the premise of desirable energy density.

[0024] Other advantages and novel features will be drawn from the following detailed description of preferred embodiments with the attached drawings. The accompanying drawings, which are incorporated in and constitute a part of this specification, illustrate embodiments of the present disclosure and, together with a general description of the disclosure given above, and the detailed description of the embodiments given below, serve to explain the principles of the disclosure:

BRIEF DESCRIPTION OF THE DRAWINGS

[0025] FIG. 1 depicts an exemplary front view of a positive plate of a lithium-ion battery according to one embodiment of the present disclosure;

[0026] FIG. 2 depicts an exemplary front view of a negative plate of a lithium-ion battery according to one embodiment of the present disclosure;

[0027] FIG. 3 depicts an exemplary top view of a positive plate of a lithium-ion battery according to one embodiment of the present disclosure;

[0028] FIG. 4 depicts an exemplary top view of a negative plate of a lithium-ion battery according to one embodiment of the present disclosure; and

[0029] FIG. 5 depicts an exemplary cross-sectional view of a lithium-ion battery according to one embodiment of the present disclosure.

DETAILED DESCRIPTION

[0030] Example embodiments of the present disclosure will now be described more fully hereinafter with reference to the accompanying drawings, in which some, but not all embodiments of the disclosure are shown. Indeed, the disclosure may be embodied in many different forms and should not be construed as limited to the embodiments set forth herein;

rather, these embodiments are provided so that this disclosure will satisfy applicable legal requirements. Like reference numerals refer to like elements throughout.

[0031] According to an embodiment of the present disclosure, a battery is provided and the battery includes: a first plate, comprising a first film and a first lead; a first insulating glue layer, disposed on a surface of the first lead; a second plate, comprising a second lead; in which a second insulating glue layer is disposed on a surface of the first film corresponding to the second lead.

[0032] According to an embodiment of the present disclosure, the first plate includes a first current collector, the first film and the first lead, the first film being disposed on the first current collector, the first lead being electrically connected with the first current collector, the first film includes: a first recess configured to receive the first lead; a second plate, comprising a second current collector, a second film and a second lead, the second film being disposed on the second current collector, the second lead being electrically connected with the second current collector, the second film being provided with a second recess configured to receive the second lead.

[0033] Specifically, the first plate is a positive plate, the first current collector is a positive current collector, the first film is a positive film, the first lead is a positive lead; the second plate is a negative plate, the second current collector is a negative current collector, the second film is a negative film, the second lead is a negative lead.

Example 1

[0034] Referring to FIG. 1 to FIG. 5, a lithium-ion battery according to one embodiment of the present disclosure includes a positive plate 1, a negative plate 2, a separator 3 disposed between the positive plate 1 and the negative plate 2, and electrolyte (not shown). The positive plate 1 includes a positive current collector 11, a positive film 12 provided on the positive current collector 11, and a positive lead 13. The negative plate 2 includes a negative current collector 21, a negative film 22 provided on the negative current collector 21, and a negative lead 23. The positive film 12 defines a first recess 14. The positive lead 13 is soldered and

seated in the first recess 14. The negative film 22 defines a second recess 24. The negative lead 23 is soldered and seated in the second recess 24. An upper surface and a lower surface of the positive lead 13 each is formed with a first insulating glue layer 15. A surface of the positive film 12 corresponding to the second recess 24 is pasted with a second insulating glue layer 16.

[0035] The second insulating glue layer 16 has a width larger than a width of the second recess 24. The second insulating glue layer 16 has a length larger than a length of the second recess 24.

[0036] The first insulating glue layer 15 and the second insulating glue layer 16 are green insulating glue layers.

[0037] The distance between the center of the first recess 14 and one end of the positive film 12, i.e. one end of the positive film 12 perpendicular to a length direction of the positive current collector 11 and formed no blank positive current collector 11, is half of a length of the positive film 12. The distance between the center of the second recess 24 and one end of the negative film 22, i.e. one end of the negative film 12 perpendicular to a length direction of the negative current collector 21 and formed no blank negative current collector 21, is half of a length of the negative film 22.

[0038] The first recess 14 has a length 25mm less than a length of the positive lead 13. The first recess 14 has a width 4mm larger than a width of the positive lead 13. The second recess 24 has a length 25mm less than a length of the negative lead 23. The second recess has a width 4mm larger than a width of the negative lead 23.

[0039] The first recess 14 has a length 55mm less than a width of the positive film 13. The second recess 24 has a length 57mm less than a width of the negative film 22.

[0040] The first recess 14 has a depth less than a thickness of the positive film 12. The second recess 24 has a depth less than a thickness of the negative film 22.

[0041] The first recess 14 has a depth 0.02mm larger than a thickness of the positive lead

13. The second recess 24 has a depth 0.02mm larger than a thickness of the negative lead 23.

[0042] A method for manufacturing a lithium-ion battery according to one embodiment of the present disclosure will be described in detail in view of a 303482 square lithium-ion battery (a lithium-ion battery having a thickness of 3.0mm, a width of 34mm and a length of 82mm). The method for manufacturing a lithium-ion battery includes the steps of:

[0043] Preparation of the positive plate:

1) adding 95wt% positive active material $LiCoO_2$, 2wt% binder PVDF and 3wt% conductive agent graphite into solvent NMP, obtaining a positive slurry having a viscosity of 3000-6000pa.s after fully stirring;

2) coating the positive slurry on an aluminum foil having a thickness of 12μm, and obtaining a positive plate 1 having a compacted density of 4.1g/cm^3 and a length of 277mm, a width of 75mm, a thickness of 0.114mm after drying and cold pressing;

3) removing the positive film 12 at a center of the positive plate 1 (at a middle portion along a length direction of the positive plate 1) via laser cleaning to define a first recess 14 having a thickness of 0.1mm, a width of 10mm and a length of 20mm;

4) coupling a positive lead 13 having a thickness of 0.08mm, a width of 6mm and a length of 45mm in the first recess 14 via laser welding, the positive lead 13 extending out of the positive plate 1 of about 15mm;

5) providing green insulating glue layers on upper and lower surfaces of the positive lead 13, and pasting green insulating glue layer on the positive film 12 corresponding to the second recess 24 in winding, ensuring the green insulating glue layer on the lower surface of the positive lead 13 entirely covering the blank positive current collector 11 in the first recess 14.

[0044] Preparation of the negative plate:

1) adding 95wt% negative active material graphite, 2wt% bonding agent SBR, 1wt% thickener

CMC and 2wt% conductive agent graphite in solvent deionized water, and obtaining negative slurry having a viscosity of 1000-3000pa.s after fully stirring;

2) coating the negative slurry on a copper foil having a thickness of 6μm, after drying and cold pressing, obtaining a negative plate having a compaction density of about 1.6g/cm^3 and a length of 285mm, a width of 77mm, a thickness of 0.135mm;

3) removing the negative active material at a center of the negative plate 2 (at a middle portion along a length direction of the negative plate 2) via mechanical cleaning to define a second recess 24, the second recess 24 having a thickness of 0.10mm, a width of 10mm and a length of 20mm;

4) providing a negative lead 23 having a thickness of 0.08mm, a width of 6mm and a length of 45mm, soldering the negative lead 23 in the second recess 24, with the negative lead 23 extending out of the negative plate 2 of 15mm.

[0045] Preparation of the electrolyte: fully mixing a mixture of methyl ethyl carbonate (EMC), diethyl carbonate (DEC), ethylene carbonate (EC) and propylene carbonate (PC) having a weight ratio of 1∶1∶0.5∶0.5; adding $LiPF_6$ as solute and obtaining a base electrolyte containing 1M $LiPF_6$; adding 0.5wt% of two fluorine lithium oxalate borate and 1wt% of adiponitrile in the base electrolyte, and obtaining electrolyte for use in a lithium-ion battery after fully dissolving.

[0046] Preparation of the lithium-ion battery: coiling the positive plate 1 and the negative plate 2 with a separator polyethylene film 3 having a thickness of 0.013mm interposed between the positive plate 1 and the negative plate 2 and obtaining a bared battery cell, with main portion of the bared battery cell having an average thickness of about 2.78mm; obtaining a final lithium-ion battery after drying the bared battery cell, pouring the electrolyte and packaging.

Example 2

[0047] Example 2 is almost the same as Example 1, except that:

[0048] The distance between a center of the first recess 14 and one end of the positive film 12 (one end of the positive film 12 perpendicular to a length direction of the positive current collector 11 and formed no blank positive current collector 11) is about 1/4 of the length of the positive film 12.

[0049] The distance between a center of the second recess 24 and one end of the negative film 22 (one end of the negative film 22 perpendicular to a length direction of the negative current collector 21 and formed no blank negative current collector 21) is about 1/4 of the length of the negative film 12.

[0050] The first recess 14 has a length 75mm less than a length of the positive lead 13. The first recess 14 has a width 2mm larger than a width of the positive lead 13. The second recess 24 has a length 75mm less than a length of the negative lead 23. The second recess 24 has a width 2mm larger than a width of the negative lead 23.

[0051] The first recess 14 has a length 30mm less than a width of the positive film 12. The second recess 24 has a length 33mm less than a width of the negative film 22.

[0052] The first recess 14 has a depth 0.08mm larger than a thickness of the positive lead 13. The second recess 24 has a depth 0.08mm larger than a thickness of the negative lead 23.

[0053] The negative active material is silicon.

[0054] The first insulating glue layer 15 and the second insulating glue layer 16 are black insulating glue layers.

[0055] Other features of Example 2 are the same as have described in Example 1 and will not be detailed further.

Example 3

[0056] Example 3 is almost the same as Example 1, except that:

[0057] The distance between a center of the first recess 14 and one end of the positive film

12 (one end of the positive film 12 perpendicular to a length direction of the positive current collector 11 and formed no blank positive current collector 11) is about 3/4 of the length of the positive film 12.

[0058] The distance between a center of the second recess 24 and one end of the negative film 22 (one end of the negative film 22 perpendicular to a length direction of the negative current collector 21 and formed no blank negative current collector 21) is about 3/4 of the length of the negative film 12.

[0059] The first recess 14 has a length 50mm less than a length of the positive lead 13. The first recess 14 has a width 8mm larger than a width of the positive lead 13. The second recess 24 has a length 50mm less than a length of the negative lead 23. The second recess 24 has a width 8mm larger than a width of the negative lead 23.

[0060] The first recess 14 has a length 70mm less than a width of the positive film 12. The second recess 24 has a length 73mm less than a width of the negative film 22.

[0061] The first recess 14 has a depth 0.05mm larger than a thickness of the positive lead 13. The second recess 24 has a depth 0.05mm larger than a thickness of the negative lead 23.

[0062] The negative active material is silicon.

[0063] The first insulating glue layer 15 and the second insulating glue layer 16 are white insulating glue layers.

[0064] Other features of Example 3 are the same as have described in Example 1 and will not be detailed further.

Example 4

[0065] Example 4 is almost the same as Example 2, except that:

[0066] The distance between a center of the first recess 14 and one end of the positive film 12 (one end of the positive film 12 perpendicular to a length direction of the positive current

collector 11 and formed no blank positive current collector 11) is about 1/6 of the length of the positive film 12.

[0067] The distance between a center of the second recess 24 and one end of the negative film 22 (one end of the negative film 22 perpendicular to a length direction of the negative current collector 21 and formed no blank negative current collector 21) is about 1/6 of the length of the negative film 12.

[0068] The first insulating glue layer 15 and the second insulating glue layer 16 are yellow insulating glue layer.

[0069] Other features of Example 4 are the same as have described in Example 2 and will not be detailed further.

Example 5

[0070] Example 5 is almost the same as Example 3, except that:

[0071] The distance between a center of the first recess 14 and one end of the positive film 12 (one end of the positive film 12 perpendicular to a length direction of the positive current collector 11 and formed no blank positive current collector 11) is about 4/5 of the length of the positive film 12.

[0072] The distance between a center of the second recess 24 and one end of the negative film 22 (one end of the negative film 22 perpendicular to a length direction of the negative current collector 21 and formed no blank negative current collector 21) is about 4/5 of the length of the negative film 12.

[0073] Other features of Example 5 are the same as have described in Example 3 and will not be detailed further.

Comparative Example 1

[0074] The Comparative Example 1 is almost the same as Example 1, except that, upper

and lower surfaces of the positive lead 13 have no first insulating glue layer 15 formed thereon. The surface of the positive film 12 corresponding to the second recess 24 has no second insulating glue layer 16 pasted thereon.

[0075] Other features of Comparative Example 1 are the same as have described in Example 1 and will not be detailed further.

Comparative Example 2

[0076] The Comparative Example 2 is almost the same as Example 1, except that, the positive lead 13 is soldered to the blank positive current collector 11, the positive film 12 does not have a first recess 14, the negative lead 23 is soldered to the blank negative current collector 21, the negative film 22 does not have a second recess 24. Other features of Comparative Example 2 are the same as have described in Example 1 and will not be detailed further.

[0077] 10 lithium-ion batteries are randomly selected from lithium-ion batteries according to Example 1, Example 2, Example 3 and Comparative Example 1 respectively. Each lithium-ion battery is carried out a cycle performance test of 300 cycles. Number of the lithium-ion batteries occurring short circuit is calculated and the testing result is shown in Table 1.

[0078] 10 lithium-ion batteries are randomly selected from lithium-ion batteries according to Example 1, Example 2, Example 3 and Comparative Example 1 respectively. Each lithium-ion battery is carried out a cycle performance test of 100 cycles. Each lithium-ion battery is disassembled to observe lithium precipitation on the negative plate 2. Number of lithium-ion batteries whose negative plate 2 occurs lithium precipitation is calculated and the testing result is shown in Table 2.

Table 1 Short circuit and lithium precipitation on the negative plate occurs to lithium-ion batteries according to Examples 1 to 3 and Comparative Example 1 after cycle test

Group	Number of batteries occurring short circuit after 300 cycles	Number of batteries occurring lithium precipitation on the negative plate after 100 cycles

Example 1	0	0
Example 2	0	1
Example 3	1	0
Comparative Example 1	5	7

[0079] As clearly shown in Table 1, due to the first insulating glue layer 15 formed on the upper and lower surfaces of the positive lead 13 and the second insulating glue layer 16 pasted on the surface of the positive film 12 corresponding to the second recess 24, the safety performance of the lithium-ion battery can be improved remarkably.

[0080] Capacity test, internal resistance test and volumetric energy density test are carried out to the lithium-ion batteries according to Example 1 and Comparative Example 2. The test result is shown in Table 2. The capacity test and internal resistance test are carried out on hang machine at 25℃, the discharge capacity is 0.2C, the internal resistance is impedance under 1000Hz, and the volumetric energy density= minimum capacity x platform voltage/ maximum volume.

Table 2 Capacity, internal resistance and volumetric energy density of lithium-ion batteries according to Example 1 and Comparative Example 2

Group	DC resistance (mΩ)	Average capacity (mAh)	Average thickness (mm)	Average volumetric energy density(Wh/L)
Example 1	55	1180	2.78	563
Comparative Example 2	62	1170	2.84	546

[0081] As clearly shown in Table 2, the structure of the positive plate and negative plate according to the present disclosure can overcome uneven thickness of the battery cell, so as to efficiently utilize the space of the lithium-ion battery, improve the capacity and the volumetric energy density of the lithium-ion battery, and reduce the internal resistance of the lithium-ion battery.

[0082] Charging and discharging cycle tests are carried out to lithium-ion batteries in accordance with Examples 2 to 5, in which for the sake of illustration, the negative active material in Example 1 is substituted by silicon and referenced as Example 6. The lithium-ion batteries are disassembled after 50 cycles. Abscission of active material at the edge of the second recess 24 is shown in Table 3.

Table 3 Abscission of active material at the edge of the second recess after charging and discharging cycle test of lithium-ion batteries according to Examples 2 to 6

	Example 4	Example 2	Example 6	Example 3	Example 5
Abscission of active material at the second recess after 50 cycles	Obvious abscission of active material	No obvious abscission of active material	No abscission of active material	No obvious abscission of active material	Obvious abscission of active material

[0083] As clearly shown in Table 3, if the negative active material for use in the negative plate 2 is apt to serious volume expansion, such as silicon, the first recess 14 in the center of the positive plate 1 and the second recess 24 in the center of the negative plate 2 can effectively

reduce abscission of active material at the edge of the second recess 24. The negative plate 2 adopting silicon as active material undertakes serious volume expansion, which may cause the negative plate 2 defining the second recess at one end thereof, cannot bear the uneven force at the second recess. However, the second recess 24 as describe in Examples 2, 3 and 6 each is located in the center of the negative plate 2. Two ends of the negative plate 2 bear almost the same forces and, therefore, abscission of active material at the edge of the second recess 24 can be improved remarkably.

[0084] Many modifications and other embodiments of the disclosure set forth herein will come to mind to one skilled in the art to which these disclosure pertain having the benefit of the teachings presented in the foregoing descriptions and the associated drawings. Therefore, it is to be understood that the disclosure are not to be limited to the specific embodiments disclosed and that modifications and other embodiments are intended to be included within the scope of the appended claims. Moreover, although the foregoing descriptions and the associated drawings describe example embodiments, it should be appreciated that alternative embodiments without departing from the scope of the appended claims. Although specific terms are employed herein, they are used in a generic and descriptive sense only and not for purposes of limitation.

CLAIMS

What is claimed is:

1. A lithium-ion battery, comprising:

a first plate comprising a first current collector, a first film and a first lead, wherein the first film is disposed on the first current collector and is provided with a first recess configured to receive the first lead, and the first lead is electrically connected to the first current collector;

a first insulating glue layer, disposed on a first location of a surface of the first lead;

a second plate comprising a second current collector, a second film and a second lead, wherein the second film is disposed on the second current collector and is provided with a second recess configured to receive the second lead, and the second lead is electrically connected to the second current collector; and

a separator disposed between the first plate and the second plate;

wherein a length of a portion of the first lead in the first recess is less than a width of a remaining portion of the first film from an edge of the first insulating glue layer covering the first film to an edge of the first film opposite to the first recess; and a second insulating glue layer is disposed on a second location of the surface of the first film corresponding to the second lead in a thickness direction of the first plate and the second plate.

2. The lithium-ion battery of claim 1, wherein,

the first plate is a positive plate, the first current collector is a positive current collector, the first film is a positive film, the first lead is a positive lead; and

the second plate is a negative plate, the second current collector is a negative current collector, the second film is a negative film and the second lead is a negative lead.

3. The lithium-ion battery of claim 2, wherein a distance between a center of the first recess and an end of the positive film is 1/4 - 3/4 of a length of the positive film, and a

distance between a center of the second recess and an end of the negative film is 1/4 - 3/4 of a length of the negative film.

4. The Lithium-ion battery of claim 2, wherein a distance between a center of the first recess and an end of the positive film is half of a length of the positive film, and a distance between a center of the second recess and an end of the negative film is half of a length of the negative film.

5. The lithium-ion battery of claim 2, wherein a length of the first recess is less than a length of the positive lead by 1 - 100mm, a width of the first recess is greater than a width of the positive lead by 1 - 10mm; and

a length of the second recess is less than a length of the negative lead by 1 - 100mm, a width of the second recess is greater than a width of the negative lead by 1 - 10mm.

6. The lithium-ion battery of claim 2, wherein a length of the first recess is less than a width of the positive film by 1 - 100mm, and a length of the second recess is less than a width of the negative film by 1 - 100mm.

7. The lithium-ion battery of claim 2, wherein a depth of the first recess is no larger than a thickness of the positive film, and a depth of the second recess is no larger than a thickness of the negative film.

8. The lithium-ion battery of claim 2, wherein a depth of the first recess is greater than a thickness of the positive lead by 0.005 - 0.1mm, and a depth of the second recess is greater than a thickness of the negative lead by 0.005 - 0.1mm.

9. The lithium-ion battery of claim 1, wherein a width of a portion of the first lead in the first recess is greater than a width of a remaining portion of the first recess not occupied by the first lead located on one side of the first lead.

10. A lithium-ion battery, comprising:

a first plate, comprising a first current collector, a first film and a first lead, wherein the first film is disposed on the first current collector and is provided with a first recess configured to receive the first lead, and the first lead is electrically connected to the first current collector, the first recess having three sides defined by the first film;

a first insulating glue layer, disposed on a first location of a first surface of the first lead and covering the three sides of the first recess defined by the first film;

a second plate, comprising a second current collector, a second film, and a second lead, wherein the second film is disposed on the second current collector and is provided with a second recess configured to receive the second lead, and the second lead is electrically connected to the second current collector; and

a separator disposed between the first plate and the second plate;

wherein a width of a portion of the first lead in the first recess is greater than a width of a remaining portion of the first recess not occupied by the first lead located on one side of the first lead.

11. The lithium-ion battery of claim 10, wherein:

the first plate is a positive plate, the first current collector is a positive current collector, the first film is a positive film, the first lead is a positive lead;

the second plate is a negative plate, the second current collector is a negative current collector, the second film is a negative film and the second lead is a negative lead.

12. The lithium-ion battery of claim 10, wherein a distance between a center of the first recess and an end of the first film is 1/4 - 3/4 of a length of the first film, and a distance

between a center of the second recess and an end of the second film is 1/4 - 3/4 of a length of the second film.

13. The lithium-ion battery of claim 10, wherein a distance between a center of the first recess and an end of the first film is half of a length of the first film, and a distance between a center of the second recess and an end of the second film is half of a length of the second film.

14. The lithium-ion battery of claim 10, wherein a length of the first recess is less than a length of the first lead by 1 - 100mm, a width of the first recess is greater than a width of the first lead by 1 - 10mm; and

a length of the second recess is less than a length of the second lead by 1 - 100mm, a width of the second recess is greater than a width of the second lead by 1 - 10mm.

15. The lithium-ion battery of claim 10, wherein a length of the first recess is less than a width of the first film by 1 - 100mm, and a length of the second recess is less than a width of the second film by 1 - 100mm.

16. The lithium-ion battery of claim 10, wherein a depth of the first recess is no larger than a thickness of the first film, and a depth of the second recess is no larger than a thickness of the second film.

17. The lithium-ion battery of claim 10, wherein a depth of the first recess is greater than a thickness of the first lead by 0.005 - 0.1mm, and a depth of the second recess is greater than a thickness of the second lead by 0.005 - 0.1mm.

18. The lithium-ion battery of claim 10, wherein a pair of second insulating glue layers directly disposed on two opposite surfaces of the first film at a first location and a second location, respectively, wherein the second lead on the second plate is sandwiched between the pair of second insulating glue layers in a thickness direction of the first plate and the second plate.

19. The lithium-ion battery of claim 10, wherein the first insulating glue layer is disposed on an upper surface and below a lower surface of the first lead in a thickness direction of the first plate and the second plate.

ABSTRACT

A lithium-ion battery having desirable safety performance includes a positive plate having a positive film, a negative plate having a negative film, a separator between the positive plate and the negative plate, and electrolyte. The positive film is provided with a first recess and a positive lead is soldered in the first recess. The negative film is provided with a second recess and a negative lead is soldered in the second recess. A first insulating glue layer is formed on an upper surface and below a lower surface of the positive lead. Surface of the positive film corresponding to the second recess is pasted with a second insulating glue layer.

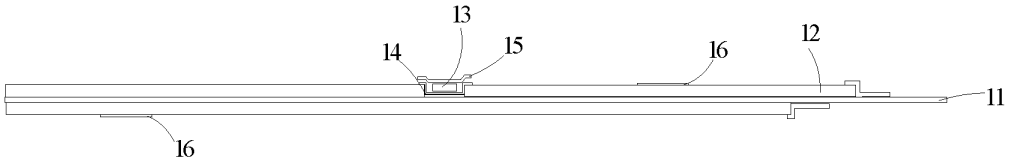


FIG. 1

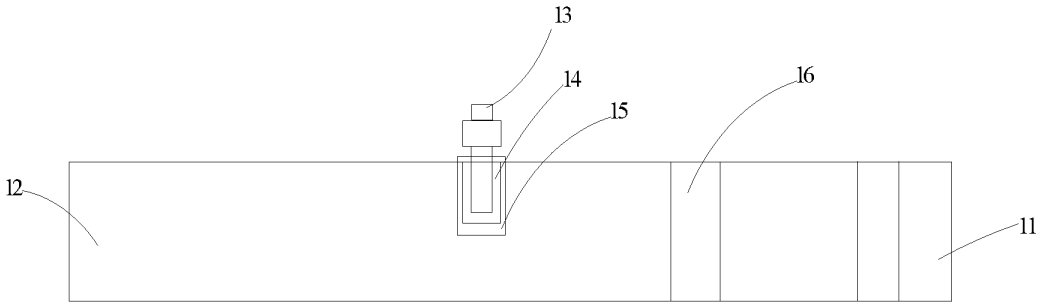


FIG. 2

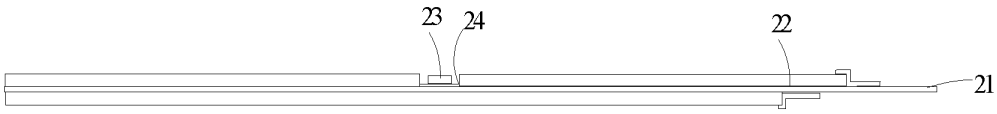


FIG. 3

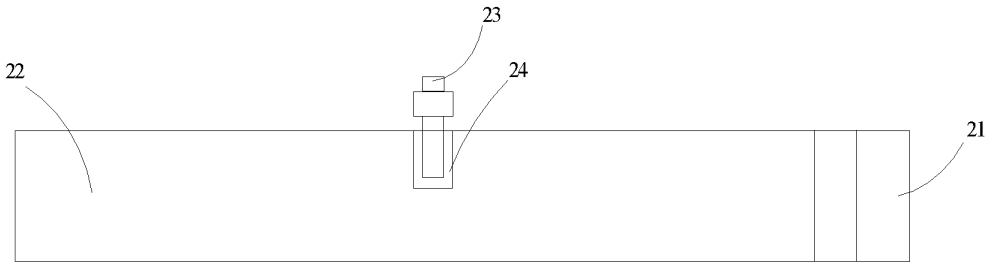


FIG. 4

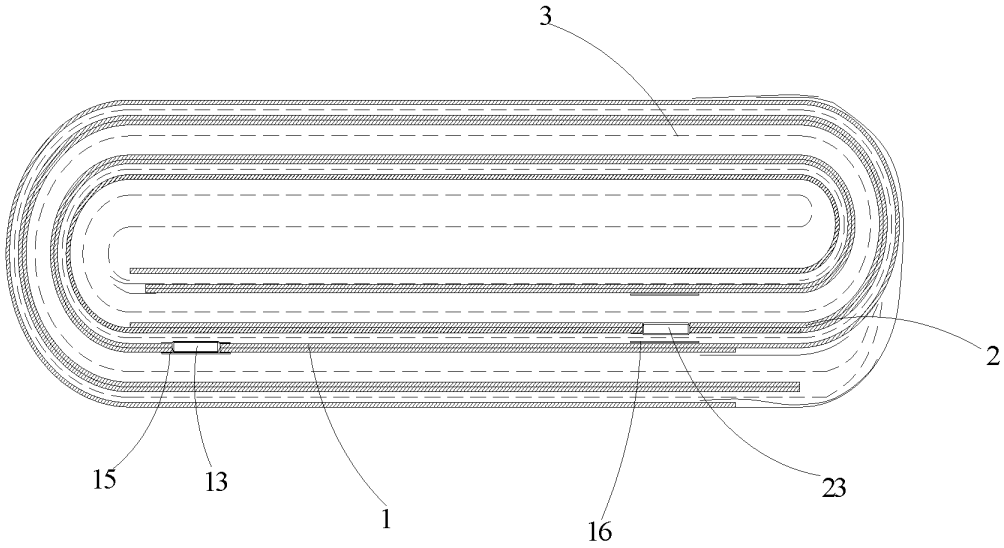


FIG. 5

Electronic Patent Application Fee Transmittal

Application Number:	
Filing Date:	
Title of Invention:	LITHIUM-ION BATTERY HAVING DESIRABLE SAFETY PERFORMANCE
First Named Inventor/Applicant Name:	Tao TAO
Filer:	Yalei Sun/Jacqueline Yu
Attorney Docket Number:	024607-02-5119-US

Filed as Large Entity

Filing Fees for Track I Prioritized Examination - Nonprovisional Application under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
UTILITY APPLICATION FILING	1011	1	320	320
UTILITY SEARCH FEE	1111	1	700	700
UTILITY EXAMINATION FEE	1311	1	800	800
REQUEST FOR PRIORITIZED EXAMINATION	1817	1	4200	4200
Pages:				
Claims:				
Miscellaneous-Filing:				
PROCESSING FEE, EXCEPT PROV. APPLS.	1830	1	140	140

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**6160**

Electronic Acknowledgement Receipt

EFS ID:	45738027
Application Number:	17746755
International Application Number:	
Confirmation Number:	8911
Title of Invention:	LITHIUM-ION BATTERY HAVING DESIRABLE SAFETY PERFORMANCE
First Named Inventor/Applicant Name:	Tao TAO
Customer Number:	24341
Filer:	Yalei Sun
Filer Authorized By:	
Attorney Docket Number:	024607-02-5119-US
Receipt Date:	17-MAY-2022
Filing Date:	
Time Stamp:	18:33:57
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$6160
RAM confirmation Number	E20225GI34243427
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		024607-02-5119-US_P2014010US5_Application.pdf	2011281 6d598015cca1afcd6c6b249884118578be741ef8	yes	44

Multipart Description/PDF files in .zip description

Document Description	Start	End
Transmittal of New Application	1	1
Fee Worksheet (SB06)	2	2
Track One Request	3	4
Internet Communications Authorization	5	6
Application Data Sheet	7	15
Oath or Declaration filed	16	17
Assignee showing of ownership per 37 CFR 3.73	18	18
Power of Attorney	19	19
Specification	20	36
Claims	37	41
Abstract	42	42
Drawings-only black and white line drawings	43	44

Warnings:

Information:

2	Fee Worksheet (SB06)	fee-info.pdf	48469 9ff0d29338019caf77a0a6c1d92d22be619474a9	no	2

Warnings:	
Information:	
Total Files Size (in bytes):	2059750

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New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 17/746,755

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY FEE($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	320
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	700
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	800
TOTAL CLAIMS (37 CFR 1.16(i))	19 minus 20 =	*			OR	x 100 =	0.00
INDEPENDENT CLAIMS (37 CFR 1.16(h))	2 minus 3 =	*				x 480 =	0.00
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						0.00
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							0.00
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	1820

APPLICATION AS AMENDED - PART II

AMENDMENT A

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
Application Size Fee (37 CFR 1.16(s))									
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
					TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

AMENDMENT B

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE($)	ADDITIONAL FEE($)		RATE($)	ADDITIONAL FEE($)
Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
Application Size Fee (37 CFR 1.16(s))									
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
					TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.

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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
17/746,755	05/17/2022	1726	1820	024607-02-5119-US	19	2

CONFIRMATION NO. 8911

FILING RECEIPT

24341
Morgan, Lewis & Bockius LLP (PA)
1400 Page Mill Road
Palo Alto, CA 94304-1124

OC000000134057312

Date Mailed: 05/25/2022

Receipt is acknowledged of this non-provisional utility patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF FIRST INVENTOR, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection.

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Inventor(s)

Tao TAO, Residence Not Provided;

Applicant(s)

NINGDE AMPEREX TECHNOLOGY LIMITED, Ningde, CHINA;

Power of Attorney: The patent practitioners associated with Customer Number 24341

Domestic Priority data as claimed by applicant

This application is a CON of 17/407,081 08/19/2021
which is a CON of 16/113,938 08/27/2018 ABN
which is a CON of 14/596,873 01/14/2015 PAT 10541441

Foreign Applications (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.)
CHINA 201420030319.4 01/17/2014 No Access Code Provided

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

If Required, Foreign Filing License Granted: 05/24/2022

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 17/746,755**

Projected Publication Date: 09/01/2022

Non-Publication Request: No

Early Publication Request: No
Title

LITHIUM-ION BATTERY HAVING DESIRABLE SAFETY PERFORMANCE

Preliminary Class

429

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

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Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign AssetsControl, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

SelectUSA

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The U.S. offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to promote and facilitate business investment. SelectUSA provides information assistance to the international investor community; serves as an ombudsman for existing and potential investors; advocates on behalf of U.S. cities, states, and regions competing for global investment; and counsels U.S. economic development organizations on investment attraction best practices. To learn more about why the United States is the best country in the world to develop technology, manufacture products, deliver services, and grow your business, visit http://www.SelectUSA.gov or call +1-202-482-6800.

Electronically filed June 2, 2022

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application of:	Tao TAO, et al.	Confirmation No.:	8911
Serial No.:	17/746,755	Art Unit:	1726
Filed:	May 17, 2022	Examiner:	To be assigned
For:	LITHIUM-ION BATTERY HAVING DESIRABLE SAFETY PERFORMANCE	Attorney Docket No.:	024607-02-5119-US

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

REQUEST FOR CORRECTED FILING RECEIPT

Attached is a copy of the Filing Receipt received from the U.S. Patent Office in the above-referenced application for which issuance of a **corrected** Filing Receipt is respectfully requested.

The correction is with respect to a USPTO error in which the Inventor(s) residence is listed as "Residence Not Provided". The Inventor(s) residence should be "Ningde, CHINA" which is indicated on the attached marked up Filing Receipt.

Also, the second inventor, Ming Liang MO is missing from the Filing Receipt and has been provided on the marked-up version.

Please note that the correct information was included in the as-filed Application Data Sheet (ADS) submitted on May 17, 2022. A corrected Filing Receipt is hereby requested.

The Commissioner is hereby authorized to charge any additional fees which may be required by this submission, including fees due under 37 C.F.R. §§ 1.16 and 1.17, or credit any overpayment to Deposit Account 50-0310. A corrected Filing Receipt is hereby requested.

Respectfully submitted,

Date: June 2, 2022

/Yalei Sun/ 57,765
Yalei Sun (Reg. No.)

MORGAN, LEWIS & BOCKIUS LLP
1400 Page Mill Road
Palo Alto, CA 94304
Phone: (650) 843-4000

UNITED STATES PATENT AND TRADEMARK OFFICE

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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
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Inventor(s)
Tao TAO, ~~Residence Not Provided;~~ Nindge, CHINA

Applicant(s)
Ming Liang MO, Nindge, CHINA
NINGDE AMPEREX TECHNOLOGY LIMITED, Ningde, CHINA;

Power of Attorney: The patent practitioners associated with Customer Number 24341.

Domestic Priority data as claimed by applicant
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which is a CON of 16/113,938 08/27/2018 ABN
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Projected Publication Date: 09/01/2022

Non-Publication Request: No

Early Publication Request: No
Title

LITHIUM-ION BATTERY HAVING DESIRABLE SAFETY PERFORMANCE

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Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

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Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	024607-02-5119-US
	Application Number	
Title of Invention	LITHIUM-ION BATTERY HAVING DESIRABLE SAFETY PERFORMANCE	

The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76.
This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.

Secrecy Order 37 CFR 5.2:

☐ Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)

Inventor Information:

Inventor 1 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Tao		TAO	

Residence Information (Select One) ○ US Residency ◉ Non US Residency ○ Active US Military Service

City	Ningde	Country of Residence [i]	CN

Mailing Address of Inventor:

Address 1	No. 1, Xingang Road		
Address 2	Zhangwan Town, Jiaocheng Zone		
City	Ningde	State/Province	FJ
Postal Code	352100	Country [i]	CN

Inventor 2 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Ming Liang		MO	

Residence Information (Select One) ○ US Residency ◉ Non US Residency ○ Active US Military Service

City	Ningde	Country of Residence [i]	CN

Mailing Address of Inventor:

Address 1	No. 1, Xingang Road		
Address 2	Zhangwan Town, Jiaocheng Zone		
City	Ningde	State/Province	FJ
Postal Code	352100	Country [i]	CN

All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the **Add** button. Add

Correspondence Information:

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PTO/AIA/14 (11-15)
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	024607-02-5119-US
	Application Number	
Title of Invention	LITHIUM-ION BATTERY HAVING DESIRABLE SAFETY PERFORMANCE	

Enter either Customer Number or complete the Correspondence Information section below. For further information see 37 CFR 1.33(a).			
☐ **An Address is being provided for the correspondence Information of this application.**			
Customer Number	24341		
Email Address		Add Email	Remove Email

Application Information:

Title of the Invention	LITHIUM-ION BATTERY HAVING DESIRABLE SAFETY PERFORMANCE		
Attorney Docket Number	024607-02-5119-US	**Small Entity Status Claimed**	☐
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	2	**Suggested Figure for Publication (if any)**	

Filing By Reference:

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☐ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32).
Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Please Select One:	◉ Customer Number	○ US Patent Practitioner	○ Limited Recognition (37 CFR 11.9)
Customer Number	24341		

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	024607-02-5119-US
	Application Number	
Title of Invention	LITHIUM-ION BATTERY HAVING DESIRABLE SAFETY PERFORMANCE	

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, 365(c), or 386(c) or indicate National Stage entry from a PCT application. Providing benefit claim information in the Application Data Sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.
When referring to the current application, please leave the "Application Number" field blank.

Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
	Continuation of	17407081	2021-08-19
Prior Application Status	Abandoned		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
17407081	Continuation of	16113938	2018-08-27
Prior Application Status	Patented		Remove

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
16113938	Continuation of	14596873	2015-01-14	10541441	2020-01-21

Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the **Add** button.

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55. When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX)[i] the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(i)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

Remove

Application Number	Country[i]	Filing Date (YYYY-MM-DD)	Access Code[i] (if applicable)
201420030319.4	CN	2014-01-17	

Additional Foreign Priority Data may be generated within this form by selecting the **Add** button.

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

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Title of Invention	LITHIUM-ION BATTERY HAVING DESIRABLE SAFETY PERFORMANCE	

☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.
NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

PTO/AIA/14 (11-15)
Approved for use through 04/30/2017. OMB 0651-0032
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Authorization or Opt-Out of Authorization to Permit Access:

When this Application Data Sheet is properly signed and filed with the application, applicant has provided written authority to permit a participating foreign intellectual property (IP) office access to the instant application-as-filed (see paragraph A in subsection 1 below) and the European Patent Office (EPO) access to any search results from the instant application (see paragraph B in subsection 1 below).

Should applicant choose not to provide an authorization identified in subsection 1 below, applicant **must opt-out** of the authorization by checking the corresponding box A or B or both in subsection 2 below.

NOTE: This section of the Application Data Sheet is **ONLY** reviewed and processed with the **INITIAL** filing of an application. After the initial filing of an application, an Application Data Sheet cannot be used to provide or rescind authorization for access by a foreign IP office(s). Instead, Form PTO/SB/39 or PTO/SB/69 must be used as appropriate.

1. Authorization to Permit Access by a Foreign Intellectual Property Office(s)

A. Priority Document Exchange (PDX) - Unless box A in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the State Intellectual Property Office of the People's Republic of China (SIPO), the World Intellectual Property Organization (WIPO), and any other foreign intellectual property office participating with the USPTO in a bilateral or multilateral priority document exchange agreement in which a foreign application claiming priority to the instant patent application is filed, access to: (1) the instant patent application-as-filed and its related bibliographic data, (2) any foreign or domestic application to which priority or benefit is claimed by the instant application and its related bibliographic data, and (3) the date of filing of this Authorization. See 37 CFR 1.14(h)(1).

B. Search Results from U.S. Application to EPO - Unless box B in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the EPO access to the bibliographic data and search results from the instant patent application when a European patent application claiming priority to the instant patent application is filed. See 37 CFR 1.14(h)(2).

The applicant is reminded that the EPO's Rule 141(1) EPC (European Patent Convention) requires applicants to submit a copy of search results from the instant application without delay in a European patent application that claims priority to the instant application.

2. Opt-Out of Authorizations to Permit Access by a Foreign Intellectual Property Office(s)

☐ A. Applicant **DOES NOT** authorize the USPTO to permit a participating foreign IP office access to the instant application-as-filed. If this box is checked, the USPTO will not be providing a participating foreign IP office with any documents and information identified in subsection 1A above.

☐ B. Applicant **DOES NOT** authorize the USPTO to transmit to the EPO any search results from the instant patent application. If this box is checked, the USPTO will not be providing the EPO with search results from the instant application.

NOTE: Once the application has published or is otherwise publicly available, the USPTO may provide access to the application in accordance with 37 CFR 1.14.

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PTO/AIA/14 (11-15)
Approved for use through 04/30/2017. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	024607-02-5119-US
	Application Number	
Title of Invention	LITHIUM-ION BATTERY HAVING DESIRABLE SAFETY PERFORMANCE	

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Applicant 1

If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.

Clear

◉ Assignee	○ Legal Representative under 35 U.S.C. 117	○ Joint Inventor
○ Person to whom the inventor is obligated to assign.	○ Person who shows sufficient proprietary interest	

If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:

Name of the Deceased or Legally Incapacitated Inventor:

If the Applicant is an Organization check here. ☒

Organization Name	NINGDE AMPEREX TECHNOLOGY LIMITED		
Mailing Address Information For Applicant:			
Address 1	No. 1, Xingang Road		
Address 2	Zhangwan Town, Jiaocheng Zone		
City	Ningde	**State/Province**	FJ
Country	CN	Postal Code	352100
Phone Number		Fax Number	
Email Address			

Additional Applicant Data may be generated within this form by selecting the Add button.

Assignee Information including Non-Applicant Assignee Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

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Approved for use through 04/30/2017. OMB 0651-0032
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	024607-02-5119-US
	Application Number	
Title of Invention	LITHIUM-ION BATTERY HAVING DESIRABLE SAFETY PERFORMANCE	

Assignee 1

Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.

If the Assignee or Non-Applicant Assignee is an Organization check here. ☐

Prefix	**Given Name**	Middle Name	**Family Name**	Suffix

Mailing Address Information For Assignee including Non-Applicant Assignee:

Address 1			
Address 2			
City		**State/Province**	
Country i		Postal Code	
Phone Number		Fax Number	
Email Address			

Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button.

Signature:

NOTE: This Application Data Sheet must be signed in accordance with 37 CFR 1.33(b). **However, if this Application Data Sheet is submitted with the INITIAL filing of the application and either box A or B is not checked in subsection 2 of the "Authorization or Opt-Out of Authorization to Permit Access" section, then this form must also be signed in accordance with 37 CFR 1.14(c).**

This Application Data Sheet **must** be signed by a patent practitioner if one or more of the applicants is a **juristic entity** (e.g., corporation or association). If the applicant is two or more joint inventors, this form must be signed by a patent practitioner, **all** joint inventors who are the applicant, or one or more joint inventor-applicants who have been given power of attorney (e.g., see USPTO Form PTO/AIA/81) on behalf of **all** joint inventor-applicants.

See 37 CFR 1.4(d) for the manner of making signatures and certifications.

Signature	/Yalei Sun/			Date (YYYY-MM-DD)	2022-05-17
First Name	Yalei	Last Name	Sun	Registration Number	57765

Additional Signature may be generated within this form by selecting the Add button.

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PTO/AIA/14 (11-15)
Approved for use through 04/30/2017. OMB 0651-0032
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Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	024607-02-5119-US
	Application Number	
Title of Invention	LITHIUM-ION BATTERY HAVING DESIRABLE SAFETY PERFORMANCE	

This collection of information is required by 37 CFR 1.76. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent CooperationTreaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Acknowledgement Receipt

EFS ID:	45863446
Application Number:	17746755
International Application Number:	
Confirmation Number:	8911
Title of Invention:	LITHIUM-ION BATTERY HAVING DESIRABLE SAFETY PERFORMANCE
First Named Inventor/Applicant Name:	Tao TAO
Customer Number:	24341
Filer:	Yalei Sun
Filer Authorized By:	
Attorney Docket Number:	024607-02-5119-US
Receipt Date:	02-JUN-2022
Filing Date:	17-MAY-2022
Time Stamp:	20:11:12
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Request for Corrected Filing Receipt	024607-02-5119-US_Request_for_Corrected_Filing_Receiptv2.pdf	4923891 2da7d96526f6a9b3798c2c297bcedd803ee534a3	no	13
Warnings:					

Information:	
Total Files Size (in bytes):	4923891

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
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Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
17/746,755	05/17/2022	1726	1820	024607-02-5119-US	19	2

CONFIRMATION NO. 8911

CORRECTED FILING RECEIPT

24341
Morgan, Lewis & Bockius LLP (PA)
1400 Page Mill Road
Palo Alto, CA 94304-1124

OC000000134294514

Date Mailed: 06/06/2022

Receipt is acknowledged of this non-provisional utility patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF FIRST INVENTOR, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection.

Please verify the accuracy of the data presented on this receipt. If an error is noted on this Filing Receipt, please submit a written request for a corrected Filing Receipt, including a properly marked-up ADS showing the changes with strike-through for deletions and underlining for additions. If you received a "Notice to File Missing Parts" or other Notice requiring a response for this application, please submit any request for correction to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections provided that the request is grantable.

Inventor(s)

Tao TAO, Ningde, CHINA;
Ming Liang MO, Ningde, CHINA;

Applicant(s)

NINGDE AMPEREX TECHNOLOGY LIMITED, Ningde, CHINA;

Power of Attorney: The patent practitioners associated with Customer Number 24341

Domestic Priority data as claimed by applicant

This application is a CON of 17/407,081 08/19/2021
which is a CON of 16/113,938 08/27/2018 ABN
which is a CON of 14/596,873 01/14/2015 PAT 10541441

Foreign Applications (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.)
CHINA 201420030319.4 01/17/2014 No Access Code Provided

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

If Required, Foreign Filing License Granted: 05/24/2022

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 17/746,755**

Projected Publication Date: 09/01/2022

Non-Publication Request: No

Early Publication Request: No

Title

LITHIUM-ION BATTERY HAVING DESIRABLE SAFETY PERFORMANCE

Preliminary Class

429

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at http://www.uspto.gov/web/offices/pac/doc/general/index.html.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, http://www.stopfakes.gov. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

LICENSE FOR FOREIGN FILING UNDER

Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

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The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign AssetsControl, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

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The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The U.S. offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to promote and facilitate business investment. SelectUSA provides information assistance to the international investor community; serves as an ombudsman for existing and potential investors; advocates on behalf of U.S. cities, states, and regions competing for global investment; and counsels U.S. economic development organizations on investment attraction best practices. To learn more about why the United States is the best country in the world to develop technology, manufacture products, deliver services, and grow your business, visit http://www.SelectUSA.gov or call +1-202-482-6800.

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United States Patent and Trademark Office
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Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/746,755	05/17/2022	Tao TAO	024607-02-5119-US	8911

24341 7590 06/23/2022

Morgan, Lewis & Bockius LLP (PA)
1400 Page Mill Road
Palo Alto, CA 94304-1124

EXAMINER	
CENTRAL, DOCKET	

ART UNIT	PAPER NUMBER
1726	

NOTIFICATION DATE	DELIVERY MODE
06/23/2022	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

padocketingdepartment@morganlewis.com
vskliba@morganlewis.com

Decision Granting Request for Prioritized Examination (Track I)	**Application No.** 17/746,755	**Applicant(s)** TAO et al.	
	Examiner FIKIRTE A GEREMEW	**Art Unit** OMBL	**AIA (FITF) Status** Yes

1. THE REQUEST FILED 17 May 2022 IS **GRANTED** .

The above-identified application has met the requirements for prioritized examination

A. ☑ for an original nonprovisional application (Track I).
B. ☐ for an application undergoing continued examination (RCE).

2. **The above-identified application will undergo prioritized examination**. The application will be accorded special status throughout its entire course of prosecution until one of the following occurs:

A. filing a **petition for extension of time** to extend the time period for filing a reply;

B. filing an **amendment to amend the application to contain more than four independent claims, more than thirty total claims** , or a multiple dependent claim;

C. filing a **request for continued examination** ;

D. filing a notice of appeal;

E. filing a request for suspension of action;

F. mailing of a notice of allowance;

G. mailing of a final Office action;

H. completion of examination as defined in 37 CFR 41.102; or

I. abandonment of the application.

Telephone inquiries with regard to this decision should be directed to FIKIRTE GEREMEW at (703) 756-1930. In his/her absence, calls may be directed to Petition Help Desk at (571) 272-3282.

/FIKIRTE A GEREMEW/ PROGRAM SUPPORT ASSISTANT, OMBL	

INFORMATION DISCLOSURE STATEMENT BY APPLICANT Substitute for Form 1449-PTO				*Electronically filed July 26, 2022*	
				Application Number	*17/746,755*
				Filing Date	*May 17, 2022*
				First Named Inventor	*Tao TAO*
				Art Unit	*1721*
				Examiner Name	*Barton, Jason Aaron*
Sheet	1	of	2	Attorney Docket Number	*024607-02-5119-US*

U.S. PATENT DOCUMENTS					
Examiner Initials	Cite No.	Document Number Number - Kind Code	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		5,017,442 A	05-21-1991	Watanabe et al.	
		5,478,668 A	12-26-1995	Gozdz et al.	
		6,551,143 B2	04-22-2003	Tanaka et al.	
		6,100,114	08-08-2000	Milkovich et al.	
		2001/0036574 A1	11-01-2001	Fukuda et al.	
		2007/0122714 A1	05-31-2007	Suzuki et al.	
		2009/0035638 A1	02-05-2009	Tsai et al.	

FOREIGN PATENT DOCUMENTS						
Examiner Initials	Cite No.	Foreign Patent Document Country Code – Number - Kind Code *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T
		CN101939873A	01-05-2011	SK ENERGY CO LTD		
		CN103066239A	04-24-2013	RESEARCH IN MOTION LTD		
		CN1221054C	09-28-2005	NANFU BATTERY CO LTD NANPING C [CN]		
		CN1350350A	05-22-2002	TEISHINA ELECTRONICS AMP CO LT [JP]		
		CN201087907Y	07-16-2008	Ke et al.		
		CN202495523U	10-17-2012	Shufa et al.		
		JPH0513064A	01-22-1993	SANYO ELECTRIC CO		
		JP1999317218A - JPH11317218A	11-16-1999	TOYOTA CENTRAL RES & DEV		
		JP1993013064A - JPH0713064A	01-17-1995	OLYMPUS OPTICAL CO		
		JP2000-277155A	10-06-2000	HITACHI LTD		
		JP2003132875A	05-09-2003	MATSUSHITA ELECTRIC IND CO LTD		

NON PATENT LITERATURE DOCUMENTS

Examiner Signature		Date Considered	

INFORMATION DISCLOSURE STATEMENT BY APPLICANT Substitute for Form 1449-PTO				***Electronically filed July 26, 2022***	
				Application Number	***17/746,755***
				Filing Date	***May 17, 2022***
				First Named Inventor	***Tao TAO***
				Art Unit	***1721***
				Examiner Name	***Barton, Jason Aaron***
Sheet	2	of	2	Attorney Docket Number	***024607-02-5119-US***

Examiner Initials	Cite No.	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published
		Evaluation Report of Utility Model Patent, ZL2014200303194, 24DEC2019, 5 pgs.
		Tao, Office Action, US14/596,873, 04APR2017, 14 pgs.
		Tao, Final Office Action, US14/596,873, 22NOV2017, 13 pgs.
		Tao, Office Action, US14/596,873, 19APR2018, 13 pgs.
		Tao, Final Office Action, US14/596,873, 05DEC2018, 13 pgs.
		Tao, Office Action, US14/596,873, 22MAR2019, 14 pgs.
		Tao, Notice of Allowance, US14/596,873, 25NOV2019, 7 pgs.
		Tao, Office Action, US16/113,938, 16AUG2019, 15 pgs.
		Tao, Office Action, US16/113,938, 13FEB2020, 23 pgs.
		Tao, Office Action, US16/113,938, 02NOV2020, 14 pgs.
		Tao, Final Office Action, US16/113,938, 20MAY2021, 18 pgs.
		Tao, Advisory Action, US16/113,938, 02AUG2021, 3 pgs.
		Machine English translation of CN202495523U (Year: 2012)

Examiner Signature		Date Considered	

Electronic Acknowledgement Receipt

EFS ID:	46278713
Application Number:	17746755
International Application Number:	
Confirmation Number:	8911
Title of Invention:	LITHIUM-ION BATTERY HAVING DESIRABLE SAFETY PERFORMANCE
First Named Inventor/Applicant Name:	Tao TAO
Customer Number:	24341
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Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		024607-02-5119-US_IDS.pdf	388568 4557ac6e660d7481f3974d4540b6a7d3bbe8c994	yes	6

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Transmittal Letter	1	4
	Information Disclosure Statement (IDS) Form (SB08)	5	6
Warnings:			
Information:			
	Total Files Size (in bytes):	388568	

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New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Electronically filed July 26, 2022

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application of:	Tao TAO et al.	Confirmation No.:	8911
Serial No.:	17/746,755	Art Unit:	1721
Filed:	May 17, 2022	Examiner:	Barton, Jason Aaron
For:	Lithium-Ion Battery Having Desirable Safety Performance	Attorney Docket No.:	024607-02-5119-US

INFORMATION DISCLOSURE STATEMENT

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In accordance with the duty of disclosure provisions of 37 C.F.R. §1.56, there is hereby provided certain information which the Examiner may consider material to the examination of the subject U.S. patent application. It is requested that the Examiner make this information of record if it is deemed material to the examination of the application.

1. Enclosures accompanying this Information Disclosure Statement are:

1a. ☒ A list of all patents, publications, applications, or other information submitted for consideration by the office.

1b. A legible copy of:

☐ Each foreign patent;

☐ Each publication or that portion which caused it to be listed on the PTO-1449;

☐ For each cited pending U.S. application, the application specification including the claims, and any drawing of the application, or portion of the application which caused it to be listed on the PTO-1449 including any claims directed to that portion;

☐ all other information or portion which caused it to be listed on the PTO-1449.

1c. ☐ An English language copy of search report(s) from a counterpart foreign application or PCT International Search Report.

1d. ☐ Explanations of relevancy (ATTACHMENT hereto) or English language abstracts of the non-English language publications.

2. ☒ This Information Disclosure Statement is filed under 37 C.F.R. §1.97(b):

☒ Within three months of the filing date of a national application other than a continued prosecution application under §1.53(d);

☐ Within three months of the date of entry of the national stage as set forth in §1.491 in an international application;

☐ Before the mailing of the first Office action on the merits;

☐ Before the mailing of a first Office action after the filing of a request for continued examination under §1.114.

3. ☐ This Information Disclosure Statement is filed under 37 C.F.R. §1.97(c) after the period specified in 37 C.F.R. §1.97(b), but before the mailing date of any of a final action under 37 C.F.R. §1.113, a notice of allowance under 37 C.F.R. §1.311 or an action that otherwise closes prosecution in the application.

(Check either Item 3a, 3b, 3c or 3d)

3a. ☐ The Certification Statement in Item 5 below is applicable. Accordingly, no fee is required.

3b. ☐ The $260 (large entity) fee set forth in 37 C.F.R. §1.17(p) in accordance with 37 C.F.R. §1.97(c) is to be charged to Morgan, Lewis & Bockius LLP Deposit Account No. 50-0310 (order no.).

3c. ☐ The $130 (small entity) fee set forth in 37 C.F.R. §1.17(p) in accordance with 37 C.F.R. §1.97(c) is to be charged to Morgan, Lewis & Bockius LLP Deposit Account No. 50-0310 (order no.).

3d. ☐ The $65 (micro entity) fee set forth in 37 C.F.R. §1.17(p) in accordance with 37 C.F.R. §1.97(c) is to be charged to Morgan, Lewis & Bockius LLP Deposit Account No. 50-0310 (order no.).

(Items 3b or 3c to be checked if any reference known for more than 3 months)

4. ☐ This Information Disclosure Statement is filed under 37 C.F.R. §1.97(d) after the period specified in 37 C.F.R. §1.97(c), but on or before the date of payment of the issue fee.

(Check Item 4a, and 4b, 4c or 4d)

4a. ☐ The Certification Statement in Item 5 below is applicable.

4b. ☐ The $260 (large entity) fee set forth in 37 C.F.R. §1.17(p) in accordance with 37 C.F.R. §1.97(c) is to be charged to Morgan, Lewis & Bockius LLP Deposit Account No. 50-0310 (order no.).

4c. ☐ The $130 (small entity) fee set forth in 37 C.F.R. §1.17(p) in accordance with 37 C.F.R. §1.97(c) is to be charged to Morgan, Lewis & Bockius LLP Deposit Account No. 50-0310 (order no.).

4d. ☐ The $65 (micro entity) fee set forth in 37 C.F.R. §1.17(p) in accordance with 37 C.F.R. §1.97(c) is to be charged to Morgan, Lewis & Bockius LLP Deposit Account No. 50-0310 (order no.).

5. ☐ Certification Statement (applicable if Item 3a or Item 4a is checked)

(Check either Item 5a, 5b, 5c or 5d)

5a. ☐ In accordance with 37 C.F.R. §1.97(e)(1), it is certified that each item of information contained in this information disclosure statement was first cited in a communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this Information Disclosure Statement.

5b. ☐ In accordance with 37 C.F.R. §1.97(e)(2), it is certified that no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 C.F.R. §1.56(c) more than three months prior to the filing of this information disclosure statement.

5c. ☐ Each item of information contained in this information disclosure statement was cited in a communication from a foreign patent office in a counterpart application, and the communication was not **received** by any individual designated in 37 C.F.R. §1.56(c) more than thirty days prior to the filing of this information disclosure statement.

5d. ☐ Pursuant to 37 C.F.R. §1.704(d), each item of information contained in this information disclosure statement was cited in a communication from a foreign patent office in a counterpart application, and the communication was not **received** by any individual designated in 37 C.F.R. §1.56(c) more than thirty days prior to the filing of this information disclosure statement.

6. ☒ Copies of each cited U.S. patent and each U.S. patent application publication are not enclosed pursuant to the USPTO OG Notice dated 05 August 2003 waiving the requirement under 37 C.F.R. 1.98(a)(2)(i) for U.S. patent applications filed after June 30, 2003.

7. ☒ This application is a continuation application under 37 C.F.R. §1.53(b) or (d).

(Check appropriate Items 7a, 7b and/or 7c)

7a. ☐ A Petition to Withdraw from issue under 37 C.F.R. §1.313(b)(5) is concurrently filed herewith.

7b. ☒ Copies of publications listed on Form PTO-1449 from prior application Serial No. **17/407,081**, filed on **August 19, 2021**, **16/.113,938**, filed on **August 27, 2018** and **14/596,873**, filed on **January 14, 2015**, of which this application claims priority under 35 U.S.C. §120, are not being submitted pursuant to 37 C.F.R. §1.98(d).

7c. ☐ Copies of the publications listed on the attached Form PTO-1449 that were not previously cited in prior application Serial No. , filed on , are provided

herewith.

8. ☐ This is a Supplemental Information Disclosure Statement. (Check Item 8a)

8a. ☐ This Supplemental Information Disclosure Statement under 37 C.F.R. §1.97(f) supplements the Information Disclosure Statement filed on . A bona fide attempt was made to comply with 37 C.F.R. §1.98, but inadvertent omissions were made. These omissions have been corrected herein. Accordingly, additional time is requested so that this Supplemental Information Disclosure Statement can be considered as if properly filed on .

9. ☐ In accordance with 37 C.F.R. §1.98, a concise explanation of what is presently understood to be the relevance of each non-English language publication is:

(Check Item 9a, 9b, or 9c)

9a. ☐ satisfied because all non-English language publications were cited on the enclosed English language copy of the PCT International Search Report or the search report from a counterpart foreign application indicating the degree of relevance found by the foreign office.

9b. ☐ set forth in the application.

9c. ☐ enclosed as an attachment hereto.

10. ☒ The Commissioner is authorized to charge any additional fee required or credit any overpayment for this Information Disclosure Statement and/or Petition to Morgan, Lewis & Bockius LLP Deposit Account No. 50-0310 (order no. 024607-02-5119-US).

11. ☒ No admission is made that the information cited in this Statement is, or is considered to be, material to patentability nor a representation that a search has been made (other than a search report of a foreign counterpart application or PCT International Search Report if submitted herewith). 37 C.F.R. §§1.97(g) and (h).

Respectfully submitted,

Date: July 26, 2022

/Yalei Sun/ 57,765

Yalei Sun (Reg. No.)
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/746,755	05/17/2022	Tao TAO	024607-02-5119-US	8911

24341 7590 07/28/2022

Morgan, Lewis & Bockius LLP (PA)
1400 Page Mill Road
Palo Alto, CA 94304-1124

EXAMINER	
BARTON, JASON AARON	

ART UNIT	PAPER NUMBER
1721	

NOTIFICATION DATE	DELIVERY MODE
07/28/2022	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

padocketingdepartment@morganlewis.com
vskliba@morganlewis.com

Office Action Summary	Application No. 17/746,755	Applicant(s) TAO et al.	
	Examiner JASON A BARTON	Art Unit 1721	AIA (FITF) Status Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☑ Responsive to communication(s) filed on 05/17/2022.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL.** 2b) ☑ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5) ☑ Claim(s) 1-19 is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6) ☐ Claim(s) _____ is/are allowed.

7) ☑ Claim(s) 1-19 is/are rejected.

8) ☐ Claim(s) _____ is/are objected to.

9) ☐ Claim(s) _____ are subject to restriction and/or election requirement

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to **PPHfeedback@uspto.gov.**

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☑ The drawing(s) filed on 05/17/2022 is/are: a)☑ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☑ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☑ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☑ Certified copies of the priority documents have been received in Application No. 16/113,938.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☑ Notice of References Cited (PTO-892)

2) ☐ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date _____.

4) ☐ Other: _____.

DETAILED ACTION

Notice of Pre-AIA or AIA Status

1. The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

Information Disclosure Statement

2. An IDS was not filed in the present application. However, an IDS was filed in the parent application (17/407,081).

3. Applicant is reminded that when an IDS has not been considered in the parent application, the information submitted via IDS in the parent application must be resubmitted in the continuation application. See MPEP 609.02 §B.2. In the future, Applicant should submit information material to patentability that has not been considered in the parent application in compliance with the rules (37 C.F.R. §§1.97 and 1.98).

4. In this case, the parent application is being examined simultaneously with the present application, and the IDS placed in the parent application's folder has been considered in relation to this application.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103 which forms the basis for all obviousness rejections set forth in this Office action:

> A patent for a claimed invention may not be obtained, notwithstanding that the claimed invention is not identically disclosed as set forth in section 102, if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains. Patentability shall not be negated by the manner in which the invention was made.

6. The factual inquiries for establishing a background for determining obviousness under 35 U.S.C. 103 are summarized as follows:

1. Determining the scope and contents of the prior art.

2. Ascertaining the differences between the prior art and the claims at issue.

3. Resolving the level of ordinary skill in the pertinent art.

4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

7. This application currently names joint inventors. In considering patentability of the claims the examiner presumes that the subject matter of the various claims was commonly owned as of the effective filing date of the claimed invention(s) absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and effective filing dates of each claim that was not commonly owned as of the effective filing date of the later invention in order for the examiner to consider the applicability of 35 U.S.C. 102(b)(2)(C) for any potential 35 U.S.C. 102(a)(2) prior art against the later invention.

8. Claims 1-9 are rejected under 35 U.S.C. 103 as being unpatentable over Sugita (WO2013038677A1) in view of Matsushita (US20140120417A1; Matsushita is 102(a)(2) art) and Kwak (US20060051662A1).

9. **Regarding claim 1**, Sugita teaches a lithium-ion battery ([001]-[002]), comprising:

a first plate (positive electrode plate 1a, FIG. 2a; [029]) comprising a first current collector (see [027]), a first film (the term is understood to mean "active material"; the active material is coated on the current collector, see [027]; FIG. 2a shows the "film" as the dark portion (no reference sign is provided)) and a first lead (collector tab 12, FIG. 2A; [029]),

wherein the first film is disposed on the first current collector (see [027]) and is provided with a first recess (exposed portion 22, FIG. 2A; [027]) configured to receive the first lead (see FIG. 2a), and the first lead is electrically connected to the first current collector (see FIG. 2a; the structure is inherently present since a "collector tab" is necessarily electrically connected to the current collector);

a second plate (negative electrode plate 2a, FIG. 13; [030], [056]) comprising a second current collector (see [027]), a second film (the active material is coated on the collector, see [027]) and a second lead (negative electrode lead 6, FIG. 2b; [027]),

wherein the second film is disposed on the second current collector and is provided with a second recess (exposed portion 31, FIG. 2b) configured to receive the second lead (see FIG. 2b), and the second lead is electrically connected to the second current collector (the structure is inherently present since a "collector tab" is necessarily electrically connected to the current collector); and

a separator (separator 3, FIG. 1; [069]) disposed between the first plate and the second plate (see FIG. 1);

wherein a length of a portion of the first lead in the first recess is less than a width of a remaining portion of the first film from an edge of the first insulating glue layer covering the first film to an edge of the first film opposite to the first recess (see FIG. 2a; since the length of the alleged first lead covers ~1/4 of the width of the current collecting plate (top-to-bottom), the limitation is held to be met).

Sugita does not teach (limitation 1) a first insulating glue layer, disposed on a first location of a surface of the first lead or (limitation 2) a second insulating glue layer is disposed on a second

location of the surface of the first film corresponding to the second lead in a thickness direction of the first plate and the second plate.

However, Matsushita teaches the deficient limitation 1. Matsushita relates to electrodes having exposed portions with a lead bonded thereto (abstract) and is thus analogous art.

Matsushita teaches an electrode (any of embodiments of Figs 4-7, see, e.g., Fig. 4a) having a recessed portion (non-coated portion 21b) with an electrode lead (lead 25) disposed in the recessed portion. The electrode lead (lead 25) is covered with an insulating glue (e.g., resin tape of protective tape 27, see [0052]). Thus Matsushita teaches a first insulating glue layer, disposed on a first location of a surface of the first lead.

Furthermore, Kwak teaches deficient limitation 2. Kwak relates to a wound electrode assembly (FIG. 6) that prevents short circuiting (abstract) and is thus analogous art. Kwak teaches a second insulating glue layer (insulation tape 160a, FIG. 6, [0044]) corresponding to the second lead (second electrode tab 136) in a thickness direction of the first plate and the second plate (see FIGS. 4 and 6). See FIG. 6 in particular, which shows that the second insulating glue layer 160a is disposed (indirectly) on the first film.

10. Thus, it would have been obvious before the effective filing date of the claimed invention to incorporated the insulating glue (protective tape 27) of Matsushita and the insulation tape (160a) of Kwak to Sugita to arrive at the claimed invention. In modifying Sugita with Matsushita, the person having ordinary skill in the art ("skilled person") would have arrived at the claimed invention wherein the lithium-ion battery comprises a first insulating glue layer, disposed on a first location of a surface of the first lead. The skilled person would have been motivated to do so in order to insulate the electrode lead and prevent thermal runaway of the battery when, for example, the separator or the like is split in an abnormal case (Matsushita, [0052]). In modifying

Sugita with Kwak, the skilled person would have arrived at the claimed invention wherein a second insulating glue layer is disposed on a second location of the surface of the first film corresponding to the second lead in a thickness direction of the first plate and the second plate. The skilled person would have been motivated to prevent short-circuiting between the first electrode plate 140 and the second electrode plate 130 (Kwak, [0056]).**Regarding claim 2**, Sugita in view of Matsushita and Kwak teach the lithium-ion battery of claim 1 as described above. Sugita also teaches wherein, the first plate is a positive plate, the first current collector is a positive current collector, the first film is a positive film, the first lead is a positive lead; and the second plate is a negative plate, the second current collector is a negative current collector, the second film is a negative film and the second lead is a negative lead. See claim mapping above.

11. **Regarding claim 3**, Sugita in view of Matsushita and Kwak teach the lithium-ion battery of claim 2 as described above. Sugita also teaches wherein a distance between a center of the first recess and an end of the positive film is 1/4 - 3/4 of a length of the positive film (see FIG. 2a and claim mapping above), and a distance between a center of the second recess and an end of the negative film is 1/4 - 3/4 of a length of the negative film (see FIG. 13 and claim mapping above).

12. **Regarding claim 4**, Sugita in view of Matsushita and Kwak teach the lithium-ion battery of claim 2 as described above. Sugita also teaches wherein a distance between a center of the first recess and an end of the positive film is half of a length of the positive film, and a distance between a center of the second recess and an end of the negative film is half of a length of the negative film (see claim mapping above and FIGS. 2a and 13).

13. **Regarding claims 5, 6 and 8**, Sugita in view of Matsushita and Kwak teach the lithium-ion battery of claim 2 as described above.

None of Sugita, Matsushita, and Kwak teach wherein a length of the first recess is less than a length of the positive lead by 1 - 100mm, a width of the first recess is greater than a width of the positive lead by 1 - 10mm; and a length of the second recess is less than a length of the negative lead by 1 - 100mm, a width of the second recess is greater than a width of the negative lead by 1 - 10mm **(claim 5)**.

None of Sugita, Matsushita, and Kwak teach wherein a length of the first recess is less than a width of the positive film by 1 - 100mm, and a length of the second recess is less than a width of the negative film by 1 - 100mm **(claim 6)**.

Lastly, none of Sugita, Matsushita, and Kwak teach wherein a depth of the first recess is greater than a thickness of the positive lead by 0.005 - 0.1mm, and a depth of the second recess is greater than a thickness of the negative lead by 0.005 - 0.1mm **(claim 8)**.

However, it has been held that changes in size (dimension) are generally recognized as being within the level of ordinary skill in the art. *In re Rose*, 220 F.2d 459, 105 USPQ 237 (CCPA 1955). Where the only difference between the prior art and the claims is a recitation of relative dimensions of the claimed device, and the device having the claimed dimensions would not perform differently than the prior art device, the claimed device is not patentably distinct from the prior art device. *Gardner v. TEC Syst., Inc.*, 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), *cert. denied*, 469 U.S. 830, 225 USPQ 232 (1984).

In the instant case, it appears that the prior art device (i.e., the combination of Sugita and Matsushita) have the same claimed features and that any relative difference in size, dimensions, or proportions would not lead to device that performs differently from the claimed device. Moreover, the present claims cover very broad ranges (three orders of magnitude) and there is no indication in the specification that such broad ranges establish the criticality of the ranges. Thus, the claimed

device of claims 5, 6 and 8 is not patentably distinct from Sugita in view of Matsushita and Kwak. Accordingly, it would have been obvious before the effective filing date of the claimed invention to have arrived at the claimed invention of claims 5, 6 and 8 because changes in proportion (size) are within ordinary skill in the art.

14. **Regarding claim 7**, Sugita in view of Matsushita and Kwak teach the lithium-ion battery of claim 2 as described above. Sugita also necessarily teaches wherein a depth of the first recess is no larger than a thickness of the positive film, and a depth of the second recess is no larger than a thickness of the negative film. The recess portion are taught by Sugita as "exposed portions" (reference numeral 22, 31 or 32; it is noted the reference sign is not provided in FIG. 13 but is apparent from comparison of the other figures) and the undersigned understands this to be a non-coated portion (see [029]), meaning the depth of the recesses are approximately equal to the thickness of the positive/negative films. Thus, the limitation is inherently met.

15. **Regarding claim 9,** Sugita in view of Matsushita and Kwak teach the lithium-ion battery of claim 1 as described above.

Neither Sugita nor Matsushita teach wherein a width of a portion of the first lead in the first recess is greater than a width of a remaining portion of the first recess not occupied by the first lead located on one side of the first lead.

However, it has been held that changes in dimension are generally recognized as being within the level of ordinary skill in the art. *In re Rose,* 220 F.2d 459, 105 USPQ 237 (CCPA 1955). Where the only difference between the prior art and the claims is a recitation of relative dimensions of the claimed device, and the device having the claimed dimensions would not perform differently than the prior art device, the claimed device is not patentably distinct from the prior art device.

Gardner v. TEC Syst., Inc., 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), *cert. denied*, 469 U.S. 830, 225 USPQ 232 (1984).

In the instant case, it does not appear that there would be any difference between the claimed device and the prior art device of Sugita in view of Matsushita. For at least these reasons, it would have been obvious before the effective filing date of the claimed invention to have arrived at the claimed invention of claim 9 because changes in proportion are within ordinary skill in the art.

16. Claims 10-17 and 19 are rejected under 35 U.S.C. 103 as being unpatentable over Sugita (WO2013038677A1) in view of Matsushita (US20140120417A1).

17. **Regarding claim 10**, Sugita teaches a lithium-ion battery ([001]-[002]), comprising:

a first plate (positive electrode plate 1a, FIG. 2a; [029]) comprising a first current collector (see [027]), a first film (the term is understood to mean "active material"; the active material is coated on the current collector, see [027]; FIG. 2a shows the "film" as the dark portion (no reference sign is provided)) and a first lead (collector tab 12, FIG. 2A; [029]),

wherein the first film is disposed on the first current collector (see [027]) and is provided with a first recess (exposed portion 22, FIG. 2A; [027]) configured to receive the first lead (see FIG. 2a), and the first lead is electrically connected to the first current collector (see FIG. 2a; the structure is inherently present since a "collector tab" is necessarily electrically connected to the current collector), the first recess having three sides defined by the first film (see FIG. 2a, the first recess has three sides defined by the alleged first film);

a second plate (negative electrode plate 2a, FIG. 13; [030], [056]) comprising a second current collector (see [027]), a second film (the active material is coated on the collector, see [027]) and a second lead (negative electrode lead 6, FIG. 2b; [027]),

wherein the second film is disposed on the second current collector and is provided with a second recess (exposed portion 31, FIG. 2b) configured to receive the second lead (see FIG. 2b), and the second lead is electrically connected to the second current collector (the structure is inherently present since a "collector tab" is necessarily electrically connected to the current collector);

wherein a width of a portion of the first lead in the first recess is greater than a width of a remaining portion of the first recess not occupied by the first lead located on one side of the first lead (see FIG. 2a and discussion below); and

a separator (separator 3, FIG. 1; [069]) disposed between the first plate and the second plate (see FIG. 1).

Sugita does not teach (1) a first insulating glue layer, disposed on a first location of a first surface of the first lead and covering the three sides of the first recess defined by the first film.

However, Matsushita teaches the deficient limitation. Matsushita relates to electrodes having exposed portions with a lead bonded thereto (abstract) and is thus analogous art.

Matsushita teaches an electrode (any of embodiments of Figs 4-7, see, e.g., Fig. 4a) having a recessed portion (non-coated portion 21b) with an electrode lead (lead 25) disposed in the recessed portion. The electrode lead (lead 25) is covered with an insulating glue (e.g., resin tape of protective tape 27, see [0052]). The recessed portion has 4 sides and the insulating glue (protective tape 27) covers all four sides and covers the entirety of the portion of the electrode disposed in the recessed portion. Thus, Matsushita teaches a first insulating glue layer, disposed

on a first location of a first surface of the first lead and covering the three sides of the first recess defined by the first film.

It would have been obvious before the effective filing date of the claimed invention to incorporated the insulating glue (protective tape 27) of Matsushita to the electrode leads of Sugita to arrive at the claimed invention wherein the lithium-ion battery comprises a first insulating glue layer, disposed on a first location of a first surface of the first lead and covering the three sides of the first recess defined by the first film. The skilled person would have been motivated to do so in order to insulate the electrode lead and prevent thermal runaway of the battery when, for example, the separator or the like is split in an abnormal case ([0052]).

It is also believed that Sugita teaches, "wherein a width of a portion of the first lead in the first recess is greater than a width of a remaining portion of the first recess not occupied by the first lead located on one side of the first lead." While the claim language is verbose, it is believed that the intent of the was to claim that the recess is wider than the lead. The claim is interpreted in this manner and in this interpretation, the claim limitation is clearly met (see FIG. 2a of Sugita), and the lead would not fit into the recess if this were not true.

18. **Regarding claim 11**, Sugita in view of Matsushita teach the lithium-ion battery of claim 10 as described above. Sugita also teaches wherein, the first plate is a positive plate, the first current collector is a positive current collector, the first film is a positive film, the first lead is a positive lead; and the second plate is a negative plate, the second current collector is a negative current collector, the second film is a negative film and the second lead is a negative lead. See claim mapping above.

19. **Regarding claim 12,** Sugita in view of Matsushita teach the lithium-ion battery of claim 10 as described above. Sugita also teaches wherein a distance between a center of the first recess

and an end of the positive film is 1/4 - 3/4 of a length of the positive film (see FIG. 2a and claim mapping above), and a distance between a center of the second recess and an end of the negative film is 1/4 - 3/4 of a length of the negative film (see FIG. 13 and claim mapping above).

20. **Regarding claim 13,** Sugita in view of Matsushita teach the lithium-ion battery of claim 10 as described above. Sugita also teaches wherein a distance between a center of the first recess and an end of the positive film is half of a length of the positive film, and a distance between a center of the second recess and an end of the negative film is half of a length of the negative film (see claim mapping above and FIGS. 2a and 13).

21. **Regarding claims 14, 15 and 17,** Sugita in view of Matsushita teach the lithium-ion battery of claim 10 as described above.

Neither Sugita nor Matsushita teach wherein a length of the first recess is less than a length of the first lead by 1 – 100 mm, a width of the first recess is greater than a width of the first lead by 1 - 10mm, and a length of the second recess is less than a length of the second lead by 1 - 100mm, a width of the second recess is greater than a width of the second lead by 1 – 10 mm **(claim 14)**.

Neither Sugita nor Matsushita teach wherein a length of the first recess is less than a width of the first film by 1 - 100mm, and a length of the second recess is less than a width of the second film by 1 - 100mm **(claim 15)**.

Lastly, neither Sugita nor Matsushita teach wherein a depth of the first recess is greater than a thickness of the first lead by 0.005 - 0.1mm, and a depth of the second recess is greater than a thickness of the second lead by 0.005 - 0.1mm **(claim 17)**.

However, it has been held that changes in size (dimension) are generally recognized as being within the level of ordinary skill in the art. *In re Rose,* 220 F.2d 459, 105 USPQ 237 (CCPA

1955). Where the only difference between the prior art and the claims is a recitation of relative dimensions of the claimed device, and the device having the claimed dimensions would not perform differently than the prior art device, the claimed device is not patentably distinct from the prior art device. *Gardner v. TEC Syst., Inc.*, 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), *cert. denied*, 469 U.S. 830, 225 USPQ 232 (1984).

In the instant case, it appears that the prior art device (i.e., the combination of Sugita and Matsushita) have the same claimed features and that any relative difference in size, dimensions, or proportions would not lead to device that performs differently from the claimed device. Moreover, the present claims cover very broad ranges (three orders of magnitude) and there is no indication in the specification that such broad ranges establish the criticality of the ranges. Thus, the claimed device of claims 14, 15 and 17 is not patentably distinct from Sugita in view of Matsushita. Accordingly, it would have been obvious before the effective filing date of the claimed invention to have arrived at the claimed invention of claims 14, 15 and 17 because changes in proportion (size) are within ordinary skill in the art.

22. **Regarding claim 16**, Sugita in view of Matsushita teach the lithium-ion battery of claim 10 as described above. Sugita also necessarily teaches wherein a depth of the first recess is no larger than a thickness of the positive film, and a depth of the second recess is no larger than a thickness of the negative film. The recess portion are taught by Sugita as "exposed portions" (reference numeral 22, 31 or 32; it is noted the reference sign is not provided in FIG. 13 but is apparent from comparison of the other figures) and the undersigned understands this to be a non-coated portion (see [029]), meaning the depth of the recesses are approximately equal to the thickness of the positive/negative films. Thus, the limitation is inherently met.

23. **Regarding claim 19,** Sugita in view of Matsushita teach the lithium-ion battery of claim 10 as described above. Sugita in view of Matsushita also necessarily teaches wherein the first insulating glue layer is disposed on an upper surface and below a lower surface of the first lead in a thickness direction of the first plate and the second plate ("[a] protective tape 27 covers, on the one main surface side of the positive electrode current collector 21A, the positive electrode current collector exposed surface 21a, the lead 25, and the protective layer 28, and, on the other main surface side of the positive electrode current collector 21A, the positive electrode current collector exposed surface 21" (Matsushita, [0052])).

24. Claim 18 is rejected under 35 U.S.C. 103 as being unpatentable over Sugita (WO2013038677A1) in view of Matsushita (US20140120417A1), and further in view of Lee (US20110027636A1).

25. **Regarding claim 18,** Sugita in view of Matsushita teach the lithium-ion battery of claim 10 as described above.

Sugita does not teach wherein a pair of second insulating glues are disposed on two opposing sides of the first film at a first location and a second location, respectively, wherein the second lead on the second plate is sandwiched between the pair of second insulating glue layers in a thickness direction of the first plate and the second plate.

However, Lee teaches the deficient limitations. Lee relates to a wound battery having an active material coating onto the current collectors (abstract) and is thus analogous art.

Lee teaches using a plurality of insulators (90a, 90b, 90c and 90d, see FIG. 1 and [0011]), of which the pairs of 90a + 90d and 90c + 90b satisfy the limitation of, "disposed on two opposing sides of the first film at a first location and a second location." Where a pair of insulators, or all of 90a-90d of the insulators of Lee are used with Sugita and Matsushita as described above, the

limitation of, "wherein the second lead on the second plate is sandwiched between the pair of second insulating glue layers in a thickness direction of the first plate and the second plate" would necessarily be met because the insulators are provided at opposing ends and on opposing surfaces.

Thus, it would have been obvious before the effective filing date of the claimed invention to have modified the lithium-ion battery of claim 10 as taught by Sugita and Matsushita with that of Lee to arrive at the claimed invention. The skilled person would have been motivated to prevent short circuit between the positive and negative electrodes ([0011]).

Conclusion

26. Any inquiry concerning this communication or earlier communications from the examiner should be directed to JASON AARON BARTON whose telephone number is (571)270-3551. The examiner can normally be reached 9:00 AM to 5:00 PM.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Allison Bourke can be reached on (303)297-4684. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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/JASON BARTON/
Examiner, Art Unit 1721

/WILLIAM E MCCLAIN/
Primary Examiner, Art Unit 1721

Notice of References Cited	Application/Control No. 17/746,755	Applicant(s)/Patent Under Reexamination TAO et al.	
	Examiner JASON A BARTON	Art Unit 1721	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-20140120417-A1	05-2014	Matsushita; Tadashi	H01M50/534	429/211
*	B	US-20110027636-A1	02-2011	Lee; Jin Soo	H01M10/0431	429/94
*	C	US-20060051662-A1	03-2006	Kwak; Yoon Tai	H01M10/0431	429/130
	D					
	E					
	F					
	G					
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	I					
	J					
	K					
	L					
	M					

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N	WO-2013038677-A1	03-2013	WO	ENDO K	H01M10/0587
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	Machine translation of WO2013038677A1 (Year: 2013)
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/746,755	TAO et al.
	Examiner	Art Unit
	JASON A BARTON	1721

CPC - Searched*		
Symbol	**Date**	**Examiner**
H01M10/0431	07/14/2022	JB
H01M10/0587	07/14/2022	JB
H01M50/531, 533, 538	07/14/2022	JB
H01M50/5$	07/14/2022	JB
H01M.cpcl.	07/14/2022	JB

CPC Combination Sets - Searched*		
Symbol	**Date**	**Examiner**

US Classification - Searched*			
Class	**Subclass**	**Date**	**Examiner**

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	**Date**	**Examiner**
Global dossier search	07/14/2022	JB
Applicant and inventor search in SEARCH	07/14/2022	JB
CPC and CPC-limited text search in SEARCH	07/14/2022	JB
“More like this” searching in SEARCH and IP.COM	07/14/2022	JB

/JASON BARTON/ Examiner, Art Unit 1721	

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/746,755	TAO et al.
	Examiner	Art Unit
	JASON A BARTON	1721

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner

/JASON BARTON/ Examiner, Art Unit 1721	



17746755

Report Run Date: 2022-07-15 UTC
Searches: 15
Markers: 1

Search #	Timestamp	Results	Page
1	2022-07-12 23:31 UTC	~27,652,907	4
2	2022-07-12 23:33 UTC	~27,652,907	4
3	2022-07-12 23:33 UTC	~27,652,907	4
4	2022-07-12 23:36 UTC	~2,345,469	4
5	2022-07-12 23:36 UTC	~239,658	4
6	2022-07-12 23:37 UTC	~35,161	5
7	2022-07-12 23:37 UTC	~13,875	5
8	2022-07-12 23:38 UTC	~8835	5
9	2022-07-13 15:43 UTC	~26,331	5
10	2022-07-13 15:43 UTC	~26,326	5
11	2022-07-13 17:26 UTC	~255	6
12	2022-07-13 17:29 UTC	13	6
13	2022-07-15 15:47 UTC	13	6
14	2022-07-15 15:47 UTC	~408	6
15	2022-07-15 19:38 UTC	~231	7

Content: Patents + NPL (190)

US Patents | US Designs | US Applications | EPO Patents | EPO Applications | China Patents | China Applications | Japan Patents | Japan Applications | Korea Patents | Korea Applications | WIPO Applications | Argentina Patents | Argentina Applications | Brazil Patents | Brazil Applications | Canada Patents | Canada Applications | Chile Patents | Chile Applications | Colombia Applications | Costa Rica Applications | Cuba Patents | Cuba Applications | Dominican Republic Applications | Ecuador Patents | Ecuador Applications | El Salvador Applications | Guatemala Applications | Honduras Applications | Mexico Patents | Mexico Applications | Nicaragua Patents | Panama Applications | Peru Applications | Trinidad & Tobago Patents | Uruguay Applications | Austria Patents | Austria Applications | Belarus Patents | Belgium Patents | Belgium Applications | Bosnia & Herzegovina Patents | Bosnia & Herzegovina Applications | Bulgaria Patents | Bulgaria Applications | Croatia Patents | Croatia Applications | Czech Republic Patents | Czech Republic Applications | Czechoslovakia Patents | Czechoslovakia Applications | Denmark Patents | Denmark Applications | Estonia Patents | Estonia Applications | EUIPO Patents | Finland Patents | Finland Applications | France Patents | France Applications | Germany Patents | Germany Applications | Great Britain Patents | Great Britain Applications | Greece Patents | Greece Applications | Hungary Patents | Hungary Applications | Iceland Patents | Iceland Applications | Ireland Patents | Ireland Applications | Italy Patents | Italy Applications | Latvia Patents | Latvia Applications | Lithuania Patents | Lithuania Applications | Luxembourg Patents | Malta Patents | Monaco Patents | Montenegro Patents | Montenegro Applications | Netherlands Patents | Netherlands Applications | Norway Patents | Norway Applications | Poland Patents | Poland Applications | Portugal Patents | Portugal Applications | Republic of Moldova Patents | Republic of Moldova Applications | Romania Patents | Romania Applications | San Marino Patents | San Marino Applications | Serbia Patents | Serbia Applications | Slovakia Patents | Slovakia Applications | Slovenia Patents | Spain Patents | Spain Applications | Sweden Patents | Sweden Applications | Switzerland Patents | Switzerland Applications | Ukraine Patents | Yugoslavia/Serbia and Montenegro Patents | Yugoslavia/Serbia and Montenegro Applications | Armenia Patents | Australia Patents | Australia Applications | Cyprus Patents | Gulf Cooperation Council Patents | Hong Kong Patents | India Patents | India Applications | Indonesia Patents | Indonesia Applications | Israel Applications | Jordan Patents | Jordan Applications | Kyrgyzstan Patents | Macao Applications | Malaysia Patents | Mongolia Patents | New Zealand Patents | Philippines Patents | Philippines Applications | Saudi Arabia Patents | Saudi Arabia Applications | Singapore Patents | Singapore Applications | Taiwan Patents | Taiwan Applications | Tajikistan Patents | Tajikistan Applications | Thailand Patents | Thailand Applications | Uzbekistan Patents | Vietnam Patents | Algeria Patents | ARIPO Patents | ARIPO Applications | Egypt Patents | Kenya Patents | Malawi Patents | Morocco Patents | Morocco Applications | OAPI Patents | South Africa Patents | Tunisia Applications | Zambia Patents | Zimbabwe Patents | EAPO Patents | EAPO Applications | Georgia Patents | Georgia Applications | Kazakhstan Patents | Kazakhstan Applications | Russia Patents | Russia Applications | Turkey Patents | Turkey Applications | IEEE Xplore Publications: IEEE Periodicals | IEEE Xplore Publications: IEEE Conferences | IEEE Xplore Publications: IEEE Standards | IEEE Xplore Publications: IEEE Early Access | IEEE Xplore Publications: SMPTE Periodicals | IEEE Xplore Publications: SMPTE Conferences | IEEE Xplore Publications: SMPTE Standards | IEEE Xplore Publications: MIT Press eBooks | IEEE Xplore Publications: Wiley-IEEE eBooks | IEEE Xplore Publications: IBM Periodicals | IEEE Xplore Publications: URSI Periodicals | IEEE Xplore Publications: VDE Conferences | IEEE Xplore Publications: Periodicals from China | IP.com Prior Art Database: The IP.com Journal | IP.com Prior Art Database: Internet Society RFC | IP.com Prior Art Database: IBM TDB Archive | IP.com Prior Art Database: Legacy Journals | IP.com Prior Art Database: Software Patent Institute | OnePetro.org: Periodicals at OnePetro.org | OnePetro.org: Conferences at OnePetro.org | Other Literature: IBM Redbooks | Other Literature: PubMed Central | Other Literature: arXiv.org

1 **2022-07-12 23:31 UTC | ~27,652,907 results from**

De-Dup: Extended Family Numbers (PAT only) | **Cut-off:** None | **Sort:** Relevance

Main Concept: Document
US20150207111 Lithium ion battery having desirable safety performance (view)

Concept Modifiers: None

Filters: None

2 **2022-07-12 23:33 UTC | ~27,652,907 results from**

De-Dup: Extended Family Numbers (PAT only) | **Cut-off:** None | **Sort:** Relevance

Main Concept: Same as Search 1

Concept Modifiers (1):
1. More Like Document: US20150207111 Lithium ion battery having desirable safety performance (view)

Filters: None

3 **2022-07-12 23:33 UTC | ~27,652,907 results from**

De-Dup: Extended Family Numbers (PAT only) | **Cut-off:** None | **Sort:** Relevance

Main Concept: Same as Search 1

Concept Modifiers: Same as Search 2

Filters: None

4 **2022-07-12 23:36 UTC | ~2,345,469 results from**

De-Dup: Extended Family Numbers (PAT only) | **Cut-off:** None | **Sort:** Relevance

Main Concept: Text
recess and electrode lead or tab

Concept Modifiers: Same as Search 2

Filters: None

5 **2022-07-12 23:36 UTC | ~239,658 results from**

De-Dup: Extended Family Numbers (PAT only) | **Cut-off:** None | **Sort:** Relevance

Main Concept: Same as Search 4

Concept Modifiers (2):
2. More Like Text: insulating glue or tape or adhesive
1. More Like Document: US20150207111 Lithium ion battery having desirable safety performance (view)

Filters: None

6 **2022-07-12 23:37 UTC | ~35,161 results from**

De-Dup: Extended Family Numbers (PAT only) | **Cut-off:** None | **Sort:** Relevance

Main Concept: Same as Search 4

Concept Modifiers (3):
3. More Like Text: wound battery or strip-shaped
2. More Like Text: insulating glue or tape or adhesive
1. More Like Document: US20150207111 Lithium ion battery having desirable safety performance (view)

Filters: None

7 **2022-07-12 23:37 UTC | ~13,875 results from**

De-Dup: Extended Family Numbers (PAT only) | **Cut-off:** None | **Sort:** Relevance

Main Concept: Same as Search 4

Concept Modifiers: Same as Search 6

Filters (1):
Publication Date: To 2014-01-17

8 **2022-07-12 23:38 UTC | ~8835 results from**

De-Dup: Extended Family Numbers (PAT only) | **Cut-off:** None | **Sort:** Relevance

Main Concept: Same as Search 4

Concept Modifiers (3):
3. More Like Text: wound or strip-shaped or cylindrical
2. More Like Text: insulating glue or tape or adhesive
1. More Like Document: US20150207111 Lithium ion battery having desirable safety performance (view)

Filters: Same as Search 7

9 **2022-07-13 15:43 UTC | ~26,331 results from**

De-Dup: Extended Family Numbers (PAT only) | **Cut-off:** None | **Sort:** Relevance

Main Concept: Document
US20140349179 Secondary battery (view)

Concept Modifiers: Same as Search 8

Filters: Same as Search 7

10 **2022-07-13 15:43 UTC | ~26,326 results from**

De-Dup: Extended Family Numbers (PAT only) | **Cut-off:** None | **Sort:** Relevance

Main Concept: Same as Search 9

Concept Modifiers (4):
4. More Like Document: US20140349179 Secondary battery (view)
3. More Like Text: wound or strip-shaped or cylindrical
2. More Like Text: insulating glue or tape or adhesive
1. More Like Document: US20150207111 Lithium ion battery having desirable safety performance (view)

Filters: Same as Search 7

11 **2022-07-13 17:26 UTC | ~255 results from**

De-Dup: Extended Family Numbers (PAT only) | **Cut-off:** None | **Sort:** Relevance

Main Concept: Text
recessed portion

Concept Modifiers: Same as Search 10

Filters: Same as Search 7

12 **2022-07-13 17:29 UTC | 13 results from**

De-Dup: Extended Family Numbers (PAT only) | **Cut-off:** None | **Sort:** Relevance

Main Concept: Same as Search 11

Concept Modifiers (5):
5. More Like Text: energy density
4. More Like Document: US20140349179 Secondary battery (view)
3. More Like Text: wound or strip-shaped or cylindrical
2. More Like Text: insulating glue or tape or adhesive
1. More Like Document: US20150207111 Lithium ion battery having desirable safety performance (view)

Filters: Same as Search 7

13 **2022-07-15 15:47 UTC | 13 results from**

De-Dup: Extended Family Numbers (PAT only) | **Cut-off:** None | **Sort:** Relevance

Main Concept: Same as Search 11

Concept Modifiers: Same as Search 12

Filters: Same as Search 7

14 **2022-07-15 15:47 UTC | ~408 results from**

De-Dup: Extended Family Numbers (PAT only) | **Cut-off:** None | **Sort:** Relevance

Main Concept: Text
insulating polymer for electrode lead

Concept Modifiers: Same as Search 12

Filters: Same as Search 7

16 **2022-07-15 19:38 UTC | ~231 results from**

De-Dup: Extended Family Numbers (PAT only) | **Cut-off:** None | **Sort:** Relevance

Main Concept: Text
pair of adhesive tape

Concept Modifiers: Same as Search 12

Filters: Same as Search 7

Bibliographic Data

Application No: 17/746,755

Foreign Priority claimed: (•) Yes ( ) No

35 USC 119 (a-d) conditions met: [✓] Yes [ ] No [ ] Met After Allowance

Verified and Acknowledged: /JASON BARTON/ Examiner's Signature | Initials

Title: LITHIUM-ION BATTERY HAVING DESIRABLE SAFETY PERFORMANCE

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
05/17/2022	429	1721	024607-02-5119-US
RULE			

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CONTINUING DATA

This application is a CON of 17407081 08/19/2021

17407081 is a CON of 16113938 08/27/2018ABN

16113938 is a CON of 14596873 01/14/2015 PAT 10541441

FOREIGN APPLICATIONS

CHINA CN201420030319.4 01/17/2014

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05/24/2022

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(43) 国際公開日
2013 年 3 月 21 日 (21.03.2013)

WIPO PCT

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(30) 優先権データ：
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(81) 指定国 (表示のない限り、全ての種類の国内保護が可能)：AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, ML, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

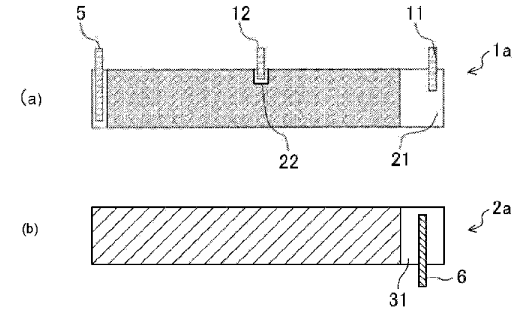
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添付公開書類：
- 国際調査報告 (条約第 21 条(3))

(54) Title: NONAQUEOUS ELECTROLYTE SECONDARY CELL

(54) 発明の名称：非水電解質二次電池

[図2]



(57) Abstract: In a nonaqueous electrolyte secondary cell of the present invention, an electrode group (4) on which are wound a positive electrode plate (1) and a negative electrode plate (2), obtained by coating a collector with an active substance layer, with a separator (3) therebetween, is housed in a cell casing (7). Of the positive electrode plate and the negative pole plate, the pole plate that is of the opposite polarity of the cell casing has at the outermost circumference of the electrode group a first collector exposed part (21) in which a collector of at least once winding is exposed, and a second collector exposed part (22) formed at a portion separated from the first collector exposed part. A first collector tab (11) is disposed in the first collector exposed part, and a second collector tab (12) is provided to the second collector exposed part. The first and second collector tabs are connected outside the electrode group.

(57) 要約：

[続葉有]

WO 2013/038677 A1

非水電解質二次電池は、集電体上に活物質層が塗着された正極板１及び負極板２が、セパレータ３を介して捲回された電極群４が電池缶７に収容され、正極板及び負極板のうち、電池缶と異極性の極板は、電極群の最外周側で、１周以上の集電体が露出した第１の集電体露出部２１と、第１の集電体露出部と離れた部位に形成された第２の集電体露出部２２とを有し、第１の集電体露出部に第１の集電タブ１１が設けられ、第２の集電体露出部に第２の集電タブ１２が設けられ、第１の集電タブ及び第２の集電タブは、電極群外で接続されている。

明　細　書

発明の名称　：非水電解質二次電池

技術分野

[0001] 本発明は、非水電解質二次電池の極板構造に関する。

背景技術

[0002] 近年、ノート型パーソナルコンピュータ、携帯電話等のポータブル機器の普及により、その電源である電池の需要が高まっている。特に、小型かつ軽量で、エネルギー密度が高く、繰り返し充放電が可能な二次電池の需要が高まっている。また、最近では、電動工具、ハイブリッドカー、電気自動車などの駆動用電源としての新しい需要が増加しつつある。

[0003] このような需要に対して、リチウムイオン二次電池に代表される非水電解質二次電池の研究開発が活発に行われている。非水電解質二次電池は、機器の高性能化及び高出力化に伴って、より大きなエネルギーを保有するようになっている。そのため、異常時に発生する熱量も大きなものとなっている。

[0004] 電池の異常な発熱とは、例えば、電池の内部短絡または過充電時の発熱である。特に、釘刺し等の外部異物によって電池缶及び電極群が変形して、内部短絡が生じた場合、正極活物質に短絡電流が流れることによって発生する熱量が大きくなるため、電池の安全性が問題になる。

[0005] このような内部短絡に対して、特許文献１または２には、捲回された電極群が電池缶に収容された非水電解質二次電池において、正極の集電体露出部、及びそれに対向して配置された負極の集電体露出部を、捲回方向に１周以上の長さにわたって形成することが記載されている。特に、当該集電体露出部を、電極群の最外周側に形成することによって、釘刺し等による内部短絡が発生しても、最外周側に設けられた正極及び負極の集電体露出部同士の短絡の方が、内周側の活物質同士の短絡よりも抵抗が小さいため、集電体露出部同士の短絡箇所に、集中的に短絡電流が流れる。その結果、電池の急激な温度上昇を抑制することができる。

先行技術文献

特許文献

[0006] 特許文献1 :特開平０８—１５３５４２号公報

特許文献2 :特開平０９—１８０７６１号公報

発明の概要

発明が解決しようとする課題

[0007] 電極群の外周側で集電体露出部同士の短絡が生じた場合でも、電極群の内周側の活物質は電位、即ち電気エネルギーを有しているため、正極及び負極の集電体を通じて、内周側から、外周側の短絡箇所に向かう方向に短絡電流が生じる。そのとき、電極群の内周側で生じた活物質同士の短絡箇所にも、集電体を通じて流れる短絡電流が流れ込むため、内周側でも、局所的な熱が生じる。特に、非水電解質二次電池の高容量化、高出力化が進むと、短絡電流も増大するため、従来の対策のみでは、十分に電池の安全性を確保することが難しい。

[0008] 本発明は、かかる課題に鑑みなされたもので、その主な目的は、異常時に電池内で内部短絡が生じた場合でも、安全性の高い非水電解質二次電池を提供することにある。

課題を解決するための手段

[0009] 上記の課題を解決するために、本発明は、捲回された電極群を備えた非水電解質二次電池において、電極群の最外周側に1周以上の集電体露出部を設けるとともに、それとは別の部位に、他の集電体露出部を設け、この2つの集電体露出部を、各集電体露出部にそれぞれ接続された2つの集電タブを介して電気的に接続した構成を採用する。

[001 0] すなわち、本発明に係る発明は、正極集電体上に正極活物質層が塗着された正極板と、負極集電体上に負極活物質層が塗着された負極板と、正極板及び負極板がセパレータを介して捲回された電極群と、電極群が収容された電池缶とを備えた非水電解質二次電池であって、正極板及び負極板のうち、電

池缶と異極性の極板は、電極群の最外周側で、捲回方向に1周以上の長さにわたって集電体が露出した第1の集電体露出部と、第1の集電体露出部と離れた部位に形成された第2の集電体露出部とを有し、第1の集電体露出部に第1の集電タブが設けられ、第2の集電体露出部に第2の集電タブが設けられ、かつ、第1の集電タブ及び第2の集電タブは、電極群外で接続されていることを特徴とする。

[001 1] このような構成により、釘等の外部異物によって電池缶に応力が加わって、電極群に内部短絡が生じても、最外周側の第1の集電体露出部で、抵抗の小さな内部短絡を発生させるとともに、内周側で発生した短絡電流を、第2の集電体露出部から、第1及び第2の集電タブを介して、第1の集電体露出部に分流することができる。これにより、異常時に電池内で内部短絡が生じた場合でも、安全性の高い非水電解質二次電池を提供することができる。

発明の効果

[001 2] 本発明によれば、異常時に電池内で内部短絡が生じた場合でも、安全性の高い非水電解質二次電池を提供することができる。

図面の簡単な説明

[001 3] [図1]本発明の一実施形態における円筒型リチウムイオン電池の構成を模式的に示した断面図である。

[図2]本発明の一実施形態における極板の構成を模式的に示した平面図で、図2（a）は正極板の平面図、図2（b）は負極板の平面図である。

[図3]本発明の他の実施形態における正極板の構成を模式的に示した平面図である。

[図4]本発明の他の実施形態における正極板の構成を模式的に示した平面図である。

[図5]本発明の他の実施形態における正極板の構成を模式的に示した平面図である。

[図6]本発明の他の実施形態における正極板の構成を模式的に示した平面図である。

[図7] 本発明の他の実施形態における正極板の構成を模式的に示した平面図である。

[図8] 本発明の他の実施形態における正極板の構成を模式的に示した平面図である。

[図9] 本発明の他の実施形態における正極板の構成を模式的に示した平面図である。

[図10] 本発明の他の実施形態における正極板の構成を模式的に示した平面図である。

[図11] 本発明の他の実施形態における正極板の構成を模式的に示した平面図である。

[図12] 本発明の他の実施形態における負極板の構成を模式的に示した平面図である。

[図13] 本発明の他の実施形態における負極板の構成を模式的に示した平面図である。

発明を実施するための形態

[0014] 本発明は、正極集電体上に正極活物質層が塗着された正極板と、負極集電体上に負極活物質層が塗着された負極板と、正極板及び負極板がセパレータを介して捲回された電極群と、電極群が収容された電池缶とを備えた非水電解質二次電池に関する。正極板及び負極板のうち、電池缶と異極性の極板は、電極群の最外周側で、捲回方向に1周以上の長さにわたって集電体が露出した第1の集電体露出部と、第1の集電体露出部と離れた部位に形成された第2の集電体露出部とを有し、第1の集電体露出部に第1の集電タブが設けられ、第2の集電体露出部に第2の集電タブが設けられ、かつ、第1の集電タブ及び第2の集電タブは、電極群外で接続されている。

[001 5] 釘等の外部異物によって、電池缶に応力が加わって、電極群に内部短絡が生じたとき、電極群の最外周側に設けられた第1の集電体露出部と、それに対向する極板との間で、抵抗の小さい内部短絡が発生する。このとき、第1の集電体露出部と第2の集電体露出部とは、第1の集電タブと第2の集電タ

プとによって、電極群外で接続されているため、電極群の内周側で発生した集電体を流れる短絡電流を、第２の集電体露出部から、第１の集電タブ及び第２の集電タブを介して、第１の集電体露出部に分流することができる。これにより、電極群の内周側で活物質層同士の内部短絡が発生しても、当該短絡箇所に、集電体を通じて流れ込む短絡電流を抑制することができる。その結果、活物質層を流れる短絡電流による異常発熱を抑制することが可能となる。

[001 6] —方、上記のような分流経路が設けられていないと、内周側から集電体を通じて第１の集電体露出部の短絡箇所に流れる短絡電流が、内周側で発生した活物質層同士の短絡箇所に流れ込むのを回避することができない。その結果、内周側で発生した短絡箇所において、局所的な異常発熱の発生を抑制することが困難になる。

[001 7] 本発明において、第２の集電体露出部は、極板の活物質層が塗着された内周側端部と外周側端部との距離をＬとしたとき、内周側端部から3／４Ｌ以下の範囲に形成されていることが好ましい。これにより、集電体を流れる短絡電流を、第２の集電体露出部から第１の集電体露出部に分流する効果をより高めることがでる。

[001 8] 本発明において、極板に電池外部へ出力するためのリー ドを設け、第２の集電体露出部を第１の集電体露出部とリー ドとの間に形成することが好ましし。また、リー ドは、電極群の最内周側に設けられていることが好ましい。これにより、集電体を流れる短絡電流を、第２の集電体露出部から第１の集電体露出部に分流する効果をより高めることができる。

[001 9] 本発明において、第２の集電体露出部は、捲回方向に１周以上の長さにわたって集電体が露出しているのが好ましい。また、第２の集電体露出部は、集電体の両面が露出していてもよい。これにより、最外周側の第１の集電体露出部で発生した抵抗の低い内部短絡に加えて、内周側の第２の集電体露出部に、抵抗の低い内部短絡箇所を分散して設けることができる。

[0020] 本発明において、第１の集電体露出部は、集電体の両面が露出していても

よい。これにより、最外周側の集電体露出部で生じる短絡抵抗をより小さくすることができる。

[0021] 本発明において、極板は、第1の集電体露出部と第2の集電体露出部との間に、第3の集電体露出部が形成され、第3の集電体露出部は、捲回方向に1周以上の長さにわたって集電体が露出していることが好ましい。これにより、最外周側の第1の集電体露出部で発生した抵抗の低い内部短絡に加えて、内周側の第3の集電体露出部に、抵抗の低い内部短絡箇所を分散して設けることができる。

[0022] 本発明において、正極板及び負極板のうち、電池缶と同極性の極板は、第1の集電体露出部と対向する部位に、集電体が露出した集電体露出部が形成されていることが好ましい。また、電池缶と同極性の極板は、第2の集電体露出部、または／及び第3の集電体露出部と対向する部位に、集電体が露出した集電体露出部が形成されていることが好ましい。これにより、最外周側及び内周側の集電体露出部で生じる短絡抵抗をより小さくすることができる。

[0023] 本発明において、正極板及び負極板のうち、電池缶と同極性の極板は、電極群の最外周側で、捲回方向に1周以上の長さにわたって集電体が露出した集電体露出部と、該集電体露出部と離れた部位に形成された他の集電体露出部とを有し、最外周側の集電体露出部にリード が設けられ、他の集電体露出部に集電タブが設けられ、かつ、リード及び集電タブは、電池缶に接続されていることが好ましい。これにより、集電体を流れる短絡電流を、集電体露出部から、集電タブ及び電池缶を介して、最外周側の集電体露出部に分流することができる。

[0024] 本発明において、電池缶が、例えばラミネートフイルムのような絶縁材料から構成され、正極板及び負極板のどちらとも、電池缶に電気的に接続されていない非水電解質二次電池の場合でも、本発明の技術的思想を用いることで、釘刺しなどの外部異物に起因した内部短絡による異常発熱を抑制し、安全性の高い電池を提供することができる。

[0025] 以下、本発明の実施形態を図面に基づいて詳細に説明する。なお、本発明は、以下の実施形態に限定されるものではない。また、本発明の効果を奏する範囲を逸脱しない範囲で、適宜変更は可能である。さらに、他の実施形態との組み合わせも可能である。

[0026] 図１は、本発明の一実施形態における円筒型リチウムイオン電池の構成を模式的に示した断面図である。

[0027] 図１において、円筒型リチウムイオン電池は、アルミニウム箔からなる正極集電体に、正極活物質層が塗着された正極板１と、銅箔からなる負極集電体に、負極活物質層が塗着された負極板２と、正極板１と負極板２との間に、厚み１６μｍのセパレータ３を配置して捲回された電極群４を備えている。正極集電体には、正極リード５が抵抗溶接され、負極集電体には、負極リード６が抵抗溶接されている。電極群４は、電解液とともに、電池缶７に収納されている。電極群４の上部及び下部には、上部絶縁板１０ａ及び下部絶縁板１０ｂが配置されている。負極リード６の一端は、電池缶７の底部と抵抗溶接されている。正極リード５の一端は、金属製フィルター９にレーザ溶接されている。電池缶７の開口端は、ガスケット１０ｃを介して、封口板８で封口されている。

[0028] 図２は、本発明の一実施形態における極板の構成を模式的に示した図で、図２（ａ）は正極板１ａの平面図、図２（ｂ）は負極板２ａの平面図である。

[0029] 図２（ａ）に示すように、正極板１ａには、電極群４の最内周側に位置する箇所に正極リード５が設けられている。なお、正極リード５は、正極集電体上の正極活物質層が塗着されていない集電体露出部に形成される。また、電極群４の最外周端部には、捲回方向に１周以上の長さにわたって正極集電体が露出した第１の集電体露出部２１が設けられ、第１の集電体露出部２１には、第１の集電タブ１１が形成されている。さらに、正極板１ａには、第１の集電体露出部２１と離れた部位に、第２の集電体露出部２２が設けられ、第２の集電体露出部２２には、第２の集電タブ１２が形成されている。第

１の集電タブ１１と第２の集電タブ１２は、電極群４外で接続されている。第１の集電タブ１１と第２の集電タブ１２との接続方法は、特に制限されないが、例えば、図１に示すように、第１の集電タブ１１及び第２の集電タブ１２の一端を、それぞれ、金属製フィルター９にレーザ溶接することによつて、金属製フィルター９を介して接続することができる。また、第１の集電タブ１１と第２の集電タブ１２とを、直接、溶接してもよい。

[0030] 図２（ｂ）に示すように、負極板２ａには、電極群４の最外周側に位置する箇所に負極リード6が設けられている。

[0031] 本実施形態において、第１の集電体露出部２１と第２の集電体露出部２２とは、それらの間に存在する正極集電体やその上に塗着された正極活物質層とは別に、第１の集電タブ１１及び第２の集電タブ１２を介して、電気的に接続されている。

[0032] 電極群４の最外周側にある第１の集電体露出部２１で内部短絡が生じた場合、電極群４の内周側で生じる短絡電流は、第１の集電タブ１１と第２の集電タブ１２がないと、正極集電体とその上に塗着された正極活物質層を流れる。そのため、電極群４の内周側の活物質層同士でも内部短絡が生じると、その短絡箇所に短絡電流が流れて発熱が生じる。

[0033] これに対して、第１の集電体露出部２１と第２の集電体露出部２２とが、第１の集電タブ１１及び第２の集電タブ１２を介して、電気的に接続されていると、電極群４の内周側で生じた短絡電流を、正極集電体とその上に塗着された正極活物質層に流れるのとは別に、第１の集電タブ１１と第２の集電タブ１２を介して、第２の集電体露出部２２から第１の集電体露出部２１へ分流することができる。そのため、釘等の外部異物により電極群４の外周側から内周側へ、短絡箇所が進行する場合でも、第１の集電体露出部２１への短絡電流の分流により、内周側で発生した短絡箇所に、正極集電体を通じて流れ込む短絡電流を抑制することができる。その結果、正極活物質層を流れる短絡電流による異常発熱を抑制することが可能となる。

[0034] 本発明において、第２の集電体露出部２２、第２の集電タブ１２、及び正

極リード5の配置場所や形状等は、特に制限されない。以下、本発明における他の実施形態を、図面を参照しながら説明する。

[0035] 図3は、本発明の他の実施形態における正極板1bの構成を模式的に示した平面図である。

[0036] 図3に示すように、本実施形態では、第2の集電体露出部22は、捲回方向に1周以上の長さにわたって集電体が露出している。これにより、最外周側の第1の集電体露出部21で発生した抵抗の低い内部短絡に加えて、内周側の第2の集電体露出部22に、抵抗の低い内部短絡箇所を分散して設けることができる。

[0037] 図4は、本発明の他の実施形態における正極板1cの構成を模式的に示した平面図である。

[0038] 図4に示すように、本実施形態では、第1の集電体露出部21と第2の集電体露出部22との間に、第3の集電体露出部23が形成され、第3の集電体露出部23は、捲回方向に1周以上の長さにわたって集電体が露出している。これにより、最外周側の第1の集電体露出部で発生した抵抗の低い内部短絡に加えて、内周側の第3の集電体露出部に、抵抗の低い内部短絡箇所を分散して設けることができる。

[0039] 図2～図4に示した正極板1a、1b、1cでは、正極リード5が、電極群4の最内周側、すなわち、第1の集電体露出部21と反対側の部位に形成されているが、これに限定されず、正極板のいずれの部位に形成されていてもよい。

[0040] 図5は、本発明の他の実施形態における正極板1dの構成を模式的に示した平面図である。

[0041] 図5に示すように、本実施形態では、正極リード5は、正極板1dの内周側 (中央部) に形成されている。また、第2の集電体露出部22は、第1の集電体露出部21と正極リード5との間に形成されている。正極リード5を、正極板1dの内周側に形成した場合、正極集電体の集電抵抗が低減されるため、電池の高出力化が図られる。このような高出力を図った電池に対して

も、異常時に電池内で内部短絡が生じた場合、電池の安全性を確保することができる。

[0042] 本発明では、第１及び第２の集電タブ１１、１２を互いに接続することによって、内周側で発生した短絡電流を、第２の集電体露出部２２から第１の集電体露出部に分流する経路を設けているが、第２の集電タブ１２を、正極リード5と兼用してもよい。この場合、正極リード5及び第１の集電タブ１１は、電極群4外で直接接続しても、あるいは、金属製フィルター9を介して接続してもよい。

[0043] 図６～図９は、本発明の他の実施形態における正極板１ｅ～１ｈの構成を模式的に示した平面図である。

[0044] 図６に示した正極板１ｅでは、第２の集電タブ１２を兼ねる正極リード5が、電極群4の最内周側に設けられており、図７に示した正極板１ｆでは、第２の集電タブ１２を兼ねる正極リード5が、電極群4の内周側に設けられている。また、図８に示した正極板１ｇでは、電極群4の内周側に設けらた第２の集電体露出部２２と、最外周側に設けられた第１の集電体露出部２１との間に、第３の集電体露出部２３を設けている。また、図９に示した正極板１ｈでは、電極群4の内周側に設けらた第２の集電体露出部２２は、捲回方向に１周以上の長さにわたって集電体が露出している。このような構成により、部品点数やプロセス工数を減らすことができる。

[0045] 上記実施形態では、第１の集電タブ１１及び第２の集電タブ１２を、電池の封口板８側で接続したが、電池缶７の底部側で接続してもよい。前者の場合には、第１及び第２の集電タブ１１、１２は、正極リード5と、捲回軸に対して同じ方向に形成され、後者の場合には、第１及び第２の集電タブ１１、１２は、正極リード5と、捲回軸に対して反対方向に形成される。なお、後者の場合、互いに接続された第１及び第２の集電タブが、負極リード6と電気的に干渉しないよう、絶縁を施すとよい。

[0046] 図１０、図１１は、本発明の他の実施形態における正極板１ｉ、１ｊの構成を模式的に示した平面図である。

[0047] 図１０に示した正極板１ｉでは、正極リード5が、電極群４の最内周側に設けられ、第２の集電タブ１２が、電極群４の内周側に設けられている。また、図１１に示した正極板１ｊでは、正極リード5が、電極群４の内周側に設けられ、第２の集電タブ１２が、正極リード5に対して、第１の集電タブ１１と反対側に設けられている。

[0048] 本発明において、第２の集電体露出部２２は、正極板１の正極活物質層が塗着された内周側端部と外周側端部との距離をＬとしたとき、内周側端部から3/ ４Ｌ以下の範囲に形成されていることが好ましい。これにより、正極集電体を流れる短絡電流を、第２の集電体露出部２２から第１の集電体露出部２１に分流する効果をより高めることがでる。

[0049] 本発明において、電池缶７と同極性の負極板２は、第１の集電体露出部２１と対向する部位に、負極集電体が露出した集電体露出部が形成されていることが好ましい。また、負極板２は、第２の集電体露出部２２、または/ 及び第３の集電体露出部２３と対向する部位に、負極集電体が露出した集電体露出部が形成されていることが好ましい。これにより、最外周側及び内周側の集電体露出部で生じる短絡抵抗をより小さくすることができる。

[0050] 上記実施形態では、電池缶７と異極性の正極板１について、第１及び第２の集電タブ１１、１２を電極群４外で接続することによって、電極群４の内周側で発生し、正極集電体を流れる短絡電流を、第２の集電体露出部から第１の集電体露出部に分流する経路を設け、これにより、内周側で発生した短絡箇所での局所的な異常発熱の発生を抑制する効果を得た。これと同様の効果は、電池缶７と同極性の負極板２についても実現することができる。

[0051] 図１２は、本発明の他の実施形態における負極板２ｂの構成を模式的に示した平面図である。

[0052] 図１２に示すように、本実施形態における負極板２ｂは、電極群４の最外周側で、捲回方向に１周以上の長さにわたって負極集電体が露出した集電体露出部３１と、電極群４の最内周側で、負極集電体が露出した集電体露出部３２とを有している。最外周側の集電体露出部３１に負極リード6が設けら

れ、最内周側の集電体露出部３２に集電タブ１６が設けられている。そして、負極リード6及び集電タブ１６は、電池缶７に接続されている。

[0053] 釘等の外部異物により、電極群４の最外周側で内部短絡が生じた場合、最内周側の集電体露出部３２は、集電タブ１６、電池缶７、釘等の外部異物を介して、負極板２の最外周側の集電体部露出部３１と電気的に接続した状態となる。したがって、電極群４の内周側の負極板２で生じた短絡電流は、負極集電体と最外周側の短絡点との間で流れる経路とは別に、電池缶７と接続された集電タブ１６と電池缶７を通じて最外周側の短絡点に分流する経路を設けることができる。電極群４の内周側で内部短絡が生じた場合、負極集電体を流れる短絡電流を分流すると同時に、最外周側の抵抗の低い短絡点に短絡電流を分流することができるため、電極群４の内周側で短絡が生じた場合でも、異常な発熱を抑制することができる。

[0054] 本実施形態において、負極リード6が負極板２の最外周側に設けられると同時に、内周側のいずれかの箇所に集電タブ１６が設けられていることが好ましい。釘等の外部異物による電気的な接続がなくても、第２の集電タブ１６と電池缶７と負極リード6との電気的な接続が形成されるため、短絡電流の分流を効果的に発現することができる。

[0055] 図１３は、本発明の他の実施形態における負極板２ｃの構成を模式的に示した平面図である。

[0056] 図１３に示した負極板２ｃでは、集電タブ１６を兼用する負極リード6が、負極板２の長手方向の中央部に設けられている。ここで、中央部とは、正極合剤層１４が設けられている正極５の領域において、内周側端部と外周側端部との間の距離をＬとしたとき、内周側端部から外周側端部に向かって距離が（2Ｚ３）Ｌ以下であり、外周側端部から内周側端部に向かって距離が（2/３）Ｌ以下であって、両方の距離関係がオーバーラップしている範囲をいう。

[0057] この場合、釘等の外部異物により、電極群４の最外周側で内部短絡が生じた場合、負極板２の最外周側の集電体部露出部は、釘を介して電池缶７と電

気的に接続された状態となる。したがって、電極群4の内周側の負極板2で生じた短絡電流は、負極集電体と最外周側の短絡点との間で流れる経路とは別に、電池缶7と接続された集電タブ16を兼用する負極リード6を介して、最外周側の短絡点に分流する経路を設けることができる。電極群4の内周側で内部短絡が生じた場合、負極集電体を流れる短絡電流を分流すると同時に、最外周側の抵抗の低い短絡点に短絡電流を分流することができる。

[0058] 次に、本発明の非水電解質二次電池の各構成要素について、さらに具体的に説明する。

[0059] 正極板1は、正極集電体と正極活物質層とを含む。

[0060] 正極活物質には、リチウム含有遷移金属複合酸化物、具体的には、コバルト酸リチウム、ニッケル酸リチウム、マンガン酸リチウムや、それらの変性体などを用いることができる。導電剤には、天然黒鉛や人造黒鉛のグラファイト類、アセチレンブラック、ケツチエンブラックなどのカーボンブラック類などを用いることができる。結着剤には、ポリフッ化ビニリデン（PVDF）、ポリテトラフルオロエチレン（PTFE）などを用いることができる。

[0061] 正極集電体には、アルミニウム、アルミニウム合金、ステンレス鋼、チタンなどを含有する金属箔、穿孔体などを用いることができる。

[0062] 正極活物質層は、例えば、正極合剤スラリーを正極集電体表面に塗布し、乾燥し、圧延することにより塗着できる。正極合剤スラリーは、たとえば、正極活物質、結着剤、導電剤などを有機溶媒または水に溶解または分散させることにより調製できる。有機溶媒には、N—メチル_2_ピロリドンなどを使用できる。正極活物質層は、正極集電体の両面、もしくは片面に塗着される。

[0063] 正極集電体の所望の箇所に未塗着部（集電体露出部）を設け、正極リード5及び第1の集電タブ11、第2の集電タブ12を溶接することにより正極板1が作製される。正極リード5及び第1の集電タブ11、第2の集電タブ12は、アルミニウムなどから形成される。

[0064] 負極板２は、負極集電体と負極活物質層とを含む。

[0065] 負極活物質には、炭素材料、リチウムと合金化可能な元素、珪素化合物、錫化合物、リチウム金属、合金などを用いることができる。炭素材料には、天然黒鉛、人造黒鉛、ハー ドカ一ボンなどがある。リチウムと合金化可能な元素には、Ａ し Ｓｉ、Ｚｎ、Ｇｅ、Ｃｄ、Ｓｎ、Ｔｉ、Ｐｂなどがある。結着剤には、ポリフッ化ビニリデン、アクリル酸モノマーを含むスチレンブタジェンゴム (ＢＭ—５００Ｂ) などを用いることができる。導電剤には、正極活物質層に含まれる導電剤と同じものを用いることができる。増粘剤には、カルボキシメチルセルロース、ポリエチレンオキシドなどを用いることができる。

[0066] 負極集電体には、ステンレス鋼、ニッケル、銅などの金属箔、穿孔体などを用いることができる。

[0067] 負極活物質層は、たとえば、負極合剤スラリーを負極集電体表面に塗布し、乾燥し、圧延することにより形成できる。負極合剤スラリーは、たとえば、負極活物質、結着剤、導電剤、増粘剤などを有機溶媒または水に溶解または分散させることにより調製できる。有機溶媒には、ＮＭＰなどを使用できる。

[0068] 負極集電体の所望の箇所に未塗着部 (集電体露出部) を設け、負極リー ド６及び集電タプ１６を溶接することにより負極板２が作製される。負極リー ド6 及び集電タプ１６は、ニッケル、ニッケル合金、銅、ニッケルで被覆した銅などを用いることができる。

[0069] 正極板 1及び負極板２を、セパレータ3 を介して正極リー ド5 と負極リー ド6 が、互いに反対方向から取り出されるように捲回することにより、電極群４が構成される。電池缶７に電極群４を挿入し、負極リー ド6 と集電タプ１６を電池缶７の有底部に溶接する。

[0070] セパレータ3 には、微多孔薄膜、織布、不織布などが用いられる。セパレ—タの材質としては、ポリプロピレン、ポリエチレンなどのポリオレフインが用いられる。

[0071] 非水電解液は、非水溶媒に電解質 (例えば、リチウム塩) を溶解させることにより得られる。非水溶媒には、環状炭酸エステル、鎖状炭酸エステル、環状カルボン酸エステルなどが用いられる。電解質には、$LiClO_4$、$LiBF_4$、$LiPF_6$などが用いられる。

[0072] 電池缶7の開口部より取り出した正極リード5は、封口板8の金属製フィルター9に溶接される。第1の集電タブ11及び第2の集電タブ12が、正極リード5と捲回軸に対して同方向に取り出されている場合は、第1の集電タブ11と第2の集電タブ12を直接、もしくは金属製フィルター9に溶接する。第1の集電タブ11と第2の集電タブ12が正極リード5と捲回方向に対して異対向に取り出されている場合は、電極群4を電池缶7に挿入する前に、第1の集電タブ11と第2の集電タブ12を溶接して電気的に接続しておく。電池缶7の開放部から非水電解液を注入した後、電池缶7の開口部を、ガスケット10cを介して封口することにより、非水電解質二次電池が作製される。

実施例

[0073] 以下、本発明の実施例を詳細に説明するが、本発明はこれらの実施例に限定されない。

[0074] 本発明の非水電解質二次電池の安全性を評価するため、以下の手順で、円筒型非水電解質二次電池を作製した。

[0075] (実施例1)

(1) 正極板の作製

正極活物質として、100質量部のコバルト酸リチウム粉末、導電剤として、3質量部のアセチレンブラック、及び、N—メチルピロリドン (NMP) の溶剤に結着剤として4質量部のポリフッ化ビニリデン (PVDF) を溶解した溶液を混合し、正極合剤を含むペーストを得た。このペーストを、厚さ15μmのアルミニウム箔集電体の両面に塗布し、乾燥後、圧延して厚みを172μmとした。

[0076] 電極群の最外周側の両面に、捲回方向に1周分の長さでアルミニウム箔が

露出するように、第１の集電体露出部２１を形成した。また、電極群の最内周側と最外周側を結ぶ中央部の両面にアルミニウム箔が露出した第２の集電体露出部２２を形成した。これを、幅５８ｍｍ、長さ６３０ｍｍの寸法に裁断し、正極板を作製した。

[0077] 正極板の第１の集電体露出部２１と第２の集電体露出部２２のそれぞれの箇所に、アルミニウムからなる第１の集電タブ１１と第２の集電タブ１２の一端を接続した。電極群４の最内周側にアルミニウム箔が露出する箇所を設け、その箇所にアルミニウム製の正極リード5の一端を接続して、図２（ａ）に示すような正極板１ａを得た。

[0078] （２）負極板の作製

負極合剤として、１００質量部の人造黒鉛粉末、１質量部のスチレン－ブタジエンゴム粒子の４０質量％水性分散液、１質量部のカルボキシメチルセルロース、及び適量の水とを混合攪拌してスラリー状の負極合剤を調整した。この負極合剤スラリーを、厚み８μｍの銅箔集電体の両面に、塗布、乾燥した後、圧延して厚みを１７４μｍとした。

[0079] 電極群の最外周側の両面に、アルミニウム箔集電体の第１の集電体露出部２１と対向する長さ以上で、銅箔集電体が露出した集電体露出部３１を形成する。これを幅５９ｍｍ、長さ６８５ｍｍの寸法に裁断し、負極板２を作製した。

[0080] 負極板２の最外周側に形成された集電体露出部３１に、ニッケル製の負極リード6の一端を接続して負極板２ａを得た。

[0081] （３）非水電解液の調整

非水溶媒として、エチレンカーボネートとエチルメチルカーボネートとジメチルカーボネートを体積比１：１：１の混合溶媒９９質量部に１質量部のビニレンカーボネートを添加し、１．０ｍｏｌ／Ｌの濃度で六フッ化リン酸リチウム（$LiPF_6$）を溶解し、非水電解液を得た。

[0082] （４）非水電解質二次電池の作製

正極板１と負極板２の間に厚み１６μｍのポリエチレン製微多孔質フィル

ムからなるセパレータを配置して捲回し、円筒状の電極群４を作製した。この電極群４の上下に、上部絶縁板１０ａ及び下部絶縁板１０ｂを装着した後、負極リード6を電池缶７に溶接して挿入した。第１の集電タブ１１と第２の集電タブ１２を抵抗溶接して接続した。正極リード5を封口板８の金属製フィルター9に溶接した。その後、電池缶７の内部に非水電解液５ｇを注入した。最後に、電池缶７の開口部をガスケット１０ｃを介して封口板８で封口して、電池Ａを完成させた。得られた円筒型電池は、直径１８．２ｍｍ、高さ６５ｍｍであり、電池容量は２８６０ｍＡｈであった。

[0083] (実施例２)

第２の集電体露出部２２を捲回方向に１周の長さになるように形成して、図３に示すような正極板１ｂを得たこと以外、電池Ａと同様にして電池Ｂを作製した。電池Ｂの電池容量は２７５０ｍＡｈであった。

[0084] (実施例３)

第２の集電タブ１２を兼ねる正極リード5を、電極群４の内周側に形成して、図７に示すような正極板１ｆを得たこと以外、電池Ａと同様にして電池Ｃを作製した。電池Ｃの電池容量は２８６０ｍＡｈであった。

[0085] (実施例４)

第１の集電体露出部２１と第２の集電体露出部２２との間に、捲回方向に１周の長さになるようにアルミニウム箔集電体が片側露出した第３の集電体露出部２３を形成して、図８に示すような正極板１ｇを得たこと以外、電池Ｃと同様にして電池Ｄを作製した。電池Ｄの電池容量は２７４０ｍＡｈであった。

[0086] (実施例５)

負極板の電極群４の最内周側に銅箔集電体が露出する集電体露出部３２を形成し、その箇所にニッケル製の集電タブ１６を接続して、図１２に示すような負極板２ｂを作製し、集電タブ１６を電池缶７に接続すること以外、電池Ｃと同様にして電池Ｅを作製した。電池Ｅの電池容量は２８６０ｍＡｈであった。

[0087] (実施例６)

第２の集電体露出部２２を捲回方向に１周の長さになるように形成して、図９に示すような正極板１ｈを作製し、第２の集電体露出部２２に対向する負極板に、銅箔集電体の露出部を形成して負極板２を得たこと以外、電池Ｅと同様にして同様にして電池Ｆを作製した。電池Ｆの電池容量は２６４０ｍＡｈであった。

[0088] (比較例１)

第２の集電体露出部２２、第１の集電タブ１１、第２の集電タブ１２を形成しないこと以外、電池Ａと同様にして電池Ｘを作製した。電池Ｘの電池容量は２８６０ｍＡｈであった。

[0089] (比較例２)

第１の集電体露出部２１に第１の集電タブ１１を形成しないこと以外、電池Ｃと同様にして電池Ｙを作製した。電池Ｙの電池容量は２８６０ｍＡｈであった。

[0090] (評価試験)

実施例１～６及び比較例１～２で得られた非水電解質二次電池を用いて、次に示す釘刺し試験を行い、安全性について評価した。

[0091] [釘刺し試験]

各電池に対して、以下の条件で充電を行った。そして、６０℃環境下で、充電状態の電池の側面から、直径３ｍｍの鉄釘を１０ｍｍ/秒の速度で２０ｍｍの深さまで突き刺し貫通して、内部短絡を発生させた。同じ試験を各５セルずつ行い、異常過熱に至るかどうか確認した。表１は、その結果を示した表である。

[0092] 定電流充電 :電流値０．５Ｃ/充電終止電圧４．３Ｖ

定電圧充電 :電圧値４．３Ｖ/充電終止電流１００ｍＡ

[0093]

[表 1]

	異常過熱した電池数 （過熱数／試験数）
実施例１	１／５
実施例２	０／５
実施例３	１／５
実施例４	０／５
実施例５	０／５
実施例６	０／５
比較例１	４／５
比較例２	４／５

[0094] 表１から明らかなように、実施例２、４～６では、釘刺し時の異常過熱もなく、電池容量も高い電池が得られた。実施例１及び３は、釘刺し時の異常過熱が５セル中１セル発生した。実施例１及び３は、正極板の中央部と外周箔とを集電タブで接続しているが、正極板の中央部は出力が高く、電極群内部での発熱が大きくなったと考えられる。正極板の内周側に第２の集電体露出部２２を設けた実施例２、４、６では、その箇所での低抵抗短絡により安全性が向上したと考えられる。実施例５、６では、負極板に設けた集電タブ１６と負極リード6とを接続したことで、さらに安全性が向上した。

[0095] 比較例１及び２は、異常過熱が多く発生した。比較例１は、外周側での集電体間短絡は発生するものの、外周側への短絡電流の分流効果が生じないため安全性が低かった。

[0096] 以上より、本発明の実施例１～６の非水電解質二次電池Ａ～Ｆは、比較例１～２の非水電解質二次電池Ｘ～Ｙに比べて、釘刺し等による外部異物による内部短絡に対する安全性が高いことが分かった。

[0097] 以上、本発明を好適な実施形態により説明してきたが、こうした記述は限

定事項ではなく、勿論、種々の改変が可能である。例えば、上記の実施形態では、捲回された電極群を含む円筒型の非水電解質二次電池について説明したが、これに限定されず、本発明の非水電解質二次電池は、各種形態の二次電池を包含する。例えば、捲回された電極群を含む角型電池、捲回された扁平状電極群を含む角型電池、積層された電極群をラミネートフィルムに収容したラミネートフィルム電池、積層された電極群を含む角型電池などがある。

産業上の利用可能性

[0098] 本発明に係る非水電解質二次電池は、携帯用電子機器の電源や、電動工具、電気自動車などの駆動用電源等に有用である。

符号の説明

[0099]

1 正極板
2 負極板
3 セパレータ
4 電極群
5 正極リード
6 負極リード
7 電池缶
8 封口板
9 金属製フィルター
10a 上部絶縁板
10b 下部絶縁板
10c ガスケット
11 第1の集電タブ
12 第2の集電タブ
16 集電タブ
21 第1の集電体露出部
22 第2の集電体露出部

２３　　第３の集電体露出部

請求の範囲

[請求項1] 正極集電体上に正極活物質層が塗着された正極板と、

負極集電体上に負極活物質層が塗着された負極板と、

前記正極板及び前記負極板がセパレータを介して捲回された電極群と、

前記電極群が収容された電池缶と

を備えた非水電解質二次電池であつて、

前記正極板及び前記負極板のうち、前記電池缶と異極性の極板は、

前記電極群の最外周側で、捲回方向に1周以上の長さにわたって集電体が露出した第1の集電体露出部と、

前記第1の集電体露出部と離れた部位に形成された第2の集電体露出部と、

を有し、

前記第1の集電体露出部に第1の集電タブが設けられ、前記第2の集電体露出部に第2の集電タブが設けられ、かつ、前記第1の集電タブ及び前記第2の集電タブは、前記電極群外で接続されている、非水電解質二次電池。

[請求項2] 前記第2の集電体露出部は、前記極板の活物質層が塗着された内周側端部と外周側端部との距離をLとしたとき、内周側端部から3Z 4L以下の範囲に形成されている、請求項1に記載の非水電解質二次電池。

[請求項3] 前記極板に、電池外部へ出力するためのリードが設けられており、

前記第2の集電体露出部は、前記第1の集電体露出部と前記リードとの間に形成されている、請求項1または2に記載の非水電解質二次電池。

[請求項4] 前記リードは、前記電極群の最内周側に設けられている、請求項3に記載の非水電解質二次電池。

[請求項5] 前記リードは、前記第2の集電タブを兼ねている、請求項3または

4に記載の非水電解質二次電池。

[請求項6] 前記第2の集電体露出部は、捲回方向に1周以上の長さにわたって集電体が露出している、請求項1に記載の非水電解質二次電池。

[請求項7] 前記第2の集電体露出部は、該集電体の両面が露出している、請求項1に記載の非水電解質二次電池。

[請求項8] 前記第1の集電体露出部は、該集電体の両面が露出している、請求項1に記載の非水電解質二次電池。

[請求項9] 前記極板は、前記第1の集電体露出部と前記第2の集電体露出部との間に、第3の集電体露出部が形成されており、

前記第3の集電体露出部は、捲回方向に1周以上の長さにわたって集電体が露出している、請求項1に記載の非水電解質二次電池。

[請求項10] 前記正極板及び前記負極板のうち、前記電池缶と同極性の極板は、前記第1の集電体露出部と対向する部位に、集電体が露出した集電体露出部が形成されている、請求項1に記載の非水電解質二次電池。

[請求項11] 前記正極板及び前記負極板のうち、前記電池缶と同極性の極板は、前記第2の集電体露出部と対向する部位に、集電体が露出した集電体露出部が形成されている、請求項6に記載の非水電解質二次電池。

[請求項12] 前記正極板及び前記負極板のうち、前記電池缶と同極性の極板は、前記第3の集電体露出部と対向する部位に、集電体が露出した集電体露出部が形成されている、請求項9に記載の非水電解質二次電池。

[請求項13] 前記正極板及び前記負極板のうち、前記電池缶と同極性の極板は、

前記電極群の最外周側で、捲回方向に1周以上の長さにわたって集電体が露出した集電体露出部と、

前記集電体露出部と離れた部位に形成された他の集電体露出部と、

を有し、

前記最外周側の集電体露出部にリードが設けられ、前記他の集電体露出部に集電タブが設けられ、かつ、前記リード及び前記集電タブは

、前記電池缶に接続されている、請求項１～１２の何れか１項に記載の非水電解質二次電池。

[請求項14] 前記正極板及び前記負極板のうち、前記電池缶と同極性の極板は、

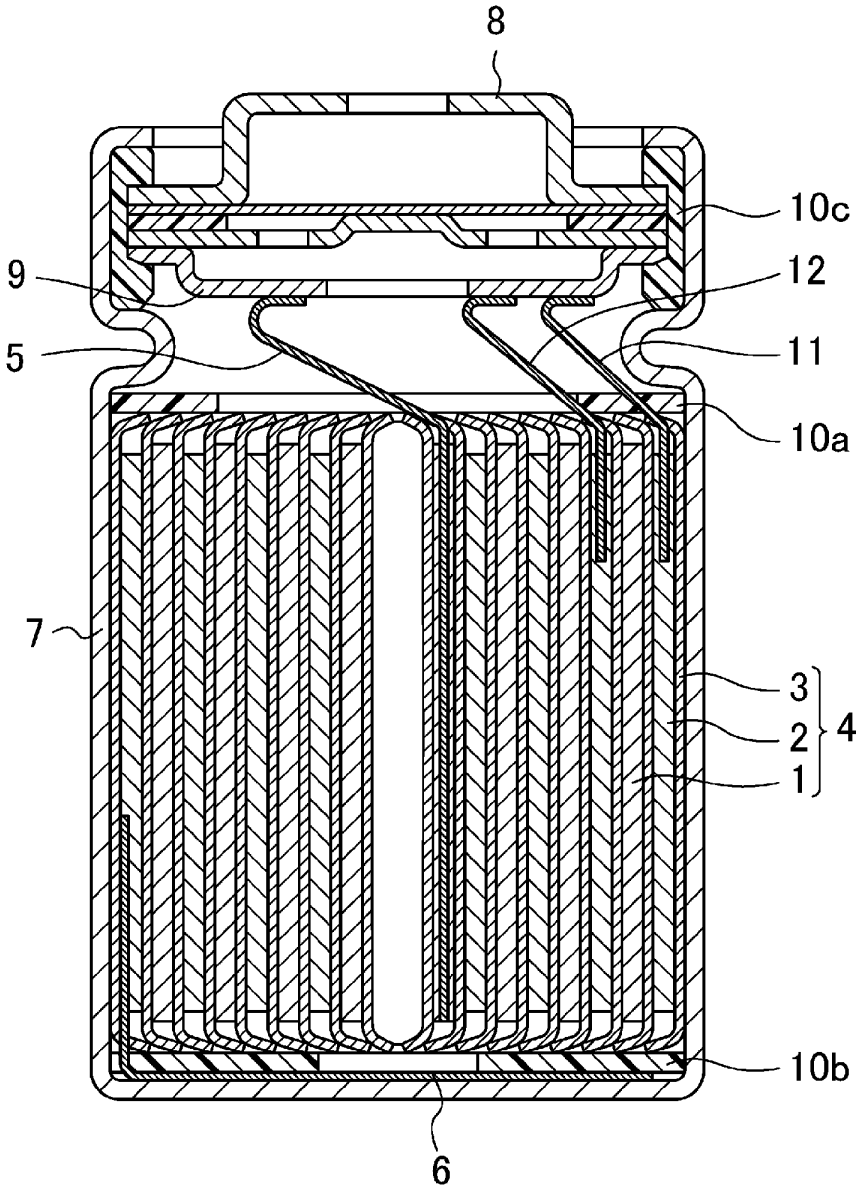
前記電極群の最外周側で、捲回方向に１周以上の長さにわたって集電体が露出した集電体露出部と、

前記極板の長手方向の中央部で、捲回方向に１周以上の長さにわたって集電体が露出した他の集電体露出部と

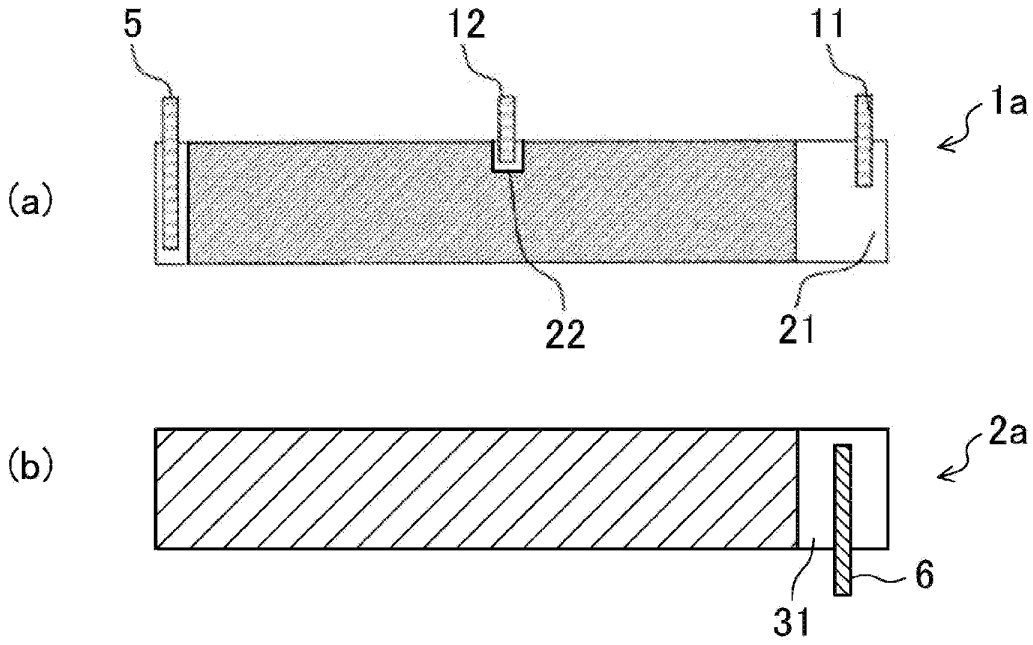
を有し、

前記中央部の他の集電体露出部に、リードが設けられ、かつ、該リードは、前記電池缶に接続されている、請求項１～１２の何れか１項に記載の非水電解質二次電池。

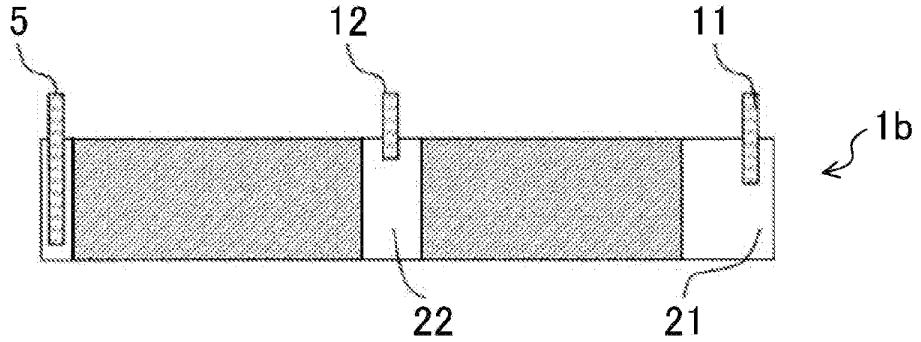
[図1]



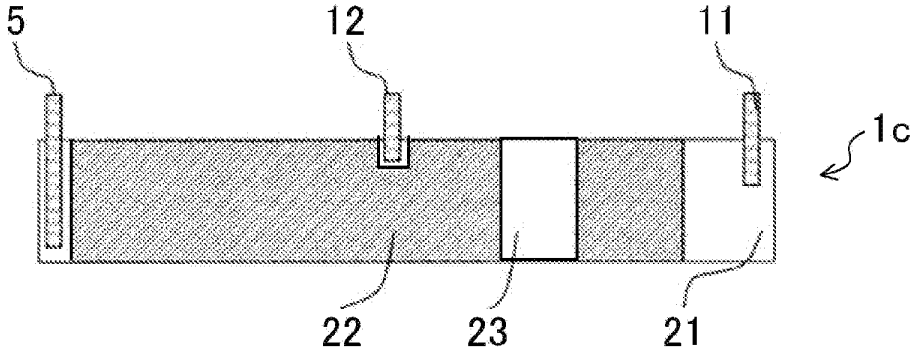
[図2]



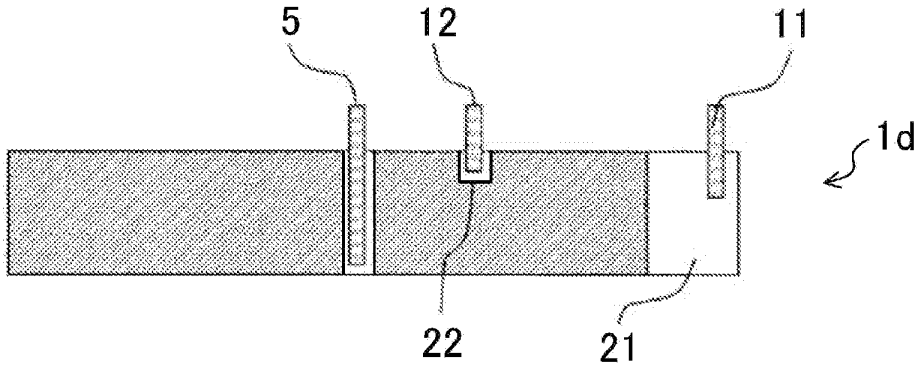
[図3]



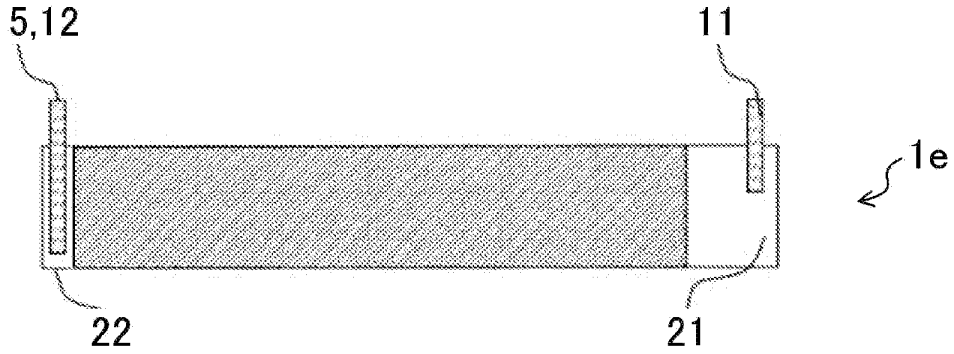
[図4]



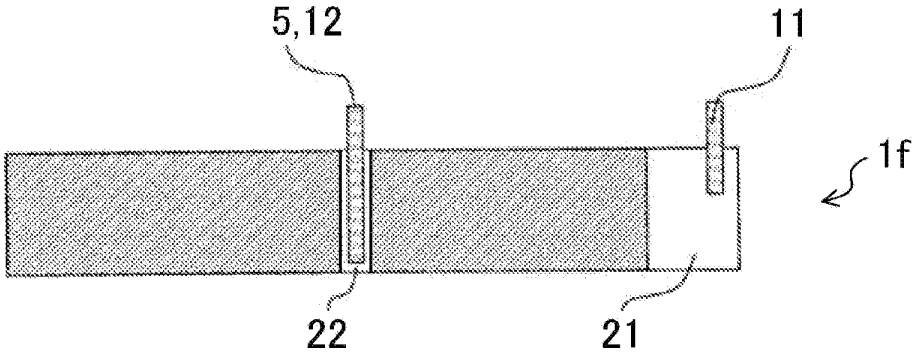
[図5]



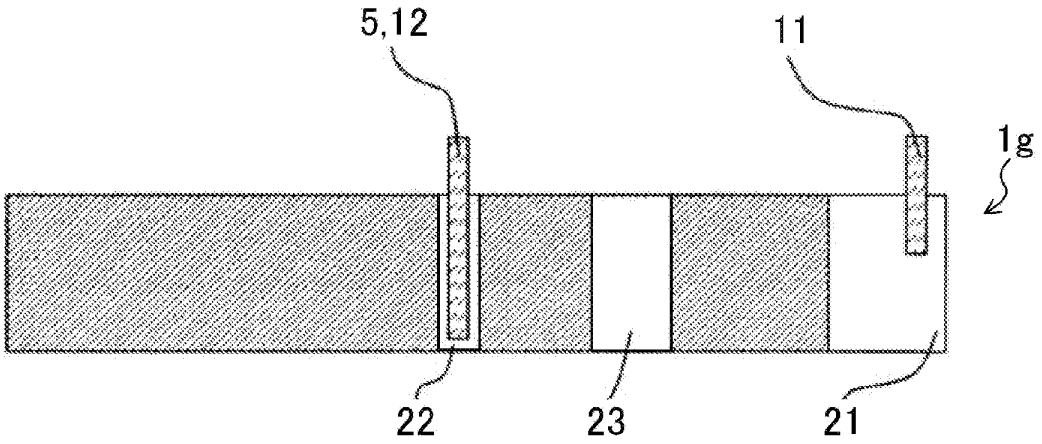
[図6]



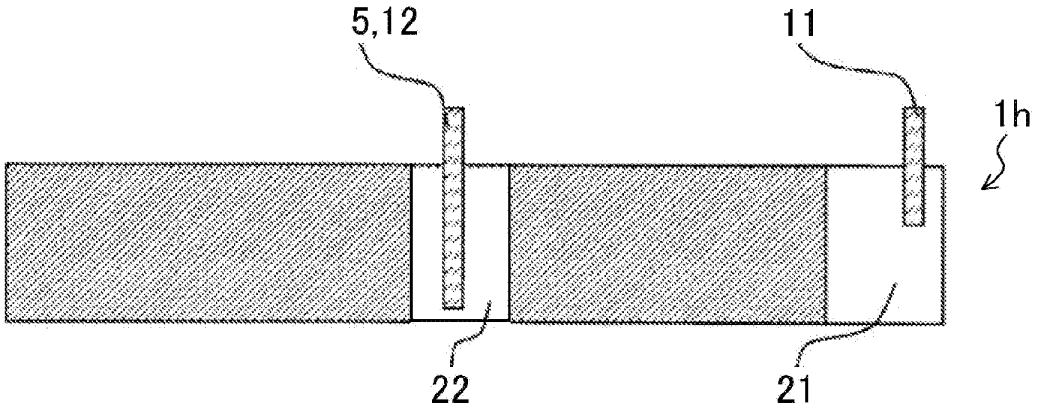
[図7]



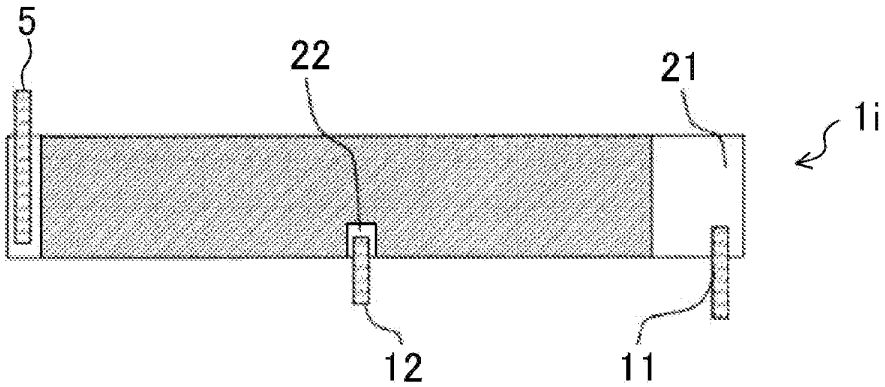
[図8]



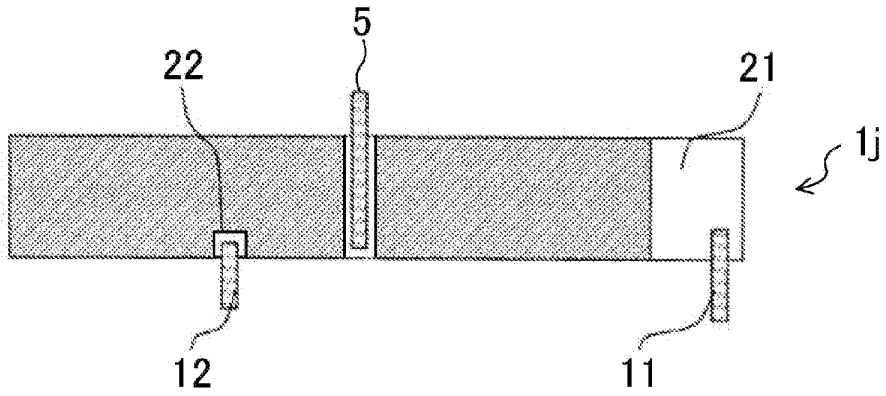
[図9]



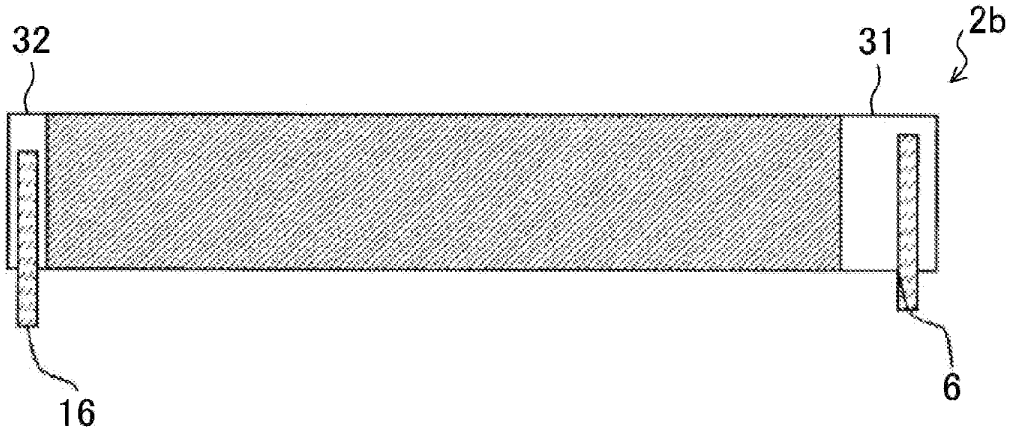
[図10]



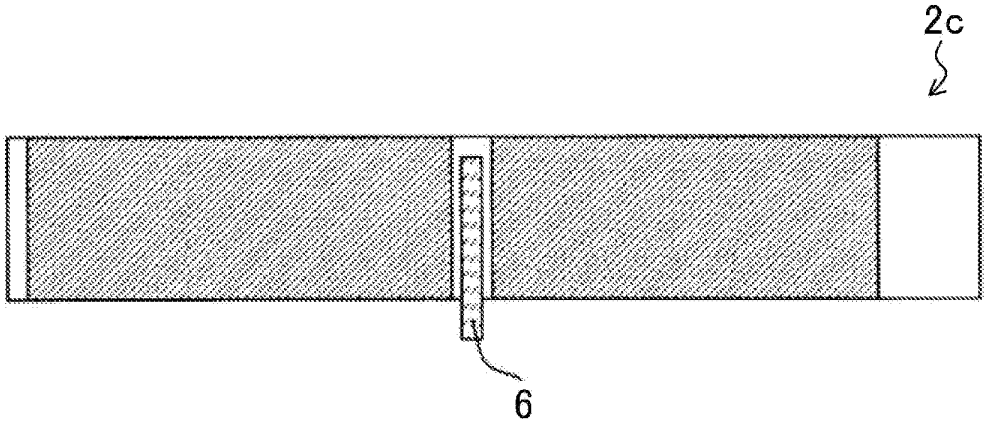
[図11]



[図12]



[図13]



INTERNATIONAL SEARCH REPORT

International application No.
PCT / JP2 012/ 005846

A. CLASSIFICATION OF SUBJECT MATTER
H01M2/2 6 (2006.01)i, H01M1 0/05 87 (2010.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
H01M2/26, H01M10/0587

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2012
Kokai Jitsuyo Shinan Koho 1971-2012 Toroku Jitsuyo Shinan Koho 1994-2012

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y A	JP 2007-220321 A (Matsushita Electric Industrial Co., Ltd.), 30 August 2007 (30.08.2007), claims; paragraphs [0011], [0041] to [0047]; fig. 1 to 2 & US 2007/0190407 A1 & US 2010/0178541 A1	1-L, 3-5, 7-8 2, 6, 9-14
Y A	JP 2008-311011 A (Panasonic Corp.), 25 December 2008 (25.12.2008), claims; paragraph [0012]; fig. 1 (Family: none)	1-L, 3-5, 7-8 2, 6, 9-14

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
29 October, 2012 (29.10.12)	06 November, 2012 (06.11.12)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (July 2009)

国際調査報告

国際出願番号 PCT/JP2012/005846

A. 発明の属する分野の分類（国際特許分類（IPC））

Int.Cl. H01M2/26 (2006.01)i, H01M10/0587 (2010.01)i

B. 調査を行った分野

調査を行った最小限資料（国際特許分類（IPC））

Int.Cl. H01M2/26, H01M10/0587

最小限資料以外の資料で調査を行った分野に含まれるもの

日本国実用新案公報	1922-19
日本国公開実用新案公報	1971-20
日本国実用新案登録公報	1996-20
日本国登録実用新案公報	1994-20

国際調査で使用した電子データベース（データベースの名称、調査に使用した用語）

年

C. 関連すると認められる文献

引用文献のカテゴリー*	引用文献名 及び一部の箇所が関連するときは、その関連する箇所の表示	関連する請求項の番号
Y	JP 2007-22032 1A (松下電器産業株式会社) 2007.08.30, 【特許請求の範囲】、	1, 3-5, 7-8
A	【0011】、【0041】－【0047】、図1－図2】 & US 2007/0190407	2, 6, 9-14
	A1 & US 2010/0178541 A1	
Y	JP 2008-31101 1A (パナソニック株式会社) 2008.12.25, 【特許請求の範囲】、	1, 3-5, 7-8
A	【0012】、図1】 (ファミリーなし)	2, 6, 9-14

☐ C欄の続きにも文献が列挙されている。

☐ パテントファミリーに関する別紙を参照。

* 引用文献のカテゴリー

「A」特に関連のある文献ではなく、一般的技術水準を示すもの

「E」国際出願日前の出願または特許であるが、国際出願日以後に公表されたもの

「L」優先権主張に疑義を提起する文献又は他の文献の発行日若しくは他の特別な理由を確立するために引用する文献（理由を付す）

「O」口頭による開示、使用、展示等に言及する文献

「P」国際出願日前で、かつ優先権の主張の基礎となる出願の日の後に公表された文献

「T」国際出願日又は優先日後に公表された文献であって出願と矛盾するものではなく、発明の原理又は理論の理解のために引用するもの

「X」特に関連のある文献であって、当該文献のみで発明の新規性又は進歩性がないと考えられるもの

「Y」特に関連のある文献であって、当該文献と他の1以上の文献との、当業者にとって自明である組合せによって進歩性がないと考えられるもの

「&」同一パテントファミリー文献

国際調査を完了した日	国際調査報告の発送日
29.10.2012	06.11.2012

国際調査機関の名称及びあて先
日本国特許庁（ISA／JP）
郵便番号100－8915
東京都千代田区霞が関三丁目4番3号

特許庁審査官（権限のある職員） 4X 2930
前田 寛之
電話番号 03-3581-1101 内線 3477

様式PCT／ISA／210（第2ページ）（2009年7月）

PE2E SEARCH - Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
L1	24	(US-41406506-$ | US-5017442-$ | US-5478668-$ | US-6100114-$ | US-6551143-$).DID. (AL-20010036574-$ | AL-20070122714-$ | AL-20090035638-$ | CN-101939873-$ | CN-103066239-$ | CN-1221054-$ | CN-1350350-$ | CN-201087907-$ | CN-202495523-$ | DB-241406506-$ | JP-1993013064-$ | JP-1999317218-$ | JP-2000277155-$ | JP-2003132875-$).DID.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/12 07:49 PM
L2	3	(US-20010036574-$ | US-20070122714-$ | US-20090035638-$).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/12 07:56 PM
L3	0	(JP-0513064-$).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/12 07:58 PM
L4	0	(JPH-0513064-$).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/12 07:58 PM
L5	0	(JP-00513064-$).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY,	OR	ON	ON	2022/07/12 07:58 PM

			CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)				
L6	4	(JP-3161778-$).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/12 07:58 PM
L7	91	(US-10135097-$ | US-10868290-$ | US-11024868-$ | US-11108118-$ | US-20100055560-$ | US-20100285370-$ | US-20170092925-$ | US-20180190963-$ | US-20180366775-$ | US-5017442-$ | US-5478668-$ | US-6100114-$ | US-6551143-$ | US-7195844-$ | US-9741988-$).DID. (CN-103367700-$ | CN-105576191-$ | CN-105990612-$ | CN-106169540-$ | CN-107534127-$ | CN-108376759-$ | CN-109888162-$ | CN-112272877-$ | CN-112582583-$ | CN-113826240-$ | CN-201087907-$ | CN-202495523-$ | CN-205355186-$ | GB-2548361-$ | JP-2005222744-$ | JP-2007294198-$ | JP-2010086754-$ | JP-2011103249-$ | JP-2013137943-$ | JP-2014241267-$ | JP-2018166080-$ | JP-4850996-$ | JP-5284933-$ | JP-5623073-$ | JP-5821913-$ | JP-	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/13 11:34 AM

		6237187-$ | JP-6288015-$ | JP-6926991-$ | KR-101489993-$ | KR-101515672-$ | KR-101980974-$ | KR-200364044-$ | KR-20060009411-$ | KR-20120022773-$ | WO-2017149977-$).DID.					
L8	4	("20020197535" | "20040191634" | "20140030607" | "20150207111").pn. OR ("11108118").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/13 11:36 AM
L9	3	("20090305120" | "20140349179" | "20150207111").pn. OR ("11024868").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/13 11:36 AM
L10	1	US-20060051662-$.did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/13 11:50 AM
L11	30	(US-10014495-$ | US-10038212-$ | US-10193125-$ | US-10312497-$ | US-10396336-$ | US-11024868-$ | US-11043700-$ | US-20060127774-$ | US-20080274410-$ | US-20110159344-$ | US-20110183191-$ | US-20130252053-$ | US-20130266845-$ | US-20130316207-$ | US-20140349179-$ | US-20160126511-$ | US-20160260954-$ | US-20180315991-$ | US-8877371-$ | US-8974944-$ | US-9159963-$ | US-9203074-$ | US-9224989-$ | US-9293744-$ | US-	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/13 11:53 AM

		9397329-$ | US-9490468-$ | US-9564626-$ | US-9595699-$ | US-9627677-$ | US-9960404-$).DID.					
L12	7	("20060111625" | "20080233474" | "20090111011" | "20130045405" | "20140120417" | "20140349179" | "20140377593").pn. OR ("11043700").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/13 11:53 AM
L13	22	((JP-2003132875-A OR CN-202495523-U OR CN-103066239-A OR CN-101939873-A OR CN-201087907-Y OR CN-1221054-C OR CN-1350350-A OR CN-1221054-A).did. AND FTDB.dbnm.) OR ((US-20140349179-A1 OR US-20140120417-A1 OR US-20090111011-A1 OR US-20080233474-A1 OR US-20130045405-A1 OR US-20040191634-A1 OR US-20060051662-A1 OR US-20090035638-A1 OR US-20070122714-A1).did. AND PGPB.dbnm.) OR ((JP-2000277155-A).did. AND JPAB.dbnm.) OR ((US-6100114-A OR US-5478668-A OR US-5017442-A).did. AND USPT.dbnm.) OR ((CN-1221054-A).did. AND FPRS.dbnm.)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/07/13 12:01 PM
L14	76440	(H01M10/0431 OR H01M10/0587 OR H01M50/531 OR H01M50/533 OR H01M50/538).cpc.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/07/13 12:03 PM

L15	5171174	(recess$7 OR pocket OR (non-coat$7 ADJ (portion OR part)) OR cavity OR hole OR gap) NEAR10 (tab$5 OR tap$5 OR lead$5)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/13 12:06 PM
L16	10212	L14 AND L15	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/13 12:06 PM
L17	953	L14 AND L15 AND @fd<"20140117"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/13 12:06 PM
L18	1	US-8795879-$.did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/13 12:22 PM
L19	1	("20090296318").pn. OR ("8795879").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/13 12:22 PM
L20	76	(US-20040126654-$ | US-20040207974-$ | US-20090296318-$ | US-20150332857-$ | US-8014127-$ | US-8218293-$ | US-8795879-$ | US-8837115-$ | US-9070511-$).DID. (CN-104137303-$ | CN-108713233-$ | CN-110706928-$ | CN-201156473-$ | EP-1580774-$ | JP-2001023866-$ | JP-2001284190-$ | JP-2006286959-$ | JP-2008147541-$ | JP-2009010070-$ | JP-2009152514-$ | JP-	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/13 12:23 PM

		2009212117-$ | JP-2009212283-$ | JP-2010074083-$ | JP-2010074089-$ | JP-2012019061-$ | JP-2012064601-$ | JP-2018157012-$ | JP-3587333-$ | JP-4413003-$ | JP-6893123-$ | JP-6953724-$ | KR-101404532-$ | KR-101434923-$ | KR-101475367-$ | KR-102079677-$ | KR-20130116836-$ | WO-2010116656-$ | WO-2021172440-$).DID.					
L21	293	L14 AND L15 AND (length NEAR10(tab$5 OR tap$5 OR lead$5)) AND @fd<"20140117"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/13 12:29 PM
L22	17297	((recess$7 OR pocket OR (non-coat$7 ADJ (portion OR part)) OR cavity OR hole OR gap) NEAR10 (energ$6 NEAR5 densit$7))	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/13 12:35 PM
L23	1	L14 AND L15 AND (length NEAR10(tab$5 OR tap$5 OR lead$5)) AND L22 AND @fd<"20140117"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/13 12:35 PM
L24	13	L14 AND L15 AND (length NEAR10(tab$5 OR tap$5 OR lead$5)) AND L22 AND @fd<"20140117"	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO))	OR	ON	ON	2022/07/13 12:37 PM
L25	5	L14 AND L15 AND (length NEAR10(tab$5 OR tap$5 OR lead$5)) AND L22 AND @pd<"20140117"	(FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/13 12:37 PM
L26	6494	(H01M10/0431 AND	(US-PGPUB; USPAT;	OR	ON	ON	2022/07/13

		H01M50/538).cpc.	USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)				12:55 PM
L27	127	L26 AND L15 AND @fd<"20140117"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/13 12:55 PM
L28	2	(US-20100124694-$ OR US-2006022937-$ OR US-20090166192-$).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/13 01:18 PM
L29	0	(US-2006022937-$).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/13 01:19 PM
L30	1	(US-20060022937-$).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/13 01:19 PM
L31	1	(US-20060222937-$).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/13 01:20 PM
L32	1	(US-6828059-$).did.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU,	OR	ON	ON	2022/07/13 01:24 PM

			CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)				
L33	1	(US-20100124694-$).did.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/13 01:25 PM
L34	1	(jp-09017410-$).did.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/13 01:25 PM
L35	1	(jp-09161837$).did.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/13 01:25 PM
L36	1	US-20070122714-$.did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/13 01:29 PM
L37	37	((JP-2003132875-A OR CN-202495523-U OR CN-103066239-A OR CN-101939873-A OR CN-201087907-Y OR CN-1221054-C OR CN-1350350-A OR CN-1221054-A).did. AND FTDB.dbnm.) OR ((US-20140349179-A1 OR	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO;	OR	ON	ON	2022/07/13 01:30 PM

		US-20140120417-A1 OR US-20090111011-A1 OR US-20110104539-A1 OR US-20110151295-A1 OR US-20010033962-A1 OR US-20090166192-A1 OR US-20080233474-A1 OR US-20130045406-A1 OR US-20120214049-A1 OR US-20110027636-A1 OR US-20060222937-A1 OR US-20130045405-A1 OR US-20130316207-A1 OR US-20130316209-A1 OR US-20130101891-A1 OR US-20120321942-A1 OR US-20040191634-A1 OR US-20060051662-A1 OR US-20090035638-A1 OR US-20070122714-A1).did. AND PGPB.dbnm.) OR ((US-9142840-B2 OR US-8837115-B2 OR US-6100114-A OR US-5478668-A OR US-5017442-A).did. AND USPT.dbnm.) OR ((KR-101475367-B1 OR CN-1221054-A).did. AND FPRS.dbnm.) OR ((JP-2000277155-A).did. AND JPAB.dbnm.)	DERWENT; IBM_TDB)				
L38	145716	(non-coat$6 OR (non ADJ coat$6) OR un-coat$6 OR (un ADJ coat$6) OR non-application$9 OR (non ADJ application$9))	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/13 01:36 PM
L39	4877	L14 AND L38	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV,	OR	ON	ON	2022/07/13 01:36 PM

			MA, OA, RU, SU, WO); FPRS; EPO; JPO)				
L40	249	L14 AND L38 AND (L38 NEAR15 (width OR length OR size OR area)) AND (L38 SAME3 (energ$7 NEAR5 dens$6))	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/13 01:37 PM
L41	23	L14 AND L38 AND (L38 NEAR15 (width OR length OR size OR area)) AND (L38 SAME3 (energ$7 NEAR5 dens$6)) AND @fd<"20140117"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/13 01:37 PM
L42	428	(H01M50/538).cpc. AND (recess$6 near15 (tab OR lead OR tap))	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/13 02:18 PM
L43	41	(H01M50/538).cpc. AND (recess$6 near15 (tab OR lead OR tap)) AND @fd<"20140117"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/13 02:18 PM
L44	507	(H01M50/5$).cpc. AND (recess$6 near15 (tab OR lead OR tap)) AND @fd<"20140117"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/13 02:22 PM
L45	114	(H01M50/538).cpc. AND (recess$6 near15 (tab OR lead OR tap)) AND @pd<"20140117"	(FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/13 02:23 PM
L46	13	("20100216001" OR "20110274953" OR "20140017565" OR "20150295270" OR "6139986" OR "20050287428" OR "20090148766" OR "20090297941" OR "20110076547" OR "20160197379" OR	(US-PGPUB; USPAT)	OR	ON	ON	2022/07/13 04:06 PM

		"7923139" OR "7955736" OR "8450006").pn.					
L47	1	US-10320024-$.did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/13 04:08 PM
L48	9	("20110104539" | "20110129708" | "20110151295" | "20120009450" | "20120321924" | "20130260203" | "20130316207" | "20140072877" | "20140302366").pn. OR ("10320024").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/13 04:08 PM
L49	0	(KR-1038115-$ OR KR-1615712-$ OR KR-20110035566-$ OR KR-20160085063-$).DID.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/13 04:12 PM
L50	4	(KR-1038115-$ OR KR-1615712-$ OR KR-20110035566-$ OR KR-20160085063-$).DID.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/13 04:12 PM
L51	4	(KR-101038115-$ OR KR-101615712-$).DID.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/13 04:13 PM
L52	45	(Artificial Intelligence) More Like: US-20140302366-A1 Text: (US-9520588-B2 OR WO-2013038701-A1	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB,	OR	ON	ON	2022/07/13 04:14 PM

		OR JP-WO2013038701-A1 OR JP-5849234-B2 OR WO-2013038677-A1 OR JP-2014225326-A OR JP-2007109612-A OR JP-6208239-B2 OR JP-6439839-B2 OR CN-103733418-B OR CN-107431250-B OR JP-H09180761-A OR JP-2003288941-A OR KR-20030078019-A OR KR-100990800-B1 OR JP-4097443-B2 OR JP-6652125-B2 OR JP-2013073680-A OR JP-2016081881-A OR CN-103733418-A).did.	HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L53	49	(Artificial Intelligence) More Like: WO-2013038677-A1 Text: (WO-2013038701-A1 OR JP-5849234-B2 OR JP-WO2013038701-A1 OR WO-2013038676-A1 OR JP-2014225326-A OR US-9520588-B2 OR US-20140302366-A1 OR WO-2016079943-A1 OR JP-2007109612-A OR JP-2010061893-A OR JP-2008311011-A OR WO-2018061381-A1 OR JP-2018018646-A OR JP-WO2018061381-A1 OR JP-2016122628-A OR JP-6567821-B2 OR WO-2019065871-A1 OR US-8530072-B2 OR JP-H09306471-A OR JP-2010086812-A).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/07/13 04:19 PM
L54	47	((JP-2003132875-A OR WO-2013038677-A1 OR WO-2013038676-A1 OR CN-202495523-U OR JP-6652125-B2 OR CN-103066239-A OR CN-101939873-A OR CN-201087907-Y OR CN-1221054-C OR CN-1350350-A OR CN-1221054-A).did. AND FTDB.dbnm.) OR ((US-20140349179-A1 OR	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA,	OR	ON	ON	2022/07/13 04:43 PM

		US-20140120417-A1 OR US-20090111011-A1 OR US-20110104539-A1 OR US-20110151295-A1 OR US-20010033962-A1 OR US-20090166192-A1 OR US-20140302366-A1 OR US-20130316207-A1 OR US-20080233474-A1 OR US-20130045406-A1 OR US-20120214049-A1 OR US-20110027636-A1 OR US-20060222937-A1 OR US-20130045405-A1 OR US-20130316209-A1 OR US-20130101891-A1 OR US-20120321942-A1 OR US-20100086858-A1 OR US-20150295270-A1 OR US-20120009450-A1 OR US-20040191634-A1 OR US-20060051662-A1 OR US-20090081530-A1 OR US-20090035638-A1 OR US-20070122714-A1).did. AND PGPB.dbnm.) OR ((US-9142840-B2 OR US-8837115-B2 OR US-6100114-A OR US-5478668-A OR US-5017442-A).did. AND USPT.dbnm.) OR ((JP-2014225326-A OR JP-2001015096-A OR JP-2000277155-A).did. AND JPAB.dbnm.) OR ((KR-101475367-B1 OR CN-1221054-A).did. AND FPRS.dbnm.)	VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L55	134	((("NINGDE") near3 ("AMPEREX") near3 ("TECHNOLOGY") near3 ("LIMITED"))).AS,AANM.	(USPAT)	OR	ON	ON	2022/07/13 09:28 PM
L56	137	((("NINGDE") near3 ("AMPEREX"))).AS,AANM.	(USPAT)	OR	ON	ON	2022/07/13 09:30 PM

L57	527	((("NINGDE") near3 ("AMPEREX"))).AS,AANM.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/13 09:30 PM
L58	1129	L57 AND L14	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/13 09:31 PM
L59	10	L57 AND L14 AND @pd<"20140117"	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/13 09:31 PM
L60	308	((("TAO") near3 ("Tao")) OR (("MO") near3 ("Ming") near3 ("Liang"))).INV.	(US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT)	OR	ON	ON	2022/07/14 10:56 AM
L61	2	L60 AND L14 AND @pd<"20140117"	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/14 10:57 AM
L62	130343969	L60AND @pd<"20140117"	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/14 10:57 AM
L63	2325	L60 AND @pd<"20140117"	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO);	OR	ON	ON	2022/07/14 10:57 AM

			FPRS; EPO; JPO)				
L65	0	L60 AND H01M50/5$.cpc. AND @pd<"20140117"	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/14 10:58 AM
L66	46	L60 AND H01M.cpcl. AND @pd<"20140117"	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/14 10:59 AM
L67	47	((JP-2003132875-A OR WO-2013038677-A1 OR WO-2013038676-A1 OR CN-202495523-U OR JP-6652125-B2 OR CN-103066239-A OR CN-101939873-A OR CN-201087907-Y OR CN-1221054-C OR CN-1350350-A OR CN-1221054-A).did. AND FTDB.dbnm.) OR ((US-20140349179-A1 OR US-20140120417-A1 OR US-20090111011-A1 OR US-20110104539-A1 OR US-20110151295-A1 OR US-20010033962-A1 OR US-20090166192-A1 OR US-20140302366-A1 OR US-20130316207-A1 OR US-20080233474-A1 OR US-20130045406-A1 OR US-20120214049-A1 OR US-20110027636-A1 OR US-20060222937-A1 OR US-20130045405-A1 OR US-20130316209-A1 OR US-20130101891-A1 OR US-20120321942-A1 OR US-	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/07/14 11:11 AM

		20100086858-A1 OR US-20150295270-A1 OR US-20120009450-A1 OR US-20040191634-A1 OR US-20060051662-A1 OR US-20090081530-A1 OR US-20090035638-A1 OR US-20070122714-A1).did. AND PGPB.dbnm.) OR ((US-9142840-B2 OR US-8837115-B2 OR US-6100114-A OR US-5478668-A OR US-5017442-A).did. AND USPT.dbnm.) OR ((JP-2014225326-A OR JP-2001015096-A OR JP-2000277155-A).did. AND JPAB.dbnm.) OR ((KR-101475367-B1 OR CN-1221054-A).did. AND FPRS.dbnm.)					
L68	12	(US-20050250052-$ OR US-20110003211-$).did. OR (CN-1489229-$ OR CN-101939869-$ OR CN-103262310-$ OR JP-2005283643-$).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/14 12:00 PM
L69	53	((JP-2003132875-A OR WO-2013038677-A1 OR WO-2013038676-A1 OR CN-202495523-U OR JP-6652125-B2 OR CN-103066239-A OR CN-101939873-A OR CN-201087907-Y OR CN-1221054-C OR CN-1350350-A OR CN-1221054-A OR CN-103262310-A OR CN-101939869-A OR JP-2005283643-A OR CN-1489229-A).did. AND FTDB.dbnm.) OR ((US-20140349179-A1 OR US-20140120417-A1 OR US-20090111011-A1 OR US-20110104539-A1 OR US-20110151295-A1	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/07/14 12:12 PM

		OR US-20010033962-A1 OR US-20090166192-A1 OR US-20140302366-A1 OR US-20130316207-A1 OR US-20080233474-A1 OR US-20130045406-A1 OR US-20120214049-A1 OR US-20110027636-A1 OR US-20060222937-A1 OR US-20130045405-A1 OR US-20130316209-A1 OR US-20130101891-A1 OR US-20120321942-A1 OR US-20100086858-A1 OR US-20150295270-A1 OR US-20120009450-A1 OR US-20040191634-A1 OR US-20060051662-A1 OR US-20090081530-A1 OR US-20090035638-A1 OR US-20070122714-A1 OR US-20110003211-A1 OR US-20050250052-A1).did. AND PGPB.dbnm.) OR ((US-9142840-B2 OR US-8837115-B2 OR US-6100114-A OR US-5478668-A OR US-5017442-A).did. AND USPT.dbnm.) OR ((JP-2014225326-A OR JP-2001015096-A OR JP-2000277155-A).did. AND JPAB.dbnm.) OR ((KR-101475367-B1 OR CN-1221054-A).did. AND FPRS.dbnm.)					
L70	53	((JP-2003132875-A OR WO-2013038677-A1 OR WO-2013038676-A1 OR CN-202495523-U OR JP-6652125-B2 OR CN-103066239-A OR CN-101939873-A OR CN-201087907-Y OR CN-1221054-C OR CN-1350350-A OR CN-1221054-A OR CN-103262310-A OR CN-101939869-A OR JP-	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/07/15 11:48 AM

		2005283643-A OR CN-1489229-A).did. AND FTDB.dbnm.) OR ((US-20140349179-A1 OR US-20140120417-A1 OR US-20090111011-A1 OR US-20110104539-A1 OR US-20110151295-A1 OR US-20010033962-A1 OR US-20090166192-A1 OR US-20140302366-A1 OR US-20130316207-A1 OR US-20080233474-A1 OR US-20130045406-A1 OR US-20120214049-A1 OR US-20110027636-A1 OR US-20060222937-A1 OR US-20130045405-A1 OR US-20130316209-A1 OR US-20130101891-A1 OR US-20120321942-A1 OR US-20100086858-A1 OR US-20150295270-A1 OR US-20120009450-A1 OR US-20040191634-A1 OR US-20060051662-A1 OR US-20090081530-A1 OR US-20090035638-A1 OR US-20070122714-A1 OR US-20110003211-A1 OR US-20050250052-A1).did. AND PGPB.dbnm.) OR ((US-9142840-B2 OR US-8837115-B2 OR US-6100114-A OR US-5478668-A OR US-5017442-A).did. AND USPT.dbnm.) OR ((JP-2014225326-A OR JP-2001015096-A OR JP-2000277155-A).did. AND JPAB.dbnm.) OR ((KR-101475367-B1 OR CN-1221054-A).did. AND FPRS.dbnm.)					
L71	4105191	(tape OR adhesive OR insulat$7) NEAR25 (electrode OR lead OR tab)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU,	OR	ON	ON	2022/07/15 11:49 AM

			CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)				
L72	34	L70 AND L71	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/15 11:49 AM
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			MA, OA, RU, SU, WO); FPRS; EPO; JPO)				
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			ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)				
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		OR US-20120009450-A1 OR US-20040191634-A1 OR US-20060051662-A1 OR US-20090081530-A1 OR US-20090035638-A1 OR US-20070122714-A1 OR US-20110003211-A1 OR US-20050250052-A1).did. AND PGPB.dbnm.) OR ((US-9142840-B2 OR US-8837115-B2 OR US-6100114-A OR US-5478668-A OR US-5017442-A).did. AND USPT.dbnm.) OR ((JP-2014225326-A OR JP-2001015096-A OR JP-2000277155-A).did. AND JPAB.dbnm.) OR ((KR-101475367-B1 OR CN-1221054-A).did. AND FPRS.dbnm.)					
L88	184982	((insulat$7 OR adhesiv$6 OR tape OR glue OR resin) NEAR10 (oppos$10 OR paired OR pair$5 OR face-to-face OR corresponding)) SAME ((short ADJ circuit) OR short-circuit OR short$7)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/20 11:07 AM
L89	1468	L14 AND L88	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/20 11:07 AM
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		A1 OR US-20050250052-A1).did. AND PGPB.dbnm.) OR ((US-9142840-B2 OR US-8837115-B2 OR US-6100114-A OR US-5478668-A OR US-5017442-A).did. AND USPT.dbnm.) OR ((JP-2014225326-A OR JP-2001015096-A OR JP-2000277155-A).did. AND JPAB.dbnm.) OR ((KR-101475367-B1 OR CN-1221054-A).did. AND FPRS.dbnm.)					

PE2E SEARCH - Search History (Interference)

There are no Interference searches to show.

Electronically filed August 8, 2022

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application of:	Tao Tao et al.	Confirmation No.:	8911
Serial No.:	17/746,755	Art Unit:	1721
Filed:	May 17, 2022	Examiner:	Barton, Jason Aaron
For:	*Lithium-Ion Battery Having Desirable Safety Performance*	Attorney Docket No.:	024607-02-5119-US

AMENDMENT AND RESPONSE TO **TRACK 1** NON-FINAL OFFICE ACTION

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450
Sir:

The enclosed Amendment is in response to the **Track 1** Office Action dated July 28, 2022 for the above identified patent application.

The Commissioner is hereby authorized to charge any required fee(s) to Morgan, Lewis & Bockius LLP Deposit Account No. 50-0310 (order no. 024607-02-5119-US).

Amendments to the Claims

The following listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1-19. (Canceled)

20. (New) A lithium-ion battery, comprising:

a positive electrode comprising a positive current collector and a positive electrode active material layer containing $LiCoO_2$, wherein the positive electrode active material layer is formed on the positive current collector, the positive electrode active material layer being provided with a first recess accommodating a positive lead being coupled with the positive current collector;

a negative electrode comprising a negative current collector and a negative electrode active material layer containing graphite or silicon, wherein the negative electrode active material layer is formed on the negative current collector, the negative electrode active material layer being provided with a second recess accommodating a negative lead being coupled with the negative current collector;

a separator disposed between the positive electrode and the negative electrode; and

an electrolyte,

wherein, a top surface of the positive lead is provided with a first insulating glue layer, a surface of the positive electrode active material layer corresponding to the second recess is pasted with a second insulating glue layer, the second insulating glue layer has a width larger than a width of the second recess, and the second insulating glue layer has a length larger than a length of the second recess.

21. (New) The lithium-ion battery of claim 20, wherein a distance between a center of the first recess and one end of the positive electrode active material layer is 1/4-3/4 of a length of the positive electrode active material layer; and a distance between a center of the second recess and one end of the negative electrode active material layer is 1/4-3/4 of a length of the negative electrode active material layer.

22. (New) The lithium-ion battery of claim 21, wherein, the distance between the center of the first recess and the one end of the positive electrode active material layer is half of the length of the positive electrode active material layer; and the distance between the center of the second recess and the one end of the negative electrode active material layer is half of the length of the negative electrode active material layer.

23. (New) The lithium-ion battery of claim 22, wherein the first recess has a length of 1-100 mm less than a length of the positive lead, the first recess has a width of 1-10 mm larger than a width of the positive lead, the second recess has a length of 1-100 mm less than a length of the negative lead, and the second recess has a width of 1-10 mm larger than a width of the negative lead.

24. (New) The lithium-ion battery of claim 20, wherein the first recess has a length of 1-100 mm less than a width of the positive electrode active material layer, and the second recess has a length of 1-100 mm less than a width of the negative electrode active material layer.

25. (New) The lithium-ion battery of claim 20, wherein the first recess has a depth of 0.005-0.1 mm larger than a thickness of the positive lead, and the second recess has a depth of 0.005-0.1 mm larger than a thickness of the negative lead.

26. (New) The lithium-ion battery of claim 20, wherein a length of a portion of the positive lead in the first recess is less than a width of a remaining portion of the positive electrode active material layer from an edge of the first insulating glue layer covering the positive electrode active material layer to an edge of the positive electrode active material layer opposite to the first recess.

27. (New) The lithium-ion battery of claim 20, wherein a width of a portion of the positive lead in the first recess is greater than a width of a remaining portion of the first recess not occupied by the positive lead located on one side of the positive lead.

28. (New) The lithium-ion battery of claim 20, wherein a surface of the positive current collector corresponding to the positive lead is covered with another first insulating glue layer.

29. (New) A lithium-ion battery, comprising:

a positive electrode, comprising a positive current collector and a positive electrode active material layer being formed on the positive current collector, the positive electrode active material layer being provided with a first recess accommodating a positive lead being coupled with the positive current collector;

a negative electrode, comprising a negative current collector and a negative electrode active material layer being formed on the negative current collector, the negative electrode active material layer being provided with a second recess accommodating a negative lead being coupled with the negative current collector;

a separator disposed between the positive electrode and the negative electrode; and

an electrolyte,

wherein, a first location of a top surface of the positive lead is provided with a first insulating glue layer; a second location of a surface of the positive electrode active material layer corresponding to the second recess is pasted with a second insulating glue layer; a third location of a surface of the positive current collector corresponding to the positive lead is covered with another first insulating glue layer; the second insulating glue layer has a width larger than a width of the second recess, and the second insulating glue layer has a length larger than a length of the second recess.

30. (New) The lithium-ion battery of claim 29, wherein a distance between a center of the first recess and one end of the positive electrode active material layer is 1/4-3/4 of a length of the positive electrode active material layer, and a distance between a center of the second recess and one end of the negative electrode active material layer is 1/4-3/4 of a length of the negative electrode active material layer.

31. (New) The lithium-ion battery of claim 29, wherein a distance between a center of the first recess and one end of the positive electrode active material layer is half of a length of the positive electrode active material layer, and a distance between a center of the second recess and one end of the negative electrode active material layer is half of a length of the negative electrode active material layer.

32. (New) The lithium-ion battery of claim 29, wherein the first recess has a length of 1-100mm less than a length of the positive lead, the first recess has a width of 1-10mm larger than a width of the positive lead, the second recess has a length of 1-100mm less than a

length of the negative lead, and the second recess has a width of 1-10mm larger than a width of the negative lead.

33. (New) The lithium-ion battery of claim 29, wherein the first recess has a length of 1-100mm less than a width of the positive electrode active material layer, and the second recess has a length of 1-100mm less than a width of the negative electrode active material layer.

34. (New) The lithium-ion battery of claim 29, wherein the first recess has a depth of 0.005-0.1mm larger than a thickness of the positive lead, and the second recess has a depth of 0.005-0.1mm larger than a thickness of the negative lead.

35. (New) The lithium-ion battery of claim 29, wherein a length of a portion of the positive lead in the first recess is less than a width of a remaining portion of the positive electrode active material layer from an edge of the first insulating glue layer covering the positive electrode active material layer to an edge of the positive electrode active material layer opposite to the first recess.

36. (New) The lithium-ion battery of claim 29, wherein a width of a portion of the positive lead in the first recess is greater than a width of a remaining portion of the first recess not occupied by the positive lead located on one side of the positive lead.

37. (New) A lithium-ion battery, comprising:

a positive electrode, comprising a positive current collector and a positive electrode active material layer being formed on the positive current collector, the positive electrode active material layer being provided with a first recess accommodating a positive lead being coupled with the positive current collector;

a negative electrode, comprising a negative current collector and a negative electrode active material layer being formed on the negative current collector, the negative electrode active material layer being provided with a second recess accommodating a negative lead being coupled with the negative current collector;

a separator disposed between the positive electrode and the negative electrode; and

an electrolyte,

wherein, a first location of a top surface of the positive lead is provided with a first insulating glue layer; a second location of a surface of the positive electrode active material layer corresponding to the second recess is pasted with a second insulating glue layer; the

second insulating glue layer has a width larger than a width of the second recess, and the second insulating glue layer has a length larger than a length of the second recess.

38. (New) The lithium-ion battery of claim 37, wherein a length of a portion of the first lead in the first recess is less than a width of a remaining portion of the first film from an edge of the first insulating glue layer covering the first film to an edge of the first film opposite to the first recess.

39. (New) The lithium-ion battery of claim 37, wherein a width of a portion of the first lead in the first recess is greater than a width of a remaining portion of the first recess not occupied by the first lead located on one side of the first lead.

REMARKS

This amendment responds to the **Track 1** office action mailed July 28, 2022. In the **Track 1** office action, the Examiner:

- rejected claims 1-9 under 35 U.S.C. 103 as being unpatentable over Sugita (WO 2013/038677), in view of Matsushita et al. (U.S. Patent Publication No. 2014/0120417; Matsushita is 102(a)(2) art) and Kwak et al. (U.S. Patent Publication No. 2006/0051662);
- rejected claims 10-17 and 19 under 35 U.S.C. 103 as being unpatentable over Sugita, in view of Matsushita; and
- rejected claim 18 under 35 U.S.C. 103 as being unpatentable over Sugita, in view of Matsushita, and further in view of Lee et al. (U.S. Patent Publication No. 2011/0027636).

INTERVIEW SUMMARY

Applicant's attorneys thank Examiner Barton for the opportunity to discuss the application during a telephone interview on August 5, 2022 with Yalei Sun. In the interview, the Applicant's attorney explained that the original claims 1-19 were filed by mistake because they are identical to the claims 1-19 of the co-pending application 17/407,081. The Examiner suggested that the Applicant file a new set of claims to replace the original claims 1-19. The Examiner also agreed that the double patenting rejection in the office action against the co-pending application 17/407,081 is moot.

REMARKS CONCERNING CLAIMS

Claims 1-19 have been canceled and new claims 20-39 have been added.

Support for the new claims can be found in at least paragraphs [0034] and [0041], and Figures 1-5 of the application as filed. No new matter has been added.

With respect to all amendments, Applicant has not dedicated or abandoned any unclaimed subject matter. Moreover, Applicant has not acquiesced to any characterizations of the invention, nor any rejections or objections of the claims, made by the Examiner. Moreover, the Applicant hereby rescinds any prior disclaimer of claim scope, to the extent they exist, made during the prosecution of this application or made during the prosecution of

any patent or other related patents/applications, and advises the Examiner that any such previous disclaimers and the cited references that they were made to avoid may need to be revisited.

After entry of this amendment, the pending claims are: claims 20-39.

REMARKS CONCERNING REJECTIONS UNDER 35 U.S.C. 103

I. **REJECTION OF CLAIMS 1-9 UNDER 35 U.S.C. 103 AS BEING UNPATENTABLE OVER SUGITA, IN VIEW OF MATSUSHITA**

II. **REJECTION OF CLAIMS 10-17 AND 19 UNDER 35 U.S.C. 103 AS BEING UNPATENTABLE OVER SUGITA, IN VIEW OF MATSUSHITA**

III. **REJECTION OF CLAIM 18 UNDER 35 U.S.C. 103 AS BEING UNPATENTABLE OVER SUGITA, IN VIEW OF MATSUSHITA, AND FURTHER IN VIEW OF LEE**

As noted above, claims 1-19 have been canceled and therefore the rejections above are moot.

Moreover, independent claim 20 recites, among others, that:

> ...
>
> wherein, a top surface of the positive lead is provided with a first insulating glue layer, a surface of the positive electrode active material layer corresponding to the second recess is pasted with a second insulating glue layer, the second insulating glue layer has a width larger than a width of the second recess, and the second insulating glue layer has a length larger than a length of the second recess.

Independent claim 29 recites, among others, that:

> ...
>
> wherein, a first location of a top surface of the positive lead is provided with a first insulating glue layer; a second location of a surface of the positive electrode active material layer corresponding to the second recess is pasted with a second insulating glue layer; a third location of a surface of the positive current collector corresponding to the positive lead is covered with another first insulating glue layer; the second insulating glue layer has a width larger than a width of the second recess, and the second insulating glue layer has a length larger than a length of the second recess.

Independent claim 37 recites, among others, that:

> ...
>
> wherein, a first location of a top surface of the positive lead is provided with a first insulating glue layer; a second location of a surface of the positive electrode active material layer corresponding

to the second recess is pasted with a second insulating glue layer; the second insulating glue layer has a width larger than a width of the second recess, and the second insulating glue layer has a length larger than a length of the second recess.

The Applicant respectfully submits that none of the cited references teach or suggest the claim features above. Therefore, the Applicant respectfully submits that claims 20-39 are patentable over the cited references.

CONCLUDING REMARKS

By responding in the foregoing remarks only to particular positions asserted by the examiner, the Applicant does not necessarily acquiesce in other positions that have not been explicitly addressed. In addition, the Applicant's arguments for the patentability of a claim should not be understood as implying that no other reasons for the patentability of that claim exist.

In light of the above amendments and remarks, the Applicant respectfully requests that the Examiner reconsider this application with a view towards allowance. The Examiner is invited to call the undersigned attorney at (650) 843-7558, if a telephone call could help resolve any remaining items.

Respectfully submitted,

Date: August 8, 2022

/Yalei Sun/ 57,765

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Phone: (650) 843-7558
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Electronic Acknowledgement Receipt

EFS ID:	46365464
Application Number:	17746755
International Application Number:	
Confirmation Number:	8911
Title of Invention:	LITHIUM-ION BATTERY HAVING DESIRABLE SAFETY PERFORMANCE
First Named Inventor/Applicant Name:	Tao TAO
Customer Number:	24341
Filer:	Yalei Sun
Filer Authorized By:	
Attorney Docket Number:	024607-02-5119-US
Receipt Date:	08-AUG-2022
Filing Date:	17-MAY-2022
Time Stamp:	19:19:37
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		024607-02-5119-US_P2014010US5_RNFOA.pdf	214553 9f4e15639ab5948d9da67dec0d3fe74831c5acfa	yes	9

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Amendment/Request for Reconsideration-After Non-Final Rejection	1	1
	Claims	2	6
	Applicant Arguments/Remarks Made in an Amendment	7	9
Warnings:			
Information:			
	Total Files Size (in bytes):	214553	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

<u>New Applications Under 35 U.S.C. 111</u>
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
<u>National Stage of an International Application under 35 U.S.C. 371</u>
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
<u>New International Application Filed with the USPTO as a Receiving Office</u>
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
17/746,755	05/17/2022	Tao TAO	024607-02-5119-US

CONFIRMATION NO. 8911

24341
Morgan, Lewis & Bockius LLP (PA)
1400 Page Mill Road
Palo Alto, CA 94304-1124

PUBLICATION NOTICE

OC000000136175778

Title:LITHIUM-ION BATTERY HAVING DESIRABLE SAFETY PERFORMANCE

Publication No.US-2022-0278360-A1
Publication Date:09/01/2022

NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/746,755	05/17/2022	Tao TAO	024607-02-5119-US	8911

24341 7590 10/24/2022

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EXAMINER	
BARTON, JASON AARON	

ART UNIT	PAPER NUMBER
1721	

NOTIFICATION DATE	DELIVERY MODE
10/24/2022	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

padocketingdepartment@morganlewis.com
vskliba@morganlewis.com

Office Action Summary	Application No. 17/746,755	Applicant(s) TAO et al.	
	Examiner JASON A BARTON	Art Unit 1721	AIA (FITF) Status Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☑ Responsive to communication(s) filed on 08/08/2022.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☑ This action is **FINAL.** 2b) ☐ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5) ☑ Claim(s) 20-39 is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6) ☐ Claim(s) _____ is/are allowed.

7) ☑ Claim(s) 20-39 is/are rejected.

8) ☐ Claim(s) _____ is/are objected to.

9) ☐ Claim(s) _____ are subject to restriction and/or election requirement

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to **PPHfeedback@uspto.gov.**

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☑ Notice of References Cited (PTO-892)

2) ☑ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date _____.

4) ☐ Other: _____.

DETAILED ACTION

Notice of Pre-AIA or AIA Status

1. The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

Response to Arguments

2. Applicant's arguments filed 08/08/2022, with respect to new independent claims 20, 29 and 37 have been considered but are not persuasive. Applicant argues that the previously cited art do not teach the limitations of the independent claims relating to the insulating glue layers. The examiner disagrees that the previously cited art does not teach the claimed limitations. New claims 20-39 stand rejected over Sugita, Matsushita and Kwak. See rejections below.

Information Disclosure Statement

3. The information disclosure statement filed 07/26/2022 fails to comply with 37 CFR 1.98(a)(2), which requires a legible copy of each cited foreign patent document; each non-patent literature publication or that portion which caused it to be listed; and all other information or that portion which caused it to be listed. It has been placed in the application file, but the information referred to therein has not been considered.

An IDS was filed 07/26/2022. No copies were provided for any of the foreign references or non-patent literature documents. Those references not considered are crossed out on the IDS accompanying this Action.

Claim Rejections - 35 USC § 112

4. The following is a quotation of 35 U.S.C. 112(b):
(b) CONCLUSION.—The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the inventor or a joint inventor regards as the invention.

The following is a quotation of 35 U.S.C. 112 (pre-AIA), second paragraph:
The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claims 28 and 29-36 are rejected under 35 U.S.C. 112(b) or 35 U.S.C. 112 (pre-AIA), second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the inventor or a joint inventor (or for applications subject to pre-AIA 35 U.S.C. 112, the applicant), regards as the invention.

6. **Claim 28 recites**, "…wherein a surface of the positive current collector **corresponding to** the positive lead is covered with another first insulating glue layer" (emphasis added). It is unclear what structure is imparted by the term, "corresponding to." For instance, it is unclear how the location of the another first insulating glue layer on the surface of the positive current collector "corresponds" to the positive lead in a structural sense. In this regard, claim 1 already requires a first insulating glue layer provided on a top surface of the positive lead. If the another first insulating glue layer corresponds to the positive lead, is the positive lead covered with two insulating glue layers? Alternatively, if the positive lead itself is not covered, it's unclear at what location or locations the another insulating glue layer would meet the limitation of, "corresponding to." For at least these reasons, the claim is indefinite.

The claim is broadly interpreted as meaning, "wherein a surface of the positive current collector is covered with another first insulating glue layer."

To overcome the rejection, it is suggested that Applicant amend the claim to more distinctly define the location of the another first insulating glue layer. Moreover, it is noted that in presenting the amendment that annotated figures from the specification can be helpful in aiding the understanding of the claimed subject matter.

7. **Claim 29** is similarly indefinite for same reasons identified in claim 28. That is, the claim recitation of, "a third location of a surface of the positive current collector corresponding to the positive lead is covered with another first insulating glue layer." By virtue of their dependency on claim 29, claims 30-36 are similarly rejected.

Claim Rejections - 35 USC § 103

8. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

9. This application currently names joint inventors. In considering patentability of the claims the examiner presumes that the subject matter of the various claims was commonly owned as of the effective filing date of the claimed invention(s) absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and effective filing dates of each claim that was not commonly owned as of the effective filing date of the later invention in order for the examiner to consider the applicability of 35 U.S.C. 102(b)(2)(C) for any potential 35 U.S.C. 102(a)(2) prior art against the later invention.

10. Claims 20-39 are rejected under 35 U.S.C. 103 as being unpatentable over Sugita (WO2013038677A1) in view of Matsushita (US20140120417A1) and Kwak (US20060051662A1).

11. **Regarding claim 20**, Sugita teaches a lithium-ion battery ([001]-[002]), comprising:

a positive electrode (positive electrode plate 1a, 1c, 1d, 1f, FIGs. 2a, 4, 5, 7; [029]; while numerous embodiments are cited, reference is made specifically to plate 1a of FIG. 2a below for brevity) comprising a positive current collector (see [027]) and a positive electrode active material layer (the active material is coated on the current collector, see [027]; e.g., FIG. 2a shows the "film" as the dark portion (no reference sign is provided)) containing LiCoO2 (lithium cobalt oxide, [060]),

wherein the positive electrode active material layer is formed on the positive current collector (see [027]), the positive electrode active material layer being provided with a first recess (exposed portion 22, FIG. 2A; [027]) accommodating a positive lead being coupled with the positive current collector (see FIG. 2a);

a negative electrode (negative electrode plate 2c, FIG. 13; [030], [056]) comprising a negative current collector (see [027]) and a negative electrode active material layer (the active material is coated on the collector, see [027]) containing graphite or silicon ([065], graphite and silicon are both disclosed),

wherein the negative electrode active material layer is formed on the negative current collector (see [027]), the negative electrode active material layer being provided with a second recess (exposed portion 31, FIG. 2b) accommodating a negative lead being coupled with the negative current collector (see FIG. 2b);

a separator (separator 3, FIG. 1; [069]) disposed between the positive electrode and the negative electrode (see FIG. 1); and

an electrolyte ([071]).

Sugita does not teach wherein, a top surface of the positive lead is provided with a first insulating glue layer, a surface of the positive electrode active material layer corresponding to the second

recess is pasted with a second insulating glue layer, the second insulating glue layer has a width larger than a width of the second recess, and the second insulating glue layer has a length larger than a length of the second recess. However, Sugita does advise to provide insulation between current collecting tabs ([045]). Accordingly, the skilled person would have been motivated to provide insulation to the battery of Sugita.

However, Matsushita and Kwak teach the deficient limitations. Matsushita relates to electrodes having exposed portions with a lead bonded thereto (abstract) and is thus analogous art. Kwak relates to a wound electrode assembly (FIG. 6) that prevents short circuiting (abstract) and is thus analogous art.

Matsushita teaches a top surface of the positive lead (lead 25, see any of embodiments of Figs 4-7; in particular, see Fig. 4a) is provided with a first insulating glue layer (resin tape of protective tape 27, see [0052]).

Kwak teaches a surface of the positive electrode active material layer (second electrode plate 130, FIG. 6; [0036]) corresponding to the second recess (see FIG. 6, the insulation tape 160a corresponds to the second electrode tab 136; see FIG. 4, the recess is formed by the absence of active material) is pasted with a second insulating glue layer (insulation tape 160a, FIG. 6, [0044]), the second insulating glue layer has a width larger than a width of the second recess (see FIG. 4, the insulation tape 160 is noticeably wider than the electrode tab 136), and the second insulating glue layer has a length larger than a length of the second recess (see FIG. 3, the insulating tape 160a has a length that protrudes beyond the length of separator, see also claim 14).

Thus, it would have been obvious before the effective filing date of the claimed invention to incorporated the insulating glue (protective tape 27) of Matsushita and the insulation tape (160a) of Kwak to Sugita to arrive at the claimed invention. The skilled person would have been motivated

to modify Sugita with Matsushita to insulate the electrode lead and prevent thermal runaway of the battery when, for example, the separator or the like is split in an abnormal case (Matsushita, [0052]). Further, the skilled person would have been motivated to modify Sugita with Kwak to prevent short-circuiting between the first electrode plate 140 and the second electrode plate 130 (Kwak, [0056]).

12. **Regarding claim 21,** Sugita in view of Matsushita and Kwak teach the lithium-ion battery of claim 20 as described above.

Sugita also teaches wherein a distance between a center of the first recess and one end of the positive electrode active material layer is 1/4-3/4 of a length of the positive electrode active material layer (see FIG. 2a; since the length of the alleged first lead covers ~1/4 of the width of the current collecting plate (top-to-bottom), the limitation is held to be met); and a distance between a center of the second recess and one end of the negative electrode active material layer is 1/4-3/4 of a length of the negative electrode active material layer (see FIG. 13 and claim mapping above).

13. **Regarding claims 22, 23, 24 and 25**, Sugita in view of Matsushita and Kwak teach the lithium-ion battery of claims 20 and 21 as described above.

None of Sugita, Matsushita or Kwak teach the limitations of claim 22, 23, 24 and 25.

Claim 23 requires wherein the first recess has a length of 1- 100 mm less than a length of the positive lead, the first recess has a width of 1-10 mm larger than a width of the positive lead, the second recess has a length of 1-100 mm less than a length of the negative lead, and the second recess has a width of 1-10 mm larger than a width of the negative lead.

Claim 24 requires wherein the first recess has a length of 1- 100 mm less than a width of the positive electrode active material layer, and the second recess has a length of 1-100 mm less than a width of the negative electrode active material layer.

Claim 25 requires wherein the first recess has a depth of 0.005-0.1 mm larger than a thickness of the positive lead, and the second recess has a depth of 0.005-0.1 mm larger than a thickness of the negative lead.

However, it has been held that changes in size (dimension) are generally recognized as being within the level of ordinary skill in the art. *In re Rose*, 220 F.2d 459, 105 USPQ 237 (CCPA 1955). Where the only difference between the prior art and the claims is a recitation of relative dimensions of the claimed device, and the device having the claimed dimensions would not perform differently than the prior art device, the claimed device is not patentably distinct from the prior art device. *Gardner v. TEC Syst., Inc.*, 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), *cert. denied*, 469 U.S. 830, 225 USPQ 232 (1984).

In the instant case, it appears that the prior art device (i.e., the combination of Sugita with Matsushita and Kwak) have the same claimed features and any relative difference in size, dimensions, or proportions would not lead to a device that performs differently from the claimed device. Moreover, the present claims cover very broad ranges (two or three orders of magnitude) and there is no indication in the specification that such broad ranges establish the criticality of the ranges. Thus, the claimed device of claims 22, 23, 24 and 25 are not patentably distinct from Sugita in view of Matsushita and Kwak. Accordingly, it would have been obvious before the effective filing date of the claimed invention to have arrived at the claimed invention of claims 22, 23, 24 and 25 because changes in proportion (size) are within ordinary skill in the art.

14. **Regarding claim 26**, Sugita in view of Matsushita and Kwak teach the lithium-ion battery of claim 20 as described above.

Sugita also teaches wherein a length of a portion of the positive lead in the first recess is less than a width of a remaining portion of the positive electrode active material layer from an edge of the first insulating glue layer covering the positive electrode active material layer to an edge of the positive electrode active material layer opposite to the first recess (see FIG. 2a; since the length of the alleged first lead covers ~1/4 of the width of the current collecting plate (top-to-bottom), the limitation is held to be met).

15. **Regarding claim 27**, Sugita in view of Matsushita and Kwak teach the lithium-ion battery of claim 20 as described above.

None of Sugita, Matsushita or Kwak teach wherein a width of a portion of the positive lead in the first recess is greater than a width of a remaining portion of the first recess not occupied by the positive lead located on one side of the positive lead.

However, it has been held that changes in dimension are generally recognized as being within the level of ordinary skill in the art. *In re Rose*, 220 F.2d 459, 105 USPQ 237 (CCPA 1955). Where the only difference between the prior art and the claims is a recitation of relative dimensions of the claimed device, and the device having the claimed dimensions would not perform differently than the prior art device, the claimed device is not patentably distinct from the prior art device. *Gardner v. TEC Syst., Inc.*, 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), *cert. denied*, 469 U.S. 830, 225 USPQ 232 (1984).

In the instant case, it does not appear that there would be any difference between the claimed device and the prior art device of Sugita in view of Matsushita. For at least these reasons, it would have been obvious before the effective filing date of the claimed invention to have arrived

at the claimed invention of claim 27 because changes in proportion are within ordinary skill in the art.

16. **Regarding claim 28**, Sugita in view of Matsushita and Kwak teach the lithium-ion battery of claim 20 as described above.

Sugita does not teach wherein a surface of the positive current collector is covered with another first insulating glue layer (the claim is interpreted in this manner due to the claim being indefinite, see §112(b) rejections above).

As noted above, Sugita advises to provide insulation between current collecting tabs ([045]), but does not explicitly state how to insulate the current collecting tabs.

Nonetheless, Kwak teaches wherein a surface of the positive current collector is covered with another first insulating glue layer (see [040], the separator 150 has insulation tape 160 that when the battery is assembled faces the positive or negative electrode plate 130/140 after being wound; FIG. 6). While it's unclear what the term, "corresponding to" in the claim means (see §112(b) rejection above), Kwak at least appears to suggest this limitation: "the insulation tape 160 may be coupled with the separator in a position facing the first electrode plate uncoated portion corresponding to the position of the first electrode tab." ([0041]).

Thus, the skilled person would have been motivated to modify the lithium-ion battery of claim 20 as taught by Sugita, Matsushita and Kwak additionally with Kwak to arrive at the claimed invention. The skilled person would have been motivated to do so in order to prevent short-circuiting between the first electrode plate 140 and the second electrode plate 130 (Kwak, [0060]).

17. **Regarding claim 29**, Sugita teaches a lithium-ion battery ([001]-[002]), comprising:

a positive electrode (positive electrode plate 1a, FIG. 2a; [029]) comprising a positive current collector (see [027]) and a positive electrode active material layer (the active material is

coated on the current collector, see [027]; FIG. 2a shows the "film" as the dark portion (no reference sign is provided)) being formed on the positive current collector (see [027]), the positive electrode active material layer being provided with a first recess (exposed portion 22, FIG. 2A; [027]) accommodating a positive lead being coupled with the positive current collector (see FIG. 2a);

a negative electrode (negative electrode plate 2a, FIG. 13; [030], [056]) comprising a negative current collector (see [027]) and a negative electrode active material layer (the active material is coated on the collector, see [027]) being formed on the negative current collector (see [027]), the negative electrode active material layer being provided with a second recess (exposed portion 31, FIG. 2b) accommodating a negative lead being coupled with the negative current collector (see FIG. 2b);

a separator (separator 3, FIG. 1; [069]) disposed between the positive electrode and the negative electrode (see FIG. 1); and

an electrolyte ([071]).

Sugita does not teach wherein (**limitation 1**) a first location of a top surface of the positive lead is provided with a first insulating glue layer, (**limitation 2**) a second location of a surface of the positive electrode active material layer corresponding to the second recess is pasted with a second insulating glue layer, the second insulating glue layer has a width larger than a width of the second recess, and the second insulating glue layer has a length larger than a length of the second recess; and (**limitation 3**) a third location of a surface of the positive current collector corresponding to the positive lead is covered with another first insulating glue layer.

However, Sugita does advise to provide insulation between current collecting tabs ([045]). Accordingly, the skilled person would have been motivated to provide insulation to the battery of Sugita, which relates to deficient limitations 1-3.

However, Matsushita and Kwak teach the deficient limitations. Matsushita relates to electrodes having exposed portions with a lead bonded thereto (abstract) and is thus analogous art. Kwak relates to a wound electrode assembly (FIG. 6) that prevents short circuiting (abstract) and is thus analogous art.

Matsushita teaches (**limitation 1**) a first location of a top surface of the positive lead (lead 25, see any of embodiments of Figs 4-7; in particular, see Fig. 4a) is provided with a first insulating glue layer (resin tape of protective tape 27, see [0052]).

Kwak teaches (**limitation 2**) a surface of the positive electrode active material layer (second electrode plate 130, FIG. 6; [0036]) corresponding to the second recess (see FIG. 6, the insulation tape 160a corresponds to the second electrode tab 136; see FIG. 4, the recess is formed by the absence of active material) is pasted with a second insulating glue layer (insulation tape 160a, FIG. 6, [0044]), the second insulating glue layer has a width larger than a width of the second recess (see FIG. 4, the insulation tape 160 is noticeably wider than the electrode tab 136), and the second insulating glue layer has a length larger than a length of the second recess (see FIG. 3, the insulating tape 160a has a length that protrudes beyond the length of separator, see also claim 14).

Kwak teaches (**limitation 3**) wherein a third location of a surface of the positive current collector is covered with another first insulating glue layer (see [040], the separator 150 has insulation tape 160 that when the battery is assembled faces the positive or negative electrode plate 130/140 after being wound; FIG. 6). While it's unclear what the term, "corresponding to" in the claim means (see §112(b) rejection above), Kwak at least appears to suggest this limitation: "the

insulation tape 160 may be coupled with the separator in a position facing the first electrode plate uncoated portion corresponding to the position of the first electrode tab." ([0041]).

Thus, it would have been obvious before the effective filing date of the claimed invention to incorporated the insulating glue (protective tape 27) of Matsushita and the insulation tapes (160, 160a) of Kwak to Sugita to arrive at the claimed invention. The skilled person would have been motivated to modify Sugita with Matsushita to insulate the electrode lead and prevent thermal runaway of the battery when, for example, the separator or the like is split in an abnormal case (Matsushita, [0052]). Further, the skilled person would have been motivated to modify Sugita with Kwak to prevent short-circuiting between the first electrode plate 140 and the second electrode plate 130 (Kwak, [0056] corresponding to insulating tape 160a and [0060] corresponding to insulating tape 160).

18. **Regarding claim 30,** Sugita in view of Matsushita and Kwak teach the lithium-ion battery of claim 29 as described above.

Sugita also teaches wherein a distance between a center of the first recess and one end of the positive electrode active material layer is 1/4-3/4 of a length of the positive electrode active material layer (see FIG. 2a; since the length of the alleged first lead covers ~1/4 of the width of the current collecting plate (top-to-bottom), the limitation is held to be met); and a distance between a center of the second recess and one end of the negative electrode active material layer is 1/4-3/4 of a length of the negative electrode active material layer (see FIG. 13 and claim mapping above).

19. **Regarding claim 31,** Sugita in view of Matsushita and Kwak teach the lithium-ion battery of claim 29 as described above.

Sugita also teaches wherein a distance between a center of the first recess and one end of the positive electrode active material layer is half of a length of the positive electrode active material layer, and a distance between a center of the second recess and one end of the negative electrode active material layer is half of a length of the negative electrode active material layer. See FIGS. 2a and 13, the first recess 22 (FIG. 2a) is located in the center and the second recess (see FIG. 13, the recess is not denoted by a reference numeral but is below tab 6) is also located in the center of the active material layer.

20. **Regarding claims 32, 33, and 34**, Sugita in view of Matsushita and Kwak teach the lithium-ion battery of claim 29 as described above.

None of Sugita, Matsushita or Kwak teach the limitations of claim 32, 33 and 34.

Claim 32 requires wherein the first recess has a length of 1- 100mm less than a length of the positive lead, the first recess has a width of 1-10mm larger than a width of the positive lead, the second recess has a length of 1-100mm less than a length of the negative lead, and the second recess has a width of 1-10mm larger than a width of the negative lead.

Claim 33 requires wherein the first recess has a length of 1- 100mm less than a width of the positive electrode active material layer, and the second recess has a length of 1-100mm less than a width of the negative electrode active material layer.

Claim 34 requires wherein the first recess has a depth of 0.005-0.1mm larger than a thickness of the positive lead, and the second recess has a depth of 0.005-0. 1mm larger than a thickness of the negative lead.

However, it has been held that changes in size (dimension) are generally recognized as being within the level of ordinary skill in the art. *In re Rose*, 220 F.2d 459, 105 USPQ 237 (CCPA 1955). Where the only difference between the prior art and the claims is a recitation of relative

dimensions of the claimed device, and the device having the claimed dimensions would not perform differently than the prior art device, the claimed device is not patentably distinct from the prior art device. *Gardner v. TEC Syst., Inc.*, 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), *cert. denied*, 469 U.S. 830, 225 USPQ 232 (1984).

In the instant case, it appears that the prior art device (i.e., the combination of Sugita with Matsushita and Kwak) have the same claimed features and any relative difference in size, dimensions, or proportions would not lead to a device that performs differently from the claimed device. Moreover, the present claims cover very broad ranges (two or three orders of magnitude) and there is no indication in the specification that such broad ranges establish the criticality of the ranges. Thus, the claimed device of claims 32, 33 and 34 are not patentably distinct from Sugita in view of Matsushita and Kwak. Accordingly, it would have been obvious before the effective filing date of the claimed invention to have arrived at the claimed invention of claims 32, 33 and 34 because changes in proportion (size) are within ordinary skill in the art.

21. **Regarding claim 35**, Sugita in view of Matsushita and Kwak teach the lithium-ion battery of claim 29 as described above.

Sugita also teaches wherein a length of a portion of the positive lead in the first recess is less than a width of a remaining portion of the positive electrode active material layer from an edge of the first insulating glue layer covering the positive electrode active material layer to an edge of the positive electrode active material layer opposite to the first recess (see FIG. 2a; since the length of the alleged first lead covers ~1/4 of the width of the current collecting plate (top-to-bottom), the limitation is held to be met).

22. **Regarding claim 36**, Sugita in view of Matsushita and Kwak teach the lithium-ion battery of claim 29 as described above.

None of Sugita, Matsushita or Kwak teach wherein a width of a portion of the positive lead in the first recess is greater than a width of a remaining portion of the first recess not occupied by the positive lead located on one side of the positive lead.

However, it has been held that changes in dimension are generally recognized as being within the level of ordinary skill in the art. *In re Rose,* 220 F.2d 459, 105 USPQ 237 (CCPA 1955). Where the only difference between the prior art and the claims is a recitation of relative dimensions of the claimed device, and the device having the claimed dimensions would not perform differently than the prior art device, the claimed device is not patentably distinct from the prior art device. *Gardner v. TEC Syst., Inc.,* 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), *cert. denied,* 469 U.S. 830, 225 USPQ 232 (1984).

In the instant case, it does not appear that there would be any difference between the claimed device and the prior art device of Sugita in view of Matsushita. For at least these reasons, it would have been obvious before the effective filing date of the claimed invention to have arrived at the claimed invention of claim 36 because changes in proportion are within ordinary skill in the art.

23. **Regarding claim 37**, Sugita teaches a lithium-ion battery ([001]-[002]), comprising:

a positive electrode (positive electrode plate 1a, FIG. 2a; [029]) comprising a positive current collector (see [027]) and a positive electrode active material layer (the active material is coated on the current collector, see [027]; FIG. 2a shows the "film" as the dark portion (no reference sign is provided)) being formed on the positive current collector (see [027]), the positive electrode active material layer being provided with a first recess (exposed portion 22, FIG. 2A; [027]) accommodating a positive lead being coupled with the positive current collector (see FIG. 2a);

a negative electrode (negative electrode plate 2a, FIG. 13; [030], [056]) comprising a negative current collector (see [027]) and a negative electrode active material layer (the active material is coated on the collector, see [027]) being formed on the negative current collector (see [027]), the negative electrode active material layer being provided with a second recess (exposed portion 31, FIG. 2b) accommodating a negative lead being coupled with the negative current collector (see FIG. 2b);

a separator (separator 3, FIG. 1; [069]) disposed between the positive electrode and the negative electrode (see FIG. 1); and

an electrolyte ([071]).

Sugita does not teach wherein (**limitation 1**) a first location of a top surface of the positive lead is provided with a first insulating glue layer, (**limitation 2**) a second location of a surface of the positive electrode active material layer corresponding to the second recess is pasted with a second insulating glue layer, the second insulating glue layer has a width larger than a width of the second recess, and the second insulating glue layer has a length larger than a length of the second recess.

However, Sugita does advise to provide insulation between current collecting tabs ([045]). Accordingly, the skilled person would have been motivated to provide insulation to the battery of Sugita, which relates to deficient limitations 1 and 2.

However, Matsushita and Kwak teach the deficient limitations. Matsushita relates to electrodes having exposed portions with a lead bonded thereto (abstract) and is thus analogous art. Kwak relates to a wound electrode assembly (FIG. 6) that prevents short circuiting (abstract) and is thus analogous art.

Matsushita teaches (**limitation 1**) a first location of a top surface of the positive lead (lead 25, see any of embodiments of Figs 4-7; in particular, see Fig. 4a) is provided with a first insulating glue layer (resin tape of protective tape 27, see [0052]).

Kwak teaches (**limitation 2**) a surface of the positive electrode active material layer (second electrode plate 130, FIG. 6; [0036]) corresponding to the second recess (see FIG. 6, the insulation tape 160a corresponds to the second electrode tab 136; see FIG. 4, the recess is formed by the absence of active material) is pasted with a second insulating glue layer (insulation tape 160a, FIG. 6, [0044]), the second insulating glue layer has a width larger than a width of the second recess (see FIG. 4, the insulation tape 160 is noticeably wider than the electrode tab 136), and the second insulating glue layer has a length larger than a length of the second recess (see FIG. 3, the insulating tape 160a has a length that protrudes beyond the length of separator, see also claim 14).

Thus, it would have been obvious before the effective filing date of the claimed invention to incorporated the insulating glue (protective tape 27) of Matsushita and the insulation tape (160a) of Kwak to Sugita to arrive at the claimed invention. The skilled person would have been motivated to modify Sugita with Matsushita to insulate the electrode lead and prevent thermal runaway of the battery when, for example, the separator or the like is split in an abnormal case (Matsushita, [0052]). Further, the skilled person would have been motivated to modify Sugita with Kwak to prevent short-circuiting between the first electrode plate 140 and the second electrode plate 130 (Kwak, [0060]).

24. **Regarding claim 38**, Sugita in view of Matsushita and Kwak teach the lithium-ion battery of claim 37 as described above.

Sugita also teaches wherein a length of a portion of the positive lead in the first recess is less than a width of a remaining portion of the positive electrode active material layer from an edge

of the first insulating glue layer covering the positive electrode active material layer to an edge of the positive electrode active material layer opposite to the first recess (see FIG. 2a; since the length of the alleged first lead covers ~1/4 of the width of the current collecting plate (top-to-bottom), the limitation is held to be met).

25. **Regarding claim 39**, Sugita in view of Matsushita and Kwak teach the lithium-ion battery of claim 37 as described above.

None of Sugita, Matsushita or Kwak teach wherein a width of a portion of the positive lead in the first recess is greater than a width of a remaining portion of the first recess not occupied by the positive lead located on one side of the positive lead.

However, it has been held that changes in dimension are generally recognized as being within the level of ordinary skill in the art. *In re Rose,* 220 F.2d 459, 105 USPQ 237 (CCPA 1955). Where the only difference between the prior art and the claims is a recitation of relative dimensions of the claimed device, and the device having the claimed dimensions would not perform differently than the prior art device, the claimed device is not patentably distinct from the prior art device. *Gardner v. TEC Syst., Inc.*, 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), *cert. denied*, 469 U.S. 830, 225 USPQ 232 (1984).

In the instant case, it does not appear that there would be any difference between the claimed device and the prior art device of Sugita in view of Matsushita. For at least these reasons, it would have been obvious before the effective filing date of the claimed invention to have arrived at the claimed invention of claim 39 because changes in proportion are within ordinary skill in the art.

Citation of Pertinent Art

26. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

- JP2007165224A: JP'224 discloses a nonaqueous electrolyte battery (abstract) having an insulating portion 8 (FIG. 3). The insulating portion is disposed cooperatively with the electrode lead 7 and across a separator 4 to prevent short-circuiting (see FIG. 3 and pg. 2 of machine translation).
- US20070172736A1: US'736 discloses a lithium secondary battery (abstract). The battery includes a heat resistant layer (30) disposed opposite a current collecting lead 14 to prevent short-circuiting ([0026]).

Conclusion

27. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

28. Any inquiry concerning this communication or earlier communications from the examiner should be directed to JASON AARON BARTON whose telephone number is (571)270-3551. The examiner can normally be reached 9:00 AM to 5:00 PM.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Allison Bourke can be reached on (303)297-4684. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of published or unpublished applications may be obtained from Patent Center. Unpublished application information in Patent Center is available to registered users. To file and manage patent submissions in Patent Center, visit: https://patentcenter.uspto.gov. Visit https://www.uspto.gov/patents/apply/patent-center for more information about Patent Center and https://www.uspto.gov/patents/docx for information about filing in DOCX format. For additional questions, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/JASON BARTON/
Examiner, Art Unit 1721

/WILLIAM E MCCLAIN/
Primary Examiner, Art Unit 1721

Notice of References Cited	Application/Control No. 17/746,755	Applicant(s)/Patent Under Reexamination TAO	
	Examiner JASON A BARTON	Art Unit 1721	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-20070172736-A1	07-2007	Fujikawa; Masato	H01M50/474	429/246
	B					
	C					
	D					
	E					
	F					
	G					
	H					
	I					
	J					
	K					
	L					
	M					

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N	JP-2007165224-A	06-2007	JP	NAGASAKI A	H01M50/474
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	Machine translation of JP-2007165224-A (Year: 2007)
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/746,755	TAO et al.
	Examiner	Art Unit
	JASON A BARTON	1721

CPC - Searched*		
Symbol	**Date**	**Examiner**
H01M10/0431	07/14/2022	JB
H01M10/0587	07/14/2022	JB
H01M50/531, 533, 538	07/14/2022	JB
H01M50/5$	07/14/2022	JB
H01M.cpcl.	07/14/2022	JB
H01M10/0431	09/08/2022	JB
H01M10/0587	09/08/2022	JB
H01M50/531, 533, 538	09/08/2022	JB
H01M50/5$	09/08/2022	JB
H01M.cpcl.	09/08/2022	JB

CPC Combination Sets - Searched*		
Symbol	**Date**	**Examiner**

US Classification - Searched*			
Class	**Subclass**	**Date**	**Examiner**

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

/JASON BARTON/ Examiner, Art Unit 1721	

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/746,755	TAO et al.
	Examiner	Art Unit
	JASON A BARTON	1721

Search Notes		
Search Notes	**Date**	**Examiner**
Global dossier search	07/14/2022	JB
Applicant and inventor search in SEARCH	07/14/2022	JB
CPC and CPC-limited text search in SEARCH	07/14/2022	JB
“More like this” searching in SEARCH and IP.COM	07/14/2022	JB
Additional search (refresh)	09/08/2022	JB

Interference Search			
US Class/CPC Symbol	**US Subclass/CPC Group**	**Date**	**Examiner**

/JASON BARTON/ Examiner, Art Unit 1721	

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H01M 2/34	***(2006.01)***	H01M	2/34	B	

審査請求 未請求　請求項の数 3　OL　（全 12 頁）

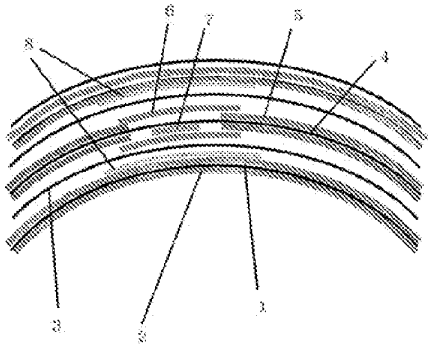
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最終頁に続く

(54)【発明の名称】非水電解液二次電池

(57)【要約】
【課題】内部短絡が、正極集電体の未塗工部と負極活物質が塗布された負極板の間で起こった場合、大きな電流が流れ、大幅な開回路電圧の低下や、発熱を引き起こす可能性があるという問題があった。
【解決手段】正極集電体に正極活物質を塗布した正極板と、負極集電体に負極活物質を塗布した負極板とを、隔離膜を介して捲回された電極群を有する非水電解液二次電池において、前記正極板の長さ方向の端部以外に未塗工部が設けてあり、前記正極板未塗工部に正極リードを接続し、前記正極リードをテープで被覆し、かつ前記正極板未塗工部と対向する負極板表面に耐熱性保護膜が形成されている非水電解液二次電池。
【選択図】図４



【特許請求の範囲】
【請求項１】
正極集電体に正極活物質を塗布した正極板と、負極集電体に負極活物質を塗布した負極板とを、隔離膜を介して捲回された電極群を有する非水電解液二次電池において、
前記正極板の長さ方向の端部以外に未塗工部が設けてあり、前記未塗工部に正極リードを接続し、前記正極リードをテープで被覆し、かつ前記未塗工部と対向する負極板表面に耐熱性保護膜が形成されている非水電解液二次電池。
【請求項２】
正極集電体に正極活物質を塗布した正極板と、負極集電体に負極活物質を塗布した負極板とを、隔離膜を介して捲回された電極群を有する非水電解液二次電池において、
前記正極板の長さ方向の端部以外に未塗工部が設けてあり、前記未塗工部に正極リードを接続し、かつ前記未塗工部と対向する負極板表面に耐熱性保護膜が形成されている非水電解液二次電池。
【請求項３】
前記正極活物質は、一般式$Li_xNi_{(1-y-z)}Co_yM_zO_2$（ｘは充放電で変化する変数であり、０＜ｘ＜１．１，０＜ｙ≦０．５，０≦ｚ＜０．５，ＭはＡｌ，Ｍｎ，Ｍｇ，Ｃａ，Ｆｅ，Ｔｉ，Ｚｎ，Ｓｒ，Ｂａ，Ｚｒ，Ｙ，Ｂ，Ｔａからなる群から選ばれる少なくとも１種類の元素）からなる請求項１または２に記載の非水電解液二次電池。
【発明の詳細な説明】
【技術分野】
【０００１】
本発明は非水電解液二次電池に関し、特に正極板と負極板の構造に関するものである。
【背景技術】
【０００２】
近年、ＡＶ機器あるいはパソコン等の電子機器のポータブル化、コードレス化が急速に進んでおり、これらの駆動用電源として小型、軽量で高エネルギー密度を有する非水電解液二次電池への要求が高まっている。非水電解液二次電池の代表であるリチウムイオン二次電池は、特に高電圧、高エネルギー密度を有する電池として期待が大きく、高容量化、高出力化、高信頼性の開発競争が激化してきている。非水電解液二次電池では、通常、正極集電体の両面に正極活物質を塗布した正極板と、負極集電体の両面に負極活物質を塗布した負極板の間に、隔離膜としてセパレータを介して渦巻き状に捲回した電極群を備えている。正極集電体の未塗工部と負極板がセパレータを介して対向する部分において、セパレータを貫通して、正極集電体の未塗工部と負極板が短絡し発熱する可能性があった。
【０００３】
この発熱を防止するため、電極群の巻き始め端部および巻き終わり端部に位置する正極板と負極板において、少なくとも一方の集電体における他方の電極に対向する未塗工部の一部または全部に耐熱性保護膜を設けることが提案されている（例えば、特許文献１参照）。
【特許文献１】特開２００４－６３３４３号公報
【発明の開示】
【発明が解決しようとする課題】
【０００４】
非水電解液二次電池の安全性を確認する試験として異物による内部短絡試験を採用した。この試験は、電極群を作製する際、内部短絡を故意的に起こすために、例えば、負極板上に鉄などの金属異物を予め埋め込んで作製する。その後、充放電を数回繰り返すことで内部短絡を発生させるという試験である。試験結果については、予め電池に熱電対を取り付け、電池の温度が１００℃以上に達したら「発熱した」と判断する方法である。この内部短絡が、正極集電体の未塗工部と負極活物質が塗布された負極板の間で起こった場合、大きな電流が流れ、大幅な開回路電圧の低下や、異常に発熱する可能性があるという問題があった。

【０００５】
特許文献１には次のような問題があった。一方の集電体における他方の電極に対向する未塗工部の一部または全部に耐熱性保護膜を設ける場合、耐熱性保護膜を集電体表面に形成する必要があり、耐熱性保護膜と集電体の密着性が低くなり、電極群作製時に耐熱性保護膜が剥がれ落ちるという問題があった。未塗工部は、活物質が塗布された電極部分に比べて窪んでおり、未塗工部のみに（活物質の塗工部に耐熱性保護膜がかからないように）耐熱性保護膜を塗布することが、製造工程上困難であるという問題があった。
【０００６】
さらに、未塗工部にリードを接続した場合も同様な理由で、耐熱性保護膜を緻密に形成することは製造工程上難しい。電極群の巻き始め端部の未塗工部の集電体に正極リードを設けた円筒形の非水電解液二次電池の場合、曲率半径が最も小さくなる最内周側に正極リードを溶接により接続しているため、正極リードのエッジ部が外周側の正極板にダメージを与え、正極板が切れるという新たな問題があった。
【０００７】
本発明はこのような従来の課題を解決するものであり、正極集電体の未塗工部に耐熱性保護膜を形成するのではなく、未塗工部と対向する負極合剤部に設けることにより、凹凸のきわめて少ない負極合剤層と、密着性の高い緻密な耐熱性保護膜を形成でき、内部短絡時の発熱を抑制できる非水電解液二次電池を提供することができる。
【課題を解決するための手段】
【０００８】
上記課題を解決するために、本発明の非水電解液二次電池は、
正極集電体に正極活物質を塗布した正極板と、負極集電体に負極活物質を塗布した負極板とを、隔離膜を介して捲回された電極群を有しており、前記正極板の長さ方向の端部以外に未塗工部が設けてあり、前記未塗工部に正極リードを接続し、前記正極リードをテープで被覆し、かつ前記未塗工部と対向する負極板表面に耐熱性保護膜が形成されている。
【０００９】
また、別の本発明の非水電解液二次電池は、前記正極板の長さ方向の端部以外に未塗工部が設けてあり、前記未塗工部に正極リードを接続し、かつ前記未塗工部と対向する負極板表面に耐熱性保護膜が形成されている。
【００１０】
こうすることにより、最も発熱の危険性の高い、正極集電体の未塗工部と負極活物質が塗布された負極板の間で起こった内部短絡時の発熱を抑制することができる。
【発明の効果】
【００１１】
本発明によると、正極集電体の未塗工部と負極活物質が塗布された負極板の間で起こる内部短絡が発生した場合、発熱が高温になることはなくなる。正極集電体の未塗工部と負極活物質が塗布された負極板の間のみを耐熱性保護膜で保護することによって、負極板全体を耐熱性保護膜で被覆した場合に比べ、非水電解液二次電池の体積当りのエネルギー密度を大きくすることができるという利点もある。また、正極集電体の未塗工部を正極板端部以外の部分に配置することにより、例えば、正極リードの溶着部を正極板の中央部にすることにより、電極群作製時に正極リード溶着箇所の捲回径が小さくならず、リードエッジ部による極板ダメージを大きく緩和することができる。
【発明を実施するための最良の形態】
【００１２】
本発明の実施の形態における非水電解液二次電池は、正極集電体に正極活物質を塗布した正極板と、負極集電体に負極活物質を塗布した負極板とを、隔離膜を介して捲回された電極群を有する非水電解液二次電池において、前記正極板の長さ方向の端部以外に未塗工部が設けてあり、前記正極板未塗工部に正極リードを接続し、前記正極リードをテープで被覆し、かつ前記正極板未塗工部と対向する負極板表面に耐熱性保護膜が形成されている。

【００１３】
こうすることにより、耐熱性保護膜を密着性よく、緻密に形成することができ、最も発熱の危険性の高い、正極集電体の未塗工部と負極活物質が塗布された負極板の間で起こった内部短絡時の発熱を抑制することができる。
【００１４】
本発明の別の実施の形態における非水電解液二次電池は、前記正極板の長さ方向の端部以外に未塗工部が設けてあり、前記正極板未塗工部に正極リードを接続し、かつ前記正極未塗工部と対向する負極板表面に耐熱性保護膜が形成されている。
【００１５】
こうすることにより、耐熱性保護膜を密着性よく、緻密に形成することができ、最も発熱の危険性の高い、正極集電体の未塗工部と負極活物質が塗布された負極板の間で起こった内部短絡時の発熱を抑制することができる。さらに、正極リードで発生した“ばり”による内部短絡を防止するために貼付しているテープがなくても、発熱の危険性はなくなるため、体積当りのエネルギー密度をさらに大きくすることができる
本発明の好ましい実施の形態における非水電解液二次電池は、正極活物質が一般式$Li_xNi_{(1-y-z)}Co_yM_zO_2$（ｘは充放電で変化する変数であり、０＜ｘ＜１．１，　０＜ｙ≦０．５，　０≦ｚ＜０．５，　ＭはＡｌ，Ｍｎ，Ｍｇ，Ｃａ，Ｆｅ，Ｔｉ，Ｚｎ，Ｓｒ，Ｂａ，Ｚｒ，Ｙ，Ｂ，Ｔａからなる群から選ばれる少なくとも１種類の元素）からなる。
【００１６】
こうすることにより、耐熱性保護膜を密着性よく、緻密に形成することができ、最も発熱の危険性の高い、正極集電体の未塗工部と負極活物質が塗布された負極板の間で起こった内部短絡時の発熱を抑制することができる。
【００１７】
以下、正極について詳述する。
【００１８】
正極活物質は、コバルト酸リチウム（$LiCoO_2$）やニッケル酸リチウム（以下、$LiNiO_2$と略す）などのリチウム含有遷移金属酸化物を用いることができる。また、原料が比較的安価なマンガンを用いたマンガン酸リチウム（$LiMn_2O_4$）のようなスピネル型複合酸化物を用いることもできる。
【００１９】
正極の増粘剤としては、カルボシキメチルセルロース（以下、ＣＭＣと略す）、メチルセルロース（ＭＣ）、ヒドロキシメチルセルロース（ＨＭＣ）、エチルセルロース、ポリビニルアルコール（ＰＶＡ）、酸化スターチ、リン酸化スターチ、およびガゼイン等を用いるとよい。
【００２０】
導電剤は電子伝導性材料であれば何でもよい。例えば、天然黒鉛（鱗片状黒鉛など）、人造黒鉛、膨張黒鉛などのグラファイト類、アセチレンブラック、チャンネルブラック、ファーネスブラック、およびサーマルブラック等のカ－ボンブラック類、炭素繊維、金属繊維などの導電性繊維類、銅、ニッケル等の金属粉末類およびポリフェニレン誘導体などの有機導電性材料などを単独又はこれらの混合物として含ませることができる。これらの導電剤のなかで、人造黒鉛、アセチレンブラック、炭素繊維が特に好ましい。導電剤の添加量は特に限定されないが、負極活物質に対して１～３０重量％が好ましく、さらには１～１０重量％が好ましい。
【００２１】
正極の集電体の材質は、アルミニウム（Ａｌ）、チタン（Ｔｉ）、およびタンタル（Ｔａ）等の金属またはその合金が使用できるが、軽量でエネルギー密度が有利であることから、特に、アルミニウム（Ａｌ）またはその合金を使用するのが望ましい。
【００２２】
以下、負極について詳述する。

【００２３】
負極活物質は、黒鉛系、非晶質系等の炭素材料あるいはその混合体、合金や金属化合物などが挙げられ、これらを単独もしくは２種以上を混合して用いることができる。合金は、ケイ素、スズ、アルミニウム、亜鉛、マグネシウム、チタン、およびニッケルよりなる群から選択される少なくとも一種の元素からなるのが好ましい。また、金属化合物はケイ素、スズ、アルミニウム、亜鉛、マグネシウム、チタン、およびニッケルの酸化物や炭化物よりなる群から選択される少なくとも一種である。負極活物質の平均粒径は特に限定されないが、１～３０μｍが好ましい。
【００２４】
負極板の集電体は電気化学的に安定な電子伝導体であれば何でもよく、銅、ニッケル、ステンレス等の金属が使用できるが、これらの中で薄膜に加工しやすく、低コストであることから銅箔が好ましい。厚みは特に限定されないが、５～２５μｍが好ましい。
【００２５】
正極板および負極板の製造に用いられる結着剤については、電極製造時に使用する溶媒や電解質に対して安定な材料であれば、特に限定されない。例えば、ポリフッ化ビニリデン（ＰＶＤＦ）、ポリテトラフルオロエチレン（ＰＴＦＥ）、スチレン・ブタジエンゴム（ＳＢＲ）、イソプロピレンゴム、ブタジエンゴム、およびエチレンプロピレンジエタンポリマー（ＥＰＤＭ）等を用いるとよい。
【００２６】
以下、非水電解質について詳述する。
【００２７】
非水溶媒は炭酸エステルが好ましい。炭酸エステルは、環状、鎖状のいずれも使用することができる。環状炭酸エステルとしては、プロピレンカーボネート（以下、ＰＣと略す）、エチレンカーボネート（ＥＣ）、ブチレンカーボネート（ＢＣ）等が好適に挙げられる。これらの高誘電率溶媒は、１種類、または２種類以上を組み合わせて使用してもよい。鎖状炭酸エステルとしては、例えばジメチルカーボネート（以下、ＤＭＣと略す）、ジエチルカーボネート（ＤＥＣ）、エチルメチルカーボネート（ＥＭＣ）、ジ－ｎ－プロピルカーボネート、メチル－ｎ－プロピルカーボネート、エチル－ｉ－プロピルカーボネート等が挙げられる。これらの低粘度溶媒は、１種類、または２種類以上を組み合わせて使用してもよい。環状炭酸エステルと鎖状炭酸エステルはそれぞれ任意に選択して組み合わせて使用することもできる。
【００２８】
電解質塩としては、過塩素酸リチウム（$LiClO_4$）、六フッ化リン酸リチウム（$LiPF_6$）、および四フッ化ホウ酸リチウム（$LiBF_4$）から選ばれる無機リチウム塩や、$LiCF_3SO_3$、$LiN(CF_3SO_2)_2$、$LiN(CF_3CF_2SO_2)_2$、$LiN(CF_3SO_2)(C_4F_9SO_2)$、および$LiC(CF_3SO_2)_3$などの含フッ素有機リチウム塩等が挙げられる。それら電解質塩の中でも、$LiPF_6$、もしくは$LiBF_4$が好ましい。これらの電解質塩は１種類、または２種類以上を組み合わせて用いることができる。これらの電解質塩は、上述した非水溶媒に、通常０．１～３．０ｍｏｌ／Ｌ、好ましくは０．５～２．０ｍｏｌ／Ｌの濃度になるように調製して使用するのが好ましい。
【００２９】
非水電解質には、過充電に対する耐性を高める添加剤を含ませてもよい。添加剤には、フェニル基およびそれに隣接する環状化合物基からなるベンゼン誘導体を用いることが好ましい。このようなベンゼン誘導体として、ビフェニル、シクロヘキシルベンゼン、ジフェニルエーテル、フェニルラクトンなどが挙げられる。
【００３０】
非水電解質二次電池の形状については特に限定されず、シート電極およびセパレータをスパイラル状にしたシリンダータイプ、ペレット電極およびセパレータを組み合わせたインサイドアウト構造のシリンダータイプ、ペレット電極およびセパレータを積層したコインタイプ等が使用可能である。

【００３１】
非水電解質二次電池を製造する方法については、特に限定されず、通常採用されている方法の中から適宜選択することができる。
【実施例】
【００３２】
以下、本発明の一実施の形態について説明する。
【００３３】
（実施例１）
まず、正極板の作製方法について説明する。炭酸リチウム（Li_2CO_3）と四酸化三コバルト（Co_3O_4）を混合して空気中において９００℃で焼成したコバルト酸リチウム（以下、$LiCoO_2$と略す）からなる正極活物質、アセチレンブラック（以下、ＡＢと略す）からなる導電材、およびポリフッ化ビニリデン（以下、ＰＶＤＦと略す）からなる結着剤を重量比が１００：２：３となるように混合したものを、Ｎ－メチル－２－ピロリドン（以下、ＮＭＰと略す）を分散媒として用いて混練分散して正極ペーストを作製した。正極ペーストを、集電体として厚さ１５μｍのアルミニウム箔に塗着し、乾燥した。その後、正極活物質を含む合剤層の密度が３．５～３．６ｇ／ｃｍ^{3}になるように圧延し、正極板の総厚みを０．１７ｍｍとした。未塗工部が６．５ｍｍを含む全長が６１２ｍｍ、幅５７ｍｍとなるように裁断した。この時、未塗工部は極板の長手方向端部より４０～４６．５ｍｍの位置になるように配置した。
【００３４】
次に、以下に説明する正極板１と２を作製した。
【００３５】
まず、前述の塗工部および未塗工部からなる極板の未塗工部に正極リード７を超音波溶着により接続し正極板α を作製した。
【００３６】
次に、正極板α のリードを保護するために幅９ｍｍのポリプロピレン（以下、ＰＰと略す）テープを貼付けした正極板β を作製した。
【００３７】
このとき正極板α およびβ の正極リード７は、いずれも５０～２００μｍの”ばり”が正極板とは逆向きの方向に出るようにした。
【００３８】
正極板α およびβ の概略断面図をそれぞれ図１および２に示す。
【００３９】
次に、負極板の作製方法について説明する。人造黒鉛からなる負極活物質、ＰＶＤＦからなる結着剤を重量比が１００：６となるように混合したものを、ＮＭＰを分散媒として用いて混練分散して負極ペーストを作製した。負極ペーストを集電体として厚さ１０μｍの銅箔に塗着、乾燥した。その後、負極活物質を含む合剤層の密度が１．５７ｇ／ｃｍ^{3}になるように圧延した。
【００４０】
負極板の総厚みを０．１７ｍｍとした。その後、幅５９ｍｍ、全長６４５ｍｍに裁断した後、最外周部に負極リードを溶接し、負極リードの周辺部のみにＰＰテープを貼付けした負極板α を作製した。
【００４１】
そして、負極板α 上の電極群作製時に「正極リード７と対向する箇所」に、以下に説明する耐熱性保護膜を形成した。
【００４２】
ここで言う、「正極リードと対向する箇所」とは、正極板α またはβ の未塗工部６．５ｍｍを含む長手方向１５ｍｍの範囲に対向する箇所のことを指す。
【００４３】
耐熱性保護膜は次のようにして作製した。無機酸化物フィラーとしてメディアン径０．

３μｍのアルミナ９６０ｇ、結着剤として変性アクリロニトリルゴム５００ｇ、および適量のＮＭＰを双腕式練合機に入れ、攪拌し、耐熱性保護膜前駆体ペーストを作製した。耐熱性保護膜前駆体ペーストを正極リード７と対向する負極板１上に塗布した。その後、乾燥して、厚さが６μｍの耐熱性保護膜を形成し、負極板β を作製した。

【００４４】

次に、無機酸化物フィラーとして、アルミナの代わりにチタニアを用い、これ以外は負極板α と同様の方法で負極板γ を作製した。

【００４５】

このようにして得られた正極板α、β と負極板α、β、およびγ を組み合わせて非水電解液二次電池を作製し、その組み合わせを表１に示した。セパレータとして厚さ１６μｍの微多孔性ポリエチレン樹脂を用い、それを介して正極板と負極板を捲回し、電極群ａ～ｆを作製した。また、電極群ｃ、ｆにおいて、正極リード７を接続した付近の概略横断面図をそれぞれ図３、４に示した。

【００４６】

以上のようにして作製した電極群ａ～ｆを、ニッケル（Ｎｉ）メッキを施した鉄製の円筒形の電池ケース１に収納し、電極群上下両面にポリプロピレン（ＰＰ）製絶縁板を配した。そして正負極板の各々から集電を行うために、正負極リードを正負極板の集電体からそれぞれ導出して、負極リードを電池ケース１に抵抗溶接で接続した。

【００４７】

次に、電極群が収納された電池ケース１内に、エチレンカーボネート（ＥＣ）とジエチルカーボネート（ＤＥＣ）を体積比で１：１で混合し、１モル／Ｌの六フッ化リン酸リチウム（$LiPF_6$）を溶解した非水電解液を注入した。そして、予めガスケットを組み込んだ封口板に、電極群から導出させた正極リード７を溶接した。その後、封口板を電池ケース１に装着し、カシメにより封口して、非水電解液二次電池Ａ～Ｆを作製した。それぞれの電池に用いた電極群を表１に示した。

【００４８】

【表１】

非水電解液二次電池	電極群	正極板	負極板	備考
A	a	α	α	従来電池
B	b	α	β	本発明電池
C	c	α	γ	本発明電池
D	d	β	α	従来電池
E	e	β	β	本発明電池
F	f	β	γ	本発明電池

電池Ａ～Ｆをそれぞれ１００セルずつ用意し、２５℃で充放電を１００サイクル繰り返した。充電条件は電圧４．２Ｖの定電流・定電圧方式で行い、最大電流は１５００ｍＡ、終止電流は１００ｍＡとした。放電条件は定電流方式で行い、電流は４００ｍＡ、終止電圧は３．０Ｖとした。今回作製した電池には、正極リードに意図的に“ばり”を設けているため、充放電中に正極リードの“ばり”による内部短絡で発熱する可能性がある。表２に、１００サイクル繰り返す最中に発生した発熱率を示す。

【００４９】

【表２】

非水電解液二次電池	発熱率
A	27/100
B	0/100
C	0/100
D	2/100
E	0/100
F	0/100

表２の結果から、電池Ｂ、Ｃ、Ｅ、およびＦは、電池Ａ、Ｄと比較すると、発熱率は電池Ａ、Ｄの方が多く、その違いは明らかであった。このことから、電池Ｂ、Ｃ、ＥおよびＦのように負極板表面に多孔性絶縁物を塗布した電池は発熱していない。発熱が起こった電池Ａ、Ｄを分解して短絡箇所を確認すると、正極リードと対向する位置のセパレータが黒色化しており、正極リードの”ばり”が原因で発熱していたことがわかった。

【００５０】

（実施例２）

次いで、正極活物質としてコバルト酸リチウム以外の正極活物質を使用した場合について説明する。

【００５１】

Ｎｉに対してＣｏのモル比が２０％になるように硫酸ニッケルと硫酸コバルトを水に溶解して硫酸ニッケル－コバルト混合溶液を作成した。この硫酸ニッケル－コバルト混合溶液に水酸化ナトリウムを投入して共沈させることにより、ニッケル－コバルト水酸化物を得た。得られたニッケル－コバルト水酸化物を水洗し、８０℃で乾燥して粉末状にし、ニッケル－コバルト水酸化物（$Ni_{0.8}Co_{0.2}(OH)_2$）を作製した。

【００５２】

このようにして作製したニッケル－コバルト水酸化物を、水酸化リチウム－水和物にＬｉ／（Ｎｉ＋Ｃｏ）のモル比が１／１になるように混合した。酸素雰囲気下で７００℃の温度で２０時間焼成し、粉砕して$LiNi_{0.8}Co_{0.2}O_2$を得た。

【００５３】

このようにして作製した正極活物質$LiNi_{0.8}Co_{0.2}O_2$、導電材としてＡＢ、および結着剤としてＰＶＤＦを、それぞれの重量比が１００：２：３となるように混合した。ＮＭＰを分散媒として用いて混練分散して作製した正極ペーストを、実施例１と同様にして塗着、圧延、裁断を行った。そして実施例１で記載した正極板α、βと同様に正極リード７を超音波溶着により接続して正極板γ、δを作製した。

【００５４】

この場合も、正極板γ、δの正極リード７には、５０～１００μｍの”ばり”が正極板とは逆向きの方向に出るようにした。

【００５５】

そして、実施例１と同様の負極板α、β、およびγと、正極板γ、δを組み合わせ、実施例１と同様の作製方法で電極群ｇ～ｌを作製した。電極群ｇ～ｌを用いて非水電解液二次電池Ｇ～Ｌを作製した。電池Ｇ～Ｌに用いた正極板、負極板、および電極群を表３に示した。

【００５６】

【表３】

非水電解液二次電池	電極群	正極板	負極板	備考
G	g	γ	α	従来電池
H	h	γ	β	本発明電池
I	I	γ	γ	本発明電池
J	j	δ	α	従来電池
K	k	δ	β	本発明電池
L	l	δ	γ	本発明電池

電池Ｇ～Ｌをそれぞれ１００セルずつ用意し、２５℃で充放電を１００サイクル実施した。充放電条件は実施例１と同じである。今回作製した電池には、正極リードに意図的に“ばり”を設けているため、充放電中に発熱する可能性がある。表４に、１００サイクル繰り返す最中に発生した発熱率を示す。

【００５７】

【表４】

非水電解液二次電池	発熱率
G	25/100
H	0/100
I	0/100
J	3/100
K	0/100
L	0/100

表４の結果から、電池Ｈ、Ｉ、Ｋ、およびＬは、電池Ｇ、Ｊと比較すると、発熱率は電池Ｇ、Ｊの方が多く、その違いは明らかであった。このことから、電池Ｈ、Ｉ、ＫおよびＬのように負極板表面に多孔性絶縁物を塗布した電池は発熱していない。発熱が起こった電池Ｇ、Ｊを分解して短絡箇所を確認すると、正極リードと対向する位置のセパレータが黒色化しており、正極リードの“バリ”が原因で発熱していたことがわかった。

【００５８】

以上のことから、正極リードの“ばり”が１００μｍのように大きくても、正極リードの“ばり”による内部短絡で発熱することなく、安全な非水電解液二次電池を提供することができる。

【００５９】

また、非水電解液二次電池として、リチウム二次電池について説明したが、リチウム二次電池以外のマグネシウム二次電池などの非水電解液二次電池においても、同様の効果が得られるものである。

【産業上の利用可能性】

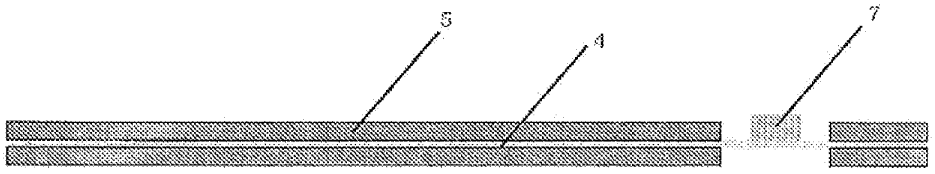
【００６０】

本発明の非水電解液二次電池は、電子機器等の主電源に有用である。例えば、携帯電話やノート型パソコン等の民生用モバイルツールの主電源、電動ドライバー等のパワーツールの主電源、およびＥＶ自動車等の産業用主電源の用途に適している。

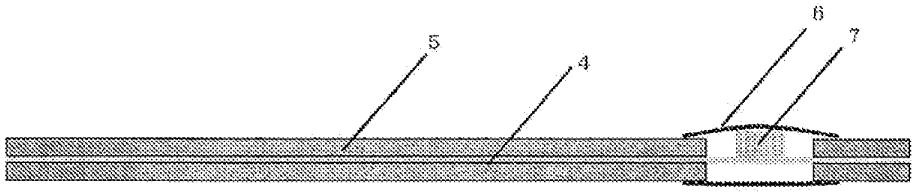
【図面の簡単な説明】

【００６１】
【図１】本発明の実施例で使用した正極板αの概略断面図
【図２】本発明の実施例で使用した正極板βの概略断面図
【図３】本発明の実施例で使用した電極群ｃの正極リード位置付近の概略横断面図
【図４】本発明の実施例で使用した電極群ｆの正極リード位置付近の概略横断面図
【符号の説明】
【００６２】
1　負極集電体
2　負極活物質
3　セパレータ
4　正極集電体
5　正極活物質
6　ＰＰテープ
7　正極リード
8　多孔性絶縁膜

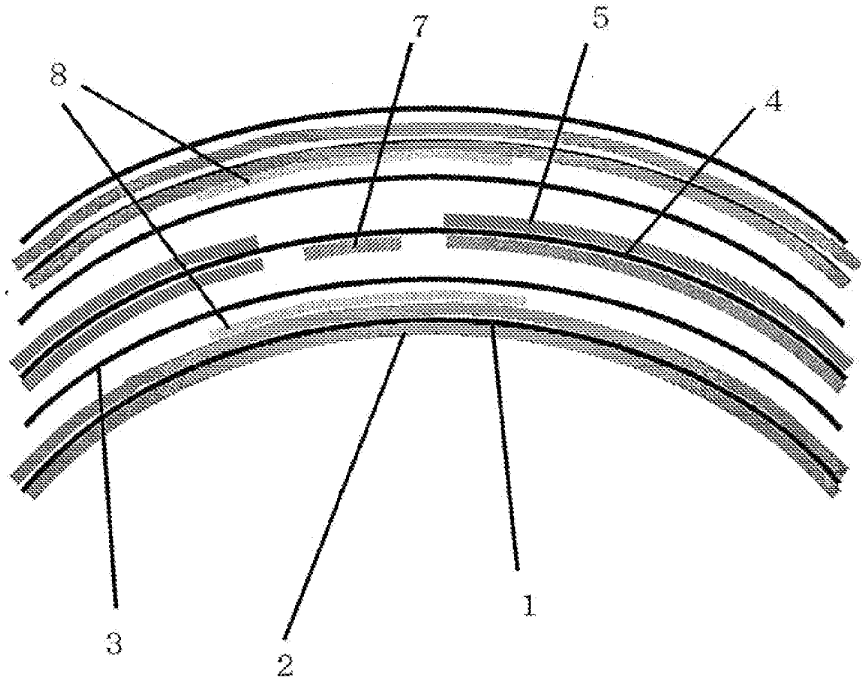
【図１】



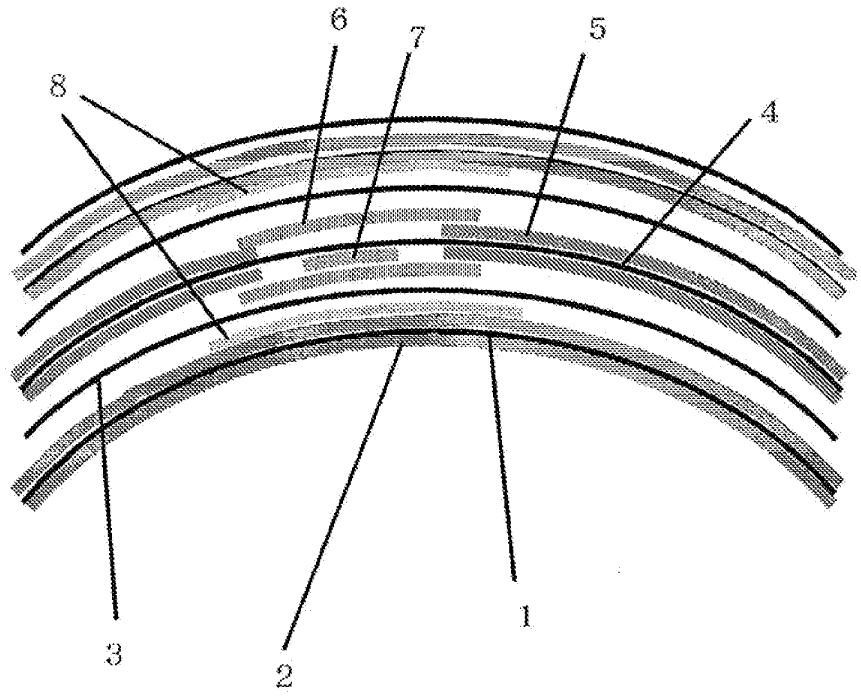
【図２】



【図３】



【図４】



フロントページの続き

Ｆターム(参考)　5H029 AJ12 AK03 AL01 AL02 AL06 AL07 AL11 AM03 AM07 BJ14
CJ05 CJ07 CJ22 DJ05 HJ02 HJ12
5H043 AA04 BA17 BA19 CA12 EA02 GA22 GA27 GA30 HA17E JA21E
KA45E LA21E
5H050 AA15 BA15 BA17 CA07 CA08 CB01 CB02 CB07 CB08 CB11
DA09 DA20 FA04 FA05 GA09 GA22 HA02 HA12

INFORMATION DISCLOSURE STATEMENT BY APPLICANT Substitute for Form 1449-PTO				*Electronically filed July 26, 2022*	
				Application Number	*17/746,755*
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				First Named Inventor	*Tao TAO*
				Art Unit	*1721*
				Examiner Name	*Barton, Jason Aaron*
Sheet	1	of	2	Attorney Docket Number	*024607-02-5119-US*

U.S. PATENT DOCUMENTS					
Examiner Initials	Cite No.	Document Number Number - Kind Code	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		5,017,442 A	05-21-1991	Watanabe et al.	
		5,478,668 A	12-26-1995	Gozdz et al.	
		6,551,143 B2	04-22-2003	Tanaka et al.	
		6,100,114	08-08-2000	Milkovich et al.	
		2001/0036574 A1	11-01-2001	Fukuda et al.	
		2007/0122714 A1	05-31-2007	Suzuki et al.	
		2009/0035638 A1	02-05-2009	Tsai et al.	

FOREIGN PATENT DOCUMENTS						
Examiner Initials	Cite No.	Foreign Patent Document Country Code – Number - Kind Code *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T
		CN101939873A	01-05-2011	SK ENERGY CO LTD		
		CN103066239A	04-24-2013	RESEARCH IN MOTION LTD		
		CN1221054C	09-28-2005	NANFU BATTERY CO LTD NANPING C [CN]		
		CN1350350A	05-22-2002	TEISHINA ELECTRONICS AMP CO LT [JP]		
		CN201087907Y	07-16-2008	Ke et al.		
		CN202495523U	10-17-2012	Shufa et al.		
		JPH0513064A	01-22-1993	SANYO ELECTRIC CO		
		~~JP1999317218A~~		~~TOYOTA CENTRAL~~		
		JPH11317218A	11-16-1999	RES & DEV		
		~~JP1993013064A~~		~~OLYMPUS OPTICAL~~		
		JPH0713064A	01-17-1995	CO		
		JP2000-277155A	10-06-2000	HITACHI LTD		
		JP2003132875A	05-09-2003	MATSUSHITA ELECTRIC IND CO LTD		

NON PATENT LITERATURE DOCUMENTS

Examiner Signature	/JASON BARTON/	Date Considered	09/09/2022

DB2/ 43704314.1

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /J.B./

INFORMATION DISCLOSURE STATEMENT BY APPLICANT Substitute for Form 1449-PTO				*Electronically filed July 26, 2022*	
				Application Number	*17/746,755*
				Filing Date	*May 17, 2022*
				First Named Inventor	*Tao TAO*
				Art Unit	*1721*
				Examiner Name	*Barton, Jason Aaron*
Sheet	2	of	2	Attorney Docket Number	*024607-02-5119-US*

Examiner Initials	Cite No.	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published
		~~Evaluation Report of Utility Model Patent, ZL201420030319.4, 24DEC2019, 5 pgs.~~
		~~Tao, Office Action, US14/596,873, 04APR2017, 14 pgs.~~
		~~Tao, Final Office Action, US14/596,873, 22NOV2017, 13 pgs.~~
		~~Tao, Office Action, US14/596,873, 19APR2018, 13 pgs.~~
		~~Tao, Final Office Action, US14/596,873, 05DEC2018, 13 pgs.~~
		~~Tao, Office Action, US14/596,873, 22MAR2019, 14 pgs.~~
		~~Tao, Notice of Allowance, US14/596,873, 25NOV2019, 7 pgs.~~
		~~Tao, Office Action, US16/113,938, 16AUG2019, 15 pgs.~~
		~~Tao, Office Action, US16/113,938, 13FEB2020, 23 pgs.~~
		~~Tao, Office Action, US16/113,938, 02NOV2020, 14 pgs.~~
		~~Tao, Final Office Action, US16/113,938, 20MAY2021, 18 pgs.~~
		~~Tao, Advisory Action, US16/113,938, 02AUG2021, 3 pgs.~~
		~~Machine English translation of CN202495523U (Year: 2012)~~

Examiner Signature	/JASON BARTON/	Date Considered	09/09/2022

DB2/ 43704314.1

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /J.B./

PE2E SEARCH - Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
L1	24	(US-41406506-$ | US-5017442-$ | US-5478668-$ | US-6100114-$ | US-6551143-$).DID. (AL-20010036574-$ | AL-20070122714-$ | AL-20090035638-$ | CN-101939873-$ | CN-103066239-$ | CN-1221054-$ | CN-1350350-$ | CN-201087907-$ | CN-202495523-$ | DB-241406506-$ | JP-1993013064-$ | JP-1999317218-$ | JP-2000277155-$ | JP-2003132875-$).DID.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/12 07:49 PM
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L3	0	(JP-0513064-$).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/12 07:58 PM
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L6	4	(JP-3161778-$).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/12 07:58 PM
L7	91	(US-10135097-$ | US-10868290-$ | US-11024868-$ | US-11108118-$ | US-20100055560-$ | US-20100285370-$ | US-20170092925-$ | US-20180190963-$ | US-20180366775-$ | US-5017442-$ | US-5478668-$ | US-6100114-$ | US-6551143-$ | US-7195844-$ | US-9741988-$).DID. (CN-103367700-$ | CN-105576191-$ | CN-105990612-$ | CN-106169540-$ | CN-107534127-$ | CN-108376759-$ | CN-109888162-$ | CN-112272877-$ | CN-112582583-$ | CN-113826240-$ | CN-201087907-$ | CN-202495523-$ | CN-205355186-$ | GB-2548361-$ | JP-2005222744-$ | JP-2007294198-$ | JP-2010086754-$ | JP-2011103249-$ | JP-2013137943-$ | JP-2014241267-$ | JP-2018166080-$ | JP-4850996-$ | JP-5284933-$ | JP-5623073-$ | JP-5821913-$ | JP-	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/13 11:34 AM

		6237187-$ | JP-6288015-$ | JP-6926991-$ | KR-101489993-$ | KR-101515672-$ | KR-101980974-$ | KR-200364044-$ | KR-20060009411-$ | KR-20120022773-$ | WO-2017149977-$).DID.					
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L9	3	("20090305120" | "20140349179" | "20150207111").pn. OR ("11024868").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/13 11:36 AM
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L11	30	(US-10014495-$ | US-10038212-$ | US-10193125-$ | US-10312497-$ | US-10396336-$ | US-11024868-$ | US-11043700-$ | US-20060127774-$ | US-20080274410-$ | US-20110159344-$ | US-20110183191-$ | US-20130252053-$ | US-20130266845-$ | US-20130316207-$ | US-20140349179-$ | US-20160126511-$ | US-20160260954-$ | US-20180315991-$ | US-8877371-$ | US-8974944-$ | US-9159963-$ | US-9203074-$ | US-9224989-$ | US-9293744-$ | US-	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/13 11:53 AM

		9397329-$ | US-9490468-$ | US-9564626-$ | US-9595699-$ | US-9627677-$ | US-9960404-$).DID.					
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L14	76440	(H01M10/0431 OR H01M10/0587 OR H01M50/531 OR H01M50/533 OR H01M50/538).cpc.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/07/13 12:03 PM

L15	5171174	(recess$7 OR pocket OR (non-coat$7 ADJ (portion OR part)) OR cavity OR hole OR gap) NEAR10 (tab$5 OR tap$5 OR lead$5)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/13 12:06 PM
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L18	1	US-8795879-$.did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/13 12:22 PM
L19	1	("20090296318").pn. OR ("8795879").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/13 12:22 PM
L20	76	(US-20040126654-$ | US-20040207974-$ | US-20090296318-$ | US-20150332857-$ | US-8014127-$ | US-8218293-$ | US-8795879-$ | US-8837115-$ | US-9070511-$).DID. (CN-104137303-$ | CN-108713233-$ | CN-110706928-$ | CN-201156473-$ | EP-1580774-$ | JP-2001023866-$ | JP-2001284190-$ | JP-2006286959-$ | JP-2008147541-$ | JP-2009010070-$ | JP-2009152514-$ | JP-	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/13 12:23 PM

		2009212117-$ | JP-2009212283-$ | JP-2010074083-$ | JP-2010074089-$ | JP-2012019061-$ | JP-2012064601-$ | JP-2018157012-$ | JP-3587333-$ | JP-4413003-$ | JP-6893123-$ | JP-6953724-$ | KR-101404532-$ | KR-101434923-$ | KR-101475367-$ | KR-102079677-$ | KR-20130116836-$ | WO-2010116656-$ | WO-2021172440-$).DID.					
L21	293	L14 AND L15 AND (length NEAR10(tab$5 OR tap$5 OR lead$5)) AND @fd<"20140117"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/13 12:29 PM
L22	17297	((recess$7 OR pocket OR (non-coat$7 ADJ (portion OR part)) OR cavity OR hole OR gap) NEAR10 (energ$6 NEAR5 densit$7))	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/13 12:35 PM
L23	1	L14 AND L15 AND (length NEAR10(tab$5 OR tap$5 OR lead$5)) AND L22 AND @fd<"20140117"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/13 12:35 PM
L24	13	L14 AND L15 AND (length NEAR10(tab$5 OR tap$5 OR lead$5)) AND L22 AND @fd<"20140117"	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO))	OR	ON	ON	2022/07/13 12:37 PM
L25	5	L14 AND L15 AND (length NEAR10(tab$5 OR tap$5 OR lead$5)) AND L22 AND @pd<"20140117"	(FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/13 12:37 PM
L26	6494	(H01M10/0431 AND	(US-PGPUB; USPAT;	OR	ON	ON	2022/07/13

		H01M50/538).cpc.	USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)				12:55 PM
L27	127	L26 AND L15 AND @fd<"20140117"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/13 12:55 PM
L28	2	(US-20100124694-$ OR US-2006022937-$ OR US-20090166192-$).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/13 01:18 PM
L29	0	(US-2006022937-$).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/13 01:19 PM
L30	1	(US-20060022937-$).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/13 01:19 PM
L31	1	(US-20060222937-$).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/13 01:20 PM
L32	1	(US-6828059-$).did.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU,	OR	ON	ON	2022/07/13 01:24 PM

			CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)				
L33	1	(US-20100124694-$).did.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/13 01:25 PM
L34	1	(jp-09017410-$).did.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/13 01:25 PM
L35	1	(jp-09161837$).did.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/13 01:25 PM
L36	1	US-20070122714-$.did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/13 01:29 PM
L37	37	((JP-2003132875-A OR CN-202495523-U OR CN-103066239-A OR CN-101939873-A OR CN-201087907-Y OR CN-1221054-C OR CN-1350350-A OR CN-1221054-A).did. AND FTDB.dbnm.) OR ((US-20140349179-A1 OR	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO;	OR	ON	ON	2022/07/13 01:30 PM

		US-20140120417-A1 OR US-20090111011-A1 OR US-20110104539-A1 OR US-20110151295-A1 OR US-20010033962-A1 OR US-20090166192-A1 OR US-20080233474-A1 OR US-20130045406-A1 OR US-20120214049-A1 OR US-20110027636-A1 OR US-20060222937-A1 OR US-20130045405-A1 OR US-20130316207-A1 OR US-20130316209-A1 OR US-20130101891-A1 OR US-20120321942-A1 OR US-20040191634-A1 OR US-20060051662-A1 OR US-20090035638-A1 OR US-20070122714-A1).did. AND PGPB.dbnm.) OR ((US-9142840-B2 OR US-8837115-B2 OR US-6100114-A OR US-5478668-A OR US-5017442-A).did. AND USPT.dbnm.) OR ((KR-101475367-B1 OR CN-1221054-A).did. AND FPRS.dbnm.) OR ((JP-2000277155-A).did. AND JPAB.dbnm.)	DERWENT; IBM_TDB)				
L38	145716	(non-coat$6 OR (non ADJ coat$6) OR un-coat$6 OR (un ADJ coat$6) OR non-application$9 OR (non ADJ application$9))	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/13 01:36 PM
L39	4877	L14 AND L38	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV,	OR	ON	ON	2022/07/13 01:36 PM

			MA, OA, RU, SU, WO); FPRS; EPO; JPO)				
L40	249	L14 AND L38 AND (L38 NEAR15 (width OR length OR size OR area)) AND (L38 SAME3 (energ$7 NEAR5 dens$6))	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/13 01:37 PM
L41	23	L14 AND L38 AND (L38 NEAR15 (width OR length OR size OR area)) AND (L38 SAME3 (energ$7 NEAR5 dens$6)) AND @fd<"20140117"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/13 01:37 PM
L42	428	(H01M50/538).cpc. AND (recess$6 near15 (tab OR lead OR tap))	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/13 02:18 PM
L43	41	(H01M50/538).cpc. AND (recess$6 near15 (tab OR lead OR tap)) AND @fd<"20140117"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/13 02:18 PM
L44	507	(H01M50/5$).cpc. AND (recess$6 near15 (tab OR lead OR tap)) AND @fd<"20140117"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/13 02:22 PM
L45	114	(H01M50/538).cpc. AND (recess$6 near15 (tab OR lead OR tap)) AND @pd<"20140117"	(FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/13 02:23 PM
L46	13	("20100216001" OR "20110274953" OR "20140017565" OR "20150295270" OR "6139986" OR "20050287428" OR "20090148766" OR "20090297941" OR "20110076547" OR "20160197379" OR	(US-PGPUB; USPAT)	OR	ON	ON	2022/07/13 04:06 PM

		"7923139" OR "7955736" OR "8450006").pn.					
L47	1	US-10320024-$.did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/13 04:08 PM
L48	9	("20110104539" | "20110129708" | "20110151295" | "20120009450" | "20120321924" | "20130260203" | "20130316207" | "20140072877" | "20140302366").pn. OR ("10320024").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/13 04:08 PM
L49	0	(KR-1038115-$ OR KR-1615712-$ OR KR-20110035566-$ OR KR-20160085063-$).DID.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/13 04:12 PM
L50	4	(KR-1038115-$ OR KR-1615712-$ OR KR-20110035566-$ OR KR-20160085063-$).DID.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/13 04:12 PM
L51	4	(KR-101038115-$ OR KR-101615712-$).DID.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/13 04:13 PM
L52	45	(Artificial Intelligence) More like doc: US-20140302366-A1 Text: (US-9520588-B2 OR WO-2013038701-A1	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB,	OR	ON	ON	2022/07/13 04:14 PM

		OR JP-WO2013038701-A1 OR JP-5849234-B2 OR WO-2013038677-A1 OR JP-2014225326-A OR JP-2007109612-A OR JP-6208239-B2 OR JP-6439839-B2 OR CN-103733418-B OR CN-107431250-B OR JP-H09180761-A OR JP-2003288941-A OR KR-20030078019-A OR KR-100990800-B1 OR JP-4097443-B2 OR JP-6652125-B2 OR JP-2013073680-A OR JP-2016081881-A OR CN-103733418-A).did.	HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L53	49	(Artificial Intelligence) More like doc: WO-2013038677-A1 Text: (WO-2013038701-A1 OR JP-5849234-B2 OR JP-WO2013038701-A1 OR WO-2013038676-A1 OR JP-2014225326-A OR US-9520588-B2 OR US-20140302366-A1 OR WO-2016079943-A1 OR JP-2007109612-A OR JP-2010061893-A OR JP-2008311011-A OR WO-2018061381-A1 OR JP-2018018646-A OR JP-WO2018061381-A1 OR JP-2016122628-A OR JP-6567821-B2 OR WO-2019065871-A1 OR US-8530072-B2 OR JP-H09306471-A OR JP-2010086812-A).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/07/13 04:19 PM
L54	47	((JP-2003132875-A OR WO-2013038677-A1 OR WO-2013038676-A1 OR CN-202495523-U OR JP-6652125-B2 OR CN-103066239-A OR CN-101939873-A OR CN-201087907-Y OR CN-1221054-C OR CN-1350350-A OR CN-1221054-A).did. AND FTDB.dbnm.) OR ((US-20140349179-A1 OR	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA,	OR	ON	ON	2022/07/13 04:43 PM

		US-20140120417-A1 OR US-20090111011-A1 OR US-20110104539-A1 OR US-20110151295-A1 OR US-20010033962-A1 OR US-20090166192-A1 OR US-20140302366-A1 OR US-20130316207-A1 OR US-20080233474-A1 OR US-20130045406-A1 OR US-20120214049-A1 OR US-20110027636-A1 OR US-20060222937-A1 OR US-20130045405-A1 OR US-20130316209-A1 OR US-20130101891-A1 OR US-20120321942-A1 OR US-20100086858-A1 OR US-20150295270-A1 OR US-20120009450-A1 OR US-20040191634-A1 OR US-20060051662-A1 OR US-20090081530-A1 OR US-20090035638-A1 OR US-20070122714-A1).did. AND PGPB.dbnm.) OR ((US-9142840-B2 OR US-8837115-B2 OR US-6100114-A OR US-5478668-A OR US-5017442-A).did. AND USPT.dbnm.) OR ((JP-2014225326-A OR JP-2001015096-A OR JP-2000277155-A).did. AND JPAB.dbnm.) OR ((KR-101475367-B1 OR CN-1221054-A).did. AND FPRS.dbnm.)	VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L55	134	((("NINGDE") near3 ("AMPEREX") near3 ("TECHNOLOGY") near3 ("LIMITED"))).AS,AANM.	(USPAT)	OR	ON	ON	2022/07/13 09:28 PM
L56	137	((("NINGDE") near3 ("AMPEREX"))).AS,AANM.	(USPAT)	OR	ON	ON	2022/07/13 09:30 PM

L57	527	((("NINGDE") near3 ("AMPEREX"))).AS,AANM.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/13 09:30 PM
L58	1129	L57 AND L14	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/13 09:31 PM
L59	10	L57 AND L14 AND @pd<"20140117"	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/13 09:31 PM
L60	308	((("TAO") near3 ("Tao")) OR (("MO") near3 ("Ming") near3 ("Liang"))).INV.	(US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT)	OR	ON	ON	2022/07/14 10:56 AM
L61	2	L60 AND L14 AND @pd<"20140117"	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/14 10:57 AM
L62	130343969	L60AND @pd<"20140117"	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/14 10:57 AM
L63	2325	L60 AND @pd<"20140117"	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO);	OR	ON	ON	2022/07/14 10:57 AM

			FPRS; EPO; JPO)				
L64	130343999	L60 AND H01M50/5$.cpc. @pd<"20140117"	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/14 10:58 AM
L65	0	L60 AND H01M50/5$.cpc. AND @pd<"20140117"	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/14 10:58 AM
L66	46	L60 AND H01M.cpcl. AND @pd<"20140117"	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/14 10:59 AM
L67	47	((JP-2003132875-A OR WO-2013038677-A1 OR WO-2013038676-A1 OR CN-202495523-U OR JP-6652125-B2 OR CN-103066239-A OR CN-101939873-A OR CN-201087907-Y OR CN-1221054-C OR CN-1350350-A OR CN-1221054-A).did. AND FTDB.dbnm.) OR ((US-20140349179-A1 OR US-20140120417-A1 OR US-20090111011-A1 OR US-20110104539-A1 OR US-20110151295-A1 OR US-20010033962-A1 OR US-20090166192-A1 OR US-20140302366-A1 OR US-20130316207-A1 OR US-20080233474-A1 OR US-20130045406-A1	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/07/14 11:11 AM

		OR US-20120214049-A1 OR US-20110027636-A1 OR US-20060222937-A1 OR US-20130045405-A1 OR US-20130316209-A1 OR US-20130101891-A1 OR US-20120321942-A1 OR US-20100086858-A1 OR US-20150295270-A1 OR US-20120009450-A1 OR US-20040191634-A1 OR US-20060051662-A1 OR US-20090081530-A1 OR US-20090035638-A1 OR US-20070122714-A1).did. AND PGPB.dbnm.) OR ((US-9142840-B2 OR US-8837115-B2 OR US-6100114-A OR US-5478668-A OR US-5017442-A).did. AND USPT.dbnm.) OR ((JP-2014225326-A OR JP-2001015096-A OR JP-2000277155-A).did. AND JPAB.dbnm.) OR ((KR-101475367-B1 OR CN-1221054-A).did. AND FPRS.dbnm.)					
L68	12	(US-20050250052-$ OR US-20110003211-$).did. OR (CN-1489229-$ OR CN-101939869-$ OR CN-103262310-$ OR JP-2005283643-$).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/14 12:00 PM
L69	53	((JP-2003132875-A OR WO-2013038677-A1 OR WO-2013038676-A1 OR CN-202495523-U OR JP-6652125-B2 OR CN-103066239-A OR CN-101939873-A OR CN-201087907-Y OR CN-1221054-C OR CN-1350350-A OR CN-1221054-A OR CN-103262310-A OR CN-	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/07/14 12:12 PM

		101939869-A OR JP-2005283643-A OR CN-1489229-A).did. AND FTDB.dbnm.) OR ((US-20140349179-A1 OR US-20140120417-A1 OR US-20090111011-A1 OR US-20110104539-A1 OR US-20110151295-A1 OR US-20010033962-A1 OR US-20090166192-A1 OR US-20140302366-A1 OR US-20130316207-A1 OR US-20080233474-A1 OR US-20130045406-A1 OR US-20120214049-A1 OR US-20110027636-A1 OR US-20060222937-A1 OR US-20130045405-A1 OR US-20130316209-A1 OR US-20130101891-A1 OR US-20120321942-A1 OR US-20100086858-A1 OR US-20150295270-A1 OR US-20120009450-A1 OR US-20040191634-A1 OR US-20060051662-A1 OR US-20090081530-A1 OR US-20090035638-A1 OR US-20070122714-A1 OR US-20110003211-A1 OR US-20050250052-A1).did. AND PGPB.dbnm.) OR ((US-9142840-B2 OR US-8837115-B2 OR US-6100114-A OR US-5478668-A OR US-5017442-A).did. AND USPT.dbnm.) OR ((JP-2014225326-A OR JP-2001015096-A OR JP-2000277155-A).did. AND JPAB.dbnm.) OR ((KR-101475367-B1 OR CN-1221054-A).did. AND FPRS.dbnm.)					
L70	53	((JP-2003132875-A OR WO-2013038677-A1 OR WO-2013038676-	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY,	OR	ON	ON	2022/07/15 11:48 AM

		A1 OR CN-202495523-U OR JP-6652125-B2 OR CN-103066239-A OR CN-101939873-A OR CN-201087907-Y OR CN-1221054-C OR CN-1350350-A OR CN-1221054-A OR CN-103262310-A OR CN-101939869-A OR JP-2005283643-A OR CN-1489229-A).did. AND FTDB.dbnm.) OR ((US-20140349179-A1 OR US-20140120417-A1 OR US-20090111011-A1 OR US-20110104539-A1 OR US-20110151295-A1 OR US-20010033962-A1 OR US-20090166192-A1 OR US-20140302366-A1 OR US-20130316207-A1 OR US-20080233474-A1 OR US-20130045406-A1 OR US-20120214049-A1 OR US-20110027636-A1 OR US-20060222937-A1 OR US-20130045405-A1 OR US-20130316209-A1 OR US-20130101891-A1 OR US-20120321942-A1 OR US-20100086858-A1 OR US-20150295270-A1 OR US-20120009450-A1 OR US-20040191634-A1 OR US-20060051662-A1 OR US-20090081530-A1 OR US-20090035638-A1 OR US-20070122714-A1 OR US-20110003211-A1 OR US-20050250052-A1).did. AND PGPB.dbnm.) OR ((US-9142840-B2 OR US-8837115-B2 OR US-6100114-A OR US-5478668-A OR US-5017442-A).did. AND USPT.dbnm.) OR ((JP-2014225326-A OR JP-	CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)				

		2001015096-A OR JP-2000277155-A).did. AND JPAB.dbnm.) OR ((KR-101475367-B1 OR CN-1221054-A).did. AND FPRS.dbnm.)					
L71	4105191	(tape OR adhesive OR insulat$7) NEAR25 (electrode OR lead OR tab)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/15 11:49 AM
L72	34	L70 AND L71	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/15 11:49 AM
L73	25	L70 AND L71 AND @fd<"20140117"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/15 11:50 AM
L74	275044	(pair OR couple) NEAR10 (adhesiv$6 OR tape)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/15 03:31 PM
L75	578	L14 AND L74	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/15 03:32 PM
L76	214	L14 AND L74 AND @fd<"20140117"	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV,	OR	ON	ON	2022/07/15 03:32 PM

			MA, OA, RU, SU, WO))				
L77	50	L14 AND L74 AND @fd<"20140117"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/15 03:32 PM
L78	139	L14 AND L74 AND @pd<"20140117"	(FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/15 03:35 PM
L79	987872	(insulat$7 ADJ4 (tape OR adhesive OR resin))	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/15 03:43 PM
L80	8568	L79 AND L14	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/15 03:44 PM
L81	6063	(insulat$7 ADJ4 (tape OR adhesive OR resin)) NEAR25 (((first AND second) OR oppos$8) ADJ surfac$7)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/15 03:44 PM
L82	175	L14 AND L81	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/15 03:44 PM
L83	14	L14 AND L81 AND @fd<"20140117"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/15 03:45 PM
L84	53	L14 AND L81 AND	(FIT (AU, AP, AT, BE,	OR	ON	ON	2022/07/15

		@fd<"20140117"	BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO))				03:48 PM
L85	52	L14 AND L81 AND @pd<"20140117"	(FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/15 03:48 PM
L86	1	US-20110027636-$.did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/15 03:51 PM
L87	53	((JP-2003132875-A OR WO-2013038677-A1 OR WO-2013038676-A1 OR CN-202495523-U OR JP-6652125-B2 OR CN-103066239-A OR CN-101939873-A OR CN-201087907-Y OR CN-1221054-C OR CN-1350350-A OR CN-1221054-A OR CN-103262310-A OR CN-101939869-A OR JP-2005283643-A OR CN-1489229-A).did. AND FTDB.dbnm.) OR ((US-20140349179-A1 OR US-20140120417-A1 OR US-20090111011-A1 OR US-20110104539-A1 OR US-20110151295-A1 OR US-20010033962-A1 OR US-20090166192-A1 OR US-20140302366-A1 OR US-20130316207-A1 OR US-20110027636-A1 OR US-20080233474-A1 OR US-20130045406-	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/07/15 05:32 PM

		A1 OR US-20120214049-A1 OR US-20060222937-A1 OR US-20130045405-A1 OR US-20130316209-A1 OR US-20130101891-A1 OR US-20120321942-A1 OR US-20100086858-A1 OR US-20150295270-A1 OR US-20120009450-A1 OR US-20040191634-A1 OR US-20060051662-A1 OR US-20090081530-A1 OR US-20090035638-A1 OR US-20070122714-A1 OR US-20110003211-A1 OR US-20050250052-A1).did. AND PGPB.dbnm.) OR ((US-9142840-B2 OR US-8837115-B2 OR US-6100114-A OR US-5478668-A OR US-5017442-A).did. AND USPT.dbnm.) OR ((JP-2014225326-A OR JP-2001015096-A OR JP-2000277155-A).did. AND JPAB.dbnm.) OR ((KR-101475367-B1 OR CN-1221054-A).did. AND FPRS.dbnm.)					
L88	184982	((insulat$7 OR adhesiv$6 OR tape OR glue OR resin) NEAR10 (oppos$10 OR paired OR pair$5 OR face-to-face OR corresponding)) SAME ((short ADJ circuit) OR short-circuit OR short$7)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/20 11:07 AM
L89	1468	L14 AND L88	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/20 11:07 AM
L90	137	L14 AND L88 AND	(US-PGPUB; USPAT;	OR	ON	ON	2022/07/20

		@fd<"20140117"	USOCR)				11:07 AM
L91	387	L14 AND L88 AND @pd<"20140117"	(FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/20 02:15 PM
L92	58	((JP-2003132875-A OR WO-2013038677-A1 OR WO-2013038676-A1 OR KR-20090027314-A OR CN-202495523-U OR WO-2013080966-A1 OR JP-6652125-B2 OR CN-103066239-A OR CN-101939873-A OR CN-201087907-Y OR CN-1221054-C OR CN-1350350-A OR CN-1221054-A OR CN-103262310-A OR CN-101939869-A OR JP-2005283643-A OR CN-1489229-A).did. AND FTDB.dbnm.) OR ((US-20140349179-A1 OR US-20140120417-A1 OR US-20110104539-A1 OR US-20110151295-A1 OR US-20010033962-A1 OR US-20140302366-A1 OR US-20130316207-A1 OR US-20110027636-A1 OR US-20110014509-A1 OR US-20100285342-A1 OR US-20060051662-A1 OR US-20090111011-A1 OR US-20080233474-A1 OR US-20130045406-A1 OR US-20120214049-A1 OR US-20090166192-A1 OR US-20060222937-A1 OR US-20130045405-A1 OR US-20130316209-A1 OR US-20130101891-A1 OR US-20120321942-A1 OR US-	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/07/20 03:01 PM

		20100086858-A1 OR US-20150295270-A1 OR US-20120009450-A1 OR US-20040191634-A1 OR US-20090081530-A1 OR US-20130230749-A1 OR US-20090035638-A1 OR US-20070122714-A1 OR US-20110003211-A1 OR US-20050250052-A1).did. AND PGPB.dbnm.) OR ((US-9142840-B2 OR US-8837115-B2 OR US-6100114-A OR US-5478668-A OR US-5017442-A).did. AND USPT.dbnm.) OR ((JP-2014225326-A OR JP-2001015096-A OR JP-2000277155-A).did. AND JPAB.dbnm.) OR ((KR-101475367-B1 OR CN-1221054-A).did. AND FPRS.dbnm.)					
L93	59	((JP-2003132875-A OR WO-2013038677-A1 OR WO-2013038676-A1 OR KR-20090027314-A OR CN-202495523-U OR WO-2013080966-A1 OR KR-20060027266-A OR JP-6652125-B2 OR CN-103066239-A OR CN-101939873-A OR CN-201087907-Y OR CN-1221054-C OR CN-1350350-A OR CN-1221054-A OR CN-103262310-A OR CN-101939869-A OR JP-2005283643-A OR CN-1489229-A).did. AND FTDB.dbnm.) OR ((US-20140349179-A1 OR US-20140120417-A1 OR US-20110104539-A1 OR US-20110151295-A1 OR US-20010033962-A1 OR US-20140302366-A1 OR US-20130316207-A1 OR US-20110027636-A1 OR US-20110014509-	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/09/08 04:47 PM

		A1 OR US-20100285342-A1 OR US-20060051662-A1 OR US-20090111011-A1 OR US-20080233474-A1 OR US-20130045406-A1 OR US-20120214049-A1 OR US-20090166192-A1 OR US-20060222937-A1 OR US-20130045405-A1 OR US-20130316209-A1 OR US-20130101891-A1 OR US-20120321942-A1 OR US-20100086858-A1 OR US-20150295270-A1 OR US-20120009450-A1 OR US-20040191634-A1 OR US-20090081530-A1 OR US-20130230749-A1 OR US-20090035638-A1 OR US-20070122714-A1 OR US-20110003211-A1 OR US-20050250052-A1).did. AND PGPB.dbnm.) OR ((US-9142840-B2 OR US-8837115-B2 OR US-6100114-A OR US-5478668-A OR US-5017442-A).did. AND USPT.dbnm.) OR ((JP-2014225326-A OR JP-2001015096-A OR JP-2000277155-A).did. AND JPAB.dbnm.) OR ((KR-101475367-B1 OR CN-1221054-A).did. AND FPRS.dbnm.)					
L94	24	(US-41406506-$ | US-5017442-$ | US-5478668-$ | US-6100114-$ | US-6551143-$).DID. (AL-20010036574-$ | AL-20070122714-$ | AL-20090035638-$ | CN-101939873-$ | CN-103066239-$ | CN-1221054-$ | CN-1350350-$ | CN-201087907-$ | CN-202495523-$ | DB-	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM

		241406506-$ | JP-1993013064-$ | JP-1999317218-$ | JP-2000277155-$ | JP-2003132875-$).DID.					
L95	3	(US-20010036574-$ | US-20070122714-$ | US-20090035638-$).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L96	0	(JP-0513064-$).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L97	0	(JPH-0513064-$).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L98	0	(JP-00513064-$).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L99	4	(JP-3161778-$).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L100	92	(US-10135097-$ | US-	(US-PGPUB; USPAT;	OR	ON	ON	2022/09/08

		10868290-$ | US-11024868-$ | US-11108118-$ | US-20100055560-$ | US-20100285370-$ | US-20170092925-$ | US-20180190963-$ | US-20180366775-$ | US-5017442-$ | US-5478668-$ | US-6100114-$ | US-6551143-$ | US-7195844-$ | US-9741988-$).DID. (CN-103367700-$ | CN-105576191-$ | CN-105990612-$ | CN-106169540-$ | CN-107534127-$ | CN-108376759-$ | CN-109888162-$ | CN-112272877-$ | CN-112582583-$ | CN-113826240-$ | CN-201087907-$ | CN-202495523-$ | CN-205355186-$ | GB-2548361-$ | JP-2005222744-$ | JP-2007294198-$ | JP-2010086754-$ | JP-2011103249-$ | JP-2013137943-$ | JP-2014241267-$ | JP-2018166080-$ | JP-4850996-$ | JP-5284933-$ | JP-5623073-$ | JP-5821913-$ | JP-6237187-$ | JP-6288015-$ | JP-6926991-$ | KR-101489993-$ | KR-101515672-$ | KR-101980974-$ | KR-200364044-$ | KR-20060009411-$ | KR-20120022773-$ | WO-2017149977-$).DID.	USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)				06:55 PM
L101	4	("20020197535" | "20040191634" | "20140030607" | "20150207111").pn. OR ("11108118").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/09/08 06:55 PM
L102	3	("20090305120" |	(US-PGPUB; USPAT;	OR	ON	ON	2022/09/08

		"20140349179" | "20150207111").pn. OR ("11024868").urpn. AND (PGPB | USPT | USOC).dbnm.	USOCR)				06:55 PM
L103	1	US-20060051662-$.did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L104	30	(US-10014495-$ | US-10038212-$ | US-10193125-$ | US-10312497-$ | US-10396336-$ | US-11024868-$ | US-11043700-$ | US-20060127774-$ | US-20080274410-$ | US-20110159344-$ | US-20110183191-$ | US-20130252053-$ | US-20130266845-$ | US-20130316207-$ | US-20140349179-$ | US-20160126511-$ | US-20160260954-$ | US-20180315991-$ | US-8877371-$ | US-8974944-$ | US-9159963-$ | US-9203074-$ | US-9224989-$ | US-9293744-$ | US-9397329-$ | US-9490468-$ | US-9564626-$ | US-9595699-$ | US-9627677-$ | US-9960404-$).DID.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L105	7	("20060111625" | "20080233474" | "20090111011" | "20130045405" | "20140120417" | "20140349179" | "20140377593").pn. OR ("11043700").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/09/08 06:55 PM
L106	22	((JP-2003132875-A OR CN-202495523-U OR	(US-PGPUB; USPAT; USOCR; FIT (AU, AP,	OR	ON	ON	2022/09/08 06:55 PM

		CN-103066239-A OR CN-101939873-A OR CN-201087907-Y OR CN-1221054-C OR CN-1350350-A OR CN-1221054-A).did. AND FTDB.dbnm.) OR ((US-20140349179-A1 OR US-20140120417-A1 OR US-20090111011-A1 OR US-20080233474-A1 OR US-20130045405-A1 OR US-20040191634-A1 OR US-20060051662-A1 OR US-20090035638-A1 OR US-20070122714-A1).did. AND PGPB.dbnm.) OR ((JP-2000277155-A).did. AND JPAB.dbnm.) OR ((US-6100114-A OR US-5478668-A OR US-5017442-A).did. AND USPT.dbnm.) OR ((CN-1221054-A).did. AND FPRS.dbnm.)	AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L107	79516	(H01M10/0431 OR H01M10/0587 OR H01M50/531 OR H01M50/533 OR H01M50/538).cpc.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/09/08 06:55 PM
L108	5257187	(recess$7 OR pocket OR (non-coat$7 ADJ (portion OR part)) OR cavity OR hole OR gap) NEAR10 (tab$5 OR tap$5 OR lead$5)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L109	10494	L14 AND L15	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV,	OR	ON	ON	2022/09/08 06:55 PM

			MA, OA, RU, SU, WO); FPRS; EPO; JPO)				
L110	955	L14 AND L15 AND @fd<"20140117"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/09/08 06:55 PM
L111	1	US-8795879-$.did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L112	1	("20090296318").pn. OR ("8795879").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/09/08 06:55 PM
L113	77	(US-20040126654-$ | US-20040207974-$ | US-20090296318-$ | US-20150332857-$ | US-8014127-$ | US-8218293-$ | US-8795879-$ | US-8837115-$ | US-9070511-$).DID. (CN-104137303-$ | CN-108713233-$ | CN-110706928-$ | CN-201156473-$ | EP-1580774-$ | JP-2001023866-$ | JP-2001284190-$ | JP-2006286959-$ | JP-2008147541-$ | JP-2009010070-$ | JP-2009152514-$ | JP-2009212117-$ | JP-2009212283-$ | JP-2010074083-$ | JP-2010074089-$ | JP-2012019061-$ | JP-2012064601-$ | JP-2018157012-$ | JP-3587333-$ | JP-4413003-$ | JP-6893123-$ | JP-6953724-$ | KR-101404532-$ | KR-101434923-$ | KR-101475367-$ | KR-102079677-$ | KR-20130116836-$ | WO-2010116656-$ | WO-2021172440-$).DID.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM

L114	293	L14 AND L15 AND (length NEAR10(tab$5 OR tap$5 OR lead$5)) AND @fd<"20140117"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/09/08 06:55 PM
L115	17601	((recess$7 OR pocket OR (non-coat$7 ADJ (portion OR part)) OR cavity OR hole OR gap) NEAR10 (energ$6 NEAR5 densit$7))	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L116	1	L14 AND L15 AND (length NEAR10(tab$5 OR tap$5 OR lead$5)) AND L22 AND @fd<"20140117"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/09/08 06:55 PM
L117	18	L14 AND L15 AND (length NEAR10(tab$5 OR tap$5 OR lead$5)) AND L22 AND @fd<"20140117"	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO))	OR	ON	ON	2022/09/08 06:55 PM
L118	8	L14 AND L15 AND (length NEAR10(tab$5 OR tap$5 OR lead$5)) AND L22 AND @pd<"20140117"	(FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L119	6698	(H01M10/0431 AND H01M50/538).cpc.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/09/08 06:55 PM
L120	127	L26 AND L15 AND @fd<"20140117"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/09/08 06:55 PM
L121	2	(US-20100124694-$ OR US-2006022937-$ OR US-20090166192-$).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB,	OR	ON	ON	2022/09/08 06:55 PM

			HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)				
L122	0	(US-2006022937-$).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L123	1	(US-20060022937-$).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L124	1	(US-20060222937-$).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L125	1	(US-6828059-$).did.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L126	1	(US-20100124694-$).did.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L127	1	(jp-09017410-$).did.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT,	OR	ON	ON	2022/09/08 06:55 PM

			AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)				
L128	1	(jp-09161837$).did.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L129	1	US-20070122714-$.did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L130	37	((JP-2003132875-A OR CN-202495523-U OR CN-103066239-A OR CN-101939873-A OR CN-201087907-Y OR CN-1221054-C OR CN-1350350-A OR CN-1221054-A).did. AND FTDB.dbnm.) OR ((US-20140349179-A1 OR US-20140120417-A1 OR US-20090111011-A1 OR US-20110104539-A1 OR US-20110151295-A1 OR US-20010033962-A1 OR US-20090166192-A1 OR US-20080233474-A1 OR US-20130045406-A1 OR US-20120214049-A1 OR US-20110027636-A1 OR US-20060222937-A1 OR US-20130045405-A1 OR US-20130316207-A1 OR US-20130316209-A1 OR US-	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/09/08 06:55 PM

		20130101891-A1 OR US-20120321942-A1 OR US-20040191634-A1 OR US-20060051662-A1 OR US-20090035638-A1 OR US-20070122714-A1).did. AND PGPB.dbnm.) OR ((US-9142840-B2 OR US-8837115-B2 OR US-6100114-A OR US-5478668-A OR US-5017442-A).did. AND USPT.dbnm.) OR ((KR-101475367-B1 OR CN-1221054-A).did. AND FPRS.dbnm.) OR ((JP-2000277155-A).did. AND JPAB.dbnm.)					
L131	147477	(non-coat$6 OR (non ADJ coat$6) OR un-coat$6 OR (un ADJ coat$6) OR non-application$9 OR (non ADJ application$9))	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L132	4977	L14 AND L38	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L133	257	L14 AND L38 AND (L38 NEAR15 (width OR length OR size OR area)) AND (L38 SAME3 (energ$7 NEAR5 dens$6))	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L134	23	L14 AND L38 AND (L38 NEAR15 (width OR length OR size OR area)) AND (L38 SAME3 (energ$7 NEAR5 dens$6)) AND @fd<"20140117"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/09/08 06:55 PM

L135	438	(H01M50/538).cpc. AND (recess$6 near15 (tab OR lead OR tap))	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L136	41	(H01M50/538).cpc. AND (recess$6 near15 (tab OR lead OR tap)) AND @fd<"20140117"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/09/08 06:55 PM
L137	509	(H01M50/5$).cpc. AND (recess$6 near15 (tab OR lead OR tap)) AND @fd<"20140117"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/09/08 06:55 PM
L138	112	(H01M50/538).cpc. AND (recess$6 near15 (tab OR lead OR tap)) AND @pd<"20140117"	(FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L139	13	("20100216001" OR "20110274953" OR "20140017565" OR "20150295270" OR "6139986" OR "20050287428" OR "20090148766" OR "20090297941" OR "20110076547" OR "20160197379" OR "7923139" OR "7955736" OR "8450006").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2022/09/08 06:55 PM
L140	1	US-10320024-$.did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L141	9	("20110104539" | "20110129708" | "20110151295" | "20120009450" | "20120321924" | "20130260203" |	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/09/08 06:55 PM

		"20130316207" | "20140072877" | "20140302366").pn. OR ("10320024").urpn. AND (PGPB | USPT | USOC).dbnm.					
L142	0	(KR-1038115-$ OR KR-1615712-$ OR KR-20110035566-$ OR KR-20160085063-$).DID.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/09/08 06:55 PM
L143	4	(KR-1038115-$ OR KR-1615712-$ OR KR-20110035566-$ OR KR-20160085063-$).DID.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L144	4	(KR-101038115-$ OR KR-101615712-$).DID.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L145	44	(Artificial Intelligence) More like doc: US-20140302366-A1 Text: (US-9520588-B2 OR WO-2013038701-A1 OR JP-WO2013038701-A1 OR JP-5849234-B2 OR WO-2013038677-A1 OR JP-2014225326-A OR JP-2007109612-A OR JP-6208239-B2 OR JP-6439839-B2 OR CN-103733418-B OR JP-H09180761-A OR JP-2003288941-A OR KR-20030078019-A OR CN-110178250-B OR KR-100990800-B1 OR JP-WO2017149977-A1 OR JP-4097443-B2 OR JP-2013073680-A OR JP-2016081881-A OR CN-103733418-A).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/09/08 06:55 PM

L146	49	(Artificial Intelligence) More like doc: WO-2013038677-A1 Text: (WO-2013038701-A1 OR JP-5849234-B2 OR JP-WO2013038701-A1 OR WO-2013038676-A1 OR JP-2014225326-A OR US-9520588-B2 OR US-20140302366-A1 OR WO-2016079943-A1 OR JP-2007109612-A OR JP-2010061893-A OR JP-2008311011-A OR WO-2018061381-A1 OR JP-2018018646-A OR JP-WO2018061381-A1 OR JP-2016122628-A OR JP-6567821-B2 OR WO-2019065871-A1 OR US-8530072-B2 OR JP-H09306471-A OR JP-2010086812-A).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/09/08 06:55 PM
L147	47	((JP-2003132875-A OR WO-2013038677-A1 OR WO-2013038676-A1 OR CN-202495523-U OR JP-6652125-B2 OR CN-103066239-A OR CN-101939873-A OR CN-201087907-Y OR CN-1221054-C OR CN-1350350-A OR CN-1221054-A).did. AND FTDB.dbnm.) OR ((US-20140349179-A1 OR US-20140120417-A1 OR US-20090111011-A1 OR US-20110104539-A1 OR US-20110151295-A1 OR US-20010033962-A1 OR US-20090166192-A1 OR US-20140302366-A1 OR US-20130316207-A1 OR US-20080233474-A1 OR US-20130045406-A1 OR US-20120214049-A1 OR US-20110027636-A1 OR US-20060222937-A1 OR US-20130045405-A1 OR US-	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/09/08 06:55 PM

		20130316209-A1 OR US-20130101891-A1 OR US-20120321942-A1 OR US-20100086858-A1 OR US-20150295270-A1 OR US-20120009450-A1 OR US-20040191634-A1 OR US-20060051662-A1 OR US-20090081530-A1 OR US-20090035638-A1 OR US-20070122714-A1).did. AND PGPB.dbnm.) OR ((US-9142840-B2 OR US-8837115-B2 OR US-6100114-A OR US-5478668-A OR US-5017442-A).did. AND USPT.dbnm.) OR ((JP-2014225326-A OR JP-2001015096-A OR JP-2000277155-A).did. AND JPAB.dbnm.) OR ((KR-101475367-B1 OR CN-1221054-A).did. AND FPRS.dbnm.)					
L148	135	((("NINGDE") near3 ("AMPEREX") near3 ("TECHNOLOGY") near3 ("LIMITED"))).AS,AANM.	(USPAT)	OR	ON	ON	2022/09/08 06:55 PM
L149	139	((("NINGDE") near3 ("AMPEREX"))).AS,AANM.	(USPAT)	OR	ON	ON	2022/09/08 06:55 PM
L150	575	((("NINGDE") near3 ("AMPEREX"))).AS,AANM.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/09/08 06:55 PM
L151	1286	L57 AND L14	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L152	10	L57 AND L14 AND @pd<"20140117"	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA,	OR	ON	ON	2022/09/08 06:55 PM

			EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)				
L153	316	((("TAO") near3 ("Tao")) OR (("MO") near3 ("Ming") near3 ("Liang"))).INV.	(US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT)	OR	ON	ON	2022/09/08 06:55 PM
L154	2	L60 AND L14 AND @pd<"20140117"	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L155	130423336	L60AND @pd<"20140117"	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L156	2325	L60 AND @pd<"20140117"	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L157	0	L60 AND H01M50/5$.cpc. AND @pd<"20140117"	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L158	46	L60 AND H01M.cpcl. AND @pd<"20140117"	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS,	OR	ON	ON	2022/09/08 06:55 PM

			IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)				
L159	47	((JP-2003132875-A OR WO-2013038677-A1 OR WO-2013038676-A1 OR CN-202495523-U OR JP-6652125-B2 OR CN-103066239-A OR CN-101939873-A OR CN-201087907-Y OR CN-1221054-C OR CN-1350350-A OR CN-1221054-A).did. AND FTDB.dbnm.) OR ((US-20140349179-A1 OR US-20140120417-A1 OR US-20090111011-A1 OR US-20110104539-A1 OR US-20110151295-A1 OR US-20010033962-A1 OR US-20090166192-A1 OR US-20140302366-A1 OR US-20130316207-A1 OR US-20080233474-A1 OR US-20130045406-A1 OR US-20120214049-A1 OR US-20110027636-A1 OR US-20060222937-A1 OR US-20130045405-A1 OR US-20130316209-A1 OR US-20130101891-A1 OR US-20120321942-A1 OR US-20100086858-A1 OR US-20150295270-A1 OR US-20120009450-A1 OR US-20040191634-A1 OR US-20060051662-A1 OR US-20090081530-A1 OR US-20090035638-A1 OR US-20070122714-A1).did. AND PGPB.dbnm.) OR ((US-9142840-B2 OR US-8837115-B2 OR US-6100114-A OR US-5478668-A OR US-5017442-A).did. AND USPT.dbnm.) OR ((JP-2014225326-A OR JP-	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/09/08 06:55 PM

		2001015096-A OR JP-2000277155-A).did. AND JPAB.dbnm.) OR ((KR-101475367-B1 OR CN-1221054-A).did. AND FPRS.dbnm.)					
L160	12	(US-20050250052-$ OR US-20110003211-$).did. OR (CN-1489229-$ OR CN-101939869-$ OR CN-103262310-$ OR JP-2005283643-$).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L161	53	((JP-2003132875-A OR WO-2013038677-A1 OR WO-2013038676-A1 OR CN-202495523-U OR JP-6652125-B2 OR CN-103066239-A OR CN-101939873-A OR CN-201087907-Y OR CN-1221054-C OR CN-1350350-A OR CN-1221054-A OR CN-103262310-A OR CN-101939869-A OR JP-2005283643-A OR CN-1489229-A).did. AND FTDB.dbnm.) OR ((US-20140349179-A1 OR US-20140120417-A1 OR US-20090111011-A1 OR US-20110104539-A1 OR US-20110151295-A1 OR US-20010033962-A1 OR US-20090166192-A1 OR US-20140302366-A1 OR US-20130316207-A1 OR US-20080233474-A1 OR US-20130045406-A1 OR US-20120214049-A1 OR US-20110027636-A1 OR US-20060222937-A1 OR US-20130045405-A1 OR US-20130316209-A1 OR US-20130101891-A1 OR US-20120321942-A1 OR US-20100086858-A1 OR	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/09/08 06:55 PM

		US-20150295270-A1 OR US-20120009450-A1 OR US-20040191634-A1 OR US-20060051662-A1 OR US-20090081530-A1 OR US-20090035638-A1 OR US-20070122714-A1 OR US-20110003211-A1 OR US-20050250052-A1).did. AND PGPB.dbnm.) OR ((US-9142840-B2 OR US-8837115-B2 OR US-6100114-A OR US-5478668-A OR US-5017442-A).did. AND USPT.dbnm.) OR ((JP-2014225326-A OR JP-2001015096-A OR JP-2000277155-A).did. AND JPAB.dbnm.) OR ((KR-101475367-B1 OR CN-1221054-A).did. AND FPRS.dbnm.)					
L162	53	((JP-2003132875-A OR WO-2013038677-A1 OR WO-2013038676-A1 OR CN-202495523-U OR JP-6652125-B2 OR CN-103066239-A OR CN-101939873-A OR CN-201087907-Y OR CN-1221054-C OR CN-1350350-A OR CN-1221054-A OR CN-103262310-A OR CN-101939869-A OR JP-2005283643-A OR CN-1489229-A).did. AND FTDB.dbnm.) OR ((US-20140349179-A1 OR US-20140120417-A1 OR US-20090111011-A1 OR US-20110104539-A1 OR US-20110151295-A1 OR US-20010033962-A1 OR US-20090166192-A1 OR US-20140302366-A1 OR US-20130316207-A1 OR US-20080233474-A1 OR US-20130045406-A1 OR US-20120214049-A1 OR US-	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/09/08 06:55 PM

		20110027636-A1 OR US-20060222937-A1 OR US-20130045405-A1 OR US-20130316209-A1 OR US-20130101891-A1 OR US-20120321942-A1 OR US-20100086858-A1 OR US-20150295270-A1 OR US-20120009450-A1 OR US-20040191634-A1 OR US-20060051662-A1 OR US-20090081530-A1 OR US-20090035638-A1 OR US-20070122714-A1 OR US-20110003211-A1 OR US-20050250052-A1).did. AND PGPB.dbnm.) OR ((US-9142840-B2 OR US-8837115-B2 OR US-6100114-A OR US-5478668-A OR US-5017442-A).did. AND USPT.dbnm.) OR ((JP-2014225326-A OR JP-2001015096-A OR JP-2000277155-A).did. AND JPAB.dbnm.) OR ((KR-101475367-B1 OR CN-1221054-A).did. AND FPRS.dbnm.)					
L163	4151033	(tape OR adhesive OR insulat$7) NEAR25 (electrode OR lead OR tab)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L164	34	L70 AND L71	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L165	25	L70 AND L71 AND @fd<"20140117"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/09/08 06:55 PM

L166	277493	(pair OR couple) NEAR10 (adhesiv$6 OR tape)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L167	581	L14 AND L74	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L168	214	L14 AND L74 AND @fd<"20140117"	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO))	OR	ON	ON	2022/09/08 06:55 PM
L169	50	L14 AND L74 AND @fd<"20140117"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/09/08 06:55 PM
L170	139	L14 AND L74 AND @pd<"20140117"	(FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L171	997639	(insulat$7 ADJ4 (tape OR adhesive OR resin))	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L172	8710	L79 AND L14	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB,	OR	ON	ON	2022/09/08 06:55 PM

			HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)				
L173	6138	(insulat$7 ADJ4 (tape OR adhesive OR resin)) NEAR25 (((first AND second) OR oppos$8) ADJ surfac$7)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L174	174	L14 AND L81	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L175	14	L14 AND L81 AND @fd<"20140117"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/09/08 06:55 PM
L176	53	L14 AND L81 AND @fd<"20140117"	(FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO))	OR	ON	ON	2022/09/08 06:55 PM
L177	52	L14 AND L81 AND @pd<"20140117"	(FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L178	1	US-20110027636-$.did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L179	53	((JP-2003132875-A OR WO-2013038677-A1 OR WO-2013038676-	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY,	OR	ON	ON	2022/09/08 06:55 PM

		A1 OR CN-202495523-U OR JP-6652125-B2 OR CN-103066239-A OR CN-101939873-A OR CN-201087907-Y OR CN-1221054-C OR CN-1350350-A OR CN-1221054-A OR CN-103262310-A OR CN-101939869-A OR JP-2005283643-A OR CN-1489229-A).did. AND FTDB.dbnm.) OR ((US-20140349179-A1 OR US-20140120417-A1 OR US-20090111011-A1 OR US-20110104539-A1 OR US-20110151295-A1 OR US-20010033962-A1 OR US-20090166192-A1 OR US-20140302366-A1 OR US-20130316207-A1 OR US-20110027636-A1 OR US-20080233474-A1 OR US-20130045406-A1 OR US-20120214049-A1 OR US-20060222937-A1 OR US-20130045405-A1 OR US-20130316209-A1 OR US-20130101891-A1 OR US-20120321942-A1 OR US-20100086858-A1 OR US-20150295270-A1 OR US-20120009450-A1 OR US-20040191634-A1 OR US-20060051662-A1 OR US-20090081530-A1 OR US-20090035638-A1 OR US-20070122714-A1 OR US-20110003211-A1 OR US-20050250052-A1).did. AND PGPB.dbnm.) OR ((US-9142840-B2 OR US-8837115-B2 OR US-6100114-A OR US-5478668-A OR US-5017442-A).did. AND USPT.dbnm.) OR ((JP-2014225326-A OR JP-	CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)				

		2001015096-A OR JP-2000277155-A).did. AND JPAB.dbnm.) OR ((KR-101475367-B1 OR CN-1221054-A).did. AND FPRS.dbnm.)					
L180	185922	((insulat$7 OR adhesiv$6 OR tape OR glue OR resin) NEAR10 (oppos$10 OR paired OR pair$5 OR face-to-face OR corresponding)) SAME ((short ADJ circuit) OR short-circuit OR short$7)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L181	1494	L14 AND L88	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L182	137	L14 AND L88 AND @fd<"20140117"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/09/08 06:55 PM
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PE2E SEARCH - Search History (Interference)

There are no Interference searches to show.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT Substitute for Form 1449-PTO				*Electronically filed December 8, 2022*	
				Application Number	*17/746,755*
				Filing Date	*May 17, 2022*
				First Named Inventor	*Tao TAO*
				Art Unit	*1721*
				Examiner Name	*Barton, Jason Aaron*
Sheet	1	of	1	Attorney Docket Number	*024607-02-5119-US*

U.S. PATENT DOCUMENTS					
Examiner Initials	Cite No.	Document Number Number - Kind Code	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear

FOREIGN PATENT DOCUMENTS						
Examiner Initials	Cite No.	Foreign Patent Document Country Code – Number - Kind Code *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T
		JP1999317218A - JPH11317218A	11-16-1999	TOYOTA CENTRAL RES & DEV		
		JP1993013064A - JPH0713064A	01-17-1995	OLYMPUS OPTICAL CO		

NON PATENT LITERATURE DOCUMENTS		
Examiner Initials	Cite No.	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published
		Evaluation Report of Utility Model Patent, ZL2014200303194, 24DEC2019, 5 pgs.
		Tao, Office Action, US14/596,873, 04APR2017, 13 pgs.
		Tao, Final Office Action, US14/596,873, 22NOV2017, 13 pgs.
		Tao, Office Action, US14/596,873, 19APR2018, 12 pgs.
		Tao, Final Office Action, US14/596,873, 05DEC2018, 13 pgs.
		Tao, Office Action, US14/596,873, 22MAR2019, 14 pgs.
		Tao, Notice of Allowance, US14/596,873, 25NOV2019, 7 pgs.
		Tao, Office Action, US16/113,938, 16AUG2019, 17 pgs.
		Tao, Office Action, US16/113,938, 13FEB2020, 22 pgs.
		Tao, Office Action, US16/113,938, 02NOV2020, 14 pgs.
		Tao, Final Office Action, US16/113,938, 20MAY2021, 22 pgs.
		Tao, Advisory Action, US16/113,938, 02AUG2021, 3 pgs.
		Machine English translation of CN202495523U (Year: 2012), 6 pgs.

Examiner Signature		Date Considered	

DB2/ 44550180.1

Electronic Acknowledgement Receipt

EFS ID:	47174292
Application Number:	17746755
International Application Number:	
Confirmation Number:	8911
Title of Invention:	LITHIUM-ION BATTERY HAVING DESIRABLE SAFETY PERFORMANCE
First Named Inventor/Applicant Name:	Tao TAO
Customer Number:	24341
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Attorney Docket Number:	024607-02-5119-US
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Time Stamp:	22:13:30
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Non Patent Literature	Evaluation-Report-on-of-Utility-Model-Patent_24DEC2019.pdf	5293278 2c7307384bff6d47deb366236f8802f16283 2058	no	5

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2	Non Patent Literature	Tao_Office-Action-US14596873_04APR2017.pdf	467527 39d368d88e91e62bdfed1e49e2c8e80c3b67d79e	no	13
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3	Non Patent Literature	Tao_Final-Office-Action-US14596873_22NOV2017.pdf	379644 8563da1755e9ead9d31d4aa25b22f14cdc9eefd8	no	13
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4	Non Patent Literature	Tao_Office-Action-US14596873_19APR2018.pdf	475498 92b41ad4162ff27e492b1980311cfba8923bda41	no	12
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6	Non Patent Literature	Tao_Office-Action-US14596873_22MAR2019.pdf	556480 ab84fdabe0fad43b4b7184b0fa46c59823b8558a	no	14
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8	Non Patent Literature	Tao_Office-Action-US16113938_16AUG2019.PDF	200922 4b6e6630aeff4eccbe6d71d2b6ebca95dcf775b2	no	17
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9	Non Patent Literature	Tao_Office-Action-US16113938_02NOV2020.PDF	572321 420a10dcd7e97bf79cdc03128f588eefca9dcac1	no	14
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10	Non Patent Literature	Tao_Advisory-Action-US16113938_02AUG2021.pdf	152730 967ad775699d91e5c5f267f76c9329c582b12dbb	no	3
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Information:					
11	Non Patent Literature	Machine-English-translation-of-CN202495523U_Year-2012.pdf	470817 284e57dc00ea381de7d6407cb643ebc9b97dc4f4	no	6
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12	Non Patent Literature	Tao_Final-Office-Action-US16113938_13FEB2020.pdf	902368 5c95dfb2293762c867c77a01e030bd6c0759683c	no	22
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14	Foreign Reference	JP1999317218A-JPH11-317218.pdf	564953 54cd8e4dcd5f01b2dd9e428c3d1052c1dcd3f8f1	no	7
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15	Foreign Reference	JP1993013064A-JPH5-13064.pdf	549586 e6080f49cce315ee84aa79bb25a09cc5306fa8c8	no	9
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16		024607-02-5119-US_Supplemental-IDS.pdf	378861 8c498428788b53c879317d2ed7d951353e89d2aa	yes	5

	Multipart Description/PDF files in .zip description		
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	Transmittal Letter	1	4
	Information Disclosure Statement (IDS) Form (SB08)	5	5

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New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Espacenet

JPH11317218A SHEET ELECTRODE

Applicants: TOYOTA CENTRAL RES & DEV

Inventors: KAWAI YASUAKI,MASAKI HIDEYUKI

Classifications:

IPC ***H01M10/04; H01M10/05; H01M2/26; H01M4/13;*** (IPC1-7): H01M10/04; H01M10/40; H01M2/26; H01M4/02;

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Priorities: JP12117598A 1998-04-30

Application: JP12117598A·1998-04-30

Publication: JPH11317218A·1999-11-16

Published as: JPH11317218A

SHEET ELECTRODE

Abstract

PROBLEM TO BE SOLVED: To reduce an active material uncoated part which is provided in a width direction of a belt-like current collector of a sheet electrode to obtain an electrode body whose dead space is small in order to improve an energy volume density of a spiral battery. SOLUTION: A sheet electrode 10 comprises, a belt-like current collector 11, an electrode active material layer 12 which is intermittently formed in the longitudinal direction on the current collector 11, and a strip lead 14 which is formed to project in a width direction to go over one side end of the current collector 11 from a part 13 where the electrode active material layer 12 of the current collector 11 is not formed. An electrode body of a spiral battery is constructed by using the sheet electrode 10.

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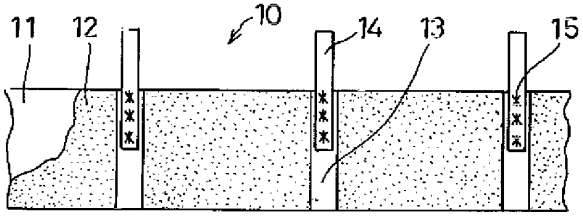
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(74)代理人　弁理士　大川　宏

(54)【発明の名称】　シート電極

(57)【要約】
【課題】　スパイラル型電池のエネルギー体積密度の向上図るべく、デッドスペースの小さな電極体を得るため、シート電極の帯状集電体の幅方向に設けられた活物質未塗工部を小さくする。
【解決手段】　シート電極１０を、帯状の集電体１１と、集電体１１の表面に長手方向に間欠的に形成された電極活物質層１２と、集電体１１の電極活物質層１２が形成されていない部分１３から集電体１１の一方の側端を越えて幅方向に延びるように形成された短冊状のリード１４とを有するように構成する。



【特許請求の範囲】
【請求項１】　帯状の集電体と、該集電体の表面に長手方向に間欠的に形成された電極活物質層と、該集電体の該電極活物質層が形成されていない部分から該集電体の一方の側端を越えて幅方向に延びるように形成された短冊状のリードとを有するシート電極。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明は、電極をセパレータを介して巻回するスパイラル型電池に使用するシート電極に関する。
【０００２】
【従来の技術】リチウムイオン二次電池等では、帯状の正極および負極をセパレータを介して巻回するスパイラル型の電池が一般的であり、広く普及している。パソコン、携帯電話等の電子機器の小型化、環境問題からの電気自動車の開発が進む中、これらのスパイラル型の電池にも大容量で小型であることの要求が高まっており、エネルギー体積密度の大きい電池の開発が望まれる。
【０００３】通常、スパイラル型電池の電極は、正極、負極とも帯状の金属箔製の集電体の表面に、電極反応を生じさせる活物質をペースト状にして塗布し、その後乾燥して製造される。つまり活物質が塗布された部分が電極活物質層として形成されるわけである。これらの電極をその間にセパレータを挟装して巻回して電極体とし、この電極体を円筒状のケースに電解質と共に密閉して電池が構成されることから、電池自体の体積に対しての実際の放電に機能する電極要素の体積が、電池のエネルギー体積密度に大きく影響することになる。
【０００４】従来、スパイラル型電池の電極は、集電体の幅方向の一端部に連続的に活物質が塗布されていない未塗工部を設け、この未塗工部に短冊状の複数のリード（タブ）を超音波接合、抵抗溶接等の手段により接合して、電極から外部端子までの集電を行っていた。リードが接合された従来の電極を図５に示す。そして、正極、負極ともこのように構成された電極ををセパレータを介して図６に示すように巻回して電極体を形成させていた。
【０００５】電極の巻回は、正極、負極のリードが巻回軸方向の互いに背向する向きに延びるようにして行うのであるが、この際、互いの電極活物質層が径方向に重なり合う位置にくるよう電極を幅方向にずらして行っていた。したがって形成された円筒形の電極体は、図７に示すように、その両側の巻回端面に活物質が塗布されていない部分、いわゆるデッドスペースを有するものとなっていた。このデッドスペースが、電池のエネルギー体積密度を向上させようとする場合の大きな障害となっていた。
【０００６】
【発明が解決しようとする課題】本発明は、デッドスペースの小さい電極体を形成させることによって、電池のエネルギー密度を向上させることを課題としている。このため本発明では、従来の電極に設けられていた活物質未塗工部、つまり帯状集電体の幅方向の一端部に連続して形成されていた活物質未塗工部を少なくすることを目的とし、従来の活物質未塗工部に代えて、活物質が塗布されている幅の中に未塗工部を複数箇所設け、この部分に集電用リードを形成した電極を使用することによって、上記デッドスペースの小さい電極体を構成させようとするものである。
【０００７】なお、理想とするのは集電体の幅方向の端部に活物質未塗工部のない電極であるが、従来は、帯状の集電体の全幅にわたって未塗工部を設けずに活物質を塗布する適当な技術がなかったため、幅方向の端部に存在する活物質未塗工部を除去するためには活物質塗布後に集電体をスリット等していた。そこで本発明のシート電極を製造する方法として、従来方法と異なる簡便な方法を採用し、この方法によって、集電体の全幅にわたって活物質を塗布し、巻回端部にデッドスペースのない電極体の製造をも容易にしようとするものである。
【０００８】
【課題を解決するための手段】本発明者は、上述したように、帯状集電体の幅方向に設けられた活物質未塗布部を小さくすることで電極体のデッドスペースが小さくなることに想到し、以下の発明に至った。本発明は、帯状の集電体と、該集電体の表面に長手方向に間欠的に形成された電極活物質層と、該集電体の該電極活物質層が形成されていない部分から該集電体の一方の側端を越えて幅方向に延びるように形成された短冊状のリードとを有するシート電極を用いてスパイラル型電池の電極体を構成させることにより、電池のエネルギー体積密度を向上させるという上記課題を解決するものである。
【０００９】つまり本発明のシート電極は、帯状集電体の表面に幅方向のほぼ全面に活物質が塗布されている所定長さの区間を、所定の間隔を隔てて集電体の全長にわたって複数設け、この活物質塗工部の間にある集電体の長手方向に直角な活物質未塗工部に、集電用リードを形成したものである。このような電極を巻回した電極体は、巻回端面に活物質未塗工部によるデッドスペースの非常に小さいものとなる。
【００１０】
【発明の実施の形態】以下に、本発明のシート電極及びその製造方法の実施例について、図面に基づいて詳細に説明する。なおここからは便宜上、リチウムイオン二次電池用の電極について説明するが、本発明のシート電極およびその製造方法は、リチウムイオン二次電池用のものに限定されるものではない。
【００１１】本発明のシート電極の一実施例を図１に示す。本実施例のシート電極１０は、帯状の集電体１１と、集電体１１の表面に長手方向に間欠的に形成された

電極活物質層１２と、集電体１１の該電極活物質層１２が形成されていない部分（以下活物質未塗工部１３という）から集電体１１の一方の側端を越えて幅方向に延びるようにに形成された短冊状のリード１４とから構成されている。まず集電体１１であるが、通常、正極には厚さ１０～２０μｍの帯状のアルミニウム箔を、また負極には厚さ１０～２０μｍの帯状の銅箔を用いる。集電体１１の幅および長さについては、電池の放電容量によって種々異なったものとなるが、放電容量の大きい大型の電池では、幅１５０ｍｍ以上、長さ５ｍ以上となる場合もある。

【００１２】次に電極活物質層１２について説明する。電極活物質層１２は、正極、負極とも、電極活物質に結着剤等を混合させてペースト状の合剤（以下活物質ペーストという）としたものを、集電体１１の表面に塗布し、乾燥させ、その後密度を高めるためロールプレスを行って成形される。活物質は、正極には$LiCoO_2$、$LiMn_2O_4$等のリチウム含有金属酸化物の粉状体を、負極には、黒鉛、有機化合物焼成体等の炭素物質の粉状体を用いる。正極活物質ペーストは、上記正極活物質粉状体に、黒鉛、アセチレンブラック等の導電剤、ポリフッ化ビニリデン等の結着剤、Ｎ－メチルピロリドン等の分散剤を混合させて作成する。また負極活物質ペーストは、上記負極活物質に、カルボキシルメチルセルロース、スチレンブタジエンゴム等の複合バインダ等を結着剤として混合して作成する。

【００１３】本実施例では、電極活物質層１２は集電体１１の長さ方向に間欠的に形成されており、電極活物質層１２の数および各電極活物質層１２の面積は、電池の放電容量、電極幅、リードの数等を総合的に考慮してなされる電池自体の設計に応じて、任意のものとすることができる。また、シート電極１０の全体から均一に集電を行うために集電用のリード１４を集電体１１の長さ方向に等間隔で配置することが望ましいことから、各電極活物質層１２の面積は均等であることが望ましく、各電極活物質層１２の間に存在する活物質未塗工部１３の幅は、この未塗工部に形成されるリード１４の幅よりも若干大きいものであればよい。

【００１４】集電体１１の幅に対する電極活物質層１２の幅に関しては、活物質ペーストの集電体１１の表面への塗布の容易性を考慮して、集電体の幅方向の両端に連続的な活物質未塗工部を設けてもよいが、本実施例では、電極体のデッドスペースを最小にすることを考えて、集電体１１の全幅にわたって電極活物質層１２を形成させている。なお電極活物質層１２は、集電体１１の片面にのみに形成させてもよいが、電池のエネルギー体積密度を考慮すれば、集電体１１の両面に形成させるのが望ましい。両面に形成させる場合、両面の電極活物質層を形成させてからリード１４を形成させるのであれば、裏面の電極活物質層は、表の面の電極活物質層１２と同位置に形成させる必要がある。これに対し、表の面の電極活物質層１２を形成しリード１４を形成させた後に裏面の電極活物質層を形成させる場合又はリードを形成させた後に両面の電極活物質層を形成させる場合は、裏面の電極活物質層は間欠的ではなく集電体１１の長さ方向に連続するものであってもよい。

【００１５】本実施例のシート電極１０において集電体１１に形成されるリード１４は、正極負極とも、それぞれの集電体１１と同じ材質の金属箔を用いる。リード１４の厚さは、電極活物質層１２の厚さを超えるものであってはならず、通常は集電体１１と同程度、つまり１０～３０μｍ程度である。またリード１４の幅は、シート電極１０が巻回されることを考慮すればあまり広いものであってはならず、通常は数～十ｍｍ程度である。これに対してリード１４の長さは、集電処理の方法によって任意のものとすることができる。

【００１６】リード１４の集電体１１への形成方法は、超音波接合、抵抗溶接、かしめ等の手段によって行うことができるが、熱影響、スパッタ、作業性等を考慮すれば超音波接合が望ましい。リード１４は、集電体１１の長さ方向と直角に接合され、その一部が集電体１１の幅方向の一端部より突出して延びている。そしてこの突出端が外部端子に集められるように連結され集電が行われることとなる。またリード１４の数量は、電池の放電容量によって異なるものとなるが、放電容量の大きい電池に使用するシート電極では、数十本にも及ぶものとなる。なお本実施例のシート電極１０では、従来のものと異なり、１つのリードに対しての接合点１５を複数設けることができ、集電の際の電気抵抗を減少させることが可能となるため、リード１４の数を減少させることができるとともに、接合部位の強度的信頼性を向上するという効果をも有している。

【００１７】次に集電用のリード１４の形成方式が異なるもう一つの実施例を図２に示す。本実施例は、集電体１１の活物質未塗工部１３に、一定の幅で切込み１６が入れられ、この切込み部の端部が集電体の幅方向の一端部から突出するように折り返されてリード１４となっているものである。先の実施例と異なり、接合という手段を用いないことから、形成部の信頼性をさらに向上させることができ、またリード材としての別部材を必要としないことから、電極の材料費を節減できるとともに、電極の軽量化が可能となるという効果をも有する。　切込み１６はプレス、レーザー切断等の任意の手段によって行うことができ、電池のエネルギー体積密度の向上を目指すことから、切込み１６の幅は活物質未塗工部１３の幅とほぼ同等の幅として電極活物質層１２の面積を極力大きくとるようにするのが望ましい。なお集電体の一端面から中央部にかけて二本の平行線上を切込むこともできるが、シート電極１１を巻回する際にある程度のテンションをかけて行うことから、集電体１１の幅方向の両

端部は切込むべきでなく、図２に示すように集電体の中央部にＵ字状の形状の切込み１６を行うのが望ましい。

【００１８】次に本発明のシート電極の製造方法であって、集電体の幅方向の端部に未塗工部を残さず、かつ集電体の長手方向に間欠的に活物質ペーストを塗布する塗工方法について説明する。本塗工方法は、集電体をバックアップロールで支持搬送しつつ、活物質ペーストを塗布ロールにて該集電体に転写塗布するリバースロール方式により、活物質を該集電体表面に連続的に塗布する活物質ペーストの塗工方法であって、前記活物質ペーストを前記塗布ロール表面に供給する工程と、該塗布ロール表面に供給されたペーストの幅を前記集電体の幅に一致させるために、該塗布ロール上に設けたペースト除去手段によって、該集電体幅より広い該ペーストの部分を除去してペースト幅を調整する工程と、所定の時間間隔で該バックアップロールと該塗布ロールとの間隙量を変化させつつ、幅調整された該活物質ペーストを該塗布ロールにより該集電体に間欠的に転写塗布する工程とを有することを特徴としている。

【００１９】つまり本活物質ペーストの塗工方法は、塗布ロールに一定の厚みで、かつ集電体の幅より若干量幅が大きく供給された活物質ペーストを、塗布ロール上に設けたナイフエッジ状のブレード等の手段により、集電体の幅より大きい部分を幅方向の両側から掻き取る等することによって、集電体の幅に一致させて、バックアップロールに支持搬送される集電体に転写するように塗布するものであり、かつ、バックアップロールに塗布ロールと近接したり離れたりする間欠動作を行わせることにより、集電体の長さ方向に直角な活物質未塗工部を形成させるものである。この手段により、塗布ロール上の活物質ペーストの幅方向の両端が整形され、集電体の端部にまで均一に、かつ幅方向に未塗工部分を残さずに間欠的に活物質を塗布することを容易にしている。

【００２０】本塗工方法で用いるリバースロール方式のコーターは、塗布ロール（アプリケーションロール）計量ロール（メータリングロール）、バックアップロールの３本の互いに平行なロールからなるコーターで、計量ロールは、塗布剤を一定の厚さで表面を平滑に保ちながら塗布ロールに供給する役割を果たし、バックアップロールは塗工基材を支持しかつ搬送する役割を果たしている。塗布ロールとバックアップロールは両者が近接しており、互いの近接部が異なる方向に向かって移動するように回転している。この両者の間隙を、基材がバックアップロールに支持されて通過することにより、塗布ロール上に供給された塗布剤が基材表面に転写塗布される。適応する塗布剤の粘度範囲が大きいこと、塗布される厚さ調整が容易なことなどから本方式のコーターを採用した。

【００２１】実際の塗工状態を図３に示す。以下この図に基づいて活物質ペーストの塗工工程について説明する。本塗工方法では、計量ロールとして断面がコンマ形状をしている金属製のコンマロール２１を用いている。ナイフブレード、ドクターロール等を用いる方式でもよいが、塗布される活物質ペーストの厚さ調整の容易さ、表面の平滑化が実現できることからこのコンマロール方式を採用した。

【００２２】金属製の塗布ロール２２の上部にこのコンマロール２１を配設し、塗布ロール２２の上部でコンマロール２１背面に堰２４を設けてペースト溜２５を形成させた。このペースト溜２５には、上記正極合剤、負極合剤とされた活物質ペーストが流入される。コンマロール２１は回転しないが、塗布ロール２２とコンマロール２２のブレードとの間隙の大きさを変化させるために、塗布ロール２２に対して直角の方向に移動させることができる。塗布ロール２２が回転することにより、活物質ペーストはこの間隙から塗布ロール２２の表面に供給される。なお供給される活物質ペーストの厚さは、この間隙の大きさによって調整されることになる。

【００２３】次に本塗工方法の最大のポイントである活物質ペーストの幅調整について説明する。塗布ロール２２の上に供給された活物質ペーストの幅は、ペースト溜２５の幅によってある程度は決定される。しかしこの幅は、コンマロール２１と塗布ロール２２の間隙の大きさ、活物質ペーストの粘度等によって変化する。また供給された活物質ペーストの幅方向の端部は、粘度等の関係によって、中央部に比べ厚くなったりまた薄くなったりし、さらには波状に蛇行してしまうこともある。集電体１１の全面にしかも均一にペーストを塗布することが目的であるから、この活物質ペーストの端部を調整することが必要となってくる。

【００２４】そこで本塗工方法では、塗布ロール２２上でロールに接するように１対のナイフブレード２６を配設して活物質ペーストの幅方向の端部を調整している。つまり、塗布ロール２２の表面に、集電体１１の幅より若干量広い幅で供給されたペーストの、集電体１１の幅方向の端部からはみ出す部分を、ナイフブレード２６によって掻き取るように除去している。この工程を塗工工程に挿入することにより、活物質ペーストの塗布幅を集電体１１の幅と一致させることに成功している。

【００２５】塗布ロール２２の表面上で幅調整された活物質ペーストは、次に集電体１１に転写塗布される工程に移る。集電体１１は、長さ方向にテンションが加えられ、ピンと張られた状態で表面がシリコンゴム製のバックアップロール２３によって支持されている。またこのバックアップロール２３は一定速度の回転運動をしており、集電体１１は一定の速度で搬送されている。

【００２６】塗布ロール２２はバックアップロール２３と近接しており、またその回転方向は両ロールとも同じ方向で、両ロールの近接部では互いに反対方向に向かうように回転している。このバックアップロール２３と塗

布ロール２２の間隙を、集電体１１が搬送されて通過する際に、塗布ロール２２の表面の活物質ペーストが集電体１１の表面に転写するように塗布される。

【００２７】ところが本発明のシート電極１０では、電極活物質層１２が集電体１１の長手方向に間欠的に形成されている必要があることから、本塗工工程において、活物質ペーストを間欠的に塗布しなければならない。そこで本塗工工程では、バックアップロール２３を塗布ロール２２との距離を変化させながら活物質ペーストを集電体１１に転写塗布している。つまり、電極活物質層１２を形成させる部分では、バックアップロール２３を塗布ロール２２に近接させ、活物質未塗工部１３とする部分ではバックアップロール２３を塗布ロール２２から離すという間欠的な運動をバックアップロール２３にさせている。近接している時間と離れている時間を調整することによって、集電体１１に形成される電極活物質層１２の長さおよび活物質未塗工部部１３の幅を任意に決定することができる。

【００２８】この工程により集電体１１への活物質ペースト塗布は完了し、次工程である乾燥工程に向かう。活物質ペーストの転写塗布の際、塗布ロール２２に残余するペーストは、塗工ロール２２の下部に設けた掻き取りブレード２７によって除去される。なお集電体１１の裏面にも活物質ペーストを塗布する場合は、もう一度同じ工程を繰り返せばよい。

【００２９】このようにして活物質の塗工工程は終了するのであるが、上記ナイフブレード２６による幅調整手段によっても、活物質ペーストの粘性の変化等の原因により、集電体１１の幅よりはみ出して塗布される場合もありうる。もしこのようなはみ出しが発生した場合、はみ出した活物質ペーストがバックアップロール２３に付着し、さらにこれが集電体１１の裏面に付着して、均一な電極が得られなくなってしまう。この場合を想定して、本塗工方法では、さらに別の手段を講じている。

【００３０】この手段は、バックアップロール２３と集電体１１の間に、集電体１１の幅よりも広い幅のシート２８を挟装するように配置し、このシート２８とともに集電体１１を搬送するものである。このシート２８により、活物質ペーストのはみ出しが生じた場合であっても、集電体１１の裏面へペーストが付着することを防いでいる。本塗工方法ではポリプロピレンのシートを用いたが、適当な強度を有する薄い帯状のものであればよく、これに限定されるものではない。

【００３１】上記シート２８を用いた手段に代えて、以下の手段を用いることもできる。バックアップロールを２段階の直径を持たせ、中央部の大きな直径の部分を集電体１１の幅と同じ長さとし、その両端を小さな直径の部分とすることである。そしてこの大径部がバックアップ部３１となって、集電体１１を支持搬送するというものである。この例を図４に示す。この手段によれば、集電体１１からはみ出した活物質ペーストは、２段径バックアップロール３０の小径部３２に垂れ落ちるだけであり、集電体１１の裏面に回り込んで付着することを防止することができる。シート２８を用いた場合、このシート２８は使い捨てとなるため電極の製造コストの増加につながることから、この２段径バックアップロール３０を用いた方法は製造コスト面から有効な手段である。

【００３２】以上、本発明のシート電極の製造方法について、実施例を掲げて説明したが、製造方法はこの実施例に限定されるものではない。例えば、上記活物質ペーストの塗工方法では、リード１４が形成されていない集電体１１に活物質ペーストを塗布するものであったが、あらかじめリード１４を成形した集電体１１を用いて、リード１４の形成されている部分に活物質ペーストが塗布されないようにバックアップロール２３の間欠運動を行わせることも可能である。また、幅の広い金属箔に活物質ペーストを塗布し、乾燥後、幅方向に分割するようスリットし同時に複数枚の電極を製造することができる。このように上記活物質ペーストの塗工方法は、簡便な方法によって、集電体の幅方向に未塗布部がなくかつ長手方向に間欠的な電極活物質層を形成できるものであり、その適用範囲も広いものである。

【００３３】

【発明の効果】本発明は、電極をセパレータを介して巻回するスパイラル型電池に使用する電極を、帯状の集電体と、該集電体の表面に長手方向に間欠的に形成された電極活物質層と、該集電体の該電極活物質層が形成されていない部分から該集電体の一方の側端を越えて幅方向に延びるように形成された短冊状のリードとからなるシート電極としたものであり、この電極を巻回した電極体は、巻回端面に存在する発電要素とならないデッドスペースを非常に小さいものすることができる。したがって、本発明のシート電極を用いた電池は、エネルギー体積密度が向上するという効果を有している。このことは、電子機器の小型化を推進するばかりでなく、電気自動車の動力源となる二次電池の開発を促進させることにもつながっている。

【図面の簡単な説明】

【図１】本発明の一の実施例であるシート電極を示す平面図

【図２】本発明の他の実施例であるシート電極を示す平面図

【図３】本発明のシート電極の電極活物質塗工方法の実施例を示す斜視図

【図４】他の活物質塗工方法の実施例に使用する２段径バックアップロールを示す斜視図

【図５】従来のシート電極を示す平面図

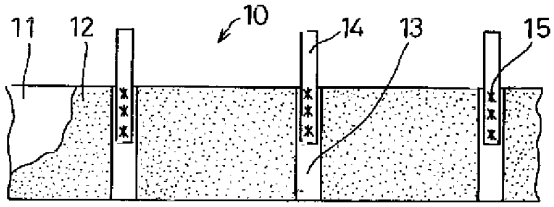
【図６】シート電極が巻回される状態を示す斜視図

【図７】電極体のデッドスペースを示す概念図

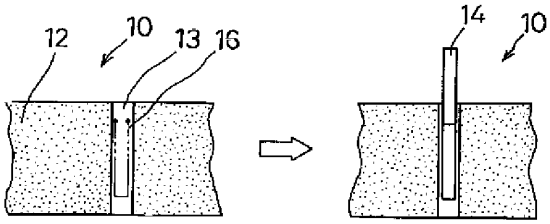
【符号の説明】

１０：シート電極　（１０ａ：正極　１０ｂ：負極）
１１：集電体　　１２：電極活物質層　　１３：活物質未塗工部
１４：リード　　１５：接合点　　１６：切込み
２０：リバースロール塗工機
２１：コンマロール　　２２：塗布ロール　　２３：バックアップロール
２４：堰　　２５：ペースト溜　　２６：ナイフブレード
２７：掻き取りブレード　　２８：シート
３０：２段径バックアップロール
３１：バックアップ部　　３２：小径部
４０：電極体
４１：セパレータ　　４２：電極要素部　　４３：デッドスペース

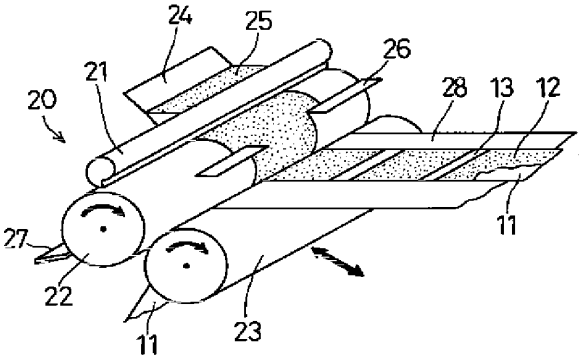
【図１】



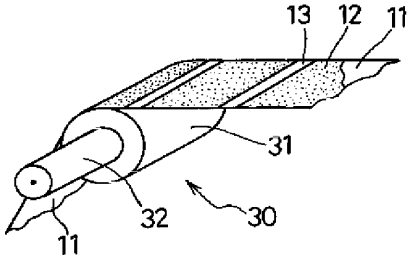
【図２】



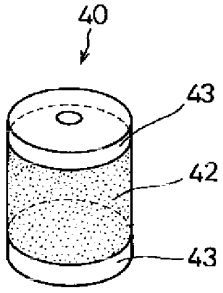
【図３】



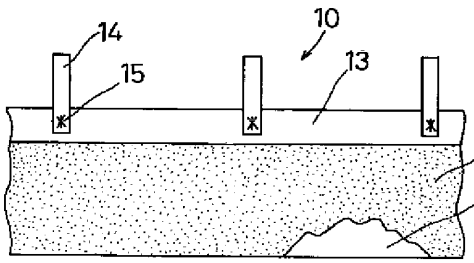
【図４】



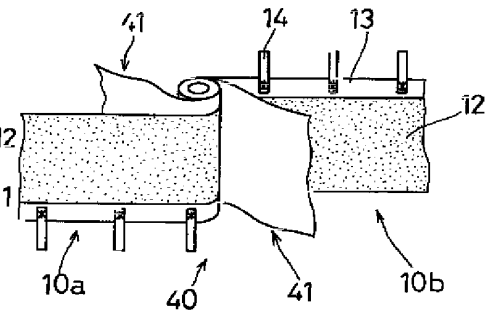
【図７】



【図５】



【図６】



Espacenet

JPH0713064A AUTOFOCUSING DEVICE FOR MICROSCOPE

Applicants: OLYMPUS OPTICAL CO

Inventors: YONEYAMA TAKASHI,NAGASAWA NOBUYUKI

Classifications:
IPC ***G02B21/00; G02B7/28;*** (IPC1-7): G02B21/00; G02B7/28;

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AUTOFOCUSING DEVICE FOR MICROSCOPE

Abstract

PURPOSE:To attain the stabilization and the high speed operation of focusing detection for various change of an observing condition in the autofocusing of the observed image of a microscope. CONSTITUTION:In the autofocusing device for a microscope, a sample image enlarged by the observation optical systems 1 to 3 of the microscope is picked up by a storage type solid-state image pickup element 7, and the focusing states of the optical systems 1 to 3 are obtained by specified calculation based on output from the element 7, so that focusing in accordance with the obtained focusing state is executed. This device is provided with a condition judging means judging the observing conditions of the optical systems 1 to 3, a storage condition setting means setting the storage time condition suitable for the observing condition judged by the condition judging means, and an optimization means fixing optimum storage time based on the output value of the element 7 and the storage time condition set by the storage condition setting means.

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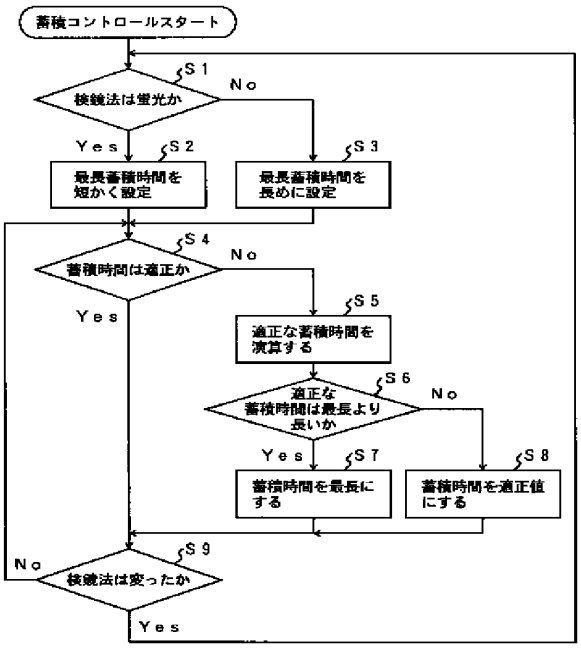
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(54)【発明の名称】　顕微鏡用自動合焦装置

(57)【要約】
【目的】本発明は、顕微鏡観察像の自動合焦において、様々な観察条件の変更に対して合焦点検出の安定化及び高速化を図ることを目的とする。
【構成】この顕微鏡用自動合焦装置は、顕微鏡の観察光学系１～３で拡大した標本像を蓄積型固体撮像素子７で撮像し、その蓄積型固体撮像素子７の出力から所定の演算によって前記観察光学系１～３の合焦状態を求め、その合焦状態に応じた焦点調節を実行するものにおいて、前記観察光学系１～３の観察条件を判断する条件判断手段Ｓ１と、前記条件判断手段Ｓ１で判断した観察条件に適した蓄積時間条件を設定する蓄積条件設定手段Ｓ２，Ｓ３と、前記蓄積型固体撮像素子７の出力値と前記蓄積条件設定手段Ｓ２，Ｓ３で設定した蓄積時間条件とから最適蓄積時間を定める最適化手段Ｓ５～Ｓ８とを具備してなる。



【特許請求の範囲】
【請求項１】　顕微鏡の観察光学系で拡大した標本像を蓄積型固体撮像素子で撮像し、その蓄積型固体撮像素子の出力から所定の演算によって前記観察光学系の合焦状態を求め、その合焦状態に応じた焦点調節を実行する顕微鏡用自動合焦装置において、
前記観察光学系の観察条件を判断する条件判断手段と、前記条件判断手段で判断した観察条件に適した蓄積時間条件を設定する蓄積条件設定手段と、前記蓄積型固体撮像素子の出力値と前記蓄積条件設定手段で設定した蓄積時間条件とから最適蓄積時間を定める最適化手段とを具備したことを特徴とする顕微鏡用自動合焦装置。
【請求項２】　前記蓄積条件設定手段は、前記最適蓄積時間の最長時間又は最短時間のうち少なくとも一方を設定することを特徴とする請求項１記載の顕微鏡用自動合焦装置。
【請求項３】　前記最適化手段は、前記蓄積型固体撮像素子の入射光量が光量過多又は光量過少の場合に、前記観察条件に基づいて前記観察光学系が合焦位置の前後で光量が大きく変化する状態となっているか否か判断し、観察光学系が合焦位置の前後で光量が大きく変化する状態となっていれば、前記標本を少なくとも一回焦点付近を通過させてから合焦動作を続行するか否か判断することを特徴とする請求項１又は請求項２に記載の顕微鏡用自動合焦装置。
【発明の詳細な説明】
【０００１】
【産業上の利用分野】本発明は、顕微鏡の自動合焦装置に係り、さらに詳しくは各種の対物レンズ，各種の検鏡法を切換えて観察する際の焦点調節技術に関する。
【０００２】
【従来の技術】撮影レンズを介して被写体像を電荷蓄積型イメージセンサ（固体撮像素子）で撮像し、そのイメージセンサの出力信号から撮影レンズの焦点状態を求める合焦演算を行い、その演算結果に応じて撮影レンズを移動させて合焦させる自動合焦装置が知られている。
【０００３】かかる自動合焦装置では、合焦時間の短縮化，合焦精度の向上を図る上で、イメージセンサの蓄積時間制御が重要である。自動焦点調節におけるイメージセンサの電荷蓄積時間に関する技術が、特開昭６１－２６０１６号公報に記載されている。
【０００４】この自動合焦装置は、イメージセンサの蓄積時間を被写体の輝度に応じて変えられるように構成し、自動焦点調節に要する時間をできるだけ短縮すると共に、積分中の手振れによる影響を考慮して、最大積分時間は規制されるようにしている。
【０００５】例えば、通常は最大積分時間を１００ｍｓｅｃに規制しておき、光量が少ないためにセンサ出力が所定値に達しないときにだけ、最大積分時間を２００ｍｓｅｃに延長して自動焦点検出の低輝度限界を広げるようにしている。また被写体のコントラストが所定値以下のローコントラスト状態の場合に、デフォーカス量が大き過ぎると判断して、ローコントラスト状態を抜け出すためにレンズをスキャンするようにしている。
【０００６】ところで、顕微鏡では、検鏡法等の条件により形成される画像に様々な特徴がある。例えば、ある検鏡法においては合焦状態で適当な画像光量が得られていても、合焦状態から外れていくのに従って急激に光量が減少し、大きく外れると暗黒状態となってしまうことがある。
【０００７】
【発明が解決しようとする課題】しかしながら、このような観察画像の場合、上述した方法で固体撮像素子の蓄積時間を制御したのでは、蓄積時間を固体撮像素子上に投影される照度に追従して制御してしまうため、次のように問題が生じる。
【０００８】すなわち、暗黒状態では蓄積時間を非常に長く設定してしまうため、対物レンズ又は標本ステージを移動させることにより合焦点に近付いて急激に照度が上がったとしても照度の変化に追従できず、合焦点を検出できなかったりする。
【０００９】また焦点から大きく外れた状態で暗黒状態となると、標本の照度が規定レベル以下であると判断して合焦検出不可として合焦動作を自動的に中止してしまうといった不具合があった。
【００１０】本発明は、以上のような実情に鑑みてなされたもので、固体撮像素子における適正な蓄積時間の制御や光量過不足の判断基準を様々な検鏡法に対して設定することができ、種々の検鏡法に対して固体撮像素子の出力を適正に保つことができ、合焦点検出を安定かつ高速で行うことのできる顕微鏡用自動合焦装置を提供することを目的とする。
【００１１】
【課題を解決するための手段】上記目的を達成するために、本発明は以下のように構成した。請求項１に対応する顕微鏡用自動合焦装置は、顕微鏡の観察光学系で拡大した標本像を蓄積型固体撮像素子で撮像し、その蓄積型固体撮像素子の出力から所定の演算によって前記観察光学系の合焦状態を求め、その合焦状態に応じた焦点調節を実行するものにおいて、前記観察光学系の観察条件を判断する条件判断手段と、前記条件判断手段で判断した観察条件に適した蓄積時間条件を設定する蓄積条件設定手段と、前記蓄積型固体撮像素子の出力値と前記蓄積条件設定手段で設定した蓄積時間条件とから最適蓄積時間を定める最適化手段とを具備する構成とした。
【００１２】請求項２に対応する顕微鏡用自動合焦装置は、上記した構成において、前記蓄積条件設定手段を、前記最適蓄積時間の最長時間又は最短時間のうち少なくとも一方を設定する構成とした。
【００１３】請求項３に対応する顕微鏡用自動合焦装置

は、上記した構成において、前記最適化手段を、前記蓄積型固体撮像素子の入射光量が光量過多又は光量過少の場合に、前記観察条件に基づいて前記観察光学系が合焦位置の前後で光量が大きく変化する状態となっているか否か判断し、観察光学系が合焦位置の前後で光量が大きく変化する状態となっていれば、前記標本を少なくとも一回焦点付近を通過させてから合焦動作を続行するか否か判断する構成とした。

【００１４】

【作用】請求項１に対応する顕微鏡用自動合焦装置では、条件判断手段により判断された観察光学系の観察条件により蓄積条件設定手段が蓄積時間条件を設定する。蓄積時間条件が設定されると、最適化手段により蓄積型固体撮像素子の出力値と蓄積条件設定手段で設定した蓄積時間条件とから最適蓄積時間が定められる。この様にして定められた最適蓄積時間で蓄積型固体撮像素子の読出しが制御されることとなる。

【００１５】このように、検鏡法，対物レンズの種別，対物レンズの倍率等、観察光学系の観察条件に応じて最適な蓄積型固体撮像素子の蓄積時間の制御内容が定められるので、合焦点検出を安定かつ高速で行うことができるようになる。

【００１６】請求項２に対応する顕微鏡用自動合焦装置では、蓄積条件設定手段が最適蓄積時間の最長時間又は最短時間のうち少なくとも一方を設定するものとなる。例えば、合焦点から外れるのに従って急激に照度が減少し暗黒となるような検鏡法であると条件判断手段が判断した場合には、暗黒状態に蓄積時間を合わせようとするのを防ぐため、最長蓄積時間を短かめに設定するようにする。このような設定により、合焦点へ近付いて照度が上がってきたときに光量変化に追従して蓄積時間制御ができるようになる。つまり、合焦点から大きく外れている状態では、照度に合わせて蓄積時間を制御せず、合焦点に近付いてきてから照度に合った蓄積制御が開始される。その結果、合焦点付近での急激な照度変化に対しても追従でき、合焦点検出に適した蓄積時間制御ができるものとなる。

【００１７】請求項３に対応する顕微鏡用自動合焦装置では、観察光学系の対物レンズ又はステージがある位置において固体撮像素子上へ投影される光量が非常に少なく画像の状態を検出できなくても、予定合焦点付近をスキャンして、それでもなお光量が規定値を上回らなかった場合にのみ光量不足と判断する。従って、合焦点付近では十分光量が得られるにも拘らず、ある位置で光量が不足しているために光量不足による焦点検出不可という判断を下すことがなくなる。

【００１８】

【実施例】以下、図面を参照して本発明の実施例について説明する。図１は本発明の一実施例に係る顕微鏡用自動合焦装置の全体構成を示す。本実施例の顕微鏡用自動合焦装置は、標本１の画像が対物レンズ２を通過して鏡筒プリズム３に入射して２方向に分岐される。鏡筒プリズム３で分岐した一方の光は接眼レンズ４に入射し、もう一方の光は投影レンズ６に入射する。投影レンズ６の結像位置に固体撮像素子７を配置している。

【００１９】固体撮像素子７は投影レンズ６により受光面に投影された標本像を電気的な画像信号に変換してアナログ処理回路８へ出力する。アナログ処理回路８で所定の処理を施しデジタル信号に変換した画像信号を演算回路９に入力している。

【００２０】演算回路９は、コントラスト等の合焦度を示す所定の評価関数に従った合焦演算を行い合焦度レベルを検出し、かつ、固体撮像素子７の出力のピーク値を演算で求め、演算で求めた合焦度レベル及びピーク値をＣＰＵ１０へ送出する。

【００２１】ＣＰＵ１０は、演算回路９によって算出した合焦度レベルに基づいて現在の合焦状態を認識し、合焦点から外れている場合にはステージ駆動回路１１に対してステージ駆動信号を出力し、ステージ１２を上下動させて焦点調節を行う。また固体撮像素子７の出力ピーク値から適正な蓄積時間を算出し、その算出した蓄積時間をタイミングジェネレータ１３に設定する。

【００２２】タイミングジェネレータ１３は、固体撮像素子７の電荷蓄積時間が、ＣＰＵ１０から設定された蓄積時間となるようなタイミングで固体撮像素子７に対して駆動パルスを出力する。このようにして固体撮像素子７の出力を常に適正な値となるように制御している。

【００２３】また、顕微鏡には様々な光学素子が取付け可能であり各種の検鏡法に対応できるようになっている。ＣＰＵ１０は、検鏡者により操作スイッチ１４から入力される検鏡法に応じて、図２に示すフローチャートに基づく処理を実施し、常に最適に蓄積時間を設定する。

【００２４】本実施例における蓄積時間設定のための原理は次のようなものである。すなわち、明視野観察は、ステージ１２の上下動に対して固体撮像素子７上に投影される光量が変化しずらく、また合焦点から外れていても合焦点に対する光量変化は比較的少ないという特徴を持っている。そこで、明視野観察の場合は、蓄積時間の設定範囲を広げ、光量が少なくてもその様な光量に追従するような蓄積時間制御を行うようにする。

【００２５】蛍光観察は、ステージ１２の上下動に対して固体撮像素子７上に投影される光量が急激に変化しやすく、焦点から大きくはずれると暗黒状態となってしまうといった特徴を持っている。そこで、蛍光観察の場合は、固体撮像素子７の蓄積時間設定範囲のうち最長蓄積時間を短く設定し、焦点から外れて暗黒状態となっても短めに設定した最長蓄積時間を越えることが無いようにし、ステージ１２の上下動により合焦点に近付いて急激に光量が増加したと時に蓄積時間が追従するようにす

る。
【００２６】次に、固体撮像素子７における電荷蓄積時間の設定動作について、図２を参照して説明する。なお、予めＣＰＵ１０の検鏡法の認知は検鏡者により操作スイッチ１４からＣＰＵ１０に対して検鏡モードが入力されることによってなされるものとする。
【００２７】ＣＰＵ１０では、検鏡法が蛍光観察か否か判断し（ステップＳ１）、蛍光観察であれば蓄積時間設定範囲の最長蓄積時間を短めに設定し（ステップＳ２）、蛍光観察でなければ最長蓄積時間を長めに設定する（ステップＳ３）。
【００２８】次に、演算回路９から読込んだ固体撮像素子７の出力のピーク値を確認し、適正なレベルになっているか否か判断する（ステップＳ４）。ステップ４での判断の結果、適正である場合には、現在の設定されている蓄積時間が最長蓄積時間内に収まっていることを条件にそのまま同じ蓄積時間を使う。また不適正である場合には、ＣＰＵ１０が適正な蓄積時間を演算する（ステップＳ５）。
【００２９】ステップＳ５で求めた蓄積時間とステップＳ２，又はステップＳ３で定めた最長蓄積時間とを比較し（ステップＳ６）、演算した蓄積時間が最長蓄積時間よりも長い場合にはステップＳ２，又はステップＳ３で定めた最長蓄積時間を最適蓄積時間としてタイミングジェネレータ１３に設定し（ステップＳ７）、最長蓄積時間よりも短い場合にはステップＳ５で求めた蓄積時間を最適蓄積時間としてタイミングジェネレータ１３に設定する（ステップＳ８）。
【００３０】そして検鏡法に変更があるか否か判断し（ステップＳ９）、変更がなければ上記したステップ４～ステップＳ８までの処理を繰り返す。また、検鏡法に変更があれば、上記したステップＳ１に処理を戻し、再び蓄積時間条件として最長蓄積時間の設定から処理を開始する。
【００３１】この様に本実施例によれば、検鏡法に応じて最長蓄積時間を決め、次に蓄積時間が適正となっているか否か判断し、最長蓄積時間を越えないような最適蓄積時間を設定するようにしたので、様々な検鏡法に応じて固体撮像素子の蓄積時間を常に最適な蓄積時間に設定でき、固体撮像素子７の出力を適正レベルに保つことができ、焦点検出を安定して行うことができる。
【００３２】次に上記実施例の変形例について説明する。本変形例は、ハードウエアの構成は上記実施例と同様であるので、図１に示す構成を持って本変形例の構成とする。本変形例における電荷蓄積時間の設定動作の内容を図３及び図４に示す。
【００３３】ＣＰＵ１０における検鏡法に応じた蓄積時間の設定原理は、上述した実施例と同様であり、同様の処理を実行している。またＣＰＵ１０は最適蓄積時間を設定する前に（ステップＳ４～ステップＳ５の間）、焦点検出が可能か否かの判断を実施している。
【００３４】この焦点検出不可の判断原理は次のようなものである。すなわち、明視野観察の場合には、合焦点と合焦点から外れた位置とで固体撮像素子７上に投影される画像の光量に大きな差が出にくいので、最長蓄積時間であっても光量が規定値を越えない場合には、光量不足により焦点検出不可と判断するようにする。
【００３５】また蛍光観察の場合には、合焦点では十分光量があっても、焦点から外れると急激に光量が減少して暗黒となってしまうので、ある位置に置いて光量が規定値以下となっていても光量不足とは判定せず、予定焦点付近をスキャンしてから最終判定を行うようにしている。
【００３６】以下、本変形例の動作について説明する。先ず、ＣＰＵ１０で検鏡法を判断し（ステップＳ１）、蛍光観察であれば蓄積時間設定範囲の最長蓄積時間を短めに設定し（ステップＳ２）、蛍光観察でなければ最長蓄積時間を長めに設定する（ステップＳ３）。次に、固体撮像素子７のピーク値が適正なレベルになっているか否か判断する（ステップＳ４）。
【００３７】ステップ４での判断の結果、不適正である場合には、焦点検出が可能な状態であるか否か判断する。すなわち、固体撮像素子７の出力が予め定められている規定値を越えているか否か判断し（ステップＴ１）、越えていなければ蓄積時間を長くする（ステップＴ２）。そして上記ステップＳ２，又はステップＳ３で定めた最長蓄積時間まで蓄積時間を延長しても規定値を越えないときは（ステップＴ３）、操作スイッチ１４からＣＰＵ１０に対して設定されている検鏡法が蛍光観察か否か判断する（ステップＴ４）。蛍光観察でない場合には焦点検出は不可能であると判断する（ステップＴ５）。
【００３８】一方、上記ステップＴ４で蛍光観察であると認識した場合は、ＣＰＵ１０からステージ駆動回路１１へ駆動信号を出力してステージ１２を上下動し、標本Ｓを予定焦点付近を通過させる（ステップＴ６）。その際に、固体撮像素子７の出力と上記規定値とを連続的に比較し、測光値≧規定値となる場所があるか否かチェックする（ステップＴ７）。そして測光値が規定値を越えることがなければ焦点検出不可能であると判断し（ステップＴ５）、測光値が規定値を越える場所があれば、ステップＳ５へ移行して規定値を越える測光値を用いて適正な蓄積時間を演算する。ステップＳ５で求めた蓄積時間とステップＳ２，又はステップＳ３で定めた最長蓄積時間とを比較し（ステップＳ６）、演算した蓄積時間が最長蓄積時間よりも長い場合にはステップＳ２，又はステップＳ３で定めた最長蓄積時間を最適蓄積時間としてタイミングジェネレータ１３に設定し（ステップＳ７）、最長蓄積時間よりも短い場合にはステップＳ５で求めた蓄積時間を最適蓄積時間としてタイミングジェネ

レータ１３に設定する（ステップＳ８）。

【００３９】また、ステップＴ１において測光値が規定値を越えていれば、焦点検出不可の判断は行わずに、直接ステップＳ５へ移行して最適蓄積時間の設定処理を実行する。

【００４０】この様に本変形例によれば、上記実施例と同様の作用効果を奏することができる上、検鏡法により合焦点検出不可の判断基準を変更するようにしたので、十分な光量が検出できるのにも拘らず光量不足であると判断して焦点調節を断念してしまうといった不具合を解消することができる。

【００４１】なお、上記実施例及び変形例では、検鏡者が操作スイッチ１４からＣＰＵ１０に対して検鏡法を入力するように構成しているが、ＣＰＵ１０が顕微鏡各部の光学要素の状態から検鏡法を認識するように構成しても良い。

【００４２】また以上の説明では観察光学系の観察条件として検鏡法について説明したが、その他に対物レンズの種別，対物レンズの倍率等に応じて蓄積時間設定範囲，焦点検出不可の判断基準を変更するように構成することもできる。また蓄積時間設定範囲のうち最長蓄積時間のみを制御するのではなく、最短蓄積時間を制御するようにしても良い。さらに焦点検出不可の判断に用いる規定値は光量不足の規定値とするだけでなく、光量過多の場合に対する規定値を設定するようにしても良い。本発明は上記実施例に限定されるものではなく、本発明の要旨を逸脱しない範囲内で種々変形実施可能である。

【００４３】

【発明の効果】以上詳記したように本発明によれば、固体撮像素子における適正な蓄積時間の制御や光量過不足の判断基準を様々な検鏡法に対して設定することができ、種々の検鏡法に対して固体撮像素子の出力を適正に保つことができ、合焦点検出を安定して行うことのできる顕微鏡用自動合焦装置を提供できる。

【図面の簡単な説明】

【図１】本発明の一実施例に係る顕微鏡用自動合焦装置の全体構成図である。

【図２】上記実施例に係る顕微鏡用自動合焦装置における蓄積時間の設定動作を示すフローチャートである。

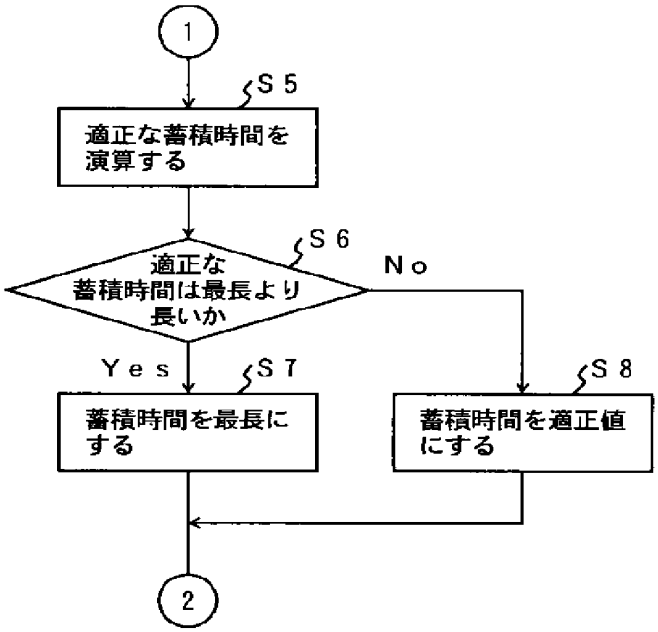
【図３】上記一実施例の変形例に係る顕微鏡用自動合焦装置における蓄積時間の設定動作及び焦点検出不可の判断動作を示すフローチャートである。

【図４】上記変形例の部分的な動作を示すフローチャートである。

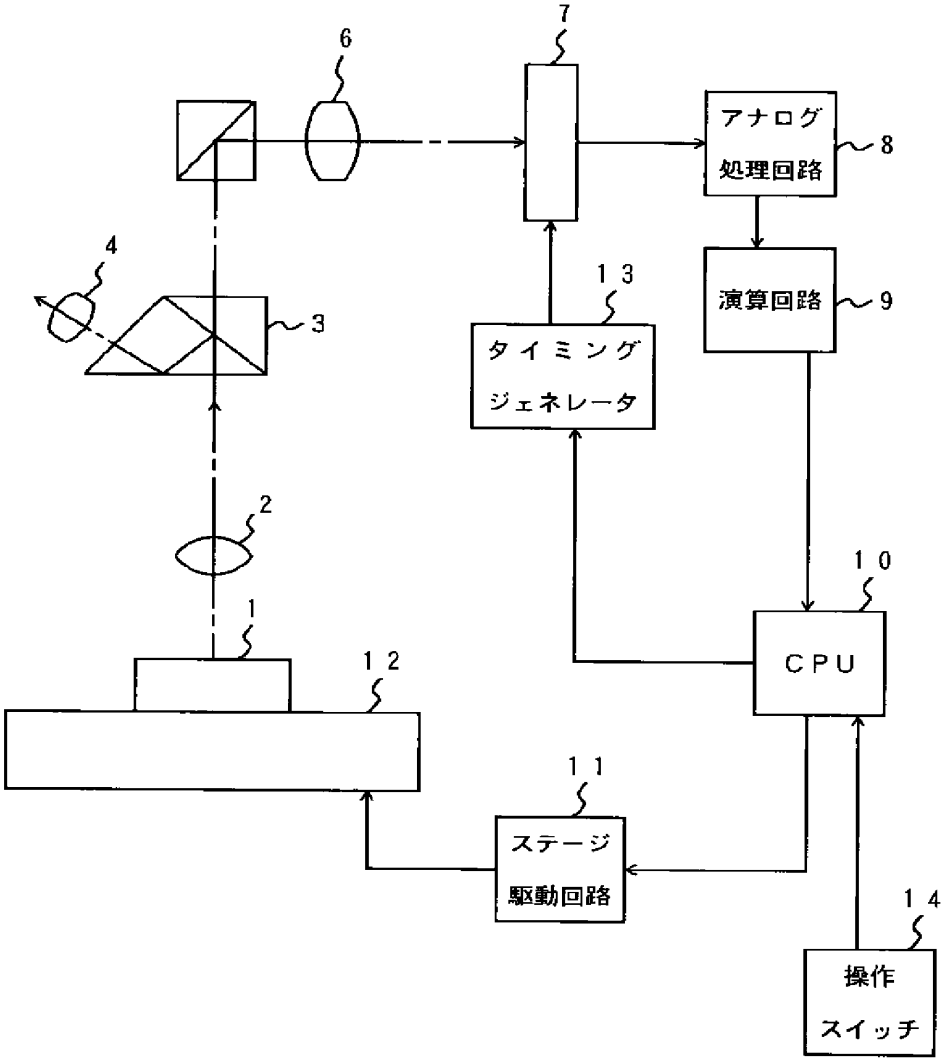
【符号の説明】

１…標本、２…対物レンズ、３…鏡筒プリズム、４…接眼レンズ、６…投影レンズ、７…固体撮像素子、８…アナログ処理回路、９…演算回路、１０…ＣＰＵ，１１…ステージ駆動回路、１２…ステージ、１３…タイミングジェネレータ、１４…操作スイッチ。

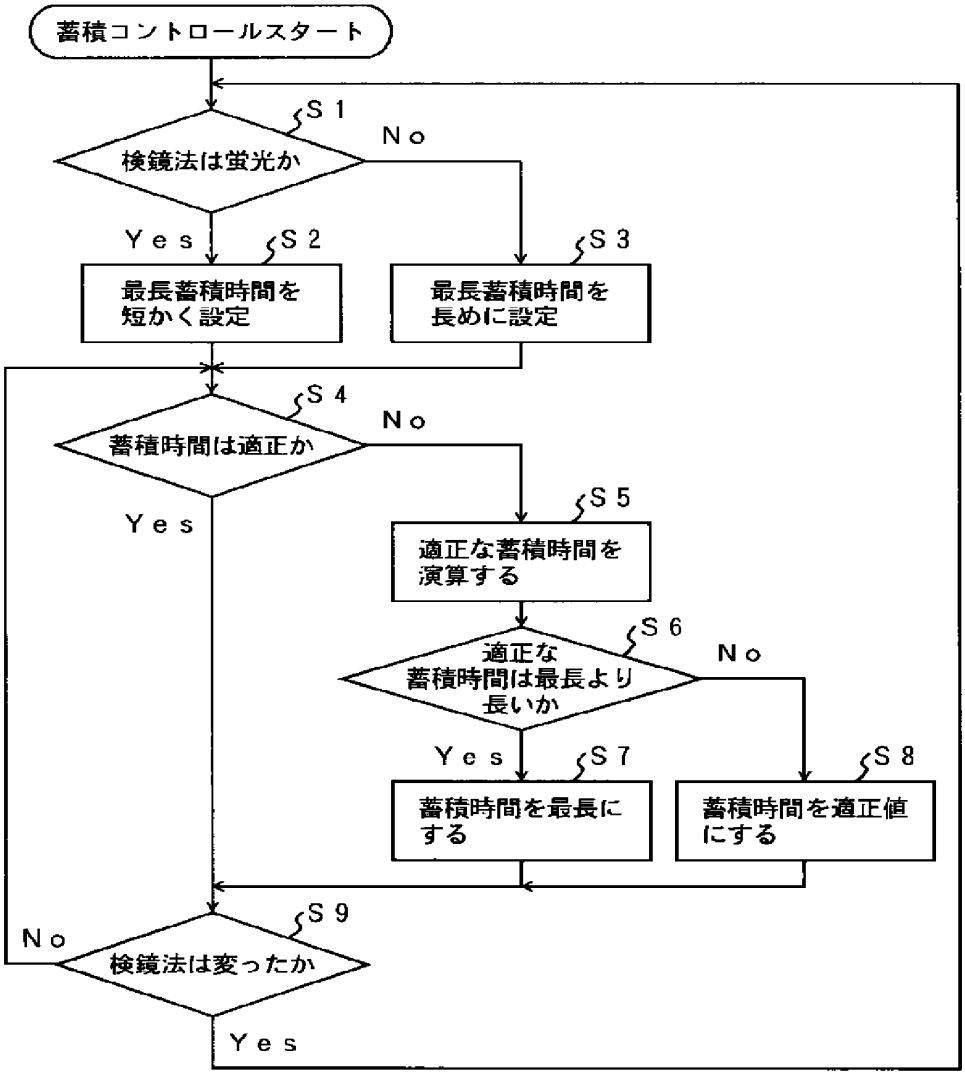
【図４】



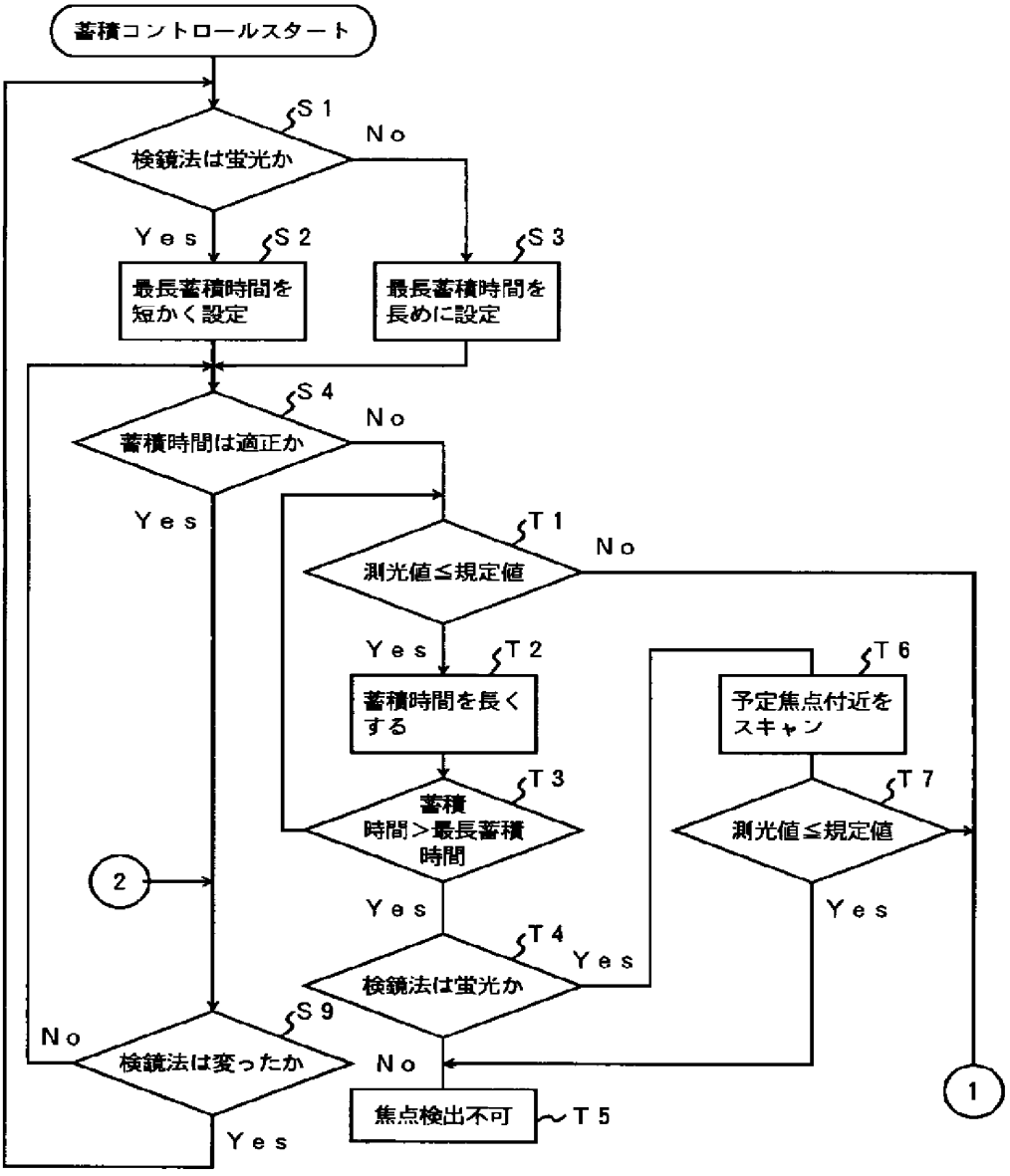
【図１】


7
6
アナログ
処理回路
8
4
13
演算回路
9
3
タイミング
ジェネレータ
2
10
1
CPU
12
11
ステージ
駆動回路
14
操作
スイッチ

【図２】


蓄積コントロールスタート
S１
検鏡法は蛍光か
No
Yes
S２
最長蓄積時間を短かく設定
S３
最長蓄積時間を長めに設定
S４
蓄積時間は適正か
No
Yes
S５
適正な蓄積時間を演算する
S６
適正な蓄積時間は最長より長いか
No
Yes
S７
蓄積時間を最長にする
S８
蓄積時間を適正値にする
S９
No
検鏡法は変ったか
Yes

【図３】


蓄積コントロールスタート
S 1
検鏡法は蛍光か
No
Yes
S 2
最長蓄積時間を短かく設定
S 3
最長蓄積時間を長めに設定
S 4
蓄積時間は適正か
No
Yes
T 1
測光値≦規定値
No
Yes
T 2
蓄積時間を長くする
T 3
蓄積時間＞最長蓄積時間
Yes
T 4
検鏡法は蛍光か
Yes
T 6
予定焦点付近をスキャン
T 7
測光値≦規定値
Yes
2
S 9
検鏡法は変ったか
No
Yes
No
焦点検出不可
T 5
1

Electronically filed December 8, 2022

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application of:	Tao TAO et al.	Confirmation No.:	8911
Serial No.:	17/746,755	Art Unit:	1721
Filed:	May 17, 2022	Examiner:	Barton, Jason Aaron
For:	Lithium-Ion Battery Having Desirable Safety Performance	Attorney Docket No.:	024607-02-5119-US

SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In accordance with the duty of disclosure provisions of 37 C.F.R. §1.56, there is hereby provided certain information which the Examiner may consider material to the examination of the subject U.S. patent application. It is requested that the Examiner make this information of record if it is deemed material to the examination of the application.

1. Enclosures accompanying this Information Disclosure Statement are:

1a. ☒ A list of all patents, publications, applications, or other information submitted for consideration by the office.

1b. A legible copy of:

☒ Each foreign patent;

☐ Each publication or that portion which caused it to be listed on the PTO-1449;

☐ For each cited pending U.S. application, the application specification including the claims, and any drawing of the application, or portion of the application which caused it to be listed on the PTO-1449 including any claims directed to that portion;

☒ all other information or portion which caused it to be listed on the PTO-1449.

1c. ☐ An English language copy of search report(s) from a counterpart foreign application or PCT International Search Report.

1d. ☐ Explanations of relevancy (ATTACHMENT hereto) or English language abstracts of the non-English language publications.

2. ☐ This Information Disclosure Statement is filed under 37 C.F.R. §1.97(b):

☐ Within three months of the filing date of a national application other than a continued prosecution application under §1.53(d);

☐ Within three months of the date of entry of the national stage as set forth in §1.491 in an international application;

☐ Before the mailing of the first Office action on the merits;

☐ Before the mailing of a first Office action after the filing of a request for continued examination under §1.114.

3. ☐ This Information Disclosure Statement is filed under 37 C.F.R. §1.97(c) after the period specified in 37 C.F.R. §1.97(b), but before the mailing date of any of a final action under 37 C.F.R. §1.113, a notice of allowance under 37 C.F.R. §1.311 or an action that otherwise closes prosecution in the application.

(Check either Item 3a, 3b, 3c or 3d)

3a. ☐ The Certification Statement in Item 5 below is applicable. Accordingly, no fee is required.

3b. ☐ The $260 (large entity) fee set forth in 37 C.F.R. §1.17(p) in accordance with 37 C.F.R. §1.97(c) is to be charged to Morgan, Lewis & Bockius LLP Deposit Account No. 50-0310 (order no.).

3c. ☐ The $130 (small entity) fee set forth in 37 C.F.R. §1.17(p) in accordance with 37 C.F.R. §1.97(c) is to be charged to Morgan, Lewis & Bockius LLP Deposit Account No. 50-0310 (order no.).

3d. ☐ The $65 (micro entity) fee set forth in 37 C.F.R. §1.17(p) in accordance with 37 C.F.R. §1.97(c) is to be charged to Morgan, Lewis & Bockius LLP Deposit Account No. 50-0310 (order no.).

(Items 3b or 3c to be checked if any reference known for more than 3 months)

4. ☐ This Information Disclosure Statement is filed under 37 C.F.R. §1.97(d) after the period specified in 37 C.F.R. §1.97(c), but on or before the date of payment of the issue fee.

(Check Item 4a, and 4b, 4c or 4d)

4a. ☐ The Certification Statement in Item 5 below is applicable.

4b. ☐ The $260 (large entity) fee set forth in 37 C.F.R. §1.17(p) in accordance with 37 C.F.R. §1.97(c) is to be charged to Morgan, Lewis & Bockius LLP Deposit Account No. 50-0310 (order no.).

4c. ☐ The $130 (small entity) fee set forth in 37 C.F.R. §1.17(p) in accordance with 37 C.F.R. §1.97(c) is to be charged to Morgan, Lewis & Bockius LLP Deposit Account No. 50-0310 (order no.).

4d. ☐ The $65 (micro entity) fee set forth in 37 C.F.R. §1.17(p) in accordance with 37 C.F.R. §1.97(c) is to be charged to Morgan, Lewis & Bockius LLP Deposit Account No. 50-0310 (order no.).

5. ☐ Certification Statement (applicable if Item 3a or Item 4a is checked)

(Check either Item 5a, 5b, 5c or 5d)

5a. ☐ In accordance with 37 C.F.R. §1.97(e)(1), it is certified that each item of information contained in this information disclosure statement was first cited in a communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this Information Disclosure Statement.

5b. ☐ In accordance with 37 C.F.R. §1.97(e)(2), it is certified that no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 C.F.R. §1.56(c) more than three months prior to the filing of this information disclosure statement.

5c. ☐ Each item of information contained in this information disclosure statement was cited in a communication from a foreign patent office in a counterpart application, and the communication was not **received** by any individual designated in 37 C.F.R. §1.56(c) more than thirty days prior to the filing of this information disclosure statement.

5d. ☐ Pursuant to 37 C.F.R. §1.704(d), each item of information contained in this information disclosure statement was cited in a communication from a foreign patent office in a counterpart application, and the communication was not **received** by any individual designated in 37 C.F.R. §1.56(c) more than thirty days prior to the filing of this information disclosure statement.

6. ☐ Copies of each cited U.S. patent and each U.S. patent application publication are not enclosed pursuant to the USPTO OG Notice dated 05 August 2003 waiving the requirement under 37 C.F.R. 1.98(a)(2)(i) for U.S. patent applications filed after June 30, 2003.

7. ☐ This application is a continuation application under 37 C.F.R. §1.53(b) or (d).

(Check appropriate Items 7a, 7b and/or 7c)

7a. ☐ A Petition to Withdraw from issue under 37 C.F.R. §1.313(b)(5) is concurrently filed herewith.

7b. ☐ Copies of publications listed on Form PTO-1449 from prior application Serial No. , filed on , of which this application claims priority under 35 U.S.C. §120, are not being submitted pursuant to 37 C.F.R. §1.98(d).

7c. ☐ Copies of the publications listed on the attached Form PTO-1449 that were not previously cited in prior application Serial No. , filed on , are provided herewith.

8. ☒ This is a Supplemental Information Disclosure Statement. (Check Item 8a)

8a. ☒ This Supplemental Information Disclosure Statement under 37 C.F.R. §1.97(f) supplements the Information Disclosure Statement filed on **July 26, 2022**. A bona fide attempt was made to comply with 37 C.F.R. §1.98, but inadvertent omissions were made. These omissions have been corrected herein. Accordingly, additional time is requested so that this Supplemental Information Disclosure Statement can be considered as if properly filed on **July 26, 2022**.

9. ☐ In accordance with 37 C.F.R. §1.98, a concise explanation of what is presently understood to be the relevance of each non-English language publication is:

(Check Item 9a, 9b, or 9c)

9a. ☐ satisfied because all non-English language publications were cited on the enclosed English language copy of the PCT International Search Report or the search report from a counterpart foreign application indicating the degree of relevance found by the foreign office.

9b. ☐ set forth in the application.

9c. ☐ enclosed as an attachment hereto.

10. ☒ The Commissioner is authorized to charge any additional fee required or credit any overpayment for this Information Disclosure Statement and/or Petition to Morgan, Lewis & Bockius LLP Deposit Account No. 50-0310 (order no. 024607-02-5119-US).

11. ☒ No admission is made that the information cited in this Statement is, or is considered to be, material to patentability nor a representation that a search has been made (other than a search report of a foreign counterpart application or PCT International Search Report if submitted herewith). 37 C.F.R. §§1.97(g) and (h).

Respectfully submitted,

Date: December 8, 2022

/Yalei Sun/ 57,765
Yalei Sun (Reg. No.)
MORGAN, LEWIS & BOCKIUS LLP
1400 Page Mill Road
Palo Alto, CA 94304
(650) 843-4000

REQUEST FOR CONTINUED EXAMINATION (RCE) TRANSMITTAL

Address to:
Mail Stop RCE
Commissioner of Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Electronically filed	January 24, 2023
Application Number	17/746,755
Confirmation Number	8911
Filing Date	May 17, 2022
First Named Inventor	Tao Tao, et al.
Art Unit	1721
Examiner Name	Barton, Jason Aaron
Attorney Docket No.	024607-02-5119-US

This is a Request for Continued Examination (RCE) under 37 C.F.R. § 1.114 of the above-identified application. Request for Continued Examination (RCE) practice under 37 CFR 1.114 does not apply to any utility or plant application filed prior to June 8, 1995, or to any design application.

1. Submission required under 37 C.F.R. § 1.114

NOTE: If the RCE is proper, any previously filed unentered amendments and amendments enclosed with the RCE will be entered in the order in which they were filed unless applicant instructs otherwise. If applicant does not wish to have any previously filed unentered amendment(s) entered, applicant must request non-entry of such amendment(s).

a. ☐ Previously submitted. If a final Office Action is outstanding, any amendments filed after the final Office Action may be considered as a submission.
   i. ☐ Consider the arguments in the Appeal Brief or Reply Brief previously filed _____
   ii. ☐ Other _____

b. ☒ Enclosed
   i. ☒ Amendment/Reply
   ii. ☐ Affidavit(s)/Declaration(s)
   iii. ☐ Information Disclosure Statement (IDS)
   iv. ☐ Other _____

2. Miscellaneous

a. ☐ Suspension of action on the above-identified application is requested under 37 C.F.R. § 1.103(c) for a period of _____ months.
(Period of suspension shall not exceed 3 months; Fee under 37 C.F.R. § 1.17(i) required)

b. ☐ Other _____

3. Fees — The RCE fee under 37 C.F.R. § 1.17(e) is required by 37 C.F.R. § 1.114 when the RCE is filed.

a. ☒ Payment has been made via Financial Manager, however, the Director is hereby authorized to charge any required fees to Morgan, Lewis & Bockius LLP Deposit Account No. 50-0310 (order no. 024607-02-5119-US).
   i. ☒ (1st request) RCE fee required under 37 C.F.R. § 1.17(e)(1), ☐ $1360 (large entity); ☐ $680 (small entity)
   ii. ☐ (2nd or subsequent request) RCE fee required under 37 C.F.R. § 1.17(e)(2), ☐ $2000 (large entity); ☐ $1000 (small entity)
   iii. ☐ Extension of time fee required under 37 C.F.R. §§ 1.136 and 1.17, to be $ for a month(s) extension, the request for which is being made herewith
   iv. ☐ Other _____

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED

Name (Print/Type)	Yalei Sun	*Registration No. (Attorney/Agent)*	57,765
Signature	/Yalei Sun/	*Date*	January 24, 2023

CERTIFICATE OF MAILING OR TRANSMISSION

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Mail Stop RCE, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, or by facsimile transmitted to fax no. 1-703- to the U.S. Patent and Trademark Office on the date indicated below.

Name (Print/Type)		*Registration No. (Attorney/Agent)*	
Signature		*Date*	

Electronically filed January 24, 2023

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application of:	Tao Tao et al.	Confirmation No.:	8911
Serial No.:	17/746,755	Art Unit:	1721
Filed:	May 17, 2022	Examiner:	Barton, Jason Aaron
For:	*Lithium-Ion Battery Having Desirable Safety Performance*	Attorney Docket No.:	024607-02-5119-US

AMENDMENT AND RESPONSE TO FINAL OFFICE ACTION FILED WITH REQUEST FOR CONTINUED EXAMINATION (RCE)

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

The enclosed Amendment is in response to the Final Office Action dated October 24, 2022 for the above-identified patent application.

The Commissioner is hereby authorized to charge any required fee(s) to Morgan, Lewis & Bockius LLP Deposit Account No. 50-0310 (order no. 024607-02-5119-US).

Electronic Patent Application Fee Transmittal

Application Number:	17746755
Filing Date:	17-May-2022
Title of Invention:	LITHIUM-ION BATTERY HAVING DESIRABLE SAFETY PERFORMANCE
First Named Inventor/Applicant Name:	Tao TAO
Filer:	Yalei Sun/Cheryl Rogers
Attorney Docket Number:	024607-02-5119-US

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
RCE- 1ST REQUEST	1801	1	1360	1360
		Total in USD ($)		**1360**

Electronic Acknowledgement Receipt

EFS ID:	47417770
Application Number:	17746755
International Application Number:	
Confirmation Number:	8911
Title of Invention:	LITHIUM-ION BATTERY HAVING DESIRABLE SAFETY PERFORMANCE
First Named Inventor/Applicant Name:	Tao TAO
Customer Number:	24341
Filer:	Yalei Sun
Filer Authorized By:	
Attorney Docket Number:	024607-02-5119-US
Receipt Date:	24-JAN-2023
Filing Date:	17-MAY-2022
Time Stamp:	18:04:19
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		024607-02-5119-US_RCE_Amendmentv2.pdf	865217 61f003a37b9b9adfc68dae77788cc9fbad3fed47	yes	15

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Request for Continued Examination (RCE)	1	1
	Response After Final Action	2	2
	Claims	3	8
	Applicant Arguments/Remarks Made in an Amendment	9	15

Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	37958 6ef27fb78e0cca6245e26ca46487d6162880 95a4	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	903175		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Amendments to the Claims

The following listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1-19. (Canceled)

20. (Currently Amended) A lithium-ion battery, comprising:

a positive electrode comprising a positive current collector and a positive electrode active material layer containing $LiCoO_2$, wherein the positive electrode active material layer is formed on the positive current collector, the positive electrode active material layer being provided with a first recess accommodating a positive lead being coupled with the positive current collector;

a negative electrode comprising a negative current collector and a negative electrode active material layer containing graphite or silicon, wherein the negative electrode active material layer is formed on the negative current collector, the negative electrode active material layer being provided with a second recess accommodating a negative lead being coupled with the negative current collector;

a separator disposed between the positive electrode and the negative electrode; and

an electrolyte,

wherein, a top surface of the positive lead is provided with a first insulating glue layer, a surface of the positive electrode active material layer ~~corresponding~~ opposite to the second recess across the separator in a thickness direction of the positive plate and the negative plate is pasted with a second insulating glue layer, the second insulating glue layer has a width larger than a width of the second recess, and the second insulating glue layer has a length larger than a length of the second recess.

21. (Previously Presented) The lithium-ion battery of claim 20, wherein a distance between a center of the first recess and one end of the positive electrode active material layer is 1/4-3/4 of a length of the positive electrode active material layer; and a distance between a center of the second recess and one end of the negative electrode active material layer is 1/4-3/4 of a length of the negative electrode active material layer.

22. (Previously Presented) The lithium-ion battery of claim 21, wherein, the distance between the center of the first recess and the one end of the positive electrode active material layer is half of the length of the positive electrode active material layer; and the distance between the center of the second recess and the one end of the negative electrode active material layer is half of the length of the negative electrode active material layer.

23. (Previously Presented) The lithium-ion battery of claim 22, wherein the first recess has a length of 1-100 mm less than a length of the positive lead, the first recess has a width of 1-10 mm larger than a width of the positive lead, the second recess has a length of 1-100 mm less than a length of the negative lead, and the second recess has a width of 1-10 mm larger than a width of the negative lead.

24. (Previously Presented) The lithium-ion battery of claim 20, wherein the first recess has a length of 1-100 mm less than a width of the positive electrode active material layer, and the second recess has a length of 1-100 mm less than a width of the negative electrode active material layer.

25. (Previously Presented) The lithium-ion battery of claim 20, wherein the first recess has a depth of 0.005-0.1 mm larger than a thickness of the positive lead, and the second recess has a depth of 0.005-0.1 mm larger than a thickness of the negative lead.

26. (Previously Presented) The lithium-ion battery of claim 20, wherein a length of a portion of the positive lead in the first recess is less than a width of a remaining portion of the positive electrode active material layer from an edge of the first insulating glue layer covering the positive electrode active material layer to an edge of the positive electrode active material layer opposite to the first recess.

27. (Previously Presented) The lithium-ion battery of claim 20, wherein a width of a portion of the positive lead in the first recess is greater than a width of a remaining portion of the first recess not occupied by the positive lead located on one side of the positive lead.

28. (Canceled)

29. (Currently Amended) A lithium-ion battery, comprising:

a positive electrode, comprising a positive current collector and a positive electrode active material layer being formed on the positive current collector, the positive electrode

active material layer being provided with a first recess accommodating a positive lead being coupled with the positive current collector;

a negative electrode, comprising a negative current collector and a negative electrode active material layer being formed on the negative current collector, the negative electrode active material layer being provided with a second recess accommodating a negative lead being coupled with the negative current collector;

a separator disposed between the positive electrode and the negative electrode; and

an electrolyte,

wherein, a first location of a top surface of the positive lead is provided with a first insulating glue layer; a second location of a surface of the positive electrode active material layer ~~corresponding~~ opposite to the second recess across the separator in a thickness direction of the positive plate and the negative plate is pasted with a second insulating glue layer; a third location of a surface of the positive current collector opposite to the surface of the positive current collector where the positive lead coupled ~~corresponding to the positive lead~~ is covered with another first insulating glue layer; the second insulating glue layer has a width larger than a width of the second recess, and the second insulating glue layer has a length larger than a length of the second recess.

30. (Previously Presented) The lithium-ion battery of claim 29, wherein a distance between a center of the first recess and one end of the positive electrode active material layer is 1/4-3/4 of a length of the positive electrode active material layer, and a distance between a center of the second recess and one end of the negative electrode active material layer is 1/4-3/4 of a length of the negative electrode active material layer.

31. (Previously Presented) The lithium-ion battery of claim 29, wherein a distance between a center of the first recess and one end of the positive electrode active material layer is half of a length of the positive electrode active material layer, and a distance between a center of the second recess and one end of the negative electrode active material layer is half of a length of the negative electrode active material layer.

32. (Previously Presented) The lithium-ion battery of claim 29, wherein the first recess has a length of 1-100mm less than a length of the positive lead, the first recess has a width of 1-10mm larger than a width of the positive lead, the second recess has a length of 1-100mm

less than a length of the negative lead, and the second recess has a width of 1-10mm larger than a width of the negative lead.

33. (Previously Presented) The lithium-ion battery of claim 29, wherein the first recess has a length of 1-100mm less than a width of the positive electrode active material layer, and the second recess has a length of 1-100mm less than a width of the negative electrode active material layer.

34. (Previously Presented) The lithium-ion battery of claim 29, wherein the first recess has a depth of 0.005-0.1mm larger than a thickness of the positive lead, and the second recess has a depth of 0.005-0.1mm larger than a thickness of the negative lead.

35. (Previously Presented) The lithium-ion battery of claim 29, wherein a length of a portion of the positive lead in the first recess is less than a width of a remaining portion of the positive electrode active material layer from an edge of the first insulating glue layer covering the positive electrode active material layer to an edge of the positive electrode active material layer opposite to the first recess.

36. (Previously Presented) The lithium-ion battery of claim 29, wherein a width of a portion of the positive lead in the first recess is greater than a width of a remaining portion of the first recess not occupied by the positive lead located on one side of the positive lead.

37. (Currently Amended) A lithium-ion battery, comprising:

a positive electrode, comprising a positive current collector and a positive electrode active material layer being formed on the positive current collector, the positive electrode active material layer being provided with a first recess accommodating a positive lead being coupled with the positive current collector;

a negative electrode, comprising a negative current collector and a negative electrode active material layer being formed on the negative current collector, the negative electrode active material layer being provided with a second recess accommodating a negative lead being coupled with the negative current collector;

a separator disposed between the positive electrode and the negative electrode; and

an electrolyte,

wherein, a first location of a top surface of the positive lead is provided with a first insulating glue layer; a second location of a surface of the positive electrode active material layer ~~corresponding~~ opposite to the second recess across the separator in a thickness direction of the positive plate and the negative plate is pasted with a second insulating glue layer; the second insulating glue layer has a width larger than a width of the second recess, and the second insulating glue layer has a length larger than a length of the second recess.

38. (Previously Presented) The lithium-ion battery of claim 37, wherein a length of a portion of the first lead in the first recess is less than a width of a remaining portion of the first film from an edge of the first insulating glue layer covering the first film to an edge of the first film opposite to the first recess.

39. (Previously Presented) The lithium-ion battery of claim 37, wherein a width of a portion of the first lead in the first recess is greater than a width of a remaining portion of the first recess not occupied by the first lead located on one side of the first lead.

REMARKS

This amendment responds to the final office action mailed October 24, 2022. In the final office action, the Examiner:

- commented under "*Information Disclosure Statement*" filed on July 26, 2022;
- rejected claims 28 and 29-36 as being indefinite under 35 U.S.C. § 112(b) for failing to particularly point out and distinctly claim the subject matter; and
- rejected claims 20-39 under 35 U.S.C. 103 as being unpatentable over Sugita (WO 2013/038677), in view of Matsushita et al. (U.S. Patent Publication No. 2014/0120417), and Kwak et al. (U.S. Patent Publication No. 2006/0051662).

INTERVIEW SUMMARY

Applicant's attorneys thank Examiner Barton and his supervisor for the opportunity to discuss the application during a telephone interview on December 19, 2022 with Yalei Sun. In the interview, Mr. Sun discussed the distinction between the pending claims and JP2007165224 (which has not been cited by but was considered by the Examiner in connection with examining US Patent Application No. 17/407,081). No specific agreement has been reached.

REMARKS CONCERNING CLAIMS

Claims 20, 29 and 37 have been amended. Claim 28 has been canceled.

Support for the amendments can be found in at least paragraphs [0023] and [0079], and Figures 1-5 of the application as filed. No new matter has been added.

With respect to all amendments, Applicant has not dedicated or abandoned any unclaimed subject matter. Moreover, Applicant has not acquiesced to any characterizations of the invention, nor any rejections or objections of the claims, made by the Examiner. Moreover, the Applicant hereby rescinds any prior disclaimer of claim scope, to the extent they exist, made during the prosecution of this application or made during the prosecution of any patent or other related patents/applications, and advises the Examiner that any such previous disclaimers and the cited references that they were made to avoid may need to be revisited.

After entry of this amendment, the pending claims are: claims 20-27 and 29-39.

REMARKS CONCERNING INFORMATION DISCLOSURE STATEMENT

I. COMMENTS REGARDING INFORMATION DISCLOSURE STATEMENT FILED ON JULY 26, 2022

The pending application is a continuation of the following US patent applications:

- US Patent Application No. 14/596,873 (issued as US Patent No. 10,541,441);
- US Patent Application No. 16/113,938; and
- US Patent Application No. 17/407,081.

It is the Applicant's belief that the references cited in the IDS filed on July 26, 2022 have already been filed with at least one of the parent applications. According to 37 CFR Sec 1.98(d), the Applicant does not need to submit references already submitted in the parent cases. However, the Applicant agrees to file a supplemental IDS to include a legible copy of all the foreign references and NPLs to expedite the prosecution of the pending application.

REMARKS CONCERNING REJECTIONS UNDER 35 U.S.C. 112

II. REJECTION OF CLAIMS 28 AND 29-36 AS BEING INDEFINITE UNDER 35 U.S.C. 112(B) FOR FAILING TO PARTICULARLY POINT OUT AND DISTINCTLY CLAIM THE SUBJECT MATTER

Claim 29 has been amended to recite the location of the "another first insulating glue layer". Support for the amendments can be found in in FIG. 5 and [0023] of the present application. Claim 28 has been canceled.

In light of the above, the Applicant respectfully submits that the rejection of claims 28 and 29-36 should be withdrawn.

REMARKS CONCERNING REJECTIONS UNDER 35 U.S.C. 103

III. REJECTION OF CLAIMS 20-39 UNDER 35 U.S.C. 103 AS BEING UNPATENTABLE OVER SUGITA, IN VIEW OF MATSUSHITA AND KWAK

Claim 20 as amended recites, among others that:

> ...
>
> wherein, a top surface of the positive lead is provided with a first insulating glue layer, **a surface of the positive electrode active material layer opposite to the second recess across the separator in a thickness direction of the positive plate and the negative plate is pasted with a second insulating glue layer**, the second insulating glue layer has a width larger than a width of the second recess, and the second insulating glue layer has a length larger than a length of the second recess.

Emphasis Added.

For reference, FIG. 5 of the present application (reproduced below with color annotations) depicts an exemplary cross-sectional view of a lithium-ion battery, in which the second lead 23 is separated from the second insulating glue layer 16 disposed on the surface of the first film opposite to the second lead **across the separator 3** (represented by the dashed line) in a thickness direction of the battery.

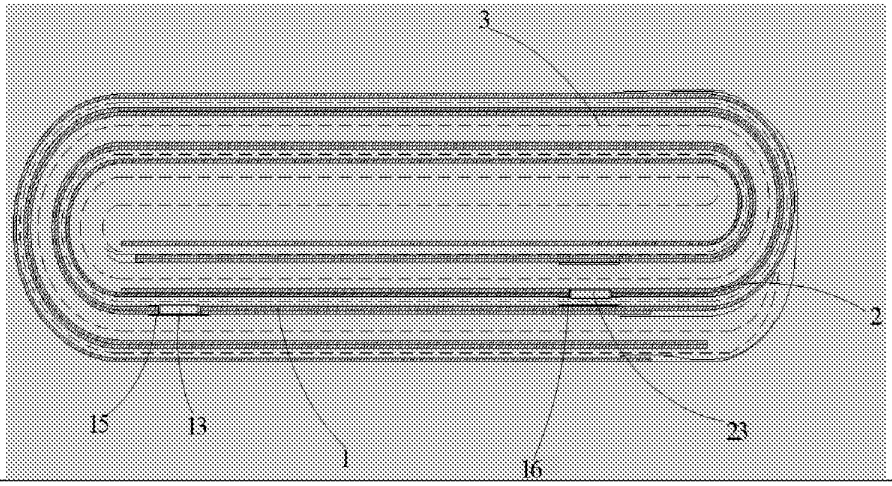


FIG. 5 of the present application

Without the second insulating glue layer 16, the charge and discharge of the lithium-ion battery may result in lithium precipitation near the second lead 23 on the negative electrode due to receiving the lithium ions escaping from the surface of the first film on the positive electrode because the negative film 22 on the second current collector 21 has been removed to form the second recess for housing the second lead 23. This would cause the penetration of the separator 3 and therefore result in a short circuit between the positive electrode and the negative electrode.

But as depicted in FIG. 5 above, the deployment of the second insulating glue layer 16 on the surface of the first film near the location of the second lead across the separator 3 prevents lithium precipitation on the surface of the second film. Thus,

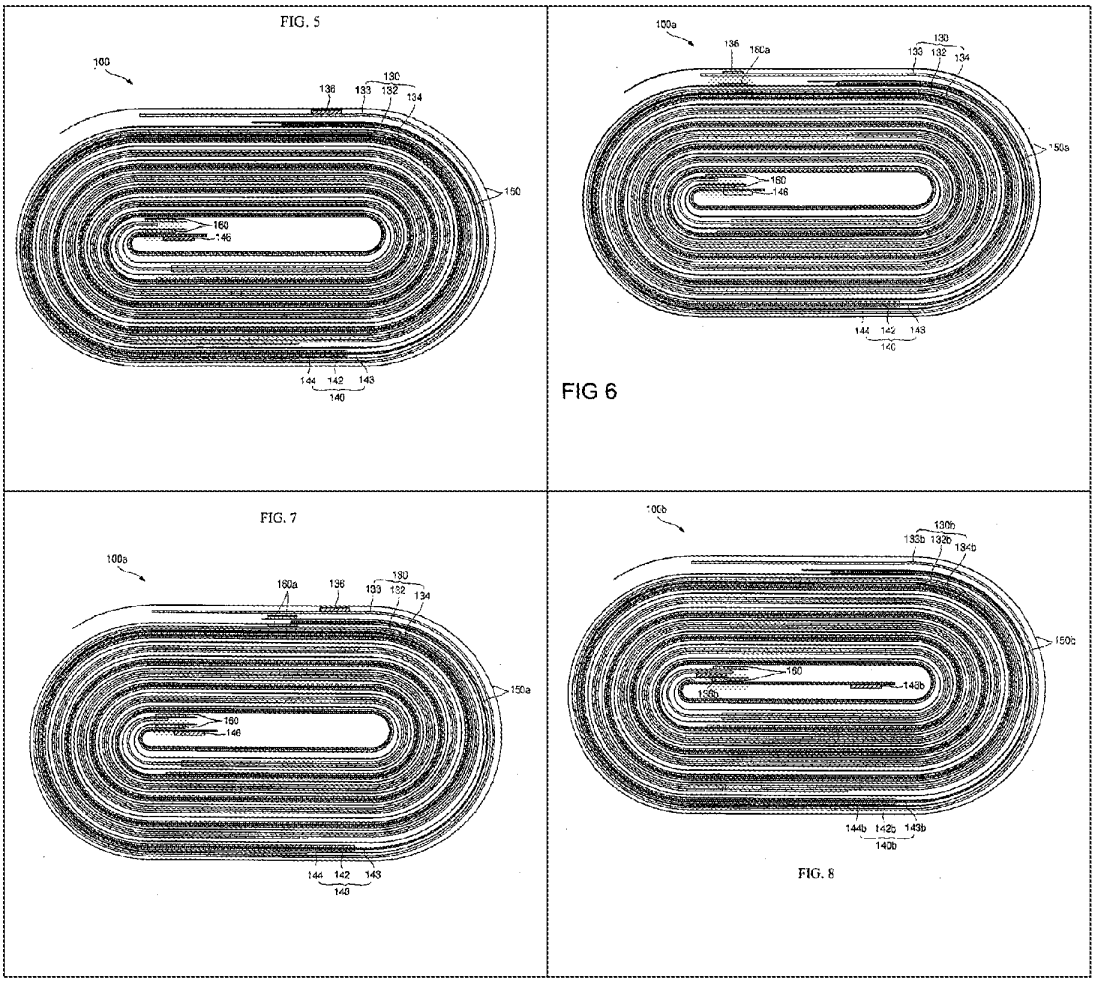
> **[0023]** Compared with the prior art, due to the arrangement of the first insulating glue layer formed on the upper and lower surfaces of the positive lead and *the second insulating glue layer pasted on the surface of the positive film corresponding to the second recess, occurrence of internal short circuit and lithium precipitation in the lithium-ion battery is remarkably reduced*, and safety performance of the lithium-ion battery is improved remarkably in the premise of desirable energy density.

In other words, the short circuit that the present application tries to prevent is the lithium precipitation-induced short circuit.

In contrast, the short circuit between the positive electrode and the negative electrode described by Kwak is caused by the contracting of the separator "due to heat that is generated near the electrode tab during overcharging, over-discharging", not by the lithium precipitation near the location of the negative lead on the negative electrode. See, e.g.,

> **[0041]** The insulation tape 160 prevents the heat that is generated from the first electrode tab 146 portion from being directly transferred to the separator 150. In particular, **the insulation tape 160 effectively prevents the separator 150 from contracting in a position corresponding to the position of the first electrode tab 146**, in spite of the heat generation at the first electrode tab 146. For that reason, the insulation tape 160 may be coupled with the separator in a position facing the first electrode plate uncoated **portion corresponding to the position of the first electrode tab.**
> **[0042]** The insulation tape 160 has a predetermined width and the same height as the second electrode 130 or first electrode plate 140 and is attached to a surface of the separator 150 that does not contact the second electrode plate 130. The insulation tape 160 is sufficiently wide to be attached to the separator 150 in a position corresponding to the second electrode uncoated portion 133 of the second electrode plate 130. **The insulation tape 160 is attached to a predetermined portion of the separator 150 and holds the separator 150 in place even when it is subjected to heat which prevents it from contracting.**

For further reference, FIGS. 5-8 of Kwak are reproduced below with the insulation tapes 160 and 160a being highlighted in each figure. As can be seen in the figures below, there is an insulation tape 160 or 160a with one side disposed on the separator (150, 150a, or 150b) and the other side disposed on the electrode collector (132 or 142) such that the separator is attached to the electrode collector at least at one end of the electrode plate to prevent the contraction of the separator along the winding direction of the battery cell.



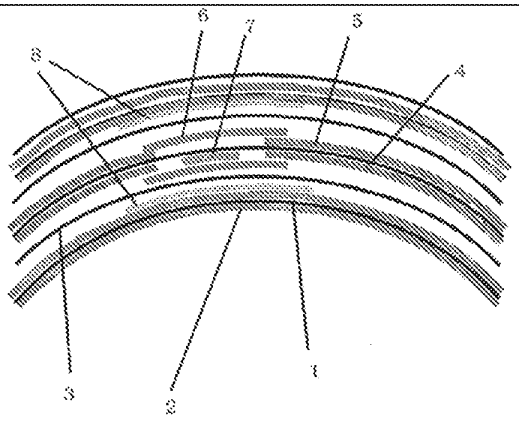
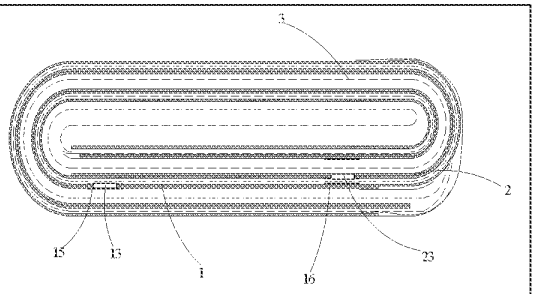
In sum, because Kwak attempts to solve a different type of short circuit problem from the present application, one skilled in the art would not have been motivated to combine the teachings of the three cited references to arrive at the claimed invention. Thus claim 20 and its dependent claims 21-27 are patentable over the three cited references.

Because claims 29 and 37 have been amended in a substantially similar manner, claims 29 and 37 as well as their respective dependent claims 30-36 and 38-39 are also patentable over the three cited references for at least the same reasons above.

REMARKS CONCERNING JP2007165224

During the phone interview, the Examiner suggests that the Japanese reference JP2007165224 might be relevant to the pending claims.

For reference, FIG. 4 of the Japanese reference and FIG. 5 of the present application are reproduced below.

	
FIG. 4 of the Japanese reference	FIG. 5 of the present application

As shown above, the numeral 4 refers to the **positive current collector** and the heat-resistant film 8 is located on the **negative active material 2** that is disposed on the **negative current collector 1**.

In contrast, the pending claim 20 requires that "a surface of the **positive electrode active material layer** corresponding to the second recess across the separator in a thickness direction of the positive plate and the negative plate is pasted with a **second insulating glue layer**". In other words, the arrangement of the second insulating glue layer of the present application is exactly **opposite** to the teaching of the JP reference. As shown in FIG. 5 of the present application, the **second insulating glue layer 16** is disposed on the surface of the **positive electrode active material layer 1**.

The difference between the teaching of the Japanese reference and the pending application lies in the fact that they are attempting to address two different problems.

According to the Japanese reference, the purpose of having the heat-resistant protective film 8 on the negative active material 2 is to protect the battery by suppressing the high heat caused by a short circuit between the positive electrode and the negative electrode. Please refer to the abstract and other relevant of the Japanese reference[1] as follows:

> PROBLEM TO BE SOLVED: To solve a problem in a nonaqueous electrolyte secondary battery that a large current flows

[1] The English translation of the Japanese reference can be found at https://patents.google.com/patent/JP2007165224A/en?oq=JP2007165224.

> and an open circuit voltage is decreased and **a heating may be caused, in case an internal short circuit occurs between an uncoated part of a cathode collector and an anode plate coated by an anode active substance**.
>
> By doing so, the heat-resistant protective film can be formed densely with good adhesion, and the **highest risk of heat generation between the uncoated portion of the positive electrode current collector and the negative electrode plate coated with the negative electrode active material heat generation at the time of internal short circuit that occurred can be suppressed**.

Emphasis Added.

In other words, the Japanese reference does **not** prevent short circuit but it tries to mitigate the heat buildup near the lead **after the short circuit has occurred**.

In contrast, as described above, by covering the surface of the positive film (including a large amount of lithium-ion) near the location of the second lead across the separator 3 with the deployment of the second insulating glue layer 16, it is more difficult for the lithium-ion to move across the separator 3 to arrive at the second lead on the negative current collector, which would have resulted into a lithium precipitation on the surface of the second film near the second lead and the "occurrence of **internal short circuit** ··· in the lithium-ion battery" .

In other words, the technical problem of the present application is how to prevent the lithium-ion battery from having a short circuit on the first place than how to suppress heat after the short circuit has occurred. Thus, it would not be apparent for one of ordinary skill in the art to modify the battery design of the Japanese reference to address a technical problem that has never been contemplated in the Japanese reference.

In view of the above, the Applicant respectfully submits that the pending claims are patentable over the Japanese reference as well.

CONCLUDING REMARKS

By responding in the foregoing remarks only to particular positions asserted by the examiner, the Applicant does not necessarily acquiesce in other positions that have not been explicitly addressed. In addition, the Applicant's arguments for the patentability of a claim should not be understood as implying that no other reasons for the patentability of that claim exist.

In light of the above amendments and remarks, the Applicant respectfully requests that the Examiner reconsider this application with a view towards allowance. The Examiner is invited to call the undersigned attorney at (650) 843-7558, if a telephone call could help resolve any remaining items.

Respectfully submitted,

Date: January 24, 2023

/Yalei Sun/ 57,765

Yalei Sun (Reg. No.)
MORGAN, LEWIS & BOCKIUS LLP
1400 Page Mill Road
Palo Alto, CA 94304
Phone: (650) 843-7558
E-mail: yalei.sun@morganlewis.com

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Sale Item Reference Number	Effective Date
17746755	01/24/2023

Document Number	Fee Code	Fee Code Description	Amount Paid	Payment Method
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/746,755	05/17/2022	Tao TAO	024607-02-5119-US	8911

24341 7590 01/30/2023

Morgan, Lewis & Bockius LLP (PA)
1400 Page Mill Road
Palo Alto, CA 94304-1124

EXAMINER	
BARTON, JASON AARON	

ART UNIT	PAPER NUMBER
1721	

NOTIFICATION DATE	DELIVERY MODE
01/30/2023	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

donald.mixon@morganlewis.com
padocketingdepartment@morganlewis.com

Applicant-Initiated Interview Summary	**Application No.** 17/746,755	**Applicant(s)** TAO et al.		
	Examiner JASON A BARTON	**Art Unit** 1721	**AIA (First Inventor to File) Status** Yes	**Page** 1 of 2

All Participants (applicant, applicants representative, PTO personnel)	**Title**	**Type**
JASON A BARTON	Examiner	Telephonic
WILLIAM MCCLAIN	Primary Examiner	
YALEI SUN	Attorney of Record	

Date of Interview: 11 January 2023

Issues Discussed:

35 U.S.C. 103

Examiner convened with Applicant's counsel on 12/19/2022 to discuss an interview agenda (see attachment). Applicant proposed amending the independent claim to recite, "...a surface of the positive electrode active material layer corresponding to the second recess across the separator in a thickness direction of the positive plate and the negative plate." A similar limitation was discussed in the related parent case (17/407,081). Examiner indicated that Jp2007165224, which was cited in the pertinent prior art, would most likely be cited against the claims.

Applicant's counsel suggested sending proposed amendments in the 12/19/2022 interview. Examiner agreed.

In a subsequent email on 01/06/2023, Applicant's counsel proposed arguments (see attachment) for preemptively addressing the Jp'224 reference. Examiner indicated 1/11/2023 that the proposed arguments would most likely be insufficient for overcoming the Jp'224 reference upon formal filing.

☑ Attachment

/JASON BARTON/ Examiner, Art Unit 1721	/WILLIAM E MCCLAIN/ Primary Examiner, Art Unit 1721

Applicant is reminded that a complete written statement as to the substance of the interview must be made of record in the application file. It is the applicants responsibility to provide the written statement, unless the interview was initiated by the Examiner and the Examiner has indicated that a written summary will be provided. See MPEP 713.04
Please further see:
MPEP 713.04
Title 37 Code of Federal Regulations (CFR) § 1.133 Interviews, paragraph (b)
37 CFR § 1.2 Business to be transacted in writing

Applicant recordation instructions: The formal written reply to the last Office action must include the substance of the interview. (See MPEP section 713.04). If a reply to the last Office action has already been filed, applicant is given a non-extendable period of the longer of one month or thirty days from this interview date, or the mailing date of this interview summary form, whichever is later, to file a statement of the substance of the interview.

Applicant-Initiated Interview Summary	**Application No.** 17/746,755	**Applicant(s)** TAO et al.		
	Examiner JASON A BARTON	**Art Unit** 1721	**AIA (First Inventor to File) Status** Yes	**Page** **2 of 2**

Examiner recordation instructions: Examiners must summarize the substance of any interview of record. A complete and proper recordation of the substance of an interview should include the items listed in MPEP 713.04 for complete and proper recordation including the identification of the general thrust of each argument or issue discussed, a general indication of any other pertinent matters discussed regarding patentability and the general results or outcome of the interview, to include an indication as to whether or not agreement was reached on the issues raised.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application of:	Tao Tao et al.	Confirmation No.:	8911
Serial No.:	17/746,755	Art Unit:	1721
Filed:	May 17, 2022	Examiner:	Barton, Jason Aaron
For:	*Lithium-Ion Battery Having Desirable Safety Performance*	Attorney Docket No.:	024607-02-5119-US

PHONE INTERVIEW AGENDA

Listing of Claims:

1-19. (Canceled)

20. (Currently Amended) A lithium-ion battery, comprising:

a positive electrode comprising a positive current collector and a positive electrode active material layer containing $LiCoO_2$, wherein the positive electrode active material layer is formed on the positive current collector, the positive electrode active material layer being provided with a first recess accommodating a positive lead being coupled with the positive current collector;

a negative electrode comprising a negative current collector and a negative electrode active material layer containing graphite or silicon, wherein the negative electrode active material layer is formed on the negative current collector, the negative electrode active material layer being provided with a second recess accommodating a negative lead being coupled with the negative current collector;

a separator disposed between the positive electrode and the negative electrode; and

an electrolyte,

wherein, a top surface of the positive lead is provided with a first insulating glue layer, a surface of the positive electrode active material layer corresponding to the second recess across the separator in a thickness direction of the positive plate and the negative plate is pasted with a second insulating glue layer, the second insulating glue layer has a width

larger than a width of the second recess, and the second insulating glue layer has a length larger than a length of the second recess.

Comments about JP2007165224:

First:

The problem to be addressed by this patent is described in the following paragraph:

By doing so, **the heat-resistant protective film can be formed densely with good adhesion, and the highest risk of heat generation between the uncoated portion of the positive electrode current collector and the negative electrode plate coated with the negative electrode active material Heat generation at the time of internal short circuit that occurred can be suppressed.**

In other words, this JP patent does not try to prevent the short-circuit. Actually, it tries to deal with the over-heating issue after the short circuit occurs.

Second:

The JP patent does not teach the following claim feature because it does not teach the recess in the negative electrode.

the second insulating glue layer has a length larger than a length of the second recess.

Barton, Jason

From: Barton, Jason
Sent: Wednesday, January 11, 2023 9:11 AM
To: Sun, Yalei
Cc: McClain, William E.
Subject: RE: 024607-02-5119-US (P2014010US5) Phone Interview Agenda.DOCX

Hi Mr. Sun,

I think my preliminary opinion on the positive/negative current collector distinction you have made is that the heat-resistant film 8 is applicable in either case, i.e., as applied in the disclosed positive/negative and in the non-disclosed opposite manner. Similar to point #2 which we discussed during the interview, I don't think there is a patentable distinction as it follows from common sense that the limitation would be met (i.e., the alleged insulating glue layer needs to be at least as large in both width/length directions to cover the electrode inside the recess), even if it is not expressly shown in the figures or discussed in the specification of the JP reference.

Having addressed these items, please proceed to formal file your response.

Best regards,

Jason Barton
Junior Patent Examiner | AU 1721
Email: jason.barton@uspto.gov
Ph.: (571)-270-3551

From: Sun, Yalei <yalei.sun@morganlewis.com>
Sent: Friday, January 6, 2023 12:46 PM
To: Barton, Jason <Jason.Barton@uspto.gov>
Cc: McClain, William E. <william.mcclain@USPTO.GOV>
Subject: RE: 024607-02-5119-US (P2014010US5) Phone Interview Agenda.DOCX

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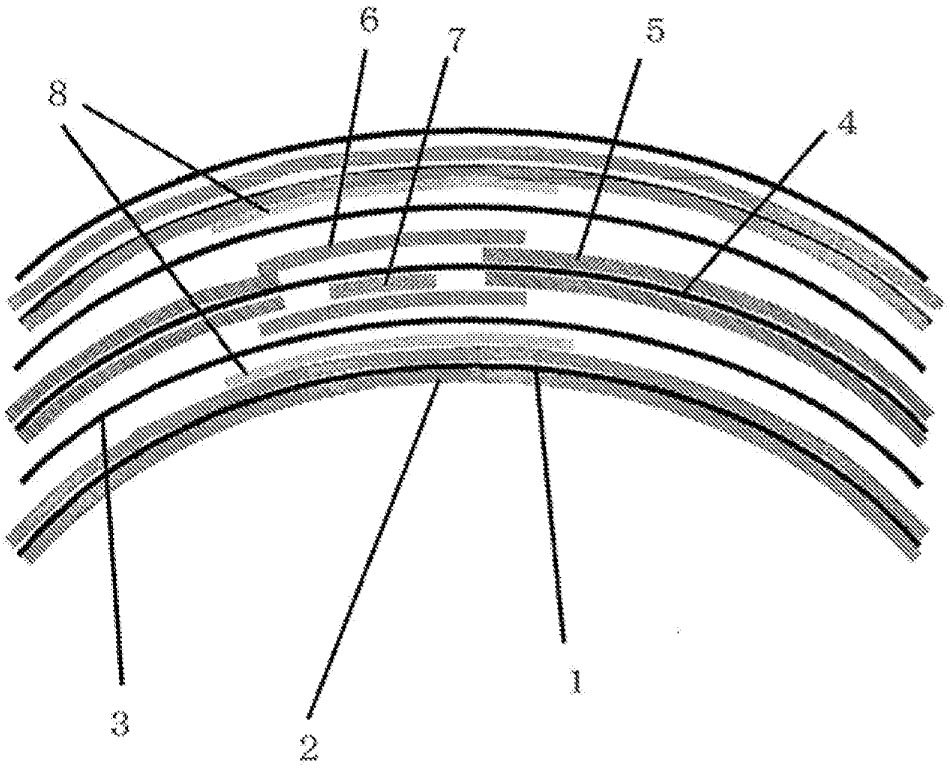
Examiner Barton,

Thanks for your email below.

We will wait for the final OA of the parent case before requesting the interview.

As for the child case, I would like to further explain the differences between the JP reference and the pending claims.

As you can see from the figure 4 of the JP reference, the numeral 4 refers to the positive current collector and the heat-resistant film 8 is located on the negative active material 2 that is disposed on the negative current collector 1.



In contrast, the pending claim 20 requires that "a surface of the positive electrode active material layer corresponding to the second recess across the separator in a thickness direction of the positive plate and the negative plate is pasted with a second insulating glue layer". In other words, the arrangement of the second insulating glue layer of the present application is exactly opposite to the teaching of the JP reference. See the Fig. 5 of the present application below. Note that the second insulating glue layer highlighted in the figure is disposed on the surface of the positive electrode active material layer.

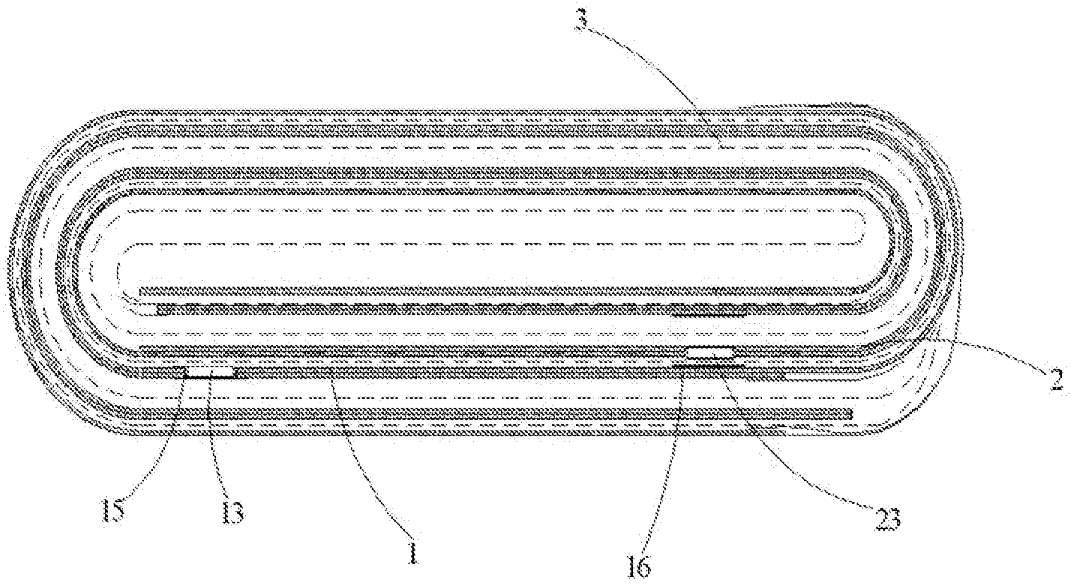


FIG. 5

Please feel free to call me if you think that it is helpful.

Thanks,

Yalei Sun | 孙亚雷
Morgan, Lewis & Bockius LLP
1400 Page Mill Road | Palo Alto,CA 94304
Direct: +1.650.843.7558 | Main:+1.650.843.4000 | Fax: +1.650.843.4001
yalei.sun@morganlewis.com| www.morganlewis.com
Assistant: Cheryl A. Rogers |+1.650.843.7839 | cheryl.rogers@morganlewis.com

---

From: Barton, Jason <Jason.Barton@uspto.gov>
Sent: Wednesday, January 4, 2023 12:15 PM
To: Sun, Yalei <yalei.sun@morganlewis.com>
Cc: McClain, William E. <william.mcclain@USPTO.GOV>
Subject: RE: 024607-02-5119-US (P2014010US5) Phone Interview Agenda.DOCX

[EXTERNAL EMAIL]
Hi Mr. Sun,

I just received your voicemail a moment ago. In your voicemail you requested to discuss the parent to this case. Since I have already started drafting the final rejection in that case I am going to decline your interview request. However, please consider requesting an interview after you receive the final office action in that case if you would like to.

With respect to the case we discussed on Dec. 19th, my understanding was that you were going to send me proposed claim limitations to consider prior to submitting a response. I have not received such proposed claim

limitations. In the next few days I will submit my interview summary to make our discussion of record, with or without having received the proposed claim limitations.

Best regards,

Jason Barton
Junior Patent Examiner | AU 1721
Email: jason.barton@uspto.gov
Ph.: (571)-270-3551

From: Barton, Jason
Sent: Wednesday, December 14, 2022 12:43 PM
To: Sun, Yalei <yalei.sun@morganlewis.com>
Subject: RE: 024607-02-5119-US (P2014010US5) Phone Interview Agenda.DOCX

Mr. Sun,

I have you scheduled for 4 PM ET on 12/19. Please give me a call at the below number at that time. Thanks.

Best regards,

Jason Barton
Junior Patent Examiner | AU 1721
Email: jason.barton@uspto.gov
Ph.: (571)-270-3551

From: Sun, Yalei <yalei.sun@morganlewis.com>
Sent: Wednesday, December 14, 2022 12:27 PM
To: Barton, Jason <Jason.Barton@uspto.gov>
Subject: RE: 024607-02-5119-US (P2014010US5) Phone Interview Agenda.DOCX

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Thanks Examiner Barton.

How about 4 PM ET and 1 PM PT on Monday December 19?

Yalei Sun | 孙亚雷
Morgan, Lewis & Bockius LLP
1400 Page Mill Road | Palo Alto,CA 94304
Direct: +1.650.843.7558 | Main:+1.650.843.4000 | Fax: +1.650.843.4001
yalei.sun@morganlewis.com| www.morganlewis.com
Assistant: Cheryl A. Rogers |+1.650.843.7839 | cheryl.rogers@morganlewis.com

---

From: Barton, Jason <Jason.Barton@uspto.gov>
Sent: Wednesday, December 14, 2022 10:35 AM

To: Sun, Yalei <yalei.sun@morganlewis.com>
Subject: RE: 024607-02-5119-US (P2014010US5) Phone Interview Agenda.DOCX

[EXTERNAL EMAIL]
Hello Mr. Sun,

Thank you for confirming during our phone call that you filed an email communication authorization in this case.

Per our phone conversation a moment ago, please take a look at JP2007165224A and let me know if you would still like to proceed with the proposed amendment. A copy and machine translation of this reference accompanied the final rejection issued in this case (17746755).

Per our discussion, we will be responding to response in the parent case (17407081) in the approximately the next 30 days.

Regarding availability, Will McClain and I are available for a 30 minute discussion during the following times:

- Monday, December 19, 2022: 1:00 PM to 5:00 PM ET; and
- Tuesday, December 20, 2022: 1:30 PM to 5:00 PM ET.

If you do not have availability during those times, please give me a call and we can discuss arranging an interview for Wednesday or a day later in the week.

Best regards,

Jason Barton
Junior Patent Examiner | AU 1721
Email: jason.barton@uspto.gov
Ph.: (571)-270-3551

From: Sun, Yalei <yalei.sun@morganlewis.com>
Sent: Monday, December 12, 2022 5:14 PM
To: Barton, Jason <Jason.Barton@uspto.gov>
Subject: 024607-02-5119-US (P2014010US5) Phone Interview Agenda.DOCX

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Examiner Barton,

I am wondering if you are available for having a quick interview for this case.

FYI. The case is a CON of US Application No. 17/407,081 for which we had a phone interview on 9/14/2022.

This claim amendment is consistent with the one we made to 17/407,081.

Thanks,

Yalei Sun | 孙亚雷
Morgan, Lewis & Bockius LLP
1400 Page Mill Road | Palo Alto,CA 94304
Direct: +1.650.843.7558 | Main:+1.650.843.4000 | Fax: +1.650.843.4001
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Assistant: Cheryl A. Rogers |+1.650.843.7839 | cheryl.rogers@morganlewis.com

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Notice of References Cited	Application/Control No. 17/746,755	Applicant(s)/Patent Under Reexamination TAO et al.	
	Examiner JASON A BARTON	Art Unit 1721	Page 1 of 1

U.S. PATENT DOCUMENTS

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	K					
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FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N	JP-2007165224-A	06-2007	JP	NAGASAKI A	Y02P70/50
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	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

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	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/746,755	TAO et al.
	Examiner	Art Unit
	JASON A BARTON	1721

CPC - Searched*		
Symbol	**Date**	**Examiner**
H01M10/0431	07/14/2022	JB
H01M10/0587	07/14/2022	JB
H01M50/531, 533, 538	07/14/2022	JB
H01M50/5$	07/14/2022	JB
H01M.cpcl.	07/14/2022	JB
H01M10/0431	09/08/2022	JB
H01M10/0587	09/08/2022	JB
H01M50/531, 533, 538	09/08/2022	JB
H01M50/5$	09/08/2022	JB
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Class	**Subclass**	**Date**	**Examiner**

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/JASON BARTON/ Examiner, Art Unit 1721	

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	Examiner	**Art Unit**
	JASON A BARTON	1721

Search Notes		
Search Notes	**Date**	**Examiner**
Global dossier search	07/14/2022	JB
Applicant and inventor search in SEARCH	07/14/2022	JB
CPC and CPC-limited text search in SEARCH	07/14/2022	JB
“More like this” searching in SEARCH and IP.COM	07/14/2022	JB
Additional search (refresh)	09/08/2022	JB
Discussion with Will McClain regarding strategy and search	03/23/2023	JB
Additional searching in SEARCH	03/24/2023	JB

Interference Search			
US Class/CPC Symbol	**US Subclass/CPC Group**	**Date**	**Examiner**

/JASON BARTON/ Examiner, Art Unit 1721	

(19)日本国特許庁(JP)　(12)公開特許公報(A)　(11)特許出願公開番号
特開2007-165224
(P2007-165224A)
(43)公開日　平成19年6月28日(2007.6.28)

(51)Int.Cl.		F I			テーマコード（参考）
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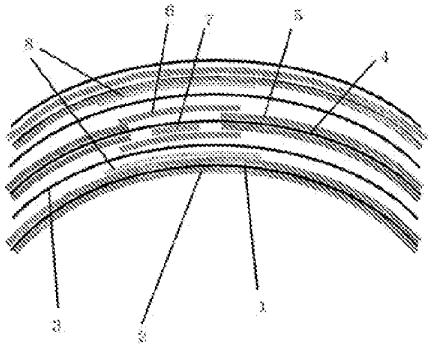
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(54)【発明の名称】非水電解液二次電池

(57)【要約】
【課題】内部短絡が、正極集電体の未塗工部と負極活物質が塗布された負極板の間で起こった場合、大きな電流が流れ、大幅な開回路電圧の低下や、発熱を引き起こす可能性があるという問題があった。
【解決手段】正極集電体に正極活物質を塗布した正極板と、負極集電体に負極活物質を塗布した負極板とを、隔離膜を介して捲回された電極群を有する非水電解液二次電池において、前記正極板の長さ方向の端部以外に未塗工部が設けてあり、前記正極板未塗工部に正極リードを接続し、前記正極リードをテープで被覆し、かつ前記正極板未塗工部と対向する負極板表面に耐熱性保護膜が形成されている非水電解液二次電池。
【選択図】図４



【特許請求の範囲】
【請求項１】
正極集電体に正極活物質を塗布した正極板と、負極集電体に負極活物質を塗布した負極板とを、隔離膜を介して捲回された電極群を有する非水電解液二次電池において、
前記正極板の長さ方向の端部以外に未塗工部が設けてあり、前記未塗工部に正極リードを接続し、前記正極リードをテープで被覆し、かつ前記未塗工部と対向する負極板表面に耐熱性保護膜が形成されている非水電解液二次電池。
【請求項２】
正極集電体に正極活物質を塗布した正極板と、負極集電体に負極活物質を塗布した負極板とを、隔離膜を介して捲回された電極群を有する非水電解液二次電池において、
前記正極板の長さ方向の端部以外に未塗工部が設けてあり、前記未塗工部に正極リードを接続し、かつ前記未塗工部と対向する負極板表面に耐熱性保護膜が形成されている非水電解液二次電池。
【請求項３】
前記正極活物質は、一般式$Li_xNi_{(1-y-z)}Co_yM_zO_2$（ｘは充放電で変化する変数であり、０＜ｘ＜１．１，０＜ｙ≦０．５，０≦ｚ＜０．５，ＭはＡｌ，Ｍｎ，Ｍｇ，Ｃａ，Ｆｅ，Ｔｉ，Ｚｎ，Ｓｒ，Ｂａ，Ｚｒ，Ｙ，Ｂ，Ｔａからなる群から選ばれる少なくとも１種類の元素）からなる請求項１または２に記載の非水電解液二次電池。
【発明の詳細な説明】
【技術分野】
【０００１】
本発明は非水電解液二次電池に関し、特に正極板と負極板の構造に関するものである。
【背景技術】
【０００２】
近年、ＡＶ機器あるいはパソコン等の電子機器のポータブル化、コードレス化が急速に進んでおり、これらの駆動用電源として小型、軽量で高エネルギー密度を有する非水電解液二次電池への要求が高まっている。非水電解液二次電池の代表であるリチウムイオン二次電池は、特に高電圧、高エネルギー密度を有する電池として期待が大きく、高容量化、高出力化、高信頼性の開発競争が激化してきている。非水電解液二次電池では、通常、正極集電体の両面に正極活物質を塗布した正極板と、負極集電体の両面に負極活物質を塗布した負極板の間に、隔離膜としてセパレータを介して渦巻き状に捲回した電極群を備えている。正極集電体の未塗工部と負極板がセパレータを介して対向する部分において、セパレータを貫通して、正極集電体の未塗工部と負極板が短絡し発熱する可能性があった。
【０００３】
この発熱を防止するため、電極群の巻き始め端部および巻き終わり端部に位置する正極板と負極板において、少なくとも一方の集電体における他方の電極に対向する未塗工部の一部または全部に耐熱性保護膜を設けることが提案されている（例えば、特許文献１参照）。
【特許文献１】特開２００４－６３３４３号公報
【発明の開示】
【発明が解決しようとする課題】
【０００４】
非水電解液二次電池の安全性を確認する試験として異物による内部短絡試験を採用した。この試験は、電極群を作製する際、内部短絡を故意的に起こすために、例えば、負極板上に鉄などの金属異物を予め埋め込んで作製する。その後、充放電を数回繰り返すことで内部短絡を発生させるという試験である。試験結果については、予め電池に熱電対を取り付け、電池の温度が１００℃以上に達したら「発熱した」と判断する方法である。この内部短絡が、正極集電体の未塗工部と負極活物質が塗布された負極板の間で起こった場合、大きな電流が流れ、大幅な開回路電圧の低下や、異常に発熱する可能性があるという問題があった。

【０００５】
特許文献１には次のような問題があった。一方の集電体における他方の電極に対向する未塗工部の一部または全部に耐熱性保護膜を設ける場合、耐熱性保護膜を集電体表面に形成する必要があり、耐熱性保護膜と集電体の密着性が低くなり、電極群作製時に耐熱性保護膜が剥がれ落ちるという問題があった。未塗工部は、活物質が塗布された電極部分に比べて窪んでおり、未塗工部のみに（活物質の塗工部に耐熱性保護膜がかからないように）耐熱性保護膜を塗布することが、製造工程上困難であるという問題があった。
【０００６】
さらに、未塗工部にリードを接続した場合も同様な理由で、耐熱性保護膜を緻密に形成することは製造工程上難しい。電極群の巻き始め端部の未塗工部の集電体に正極リードを設けた円筒形の非水電解液二次電池の場合、曲率半径が最も小さくなる最内周側に正極リードを溶接により接続しているため、正極リードのエッジ部が外周側の正極板にダメージを与え、正極板が切れるという新たな問題があった。
【０００７】
本発明はこのような従来の課題を解決するものであり、正極集電体の未塗工部に耐熱性保護膜を形成するのではなく、未塗工部と対向する負極合剤部に設けることにより、凹凸のきわめて少ない負極合剤層と、密着性の高い緻密な耐熱性保護膜を形成でき、内部短絡時の発熱を抑制できる非水電解液二次電池を提供することができる。
【課題を解決するための手段】
【０００８】
上記課題を解決するために、本発明の非水電解液二次電池は、
正極集電体に正極活物質を塗布した正極板と、負極集電体に負極活物質を塗布した負極板とを、隔離膜を介して捲回された電極群を有しており、前記正極板の長さ方向の端部以外に未塗工部が設けてあり、前記未塗工部に正極リードを接続し、前記正極リードをテープで被覆し、かつ前記未塗工部と対向する負極板表面に耐熱性保護膜が形成されている。
【０００９】
また、別の本発明の非水電解液二次電池は、前記正極板の長さ方向の端部以外に未塗工部が設けてあり、前記未塗工部に正極リードを接続し、かつ前記未塗工部と対向する負極板表面に耐熱性保護膜が形成されている。
【００１０】
こうすることにより、最も発熱の危険性の高い、正極集電体の未塗工部と負極活物質が塗布された負極板の間で起こった内部短絡時の発熱を抑制することができる。
【発明の効果】
【００１１】
本発明によると、正極集電体の未塗工部と負極活物質が塗布された負極板の間で起こる内部短絡が発生した場合、発熱が高温になることはなくなる。正極集電体の未塗工部と負極活物質が塗布された負極板の間のみを耐熱性保護膜で保護することによって、負極板全体を耐熱性保護膜で被覆した場合に比べ、非水電解液二次電池の体積当りのエネルギー密度を大きくすることができるという利点もある。また、正極集電体の未塗工部を正極板端部以外の部分に配置することにより、例えば、正極リードの溶着部を正極板の中央部にすることにより、電極群作製時に正極リード溶着箇所の捲回径が小さくならず、リードエッジ部による極板ダメージを大きく緩和することができる。
【発明を実施するための最良の形態】
【００１２】
本発明の実施の形態における非水電解液二次電池は、正極集電体に正極活物質を塗布した正極板と、負極集電体に負極活物質を塗布した負極板とを、隔離膜を介して捲回された電極群を有する非水電解液二次電池において、前記正極板の長さ方向の端部以外に未塗工部が設けてあり、前記正極板未塗工部に正極リードを接続し、前記正極リードをテープで被覆し、かつ前記正極板未塗工部と対向する負極板表面に耐熱性保護膜が形成されている。

【００１３】
こうすることにより、耐熱性保護膜を密着性よく、緻密に形成することができ、最も発熱の危険性の高い、正極集電体の未塗工部と負極活物質が塗布された負極板の間で起こった内部短絡時の発熱を抑制することができる。
【００１４】
本発明の別の実施の形態における非水電解液二次電池は、前記正極板の長さ方向の端部以外に未塗工部が設けてあり、前記正極板未塗工部に正極リードを接続し、かつ前記正極未塗工部と対向する負極板表面に耐熱性保護膜が形成されている。
【００１５】
こうすることにより、耐熱性保護膜を密着性よく、緻密に形成することができ、最も発熱の危険性の高い、正極集電体の未塗工部と負極活物質が塗布された負極板の間で起こった内部短絡時の発熱を抑制することができる。さらに、正極リードで発生した“ばり”による内部短絡を防止するために貼付しているテープがなくても、発熱の危険性はなくなるため、体積当りのエネルギー密度をさらに大きくすることができる
本発明の好ましい実施の形態における非水電解液二次電池は、正極活物質が一般式$Li_xNi_{(1-y-z)}Co_yM_zO_2$（ｘは充放電で変化する変数であり、０＜ｘ＜１．１，　０＜ｙ≦０．５，　０≦ｚ＜０．５，　ＭはＡｌ，Ｍｎ，Ｍｇ，Ｃａ，Ｆｅ，Ｔｉ，Ｚｎ，Ｓｒ，Ｂａ，Ｚｒ，Ｙ，Ｂ，Ｔａからなる群から選ばれる少なくとも１種類の元素）からなる。
【００１６】
こうすることにより、耐熱性保護膜を密着性よく、緻密に形成することができ、最も発熱の危険性の高い、正極集電体の未塗工部と負極活物質が塗布された負極板の間で起こった内部短絡時の発熱を抑制することができる。
【００１７】
以下、正極について詳述する。
【００１８】
正極活物質は、コバルト酸リチウム（$LiCoO_2$）やニッケル酸リチウム（以下、$LiNiO_2$と略す）などのリチウム含有遷移金属酸化物を用いることができる。また、原料が比較的安価なマンガンを用いたマンガン酸リチウム（$LiMn_2O_4$）のようなスピネル型複合酸化物を用いることもできる。
【００１９】
正極の増粘剤としては、カルボシキメチルセルロース（以下、ＣＭＣと略す）、メチルセルロース（ＭＣ）、ヒドロキシメチルセルロース（ＨＭＣ）、エチルセルロース、ポリビニルアルコール（ＰＶＡ）、酸化スターチ、リン酸化スターチ、およびガゼイン等を用いるとよい。
【００２０】
導電剤は電子伝導性材料であれば何でもよい。例えば、天然黒鉛（鱗片状黒鉛など）、人造黒鉛、膨張黒鉛などのグラファイト類、アセチレンブラック、チャンネルブラック、ファーネスブラック、およびサーマルブラック等のカ－ボンブラック類、炭素繊維、金属繊維などの導電性繊維類、銅、ニッケル等の金属粉末類およびポリフェニレン誘導体などの有機導電性材料などを単独又はこれらの混合物として含ませることができる。これらの導電剤のなかで、人造黒鉛、アセチレンブラック、炭素繊維が特に好ましい。導電剤の添加量は特に限定されないが、負極活物質に対して１～３０重量％が好ましく、さらには１～１０重量％が好ましい。
【００２１】
正極の集電体の材質は、アルミニウム（Ａｌ）、チタン（Ｔｉ）、およびタンタル（Ｔａ）等の金属またはその合金が使用できるが、軽量でエネルギー密度が有利であることから、特に、アルミニウム（Ａｌ）またはその合金を使用するのが望ましい。
【００２２】
以下、負極について詳述する。

【００２３】
負極活物質は、黒鉛系、非晶質系等の炭素材料あるいはその混合体、合金や金属化合物などが挙げられ、これらを単独もしくは２種以上を混合して用いることができる。合金は、ケイ素、スズ、アルミニウム、亜鉛、マグネシウム、チタン、およびニッケルよりなる群から選択される少なくとも一種の元素からなるのが好ましい。また、金属化合物はケイ素、スズ、アルミニウム、亜鉛、マグネシウム、チタン、およびニッケルの酸化物や炭化物よりなる群から選択される少なくとも一種である。負極活物質の平均粒径は特に限定されないが、１～３０μｍが好ましい。
【００２４】
負極板の集電体は電気化学的に安定な電子伝導体であれば何でもよく、銅、ニッケル、ステンレス等の金属が使用できるが、これらの中で薄膜に加工しやすく、低コストであることから銅箔が好ましい。厚みは特に限定されないが、５～２５μｍが好ましい。
【００２５】
正極板および負極板の製造に用いられる結着剤については、電極製造時に使用する溶媒や電解質に対して安定な材料であれば、特に限定されない。例えば、ポリフッ化ビニリデン（ＰＶＤＦ）、ポリテトラフルオロエチレン（ＰＴＦＥ）、スチレン・ブタジエンゴム（ＳＢＲ）、イソプロピレンゴム、ブタジエンゴム、およびエチレンプロピレンジエタンポリマー（ＥＰＤＭ）等を用いるとよい。
【００２６】
以下、非水電解質について詳述する。
【００２７】
非水溶媒は炭酸エステルが好ましい。炭酸エステルは、環状、鎖状のいずれも使用することができる。環状炭酸エステルとしては、プロピレンカーボネート（以下、ＰＣと略す）、エチレンカーボネート（ＥＣ）、ブチレンカーボネート（ＢＣ）等が好適に挙げられる。これらの高誘電率溶媒は、１種類、または２種類以上を組み合わせて使用してもよい。鎖状炭酸エステルとしては、例えばジメチルカーボネート（以下、ＤＭＣと略す）、ジエチルカーボネート（ＤＥＣ）、エチルメチルカーボネート（ＥＭＣ）、ジ－ｎ－プロピルカーボネート、メチル－ｎ－プロピルカーボネート、エチル－ｉ－プロピルカーボネート等が挙げられる。これらの低粘度溶媒は、１種類、または２種類以上を組み合わせて使用してもよい。環状炭酸エステルと鎖状炭酸エステルはそれぞれ任意に選択して組み合わせて使用することもできる。
【００２８】
電解質塩としては、過塩素酸リチウム（$LiClO_4$）、六フッ化リン酸リチウム（$LiPF_6$）、および四フッ化ホウ酸リチウム（$LiBF_4$）から選ばれる無機リチウム塩や、$LiCF_3SO_3$、$LiN(CF_3SO_2)_2$、$LiN(CF_3CF_2SO_2)_2$、$LiN(CF_3SO_2)(C_4F_9SO_2)$、および$LiC(CF_3SO_2)_3$などの含フッ素有機リチウム塩等が挙げられる。それら電解質塩の中でも、$LiPF_6$、もしくは$LiBF_4$が好ましい。これらの電解質塩は１種類、または２種類以上を組み合わせて用いることができる。これらの電解質塩は、上述した非水溶媒に、通常０．１～３．０ｍｏｌ／Ｌ、好ましくは０．５～２．０ｍｏｌ／Ｌの濃度になるように調製して使用するのが好ましい。
【００２９】
非水電解質には、過充電に対する耐性を高める添加剤を含ませてもよい。添加剤には、フェニル基およびそれに隣接する環状化合物基からなるベンゼン誘導体を用いることが好ましい。このようなベンゼン誘導体として、ビフェニル、シクロヘキシルベンゼン、ジフェニルエーテル、フェニルラクトンなどが挙げられる。
【００３０】
非水電解質二次電池の形状については特に限定されず、シート電極およびセパレータをスパイラル状にしたシリンダータイプ、ペレット電極およびセパレータを組み合わせたインサイドアウト構造のシリンダータイプ、ペレット電極およびセパレータを積層したコインタイプ等が使用可能である。

【００３１】
非水電解質二次電池を製造する方法については、特に限定されず、通常採用されている方法の中から適宜選択することができる。
【実施例】
【００３２】
以下、本発明の一実施の形態について説明する。
【００３３】
（実施例１）
まず、正極板の作製方法について説明する。炭酸リチウム（Li_2CO_3）と四酸化三コバルト（Co_3O_4）を混合して空気中において９００℃で焼成したコバルト酸リチウム（以下、$LiCoO_2$と略す）からなる正極活物質、アセチレンブラック（以下、ＡＢと略す）からなる導電材、およびポリフッ化ビニリデン（以下、ＰＶＤＦと略す）からなる結着剤を重量比が１００：２：３となるように混合したものを、Ｎ－メチル－２－ピロリドン（以下、ＮＭＰと略す）を分散媒として用いて混練分散して正極ペーストを作製した。正極ペーストを、集電体として厚さ１５μｍのアルミニウム箔に塗着し、乾燥した。その後、正極活物質を含む合剤層の密度が３．５～３．６ｇ／ｃｍ^{3}になるように圧延し、正極板の総厚みを０．１７ｍｍとした。未塗工部が６．５ｍｍを含む全長が６１２ｍｍ、幅５７ｍｍとなるように裁断した。この時、未塗工部は極板の長手方向端部より４０～４６．５ｍｍの位置になるように配置した。
【００３４】
次に、以下に説明する正極板１と２を作製した。
【００３５】
まず、前述の塗工部および未塗工部からなる極板の未塗工部に正極リード７を超音波溶着により接続し正極板α を作製した。
【００３６】
次に、正極板α のリードを保護するために幅９ｍｍのポリプロピレン（以下、ＰＰと略す）テープを貼付けした正極板β を作製した。
【００３７】
このとき正極板α およびβ の正極リード７は、いずれも５０～２００μｍの”ばり”が正極板とは逆向きの方向に出るようにした。
【００３８】
正極板α およびβ の概略断面図をそれぞれ図１および２に示す。
【００３９】
次に、負極板の作製方法について説明する。人造黒鉛からなる負極活物質、ＰＶＤＦからなる結着剤を重量比が１００：６となるように混合したものを、ＮＭＰを分散媒として用いて混練分散して負極ペーストを作製した。負極ペーストを集電体として厚さ１０μｍの銅箔に塗着、乾燥した。その後、負極活物質を含む合剤層の密度が１．５７ｇ／ｃｍ^{3}になるように圧延した。
【００４０】
負極板の総厚みを０．１７ｍｍとした。その後、幅５９ｍｍ、全長６４５ｍｍに裁断した後、最外周部に負極リードを溶接し、負極リードの周辺部のみにＰＰテープを貼付けした負極板α を作製した。
【００４１】
そして、負極板α 上の電極群作製時に「正極リード７と対向する箇所」に、以下に説明する耐熱性保護膜を形成した。
【００４２】
ここで言う、「正極リードと対向する箇所」とは、正極板α またはβ の未塗工部６．５ｍｍを含む長手方向１５ｍｍの範囲に対向する箇所のことを指す。
【００４３】
耐熱性保護膜は次のようにして作製した。無機酸化物フィラーとしてメディアン径０．

３μｍのアルミナ９６０ｇ、結着剤として変性アクリロニトリルゴム５００ｇ、および適量のＮＭＰを双腕式練合機に入れ、攪拌し、耐熱性保護膜前駆体ペーストを作製した。耐熱性保護膜前駆体ペーストを正極リード７と対向する負極板１上に塗布した。その後、乾燥して、厚さが６μｍの耐熱性保護膜を形成し、負極板β を作製した。

【００４４】

次に、無機酸化物フィラーとして、アルミナの代わりにチタニアを用い、これ以外は負極板α と同様の方法で負極板γ を作製した。

【００４５】

このようにして得られた正極板α、β と負極板α、β、およびγ を組み合わせて非水電解液二次電池を作製し、その組み合わせを表１に示した。セパレータとして厚さ１６μｍの微多孔性ポリエチレン樹脂を用い、それを介して正極板と負極板を捲回し、電極群ａ～ｆを作製した。また、電極群ｃ、ｆにおいて、正極リード７を接続した付近の概略横断面図をそれぞれ図３、４に示した。

【００４６】

以上のようにして作製した電極群ａ～ｆを、ニッケル（Ｎｉ）メッキを施した鉄製の円筒形の電池ケース１に収納し、電極群上下両面にポリプロピレン（ＰＰ）製絶縁板を配した。そして正負極板の各々から集電を行うために、正負極リードを正負極板の集電体からそれぞれ導出して、負極リードを電池ケース１に抵抗溶接で接続した。

【００４７】

次に、電極群が収納された電池ケース１内に、エチレンカーボネート（ＥＣ）とジエチルカーボネート（ＤＥＣ）を体積比で１：１で混合し、１モル／Ｌの六フッ化リン酸リチウム（$LiPF_6$）を溶解した非水電解液を注入した。そして、予めガスケットを組み込んだ封口板に、電極群から導出させた正極リード７を溶接した。その後、封口板を電池ケース１に装着し、カシメにより封口して、非水電解液二次電池Ａ～Ｆを作製した。それぞれの電池に用いた電極群を表１に示した。

【００４８】

【表１】

非水電解液二次電池	電極群	正極板	負極板	備考
A	a	α	α	従来電池
B	b	α	β	本発明電池
C	c	α	γ	本発明電池
D	d	β	α	従来電池
E	e	β	β	本発明電池
F	f	β	γ	本発明電池

電池Ａ～Ｆをそれぞれ１００セルずつ用意し、２５℃で充放電を１００サイクル繰り返した。充電条件は電圧４．２Ｖの定電流・定電圧方式で行い、最大電流は１５００ｍＡ、終止電流は１００ｍＡとした。放電条件は定電流方式で行い、電流は４００ｍＡ、終止電圧は３．０Ｖとした。今回作製した電池には、正極リードに意図的に“ばり”を設けているため、充放電中に正極リードの“ばり”による内部短絡で発熱する可能性がある。表２に、１００サイクル繰り返す最中に発生した発熱率を示す。

【００４９】

【表２】

非水電解液二次電池	発熱率
A	27/100
B	0/100
C	0/100
D	2/100
E	0/100
F	0/100

表２の結果から、電池Ｂ、Ｃ、Ｅ、およびＦは、電池Ａ、Ｄと比較すると、発熱率は電池Ａ、Ｄの方が多く、その違いは明らかであった。このことから、電池Ｂ、Ｃ、ＥおよびＦのように負極板表面に多孔性絶縁物を塗布した電池は発熱していない。発熱が起こった電池Ａ、Ｄを分解して短絡箇所を確認すると、正極リードと対向する位置のセパレータが黒色化しており、正極リードの”ばり”が原因で発熱していたことがわかった。

【００５０】

（実施例２）

次いで、正極活物質としてコバルト酸リチウム以外の正極活物質を使用した場合について説明する。

【００５１】

Ｎｉに対してＣｏのモル比が２０％になるように硫酸ニッケルと硫酸コバルトを水に溶解して硫酸ニッケル－コバルト混合溶液を作成した。この硫酸ニッケル－コバルト混合溶液に水酸化ナトリウムを投入して共沈させることにより、ニッケル－コバルト水酸化物を得た。得られたニッケル－コバルト水酸化物を水洗し、８０℃で乾燥して粉末状にし、ニッケル－コバルト水酸化物（$Ni_{0.8}Co_{0.2}(OH)_2$）を作製した。

【００５２】

このようにして作製したニッケル－コバルト水酸化物を、水酸化リチウム－水和物にＬｉ／（Ｎｉ＋Ｃｏ）のモル比が１／１になるように混合した。酸素雰囲気下で７００℃の温度で２０時間焼成し、粉砕して$LiNi_{0.8}Co_{0.2}O_2$を得た。

【００５３】

このようにして作製した正極活物質$LiNi_{0.8}Co_{0.2}O_2$、導電材としてＡＢ、および結着剤としてＰＶＤＦを、それぞれの重量比が１００：２：３となるように混合した。ＮＭＰを分散媒として用いて混練分散して作製した正極ペーストを、実施例１と同様にして塗着、圧延、裁断を行った。そして実施例１で記載した正極板α、βと同様に正極リード７を超音波溶着により接続して正極板γ、δを作製した。

【００５４】

この場合も、正極板γ、δの正極リード７には、５０～１００μｍの”ばり”が正極板とは逆向きの方向に出るようにした。

【００５５】

そして、実施例１と同様の負極板α、β、およびγと、正極板γ、δを組み合わせ、実施例１と同様の作製方法で電極群ｇ～ｌを作製した。電極群ｇ～ｌを用いて非水電解液二次電池Ｇ～Ｌを作製した。電池Ｇ～Ｌに用いた正極板、負極板、および電極群を表３に示した。

【００５６】

【表３】

非水電解液二次電池	電極群	正極板	負極板	備考
G	g	γ	α	従来電池
H	h	γ	β	本発明電池
I	I	γ	γ	本発明電池
J	j	δ	α	従来電池
K	k	δ	β	本発明電池
L	l	δ	γ	本発明電池

電池Ｇ～Ｌをそれぞれ１００セルずつ用意し、２５℃で充放電を１００サイクル実施した。充放電条件は実施例１と同じである。今回作製した電池には、正極リードに意図的に“ばり”を設けているため、充放電中に発熱する可能性がある。表４に、１００サイクル繰り返す最中に発生した発熱率を示す。

【００５７】

【表４】

非水電解液二次電池	発熱率
G	25/100
H	0/100
I	0/100
J	3/100
K	0/100
L	0/100

表４の結果から、電池Ｈ、Ｉ、Ｋ、およびＬは、電池Ｇ、Ｊと比較すると、発熱率は電池Ｇ、Ｊの方が多く、その違いは明らかであった。このことから、電池Ｈ、Ｉ、ＫおよびＬのように負極板表面に多孔性絶縁物を塗布した電池は発熱していない。発熱が起こった電池Ｇ、Ｊを分解して短絡箇所を確認すると、正極リードと対向する位置のセパレータが黒色化しており、正極リードの“バリ”が原因で発熱していたことがわかった。

【００５８】

以上のことから、正極リードの“ばり”が１００μｍのように大きくても、正極リードの“ばり”による内部短絡で発熱することなく、安全な非水電解液二次電池を提供することができる。

【００５９】

また、非水電解液二次電池として、リチウム二次電池について説明したが、リチウム二次電池以外のマグネシウム二次電池などの非水電解液二次電池においても、同様の効果が得られるものである。

【産業上の利用可能性】

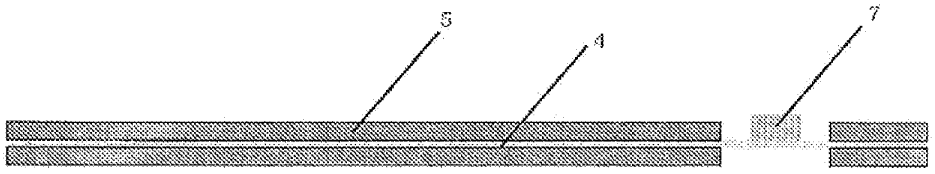
【００６０】

本発明の非水電解液二次電池は、電子機器等の主電源に有用である。例えば、携帯電話やノート型パソコン等の民生用モバイルツールの主電源、電動ドライバー等のパワーツールの主電源、およびＥＶ自動車等の産業用主電源の用途に適している。

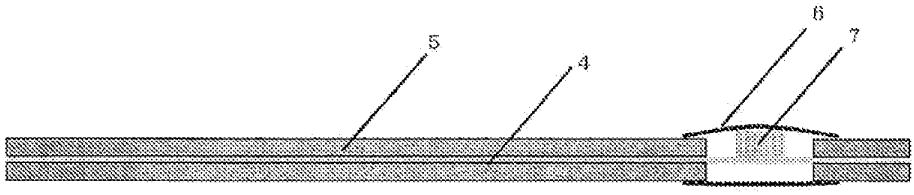
【図面の簡単な説明】

【００６１】
【図１】本発明の実施例で使用した正極板αの概略断面図
【図２】本発明の実施例で使用した正極板βの概略断面図
【図３】本発明の実施例で使用した電極群ｃの正極リード位置付近の概略横断面図
【図４】本発明の実施例で使用した電極群ｆの正極リード位置付近の概略横断面図
【符号の説明】
【００６２】
1　負極集電体
2　負極活物質
3　セパレータ
4　正極集電体
5　正極活物質
6　ＰＰテープ
7　正極リード
8　多孔性絶縁膜

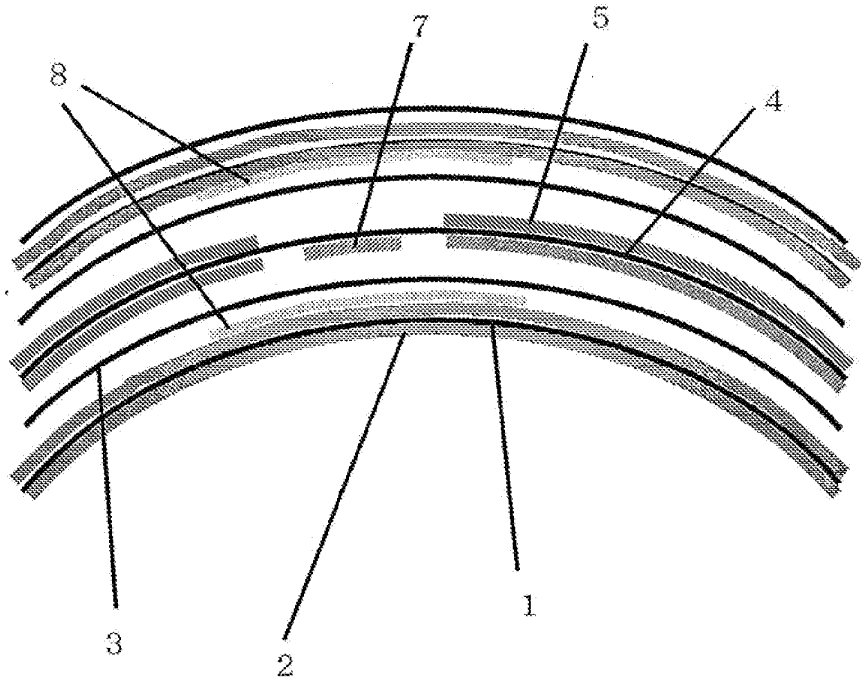
【図１】



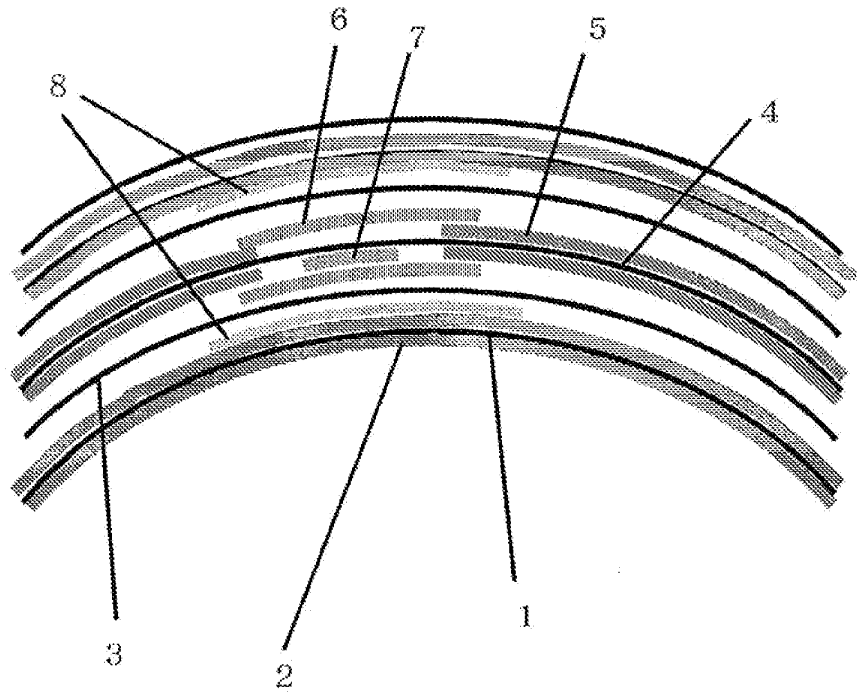
【図２】



【図３】



【図４】



フロントページの続き

Ｆターム(参考)　5H029 AJ12 AK03 AL01 AL02 AL06 AL07 AL11 AM03 AM07 BJ14
CJ05 CJ07 CJ22 DJ05 HJ02 HJ12
5H043 AA04 BA17 BA19 CA12 EA02 GA22 GA27 GA30 HA17E JA21E
KA45E LA21E
5H050 AA15 BA15 BA17 CA07 CA08 CB01 CB02 CB07 CB08 CB11
DA09 DA20 FA04 FA05 GA09 GA22 HA02 HA12

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				Art Unit	*1721*
				Examiner Name	*Barton, Jason Aaron*
Sheet	1	of	1	Attorney Docket Number	*024607-02-5119-US*

U.S. PATENT DOCUMENTS					
Examiner Initials	Cite No.	Document Number Number - Kind Code	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear

FOREIGN PATENT DOCUMENTS						
Examiner Initials	Cite No.	Foreign Patent Document Country Code – Number - Kind Code *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T
		JP1999317218A - JPH11317218A	11-16-1999	TOYOTA CENTRAL RES & DEV		
		JP1993013064A - JPH0713064A	01-17-1995	OLYMPUS OPTICAL CO		

NON PATENT LITERATURE DOCUMENTS		
Examiner Initials	Cite No.	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published
		Evaluation Report of Utility Model Patent, ZL2014200303194, 24DEC2019, 5 pgs.
		Tao, Office Action, US14/596,873, 04APR2017, 13 pgs.
		Tao, Final Office Action, US14/596,873, 22NOV2017, 13 pgs.
		Tao, Office Action, US14/596,873, 19APR2018, 12 pgs.
		Tao, Final Office Action, US14/596,873, 05DEC2018, 13 pgs.
		Tao, Office Action, US14/596,873, 22MAR2019, 14 pgs.
		Tao, Notice of Allowance, US14/596,873, 25NOV2019, 7 pgs.
		Tao, Office Action, US16/113,938, 16AUG2019, 17 pgs.
		Tao, Office Action, US16/113,938, 13FEB2020, 22 pgs.
		Tao, Office Action, US16/113,938, 02NOV2020, 14 pgs.
		Tao, Final Office Action, US16/113,938, 20MAY2021, 22 pgs.
		Tao, Advisory Action, US16/113,938, 02AUG2021, 3 pgs.
		Machine English translation of CN202495523U (Year: 2012), 6 pgs.

Examiner Signature	/JASON BARTON/	Date Considered	03/24/2023

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ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /J.B./

PE2E SEARCH - Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
L1	24	(US-41406506-$ | US-5017442-$ | US-5478668-$ | US-6100114-$ | US-6551143-$).DID. (AL-20010036574-$ | AL-20070122714-$ | AL-20090035638-$ | CN-101939873-$ | CN-103066239-$ | CN-1221054-$ | CN-1350350-$ | CN-201087907-$ | CN-202495523-$ | DB-241406506-$ | JP-1993013064-$ | JP-1999317218-$ | JP-2000277155-$ | JP-2003132875-$).DID.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/12 07:49 PM
L2	3	(US-20010036574-$ | US-20070122714-$ | US-20090035638-$).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/12 07:56 PM
L3	0	(JP-0513064-$).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/12 07:58 PM
L4	0	(JPH-0513064-$).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/12 07:58 PM
L5	0	(JP-00513064-$).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY,	OR	ON	ON	2022/07/12 07:58 PM

			CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)				
L6	4	(JP-3161778-$).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/12 07:58 PM
L7	91	(US-10135097-$ | US-10868290-$ | US-11024868-$ | US-11108118-$ | US-20100055560-$ | US-20100285370-$ | US-20170092925-$ | US-20180190963-$ | US-20180366775-$ | US-5017442-$ | US-5478668-$ | US-6100114-$ | US-6551143-$ | US-7195844-$ | US-9741988-$).DID. (CN-103367700-$ | CN-105576191-$ | CN-105990612-$ | CN-106169540-$ | CN-107534127-$ | CN-108376759-$ | CN-109888162-$ | CN-112272877-$ | CN-112582583-$ | CN-113826240-$ | CN-201087907-$ | CN-202495523-$ | CN-205355186-$ | GB-2548361-$ | JP-2005222744-$ | JP-2007294198-$ | JP-2010086754-$ | JP-2011103249-$ | JP-2013137943-$ | JP-2014241267-$ | JP-2018166080-$ | JP-4850996-$ | JP-5284933-$ | JP-5623073-$ | JP-5821913-$ | JP-	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/13 11:34 AM

		6237187-$ | JP-6288015-$ | JP-6926991-$ | KR-101489993-$ | KR-101515672-$ | KR-101980974-$ | KR-200364044-$ | KR-20060009411-$ | KR-20120022773-$ | WO-2017149977-$).DID.					
L8	4	("20020197535" | "20040191634" | "20140030607" | "20150207111").pn. OR ("11108118").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/13 11:36 AM
L9	3	("20090305120" | "20140349179" | "20150207111").pn. OR ("11024868").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/13 11:36 AM
L10	1	US-20060051662-$.did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/13 11:50 AM
L11	30	(US-10014495-$ | US-10038212-$ | US-10193125-$ | US-10312497-$ | US-10396336-$ | US-11024868-$ | US-11043700-$ | US-20060127774-$ | US-20080274410-$ | US-20110159344-$ | US-20110183191-$ | US-20130252053-$ | US-20130266845-$ | US-20130316207-$ | US-20140349179-$ | US-20160126511-$ | US-20160260954-$ | US-20180315991-$ | US-8877371-$ | US-8974944-$ | US-9159963-$ | US-9203074-$ | US-9224989-$ | US-9293744-$ | US-	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/13 11:53 AM

		9397329-$ | US-9490468-$ | US-9564626-$ | US-9595699-$ | US-9627677-$ | US-9960404-$).DID.					
L12	7	("20060111625" | "20080233474" | "20090111011" | "20130045405" | "20140120417" | "20140349179" | "20140377593").pn. OR ("11043700").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/13 11:53 AM
L13	22	((JP-2003132875-A OR CN-202495523-U OR CN-103066239-A OR CN-101939873-A OR CN-201087907-Y OR CN-1221054-C OR CN-1350350-A OR CN-1221054-A).did. AND FTDB.dbnm.) OR ((US-20140349179-A1 OR US-20140120417-A1 OR US-20090111011-A1 OR US-20080233474-A1 OR US-20130045405-A1 OR US-20040191634-A1 OR US-20060051662-A1 OR US-20090035638-A1 OR US-20070122714-A1).did. AND PGPB.dbnm.) OR ((JP-2000277155-A).did. AND JPAB.dbnm.) OR ((US-6100114-A OR US-5478668-A OR US-5017442-A).did. AND USPT.dbnm.) OR ((CN-1221054-A).did. AND FPRS.dbnm.)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/07/13 12:01 PM
L14	76440	(H01M10/0431 OR H01M10/0587 OR H01M50/531 OR H01M50/533 OR H01M50/538).cpc.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/07/13 12:03 PM

L15	5171174	(recess$7 OR pocket OR (non-coat$7 ADJ (portion OR part)) OR cavity OR hole OR gap) NEAR10 (tab$5 OR tap$5 OR lead$5)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/13 12:06 PM
L16	10212	L14 AND L15	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/13 12:06 PM
L17	953	L14 AND L15 AND @fd<"20140117"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/13 12:06 PM
L18	1	US-8795879-$.did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/13 12:22 PM
L19	1	("20090296318").pn. OR ("8795879").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/13 12:22 PM
L20	76	(US-20040126654-$ | US-20040207974-$ | US-20090296318-$ | US-20150332857-$ | US-8014127-$ | US-8218293-$ | US-8795879-$ | US-8837115-$ | US-9070511-$).DID. (CN-104137303-$ | CN-108713233-$ | CN-110706928-$ | CN-201156473-$ | EP-1580774-$ | JP-2001023866-$ | JP-2001284190-$ | JP-2006286959-$ | JP-2008147541-$ | JP-2009010070-$ | JP-2009152514-$ | JP-	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/13 12:23 PM

		2009212117-$ | JP-2009212283-$ | JP-2010074083-$ | JP-2010074089-$ | JP-2012019061-$ | JP-2012064601-$ | JP-2018157012-$ | JP-3587333-$ | JP-4413003-$ | JP-6893123-$ | JP-6953724-$ | KR-101404532-$ | KR-101434923-$ | KR-101475367-$ | KR-102079677-$ | KR-20130116836-$ | WO-2010116656-$ | WO-2021172440-$).DID.					
L21	293	L14 AND L15 AND (length NEAR10(tab$5 OR tap$5 OR lead$5)) AND @fd<"20140117"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/13 12:29 PM
L22	17297	((recess$7 OR pocket OR (non-coat$7 ADJ (portion OR part)) OR cavity OR hole OR gap) NEAR10 (energ$6 NEAR5 densit$7))	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/13 12:35 PM
L23	1	L14 AND L15 AND (length NEAR10(tab$5 OR tap$5 OR lead$5)) AND L22 AND @fd<"20140117"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/13 12:35 PM
L24	13	L14 AND L15 AND (length NEAR10(tab$5 OR tap$5 OR lead$5)) AND L22 AND @fd<"20140117"	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO))	OR	ON	ON	2022/07/13 12:37 PM
L25	5	L14 AND L15 AND (length NEAR10(tab$5 OR tap$5 OR lead$5)) AND L22 AND @pd<"20140117"	(FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/13 12:37 PM
L26	6494	(H01M10/0431 AND	(US-PGPUB; USPAT;	OR	ON	ON	2022/07/13

		H01M50/538).cpc.	USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)				12:55 PM
L27	127	L26 AND L15 AND @fd<"20140117"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/13 12:55 PM
L28	2	(US-20100124694-$ OR US-2006022937-$ OR US-20090166192-$).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/13 01:18 PM
L29	0	(US-2006022937-$).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/13 01:19 PM
L30	1	(US-20060022937-$).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/13 01:19 PM
L31	1	(US-20060222937-$).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/13 01:20 PM
L32	1	(US-6828059-$).did.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU,	OR	ON	ON	2022/07/13 01:24 PM

			CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)				
L33	1	(US-20100124694-$).did.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/13 01:25 PM
L34	1	(jp-09017410-$).did.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/13 01:25 PM
L35	1	(jp-09161837$).did.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/13 01:25 PM
L36	1	US-20070122714-$.did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/13 01:29 PM
L37	37	((JP-2003132875-A OR CN-202495523-U OR CN-103066239-A OR CN-101939873-A OR CN-201087907-Y OR CN-1221054-C OR CN-1350350-A OR CN-1221054-A).did. AND FTDB.dbnm.) OR ((US-20140349179-A1 OR	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO;	OR	ON	ON	2022/07/13 01:30 PM

		US-20140120417-A1 OR US-20090111011-A1 OR US-20110104539-A1 OR US-20110151295-A1 OR US-20010033962-A1 OR US-20090166192-A1 OR US-20080233474-A1 OR US-20130045406-A1 OR US-20120214049-A1 OR US-20110027636-A1 OR US-20060222937-A1 OR US-20130045405-A1 OR US-20130316207-A1 OR US-20130316209-A1 OR US-20130101891-A1 OR US-20120321942-A1 OR US-20040191634-A1 OR US-20060051662-A1 OR US-20090035638-A1 OR US-20070122714-A1).did. AND PGPB.dbnm.) OR ((US-9142840-B2 OR US-8837115-B2 OR US-6100114-A OR US-5478668-A OR US-5017442-A).did. AND USPT.dbnm.) OR ((KR-101475367-B1 OR CN-1221054-A).did. AND FPRS.dbnm.) OR ((JP-2000277155-A).did. AND JPAB.dbnm.)	DERWENT; IBM_TDB)				
L38	145716	(non-coat$6 OR (non ADJ coat$6) OR un-coat$6 OR (un ADJ coat$6) OR non-application$9 OR (non ADJ application$9))	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/13 01:36 PM
L39	4877	L14 AND L38	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV,	OR	ON	ON	2022/07/13 01:36 PM

			MA, OA, RU, SU, WO); FPRS; EPO; JPO)				
L40	249	L14 AND L38 AND (L38 NEAR15 (width OR length OR size OR area)) AND (L38 SAME3 (energ$7 NEAR5 dens$6))	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/13 01:37 PM
L41	23	L14 AND L38 AND (L38 NEAR15 (width OR length OR size OR area)) AND (L38 SAME3 (energ$7 NEAR5 dens$6)) AND @fd<"20140117"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/13 01:37 PM
L42	428	(H01M50/538).cpc. AND (recess$6 near15 (tab OR lead OR tap))	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/13 02:18 PM
L43	41	(H01M50/538).cpc. AND (recess$6 near15 (tab OR lead OR tap)) AND @fd<"20140117"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/13 02:18 PM
L44	507	(H01M50/5$).cpc. AND (recess$6 near15 (tab OR lead OR tap)) AND @fd<"20140117"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/13 02:22 PM
L45	114	(H01M50/538).cpc. AND (recess$6 near15 (tab OR lead OR tap)) AND @pd<"20140117"	(FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/13 02:23 PM
L46	13	("20100216001" OR "20110274953" OR "20140017565" OR "20150295270" OR "6139986" OR "20050287428" OR "20090148766" OR "20090297941" OR "20110076547" OR "20160197379" OR	(US-PGPUB; USPAT)	OR	ON	ON	2022/07/13 04:06 PM

		"7923139" OR "7955736" OR "8450006").pn.					
L47	1	US-10320024-$.did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/13 04:08 PM
L48	9	("20110104539" | "20110129708" | "20110151295" | "20120009450" | "20120321924" | "20130260203" | "20130316207" | "20140072877" | "20140302366").pn. OR ("10320024").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/13 04:08 PM
L49	0	(KR-1038115-$ OR KR-1615712-$ OR KR-20110035566-$ OR KR-20160085063-$).DID.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/13 04:12 PM
L50	4	(KR-1038115-$ OR KR-1615712-$ OR KR-20110035566-$ OR KR-20160085063-$).DID.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/13 04:12 PM
L51	4	(KR-101038115-$ OR KR-101615712-$).DID.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/13 04:13 PM
L52	45	(Artificial Intelligence) More like doc: US-20140302366-A1 Text: (US-9520588-B2 OR WO-2013038701-A1	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB,	OR	ON	ON	2022/07/13 04:14 PM

		OR JP-WO2013038701-A1 OR JP-5849234-B2 OR WO-2013038677-A1 OR JP-2014225326-A OR JP-2007109612-A OR JP-6208239-B2 OR JP-6439839-B2 OR CN-103733418-B OR CN-107431250-B OR JP-H09180761-A OR JP-2003288941-A OR KR-20030078019-A OR KR-100990800-B1 OR JP-4097443-B2 OR JP-6652125-B2 OR JP-2013073680-A OR JP-2016081881-A OR CN-103733418-A).did.	HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L53	49	(Artificial Intelligence) More like doc: WO-2013038677-A1 Text: (WO-2013038701-A1 OR JP-5849234-B2 OR JP-WO2013038701-A1 OR WO-2013038676-A1 OR JP-2014225326-A OR US-9520588-B2 OR US-20140302366-A1 OR WO-2016079943-A1 OR JP-2007109612-A OR JP-2010061893-A OR JP-2008311011-A OR WO-2018061381-A1 OR JP-2018018646-A OR JP-WO2018061381-A1 OR JP-2016122628-A OR JP-6567821-B2 OR WO-2019065871-A1 OR US-8530072-B2 OR JP-H09306471-A OR JP-2010086812-A).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/07/13 04:19 PM
L54	47	((JP-2003132875-A OR WO-2013038677-A1 OR WO-2013038676-A1 OR CN-202495523-U OR JP-6652125-B2 OR CN-103066239-A OR CN-101939873-A OR CN-201087907-Y OR CN-1221054-C OR CN-1350350-A OR CN-1221054-A).did. AND FTDB.dbnm.) OR ((US-20140349179-A1 OR	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA,	OR	ON	ON	2022/07/13 04:43 PM

		US-20140120417-A1 OR US-20090111011-A1 OR US-20110104539-A1 OR US-20110151295-A1 OR US-20010033962-A1 OR US-20090166192-A1 OR US-20140302366-A1 OR US-20130316207-A1 OR US-20080233474-A1 OR US-20130045406-A1 OR US-20120214049-A1 OR US-20110027636-A1 OR US-20060222937-A1 OR US-20130045405-A1 OR US-20130316209-A1 OR US-20130101891-A1 OR US-20120321942-A1 OR US-20100086858-A1 OR US-20150295270-A1 OR US-20120009450-A1 OR US-20040191634-A1 OR US-20060051662-A1 OR US-20090081530-A1 OR US-20090035638-A1 OR US-20070122714-A1).did. AND PGPB.dbnm.) OR ((US-9142840-B2 OR US-8837115-B2 OR US-6100114-A OR US-5478668-A OR US-5017442-A).did. AND USPT.dbnm.) OR ((JP-2014225326-A OR JP-2001015096-A OR JP-2000277155-A).did. AND JPAB.dbnm.) OR ((KR-101475367-B1 OR CN-1221054-A).did. AND FPRS.dbnm.)	VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L55	134	((("NINGDE") near3 ("AMPEREX") near3 ("TECHNOLOGY") near3 ("LIMITED"))).AS,AANM.	(USPAT)	OR	ON	ON	2022/07/13 09:28 PM
L56	137	((("NINGDE") near3 ("AMPEREX"))).AS,AANM.	(USPAT)	OR	ON	ON	2022/07/13 09:30 PM

L57	527	((("NINGDE") near3 ("AMPEREX"))).AS,AANM.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/13 09:30 PM
L58	1129	L57 AND L14	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/13 09:31 PM
L59	10	L57 AND L14 AND @pd<"20140117"	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/13 09:31 PM
L60	308	((("TAO") near3 ("Tao")) OR (("MO") near3 ("Ming") near3 ("Liang"))).INV.	(US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT)	OR	ON	ON	2022/07/14 10:56 AM
L61	2	L60 AND L14 AND @pd<"20140117"	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/14 10:57 AM
L62	130343969	L60AND @pd<"20140117"	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/14 10:57 AM
L63	2325	L60 AND @pd<"20140117"	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO);	OR	ON	ON	2022/07/14 10:57 AM

			FPRS; EPO; JPO)				
L65	0	L60 AND H01M50/5$.cpc. AND @pd<"20140117"	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/14 10:58 AM
L66	46	L60 AND H01M.cpcl. AND @pd<"20140117"	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/14 10:59 AM
L67	47	((JP-2003132875-A OR WO-2013038677-A1 OR WO-2013038676-A1 OR CN-202495523-U OR JP-6652125-B2 OR CN-103066239-A OR CN-101939873-A OR CN-201087907-Y OR CN-1221054-C OR CN-1350350-A OR CN-1221054-A).did. AND FTDB.dbnm.) OR ((US-20140349179-A1 OR US-20140120417-A1 OR US-20090111011-A1 OR US-20110104539-A1 OR US-20110151295-A1 OR US-20010033962-A1 OR US-20090166192-A1 OR US-20140302366-A1 OR US-20130316207-A1 OR US-20080233474-A1 OR US-20130045406-A1 OR US-20120214049-A1 OR US-20110027636-A1 OR US-20060222937-A1 OR US-20130045405-A1 OR US-20130316209-A1 OR US-20130101891-A1 OR US-20120321942-A1 OR US-	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/07/14 11:11 AM

		20100086858-A1 OR US-20150295270-A1 OR US-20120009450-A1 OR US-20040191634-A1 OR US-20060051662-A1 OR US-20090081530-A1 OR US-20090035638-A1 OR US-20070122714-A1).did. AND PGPB.dbnm.) OR ((US-9142840-B2 OR US-8837115-B2 OR US-6100114-A OR US-5478668-A OR US-5017442-A).did. AND USPT.dbnm.) OR ((JP-2014225326-A OR JP-2001015096-A OR JP-2000277155-A).did. AND JPAB.dbnm.) OR ((KR-101475367-B1 OR CN-1221054-A).did. AND FPRS.dbnm.)					
L68	12	(US-20050250052-$ OR US-20110003211-$).did. OR (CN-1489229-$ OR CN-101939869-$ OR CN-103262310-$ OR JP-2005283643-$).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/14 12:00 PM
L69	53	((JP-2003132875-A OR WO-2013038677-A1 OR WO-2013038676-A1 OR CN-202495523-U OR JP-6652125-B2 OR CN-103066239-A OR CN-101939873-A OR CN-201087907-Y OR CN-1221054-C OR CN-1350350-A OR CN-1221054-A OR CN-103262310-A OR CN-101939869-A OR JP-2005283643-A OR CN-1489229-A).did. AND FTDB.dbnm.) OR ((US-20140349179-A1 OR US-20140120417-A1 OR US-20090111011-A1 OR US-20110104539-A1 OR US-20110151295-A1	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/07/14 12:12 PM

		OR US-20010033962-A1 OR US-20090166192-A1 OR US-20140302366-A1 OR US-20130316207-A1 OR US-20080233474-A1 OR US-20130045406-A1 OR US-20120214049-A1 OR US-20110027636-A1 OR US-20060222937-A1 OR US-20130045405-A1 OR US-20130316209-A1 OR US-20130101891-A1 OR US-20120321942-A1 OR US-20100086858-A1 OR US-20150295270-A1 OR US-20120009450-A1 OR US-20040191634-A1 OR US-20060051662-A1 OR US-20090081530-A1 OR US-20090035638-A1 OR US-20070122714-A1 OR US-20110003211-A1 OR US-20050250052-A1).did. AND PGPB.dbnm.) OR ((US-9142840-B2 OR US-8837115-B2 OR US-6100114-A OR US-5478668-A OR US-5017442-A).did. AND USPT.dbnm.) OR ((JP-2014225326-A OR JP-2001015096-A OR JP-2000277155-A).did. AND JPAB.dbnm.) OR ((KR-101475367-B1 OR CN-1221054-A).did. AND FPRS.dbnm.)					
L70	53	((JP-2003132875-A OR WO-2013038677-A1 OR WO-2013038676-A1 OR CN-202495523-U OR JP-6652125-B2 OR CN-103066239-A OR CN-101939873-A OR CN-201087907-Y OR CN-1221054-C OR CN-1350350-A OR CN-1221054-A OR CN-103262310-A OR CN-101939869-A OR JP-	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/07/15 11:48 AM

		2005283643-A OR CN-1489229-A).did. AND FTDB.dbnm.) OR ((US-20140349179-A1 OR US-20140120417-A1 OR US-20090111011-A1 OR US-20110104539-A1 OR US-20110151295-A1 OR US-20010033962-A1 OR US-20090166192-A1 OR US-20140302366-A1 OR US-20130316207-A1 OR US-20080233474-A1 OR US-20130045406-A1 OR US-20120214049-A1 OR US-20110027636-A1 OR US-20060222937-A1 OR US-20130045405-A1 OR US-20130316209-A1 OR US-20130101891-A1 OR US-20120321942-A1 OR US-20100086858-A1 OR US-20150295270-A1 OR US-20120009450-A1 OR US-20040191634-A1 OR US-20060051662-A1 OR US-20090081530-A1 OR US-20090035638-A1 OR US-20070122714-A1 OR US-20110003211-A1 OR US-20050250052-A1).did. AND PGPB.dbnm.) OR ((US-9142840-B2 OR US-8837115-B2 OR US-6100114-A OR US-5478668-A OR US-5017442-A).did. AND USPT.dbnm.) OR ((JP-2014225326-A OR JP-2001015096-A OR JP-2000277155-A).did. AND JPAB.dbnm.) OR ((KR-101475367-B1 OR CN-1221054-A).did. AND FPRS.dbnm.)					
L71	4105191	(tape OR adhesive OR insulat$7) NEAR25 (electrode OR lead OR tab)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU,	OR	ON	ON	2022/07/15 11:49 AM

			CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)				
L72	34	L70 AND L71	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/15 11:49 AM
L73	25	L70 AND L71 AND @fd<"20140117"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/15 11:50 AM
L74	275044	(pair OR couple) NEAR10 (adhesiv$6 OR tape)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/15 03:31 PM
L75	578	L14 AND L74	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/15 03:32 PM
L76	214	L14 AND L74 AND @fd<"20140117"	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO))	OR	ON	ON	2022/07/15 03:32 PM
L77	50	L14 AND L74 AND @fd<"20140117"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/15 03:32 PM
L78	139	L14 AND L74 AND @pd<"20140117"	(FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV,	OR	ON	ON	2022/07/15 03:35 PM

			MA, OA, RU, SU, WO); FPRS; EPO; JPO)				
L79	987872	(insulat$7 ADJ4 (tape OR adhesive OR resin))	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/15 03:43 PM
L80	8568	L79 AND L14	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/15 03:44 PM
L81	6063	(insulat$7 ADJ4 (tape OR adhesive OR resin)) NEAR25 (((first AND second) OR oppos$8) ADJ surfac$7)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/15 03:44 PM
L82	175	L14 AND L81	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/15 03:44 PM
L83	14	L14 AND L81 AND @fd<"20140117"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/15 03:45 PM
L84	53	L14 AND L81 AND @fd<"20140117"	(FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO))	OR	ON	ON	2022/07/15 03:48 PM
L85	52	L14 AND L81 AND @pd<"20140117"	(FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP,	OR	ON	ON	2022/07/15 03:48 PM

			ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)				
L86	1	US-20110027636-$.did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/15 03:51 PM
L87	53	((JP-2003132875-A OR WO-2013038677-A1 OR WO-2013038676-A1 OR CN-202495523-U OR JP-6652125-B2 OR CN-103066239-A OR CN-101939873-A OR CN-201087907-Y OR CN-1221054-C OR CN-1350350-A OR CN-1221054-A OR CN-103262310-A OR CN-101939869-A OR JP-2005283643-A OR CN-1489229-A).did. AND FTDB.dbnm.) OR ((US-20140349179-A1 OR US-20140120417-A1 OR US-20090111011-A1 OR US-20110104539-A1 OR US-20110151295-A1 OR US-20010033962-A1 OR US-20090166192-A1 OR US-20140302366-A1 OR US-20130316207-A1 OR US-20110027636-A1 OR US-20080233474-A1 OR US-20130045406-A1 OR US-20120214049-A1 OR US-20060222937-A1 OR US-20130045405-A1 OR US-20130316209-A1 OR US-20130101891-A1 OR US-20120321942-A1 OR US-20100086858-A1 OR US-20150295270-A1	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/07/15 05:32 PM

		OR US-20120009450-A1 OR US-20040191634-A1 OR US-20060051662-A1 OR US-20090081530-A1 OR US-20090035638-A1 OR US-20070122714-A1 OR US-20110003211-A1 OR US-20050250052-A1).did. AND PGPB.dbnm.) OR ((US-9142840-B2 OR US-8837115-B2 OR US-6100114-A OR US-5478668-A OR US-5017442-A).did. AND USPT.dbnm.) OR ((JP-2014225326-A OR JP-2001015096-A OR JP-2000277155-A).did. AND JPAB.dbnm.) OR ((KR-101475367-B1 OR CN-1221054-A).did. AND FPRS.dbnm.)					
L88	184982	((insulat$7 OR adhesiv$6 OR tape OR glue OR resin) NEAR10 (oppos$10 OR paired OR pair$5 OR face-to-face OR corresponding)) SAME ((short ADJ circuit) OR short-circuit OR short$7)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/20 11:07 AM
L89	1468	L14 AND L88	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/20 11:07 AM
L90	137	L14 AND L88 AND @fd<"20140117"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/20 11:07 AM
L91	387	L14 AND L88 AND @pd<"20140117"	(FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/07/20 02:15 PM

L92	58	((JP-2003132875-A OR WO-2013038677-A1 OR WO-2013038676-A1 OR KR-20090027314-A OR CN-202495523-U OR WO-2013080966-A1 OR JP-6652125-B2 OR CN-103066239-A OR CN-101939873-A OR CN-201087907-Y OR CN-1221054-C OR CN-1350350-A OR CN-1221054-A OR CN-103262310-A OR CN-101939869-A OR JP-2005283643-A OR CN-1489229-A).did. AND FTDB.dbnm.) OR ((US-20140349179-A1 OR US-20140120417-A1 OR US-20110104539-A1 OR US-20110151295-A1 OR US-20010033962-A1 OR US-20140302366-A1 OR US-20130316207-A1 OR US-20110027636-A1 OR US-20110014509-A1 OR US-20100285342-A1 OR US-20060051662-A1 OR US-20090111011-A1 OR US-20080233474-A1 OR US-20130045406-A1 OR US-20120214049-A1 OR US-20090166192-A1 OR US-20060222937-A1 OR US-20130045405-A1 OR US-20130316209-A1 OR US-20130101891-A1 OR US-20120321942-A1 OR US-20100086858-A1 OR US-20150295270-A1 OR US-20120009450-A1 OR US-20040191634-A1 OR US-20090081530-A1 OR US-20130230749-A1 OR US-20090035638-A1 OR US-20070122714-A1 OR US-20110003211-	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/07/20 03:01 PM

		A1 OR US-20050250052-A1).did. AND PGPB.dbnm.) OR ((US-9142840-B2 OR US-8837115-B2 OR US-6100114-A OR US-5478668-A OR US-5017442-A).did. AND USPT.dbnm.) OR ((JP-2014225326-A OR JP-2001015096-A OR JP-2000277155-A).did. AND JPAB.dbnm.) OR ((KR-101475367-B1 OR CN-1221054-A).did. AND FPRS.dbnm.)					
L93	59	((JP-2003132875-A OR WO-2013038677-A1 OR WO-2013038676-A1 OR KR-20090027314-A OR CN-202495523-U OR WO-2013080966-A1 OR KR-20060027266-A OR JP-6652125-B2 OR CN-103066239-A OR CN-101939873-A OR CN-201087907-Y OR CN-1221054-C OR CN-1350350-A OR CN-1221054-A OR CN-103262310-A OR CN-101939869-A OR JP-2005283643-A OR CN-1489229-A).did. AND FTDB.dbnm.) OR ((US-20140349179-A1 OR US-20140120417-A1 OR US-20110104539-A1 OR US-20110151295-A1 OR US-20010033962-A1 OR US-20140302366-A1 OR US-20130316207-A1 OR US-20110027636-A1 OR US-20110014509-A1 OR US-20100285342-A1 OR US-20060051662-A1 OR US-20090111011-A1 OR US-20080233474-A1 OR US-20130045406-A1 OR US-20120214049-A1 OR US-20090166192-A1 OR US-20060222937-A1	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/09/08 04:47 PM

		OR US-20130045405-A1 OR US-20130316209-A1 OR US-20130101891-A1 OR US-20120321942-A1 OR US-20100086858-A1 OR US-20150295270-A1 OR US-20120009450-A1 OR US-20040191634-A1 OR US-20090081530-A1 OR US-20130230749-A1 OR US-20090035638-A1 OR US-20070122714-A1 OR US-20110003211-A1 OR US-20050250052-A1).did. AND PGPB.dbnm.) OR ((US-9142840-B2 OR US-8837115-B2 OR US-6100114-A OR US-5478668-A OR US-5017442-A).did. AND USPT.dbnm.) OR ((JP-2014225326-A OR JP-2001015096-A OR JP-2000277155-A).did. AND JPAB.dbnm.) OR ((KR-101475367-B1 OR CN-1221054-A).did. AND FPRS.dbnm.)					
L94	24	(US-41406506-$ | US-5017442-$ | US-5478668-$ | US-6100114-$ | US-6551143-$).DID. (AL-20010036574-$ | AL-20070122714-$ | AL-20090035638-$ | CN-101939873-$ | CN-103066239-$ | CN-1221054-$ | CN-1350350-$ | CN-201087907-$ | CN-202495523-$ | DB-241406506-$ | JP-1993013064-$ | JP-1999317218-$ | JP-2000277155-$ | JP-2003132875-$).DID.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L95	3	(US-20010036574-$ | US-20070122714-$ | US-20090035638-$).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA,	OR	ON	ON	2022/09/08 06:55 PM

			EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)				
L96	0	(JP-0513064-$).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L97	0	(JPH-0513064-$).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L98	0	(JP-00513064-$).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L99	4	(JP-3161778-$).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L100	92	(US-10135097-$ | US-10868290-$ | US-11024868-$ | US-11108118-$ | US-20100055560-$ | US-20100285370-$ | US-20170092925-$ | US-20180190963-$ | US-20180366775-$ | US-5017442-$ | US-5478668-$ | US-	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM

		6100114-$ | US-6551143-$ | US-7195844-$ | US-9741988-$).DID. (CN-103367700-$ | CN-105576191-$ | CN-105990612-$ | CN-106169540-$ | CN-107534127-$ | CN-108376759-$ | CN-109888162-$ | CN-112272877-$ | CN-112582583-$ | CN-113826240-$ | CN-201087907-$ | CN-202495523-$ | CN-205355186-$ | GB-2548361-$ | JP-2005222744-$ | JP-2007294198-$ | JP-2010086754-$ | JP-2011103249-$ | JP-2013137943-$ | JP-2014241267-$ | JP-2018166080-$ | JP-4850996-$ | JP-5284933-$ | JP-5623073-$ | JP-5821913-$ | JP-6237187-$ | JP-6288015-$ | JP-6926991-$ | KR-101489993-$ | KR-101515672-$ | KR-101980974-$ | KR-200364044-$ | KR-20060009411-$ | KR-20120022773-$ | WO-2017149977-$).DID.					
L101	4	("20020197535" | "20040191634" | "20140030607" | "20150207111").pn. OR ("11108118").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/09/08 06:55 PM
L102	3	("20090305120" | "20140349179" | "20150207111").pn. OR ("11024868").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/09/08 06:55 PM
L103	1	US-20060051662-$.did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA,	OR	ON	ON	2022/09/08 06:55 PM

			EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)				
L104	30	(US-10014495-$ | US-10038212-$ | US-10193125-$ | US-10312497-$ | US-10396336-$ | US-11024868-$ | US-11043700-$ | US-20060127774-$ | US-20080274410-$ | US-20110159344-$ | US-20110183191-$ | US-20130252053-$ | US-20130266845-$ | US-20130316207-$ | US-20140349179-$ | US-20160126511-$ | US-20160260954-$ | US-20180315991-$ | US-8877371-$ | US-8974944-$ | US-9159963-$ | US-9203074-$ | US-9224989-$ | US-9293744-$ | US-9397329-$ | US-9490468-$ | US-9564626-$ | US-9595699-$ | US-9627677-$ | US-9960404-$).DID.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L105	7	("20060111625" | "20080233474" | "20090111011" | "20130045405" | "20140120417" | "20140349179" | "20140377593").pn. OR ("11043700").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/09/08 06:55 PM
L106	22	((JP-2003132875-A OR CN-202495523-U OR CN-103066239-A OR CN-101939873-A OR CN-201087907-Y OR CN-1221054-C OR CN-1350350-A OR CN-1221054-A).did. AND FTDB.dbnm.) OR ((US-20140349179-A1 OR US-20140120417-A1 OR US-20090111011-	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/09/08 06:55 PM

		A1 OR US-20080233474-A1 OR US-20130045405-A1 OR US-20040191634-A1 OR US-20060051662-A1 OR US-20090035638-A1 OR US-20070122714-A1).did. AND PGPB.dbnm.) OR ((JP-2000277155-A).did. AND JPAB.dbnm.) OR ((US-6100114-A OR US-5478668-A OR US-5017442-A).did. AND USPT.dbnm.) OR ((CN-1221054-A).did. AND FPRS.dbnm.)					
L107	79516	(H01M10/0431 OR H01M10/0587 OR H01M50/531 OR H01M50/533 OR H01M50/538).cpc.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/09/08 06:55 PM
L108	5257187	(recess$7 OR pocket OR (non-coat$7 ADJ (portion OR part)) OR cavity OR hole OR gap) NEAR10 (tab$5 OR tap$5 OR lead$5)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L109	10494	L14 AND L15	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L110	955	L14 AND L15 AND @fd<"20140117"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/09/08 06:55 PM
L111	1	US-8795879-$.did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA,	OR	ON	ON	2022/09/08 06:55 PM

			EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)				
L112	1	("20090296318").pn. OR ("8795879").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/09/08 06:55 PM
L113	77	(US-20040126654-$ | US-20040207974-$ | US-20090296318-$ | US-20150332857-$ | US-8014127-$ | US-8218293-$ | US-8795879-$ | US-8837115-$ | US-9070511-$).DID. (CN-104137303-$ | CN-108713233-$ | CN-110706928-$ | CN-201156473-$ | EP-1580774-$ | JP-2001023866-$ | JP-2001284190-$ | JP-2006286959-$ | JP-2008147541-$ | JP-2009010070-$ | JP-2009152514-$ | JP-2009212117-$ | JP-2009212283-$ | JP-2010074083-$ | JP-2010074089-$ | JP-2012019061-$ | JP-2012064601-$ | JP-2018157012-$ | JP-3587333-$ | JP-4413003-$ | JP-6893123-$ | JP-6953724-$ | KR-101404532-$ | KR-101434923-$ | KR-101475367-$ | KR-102079677-$ | KR-20130116836-$ | WO-2010116656-$ | WO-2021172440-$).DID.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L114	293	L14 AND L15 AND (length NEAR10(tab$5 OR tap$5 OR lead$5)) AND @fd<"20140117"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/09/08 06:55 PM
L115	17601	((recess$7 OR pocket OR (non-coat$7 ADJ (portion OR part)) OR cavity OR hole OR gap) NEAR10 (energ$6 NEAR5 densit$7))	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB,	OR	ON	ON	2022/09/08 06:55 PM

			HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)				
L116	1	L14 AND L15 AND (length NEAR10(tab$5 OR tap$5 OR lead$5)) AND L22 AND @fd<"20140117"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/09/08 06:55 PM
L117	18	L14 AND L15 AND (length NEAR10(tab$5 OR tap$5 OR lead$5)) AND L22 AND @fd<"20140117"	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO))	OR	ON	ON	2022/09/08 06:55 PM
L118	8	L14 AND L15 AND (length NEAR10(tab$5 OR tap$5 OR lead$5)) AND L22 AND @pd<"20140117"	(FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L119	6698	(H01M10/0431 AND H01M50/538).cpc.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/09/08 06:55 PM
L120	127	L26 AND L15 AND @fd<"20140117"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/09/08 06:55 PM
L121	2	(US-20100124694-$ OR US-2006022937-$ OR US-20090166192-$).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L122	0	(US-2006022937-$).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB,	OR	ON	ON	2022/09/08 06:55 PM

			HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)				
L123	1	(US-20060022937-$).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L124	1	(US-20060222937-$).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L125	1	(US-6828059-$).did.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L126	1	(US-20100124694-$).did.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L127	1	(jp-09017410-$).did.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L128	1	(jp-09161837$).did.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT,	OR	ON	ON	2022/09/08 06:55 PM

			AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)				
L129	1	US-20070122714-$.did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L130	37	((JP-2003132875-A OR CN-202495523-U OR CN-103066239-A OR CN-101939873-A OR CN-201087907-Y OR CN-1221054-C OR CN-1350350-A OR CN-1221054-A).did. AND FTDB.dbnm.) OR ((US-20140349179-A1 OR US-20140120417-A1 OR US-20090111011-A1 OR US-20110104539-A1 OR US-20110151295-A1 OR US-20010033962-A1 OR US-20090166192-A1 OR US-20080233474-A1 OR US-20130045406-A1 OR US-20120214049-A1 OR US-20110027636-A1 OR US-20060222937-A1 OR US-20130045405-A1 OR US-20130316207-A1 OR US-20130316209-A1 OR US-20130101891-A1 OR US-20120321942-A1 OR US-20040191634-A1 OR US-20060051662-A1 OR US-20090035638-A1 OR US-20070122714-A1).did. AND PGPB.dbnm.) OR ((US-9142840-B2 OR US-	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/09/08 06:55 PM

		8837115-B2 OR US-6100114-A OR US-5478668-A OR US-5017442-A).did. AND USPT.dbnm.) OR ((KR-101475367-B1 OR CN-1221054-A).did. AND FPRS.dbnm.) OR ((JP-2000277155-A).did. AND JPAB.dbnm.)					
L131	147477	(non-coat$6 OR (non ADJ coat$6) OR un-coat$6 OR (un ADJ coat$6) OR non-application$9 OR (non ADJ application$9))	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L132	4977	L14 AND L38	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L133	257	L14 AND L38 AND (L38 NEAR15 (width OR length OR size OR area)) AND (L38 SAME3 (energ$7 NEAR5 dens$6))	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L134	23	L14 AND L38 AND (L38 NEAR15 (width OR length OR size OR area)) AND (L38 SAME3 (energ$7 NEAR5 dens$6)) AND @fd<"20140117"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/09/08 06:55 PM
L135	438	(H01M50/538).cpc. AND (recess$6 near15 (tab OR lead OR tap))	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO);	OR	ON	ON	2022/09/08 06:55 PM

			FPRS; EPO; JPO)				
L136	41	(H01M50/538).cpc. AND (recess$6 near15 (tab OR lead OR tap)) AND @fd<"20140117"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/09/08 06:55 PM
L137	509	(H01M50/5$).cpc. AND (recess$6 near15 (tab OR lead OR tap)) AND @fd<"20140117"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/09/08 06:55 PM
L138	112	(H01M50/538).cpc. AND (recess$6 near15 (tab OR lead OR tap)) AND @pd<"20140117"	(FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L139	13	("20100216001" OR "20110274953" OR "20140017565" OR "20150295270" OR "6139986" OR "20050287428" OR "20090148766" OR "20090297941" OR "20110076547" OR "20160197379" OR "7923139" OR "7955736" OR "8450006").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2022/09/08 06:55 PM
L140	1	US-10320024-$.did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L141	9	("20110104539" | "20110129708" | "20110151295" | "20120009450" | "20120321924" | "20130260203" | "20130316207" | "20140072877" | "20140302366").pn. OR ("10320024").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/09/08 06:55 PM
L142	0	(KR-1038115-$ OR KR-1615712-$ OR KR-20110035566-$ OR	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/09/08 06:55 PM

		KR-20160085063-$).DID.					
L143	4	(KR-1038115-$ OR KR-1615712-$ OR KR-20110035566-$ OR KR-20160085063-$).DID.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L144	4	(KR-101038115-$ OR KR-101615712-$).DID.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L145	44	(Artificial Intelligence) More like doc: US-20140302366-A1 Text: (US-9520588-B2 OR WO-2013038701-A1 OR JP-WO2013038701-A1 OR JP-5849234-B2 OR WO-2013038677-A1 OR JP-2014225326-A OR JP-2007109612-A OR JP-6208239-B2 OR JP-6439839-B2 OR CN-103733418-B OR JP-H09180761-A OR JP-2003288941-A OR KR-20030078019-A OR CN-110178250-B OR KR-100990800-B1 OR JP-WO2017149977-A1 OR JP-4097443-B2 OR JP-2013073680-A OR JP-2016081881-A OR CN-103733418-A).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/09/08 06:55 PM
L146	49	(Artificial Intelligence) More like doc: WO-2013038677-A1 Text: (WO-2013038701-A1 OR JP-5849234-B2 OR JP-WO2013038701-A1 OR WO-2013038676-A1 OR JP-2014225326-	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO,	OR	ON	ON	2022/09/08 06:55 PM

		A OR US-9520588-B2 OR US-20140302366-A1 OR WO-2016079943-A1 OR JP-2007109612-A OR JP-2010061893-A OR JP-2008311011-A OR WO-2018061381-A1 OR JP-2018018646-A OR JP-WO2018061381-A1 OR JP-2016122628-A OR JP-6567821-B2 OR WO-2019065871-A1 OR US-8530072-B2 OR JP-H09306471-A OR JP-2010086812-A).did.	MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L147	47	((JP-2003132875-A OR WO-2013038677-A1 OR WO-2013038676-A1 OR CN-202495523-U OR JP-6652125-B2 OR CN-103066239-A OR CN-101939873-A OR CN-201087907-Y OR CN-1221054-C OR CN-1350350-A OR CN-1221054-A).did. AND FTDB.dbnm.) OR ((US-20140349179-A1 OR US-20140120417-A1 OR US-20090111011-A1 OR US-20110104539-A1 OR US-20110151295-A1 OR US-20010033962-A1 OR US-20090166192-A1 OR US-20140302366-A1 OR US-20130316207-A1 OR US-20080233474-A1 OR US-20130045406-A1 OR US-20120214049-A1 OR US-20110027636-A1 OR US-20060222937-A1 OR US-20130045405-A1 OR US-20130316209-A1 OR US-20130101891-A1 OR US-20120321942-A1 OR US-20100086858-A1 OR US-20150295270-A1 OR US-20120009450-A1 OR US-20040191634-A1 OR US-20060051662-A1	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/09/08 06:55 PM

		OR US-20090081530-A1 OR US-20090035638-A1 OR US-20070122714-A1).did. AND PGPB.dbnm.) OR ((US-9142840-B2 OR US-8837115-B2 OR US-6100114-A OR US-5478668-A OR US-5017442-A).did. AND USPT.dbnm.) OR ((JP-2014225326-A OR JP-2001015096-A OR JP-2000277155-A).did. AND JPAB.dbnm.) OR ((KR-101475367-B1 OR CN-1221054-A).did. AND FPRS.dbnm.)					
L148	135	((("NINGDE") near3 ("AMPEREX") near3 ("TECHNOLOGY") near3 ("LIMITED"))).AS,AANM.	(USPAT)	OR	ON	ON	2022/09/08 06:55 PM
L149	139	((("NINGDE") near3 ("AMPEREX"))).AS,AANM.	(USPAT)	OR	ON	ON	2022/09/08 06:55 PM
L150	575	((("NINGDE") near3 ("AMPEREX"))).AS,AANM.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/09/08 06:55 PM
L151	1286	L57 AND L14	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L152	10	L57 AND L14 AND @pd<"20140117"	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L153	316	((("TAO") near3 ("Tao")) OR (("MO") near3 ("Ming") near3 ("Liang"))).INV.	(US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT)	OR	ON	ON	2022/09/08 06:55 PM
L154	2	L60 AND L14 AND	(US-PGPUB; USPAT;	OR	ON	ON	2022/09/08

		@pd<"20140117"	USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)				06:55 PM
L155	130423336	L60AND @pd<"20140117"	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L156	2325	L60 AND @pd<"20140117"	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L157	0	L60 AND H01M50/5$.cpc. AND @pd<"20140117"	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L158	46	L60 AND H01M.cpcl. AND @pd<"20140117"	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L159	47	((JP-2003132875-A OR WO-2013038677-A1 OR WO-2013038676-A1 OR CN-202495523-U OR JP-6652125-B2 OR CN-103066239-A OR CN-101939873-A	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS,	OR	ON	ON	2022/09/08 06:55 PM

		OR CN-201087907-Y OR CN-1221054-C OR CN-1350350-A OR CN-1221054-A).did. AND FTDB.dbnm.) OR ((US-20140349179-A1 OR US-20140120417-A1 OR US-20090111011-A1 OR US-20110104539-A1 OR US-20110151295-A1 OR US-20010033962-A1 OR US-20090166192-A1 OR US-20140302366-A1 OR US-20130316207-A1 OR US-20080233474-A1 OR US-20130045406-A1 OR US-20120214049-A1 OR US-20110027636-A1 OR US-20060222937-A1 OR US-20130045405-A1 OR US-20130316209-A1 OR US-20130101891-A1 OR US-20120321942-A1 OR US-20100086858-A1 OR US-20150295270-A1 OR US-20120009450-A1 OR US-20040191634-A1 OR US-20060051662-A1 OR US-20090081530-A1 OR US-20090035638-A1 OR US-20070122714-A1).did. AND PGPB.dbnm.) OR ((US-9142840-B2 OR US-8837115-B2 OR US-6100114-A OR US-5478668-A OR US-5017442-A).did. AND USPT.dbnm.) OR ((JP-2014225326-A OR JP-2001015096-A OR JP-2000277155-A).did. AND JPAB.dbnm.) OR ((KR-101475367-B1 OR CN-1221054-A).did. AND FPRS.dbnm.)	IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L160	12	(US-20050250052-$ OR US-20110003211-$).did. OR (CN-1489229-$ OR CN-	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU,	OR	ON	ON	2022/09/08 06:55 PM

		101939869-$ OR CN-103262310-$ OR JP-2005283643-$).did.	CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)				
L163	4151033	(tape OR adhesive OR insulat$7) NEAR25 (electrode OR lead OR tab)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L166	277493	(pair OR couple) NEAR10 (adhesiv$6 OR tape)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L171	997639	(insulat$7 ADJ4 (tape OR adhesive OR resin))	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L173	6138	(insulat$7 ADJ4 (tape OR adhesive OR resin)) NEAR25 (((first AND second) OR oppos$8) ADJ surfac$7)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM
L180	185922	((insulat$7 OR adhesiv$6 OR tape OR glue OR resin) NEAR10 (oppos$10 OR paired OR pair$5 OR face-to-face OR corresponding)) SAME ((short ADJ circuit) OR short-circuit OR short$7)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/08 06:55 PM

L189	10969	((precipitat$9) NEAR10 (lithium OR li!)) SAME ((short ADJ circuit) OR short-circuit OR short$7)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/09/14 12:16 PM
L195	60	((JP-2003132875-A OR WO-2013038677-A1 OR WO-2013038676-A1 OR KR-20090027314-A OR CN-202495523-U OR WO-2013080966-A1 OR KR-20060027266-A OR JP-6652125-B2 OR CN-103066239-A OR CN-101939873-A OR CN-201087907-Y OR CN-1221054-C OR CN-1350350-A OR CN-1221054-A OR CN-103262310-A OR CN-101939869-A OR JP-2005283643-A OR CN-1489229-A).did. AND FTDB.dbnm.) OR ((US-20140349179-A1 OR US-20140120417-A1 OR US-20110104539-A1 OR US-20110151295-A1 OR US-20010033962-A1 OR US-20140302366-A1 OR US-20130316207-A1 OR US-20110027636-A1 OR US-20110014509-A1 OR US-20100285342-A1 OR US-20060051662-A1 OR US-20090111011-A1 OR US-20080233474-A1 OR US-20130045406-A1 OR US-20120214049-A1 OR US-20090166192-A1 OR US-20060222937-A1 OR US-20130045405-A1 OR US-20130316209-A1 OR US-20130101891-A1 OR US-20120321942-A1 OR US-	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/09/14 01:11 PM

		20100086858-A1 OR US-20150295270-A1 OR US-20120009450-A1 OR US-20040191634-A1 OR US-20090081530-A1 OR US-20130230749-A1 OR US-20110143201-A1 OR US-20090035638-A1 OR US-20070122714-A1 OR US-20110003211-A1 OR US-20050250052-A1).did. AND PGPB.dbnm.) OR ((US-9142840-B2 OR US-8837115-B2 OR US-6100114-A OR US-5478668-A OR US-5017442-A).did. AND USPT.dbnm.) OR ((JP-2014225326-A OR JP-2001015096-A OR JP-2000277155-A).did. AND JPAB.dbnm.) OR ((KR-101475367-B1 OR CN-1221054-A).did. AND FPRS.dbnm.)					
L196	4	(JP-2007165224-A JP-4929701-B2).DID.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/10/12 09:16 AM
L197	1	US-20070172736-A1.DID.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2022/10/12 09:27 AM
L198	25	(CN-109891639-$ | EP-3121865-$ | JP-2001135298-$ | JP-2001266946-$ | JP-2005259639-$ | JP-2005310622-$ | JP-2018129459-$ | KR-20140132134-$).DID.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV,	OR	ON	ON	2023/03/22 04:39 PM

		(US-10115969-$ | US-10553892-$ | US-20210384548-$ | JP-H10241737-$ | JP-H1126008-$ | JP-H11026008-$).DID.	MA, OA, RU, SU, WO); FPRS; EPO; JPO)				
L199	144159	H01M.cpcl. AND (((tape OR adhesive OR insulat$7) NEAR25 (electrode OR lead OR tab)) SAME5 (lithium OR Li! NEAR20 precip$9 OR deposit$8))	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2023/03/24 03:49 PM
L200	1329	H01M.cpcl. AND (tape OR adhes$ OR glue) SAME (short$circuit OR (short ADJ circuit)) AND ((lithium OR li!) ADJ5 (precipit$9 OR depos$9))	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2023/03/24 03:50 PM
L201	464	H01M.cpcl. AND (tape OR adhes$ OR glue) SAME (short$circuit OR (short ADJ circuit)) AND ((lithium OR li!) ADJ5 (precipit$9 OR depos$9)) AND @pd<"20150101"	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2023/03/24 03:50 PM
L202	1905	H01M.cpcl. AND (tab$9 OR collect$9) SAME (short$circuit OR (short ADJ circuit)) AND ((lithium OR li!) ADJ5 (precipit$9 OR depos$9)) AND @pd<"20150101"	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2023/03/24 03:51 PM
L203	116	H01M.cpcl. AND ((tab$9 OR collect$9) NEAR25 (tap$9 OR adhes$9 OR glue)) SAME (short$circuit OR (short ADJ circuit)) AND ((lithium OR li!) ADJ5 (precipit$9 OR depos$9)) AND @pd<"20150101"	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO)	OR	ON	ON	2023/03/24 03:52 PM

PE2E SEARCH - Search History (Interference)

There are no Interference searches to show.

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Sale Accounting Date:03/31/2023

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17/746,755	05/17/2022	Tao TAO	024607-02-5119-US	8911

24341 7590 03/31/2023

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EXAMINER	
BARTON, JASON AARON	

ART UNIT	PAPER NUMBER
1721	

NOTIFICATION DATE	DELIVERY MODE
03/31/2023	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

donald.mixon@morganlewis.com
padocketingdepartment@morganlewis.com

Office Action Summary	Application No. 17/746,755	Applicant(s) TAO et al.	
	Examiner JASON A BARTON	Art Unit 1721	AIA (FITF) Status Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☑ Responsive to communication(s) filed on 01/24/2023.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL.** 2b) ☑ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5) ☑ Claim(s) 20-27 and 29-39 is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6) ☐ Claim(s) _____ is/are allowed.

7) ☑ Claim(s) 20-27 and 29-39 is/are rejected.

8) ☐ Claim(s) _____ is/are objected to.

9) ☐ Claim(s) _____ are subject to restriction and/or election requirement

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to **PPHfeedback@uspto.gov.**

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☑ Notice of References Cited (PTO-892)

2) ☑ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date _____.

4) ☐ Other: _____.

DETAILED ACTION

Notice of Pre-AIA or AIA Status

1. The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

Continued Examination Under 37 CFR 1.114

2. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission in the response filed 01/24/2023 (hereafter, "the response") has been entered.

Response to Arguments

3. Applicant's arguments filed in the response have been fully considered but they are not persuasive.

First, the new grounds of rejection apply Atsuo (JP2007165224A), rendering Applicant's arguments moot. Applicant did address Atsuo (prior to Atsuo being applied in any rejection in the present application). The arguments relating to Atsuo are not persuasive for the reasons given below.

Applicant's sole argument, which is applied to the various references, is that the present invention solves the problem of lithium precipitation causing short-circuiting, thereby improving the safety properties of the resulting battery (see pgs. 8-10 of the response). In particular, Applicant

argues that Kwak solves a different problem (pg. 11 of the response), and that the newly applied reference Atsuo solves a different problem (pgs. 12-13 of the response).

The arguments are not found persuasive because there is no requirement that the prior art references necessarily solve the same problem, or are applied according to the same rationale as that of Applicant. The reason or motivation to modify the reference may often suggest what the inventor has done, but for a different purpose or to solve a different problem. It is not necessary that the prior art suggest the combination to achieve the same advantage or result discovered by applicant. See, e.g., *In re Kahn,* 441 F.3d 977, 987, 78 USPQ2d 1329, 1336 (Fed. Cir. 2006). See MPEP 2144 §IV.

Applicant is invited to discuss the present rejections in an examiner's interview to advance prosecution.

Claim Rejections - 35 USC § 112

4. The following is a quotation of 35 U.S.C. 112(b):

> (b) CONCLUSION.—The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the inventor or a joint inventor regards as the invention.

The following is a quotation of 35 U.S.C. 112 (pre-AIA), second paragraph:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claim 38 is rejected under 35 U.S.C. 112(b) or 35 U.S.C. 112 (pre-AIA), second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the inventor or a joint inventor (or for applications subject to pre-AIA 35 U.S.C. 112, the applicant), regards as the invention.

6. There is insufficient antecedent basis for the term, "the first film" in claim 38. The claim is interpreted as reciting, "a first film."

Claim Rejections - 35 USC § 103

7. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

8. This application currently names joint inventors. In considering patentability of the claims the examiner presumes that the subject matter of the various claims was commonly owned as of the effective filing date of the claimed invention(s) absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and effective filing dates of each claim that was not commonly owned as of the effective filing date of the later invention in order for the examiner to consider the applicability of 35 U.S.C. 102(b)(2)(C) for any potential 35 U.S.C. 102(a)(2) prior art against the later invention.

9. Claims 20-27 and 37-39 are rejected under 35 U.S.C. 103 as being unpatentable over Sugita (WO2013038677A1) in view of Matsushita (US20140120417A1) and Atsuo (JP2007165224A).

10. **Regarding claim 20**, Sugita teaches a lithium-ion battery ([001]-[002]), comprising:

a positive electrode (positive electrode plate 1a, 1c, 1d, 1f, FIGs. 2a, 4, 5, 7; [029]; while numerous embodiments are cited, reference is made specifically to plate 1a of FIG. 2a below for brevity) comprising a positive current collector (see [027]) and a positive electrode active material layer (the active material is coated on the current collector, see [027]; e.g., FIG. 2a shows the "film" as the dark portion (no reference sign is provided)) containing $LiCoO_2$ (lithium cobalt oxide, [060]),

wherein the positive electrode active material layer is formed on the positive current collector (see [027]), the positive electrode active material layer being provided with a first recess

(exposed portion 22, FIG. 2A; [027]) accommodating a positive lead being coupled with the positive current collector (see FIG. 2a);

a negative electrode (negative electrode plate 2c, FIG. 13; [030], [056]) comprising a negative current collector (see [027]) and a negative electrode active material layer (the active material is coated on the collector, see [027]) containing graphite or silicon ([065], graphite and silicon are both disclosed),

wherein the negative electrode active material layer is formed on the negative current collector (see [027]), the negative electrode active material layer being provided with a second recess (exposed portion 31, FIG. 2b) accommodating a negative lead being coupled with the negative current collector (see FIG. 2b);

a separator (separator 3, FIG. 1; [069]) disposed between the positive electrode and the negative electrode (see FIG. 1); and

an electrolyte ([071]).

Sugita does not teach wherein, (**limitation 1**) a top surface of the positive lead is provided with a first insulating glue layer, (**limitation 2**) a surface of the positive electrode active material layer opposite to the second recess across the separator in a thickness direction of the positive plate and the negative plate is pasted with a second insulating glue layer, the second insulating glue layer has a width larger than a width of the second recess, and the second insulating glue layer has a length larger than a length of the second recess. However, Sugita does advise to provide insulation between current collecting tabs ([045]). Accordingly, the skilled person would have been motivated to provide insulation to the battery of Sugita.

However, Matsushita and Atsuo teach the deficient limitations. Matsushita relates to electrodes having exposed portions with a lead bonded thereto (abstract) and is thus analogous art.

Atsuo relates to secondary batteries having tape and heat-resisting protective membranes to prevent short circuiting and is thus analogous art (abstract and pg. 2, ¶1).

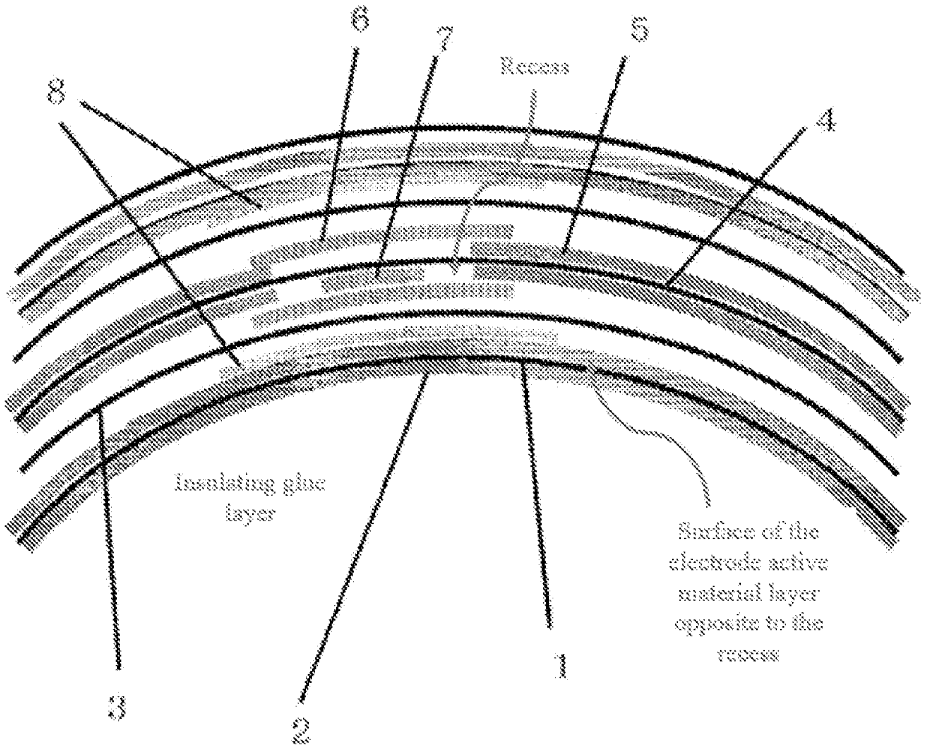
Limitation 1

Matsushita teaches a top surface of the positive lead (lead 25, see any of embodiments of Figs 4-7; in particular, see Fig. 4a) is provided with a first insulating glue layer (resin tape of protective tape 27, see [0052]).

Thus, it would have been obvious before the effective filing date of the claimed invention to incorporated the insulating glue (protective tape 27) of Matsushita to Sugita to arrive at the claimed invention wherein a top surface of the positive lead is provided with a first insulating glue layer. The skilled person would have been motivated to modify Sugita with Matsushita to insulate the electrode lead and prevent thermal runaway of the battery when, for example, the separator or the like is split in an abnormal case (Matsushita, [0052]).

Limitation 2

Atsuo teaches a surface of the electrode active material layer opposite to the recess across the separator in a thickness direction of the positive plate and the negative plate is pasted with a second insulating glue layer (see annotated FIG. 1 below).



ANNOTATED FIG. 1
(FIG. 4 of Atsuo, annotated)

The disclosure of Atsuo does not explicitly teach the verbose limitation of a second insulating glue layer has a width larger than a width of the second recess, and the second insulating glue layer has a length larger than a length of the second recess. However, Atsuo teaches that, "[a] heat resistant protective film is formed on the surface of the negative electrode plate facing the uncoated portion. By doing so, it is possible to suppress heat generation at the time of an internal short circuit occurring between the uncoated portion of the positive electrode current collector and the negative electrode plate coated with the negative electrode active material," (pg. 3, ¶¶2-3). This disclosure is held to teach the limitation because without appropriately sizing the insulating layer, it is common sense that the protective film would not be capable of performing the intended function of preventing short circuiting.

Atsuo does not specifically teach a surface of the positive electrode active material layer opposite to the second recess across the separator in a thickness direction of the positive plate in the negative plate. Rather, the opposite configuration is used as claimed by Applicant. However, Atsuo does not specifically teach that the prevention of short-circuiting is limited to when the negative electrode plate is covered with the alleged second insulating layer. Accordingly, the skilled person would have modified Sugita with Atsuo to include either (1) the second insulating layer on the positive electrode active material or, and perhaps more likely, (2) the second insulating layer on both of the positive electrode active material and the negative electrode active material (i.e., both electrode leads are protected by inclusion of the alleged second insulating layer).

Thus, it would have been obvious before the effective filing date of the claimed invention to incorporated the second insulating glue layer (porous insulating film 8) of Atsuo with Sugita to arrive at the claimed invention. In modifying Sugita with Atsuo, the skilled person would have arrived at the claimed invention wherein a surface of the positive electrode active material layer opposite to the second recess across the separator in a thickness direction of the positive plate and the negative plate is pasted with a second insulating glue layer, the second insulating glue layer has a width larger than a width of the second recess, and the second insulating glue layer has a length larger than a length of the second recess. The skilled person would have been motivated to combine Sugita with Atsuo to prevent short-circuiting (Atsuo, pg. 7, ¶9).

11. **Regarding claim 21,** Sugita in view of Matsushita and Atsuo teach the lithium-ion battery of claim 20 as described above.

Sugita also teaches wherein a distance between a center of the first recess and one end of the positive electrode active material layer is 1/4-3/4 of a length of the positive electrode active material layer (see FIG. 2a; since the length of the alleged first lead covers ~1/4 of the width of

the current collecting plate (top-to-bottom), the limitation is held to be met); and a distance between a center of the second recess and one end of the negative electrode active material layer is 1/4-3/4 of a length of the negative electrode active material layer (see FIG. 13 and claim mapping above).

12. **Regarding claims 22, 23, 24 and 25**, Sugita in view of Matsushita and Kwak teach the lithium-ion battery of claims 20 and 21 as described above.

None of Sugita, Matsushita or Atsuo teach the limitations of claim 22, 23, 24 and 25.

Claim 23 requires wherein the first recess has a length of 1- 100 mm less than a length of the positive lead, the first recess has a width of 1-10 mm larger than a width of the positive lead, the second recess has a length of 1-100 mm less than a length of the negative lead, and the second recess has a width of 1-10 mm larger than a width of the negative lead.

Claim 24 requires wherein the first recess has a length of 1- 100 mm less than a width of the positive electrode active material layer, and the second recess has a length of 1-100 mm less than a width of the negative electrode active material layer.

Claim 25 requires wherein the first recess has a depth of 0.005-0.1 mm larger than a thickness of the positive lead, and the second recess has a depth of 0.005-0.1 mm larger than a thickness of the negative lead.

However, it has been held that changes in size (dimension) are generally recognized as being within the level of ordinary skill in the art. *In re Rose*, 220 F.2d 459, 105 USPQ 237 (CCPA 1955). Where the only difference between the prior art and the claims is a recitation of relative dimensions of the claimed device, and the device having the claimed dimensions would not perform differently than the prior art device, the claimed device is not patentably distinct from the

prior art device. *Gardner v. TEC Syst., Inc.*, 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), *cert. denied*, 469 U.S. 830, 225 USPQ 232 (1984).

In the instant case, it appears that the prior art device (i.e., the combination of Sugita with Matsushita and Atsuo) have the same claimed features and any relative difference in size, dimensions, or proportions would not lead to a device that performs differently from the claimed device. Moreover, the present claims cover very broad ranges (two or three orders of magnitude) and there is no indication in the specification that such broad ranges establish the criticality of the ranges. Thus, the claimed device of claims 22, 23, 24 and 25 are not patentably distinct from Sugita in view of Matsushita and Kwak. Accordingly, it would have been obvious before the effective filing date of the claimed invention to have arrived at the claimed invention of claims 22, 23, 24 and 25 because changes in proportion (size) are within ordinary skill in the art.

13. **Regarding claim 26**, Sugita in view of Matsushita and Atsuo teach the lithium-ion battery of claim 20 as described above.

Sugita also teaches wherein a length of a portion of the positive lead in the first recess is less than a width of a remaining portion of the positive electrode active material layer from an edge of the first insulating glue layer covering the positive electrode active material layer to an edge of the positive electrode active material layer opposite to the first recess (see FIG. 2a; since the length of the alleged first lead covers ~1/4 of the width of the current collecting plate (top-to-bottom), the limitation is held to be met).

14. **Regarding claim 27**, Sugita in view of Matsushita and Atsuo teach the lithium-ion battery of claim 20 as described above.

None of Sugita, Matsushita or Atsuo teach wherein a width of a portion of the positive lead in the first recess is greater than a width of a remaining portion of the first recess not occupied by the positive lead located on one side of the positive lead.

However, it has been held that changes in dimension are generally recognized as being within the level of ordinary skill in the art. *In re Rose,* 220 F.2d 459, 105 USPQ 237 (CCPA 1955). Where the only difference between the prior art and the claims is a recitation of relative dimensions of the claimed device, and the device having the claimed dimensions would not perform differently than the prior art device, the claimed device is not patentably distinct from the prior art device. *Gardner v. TEC Syst., Inc.,* 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), *cert. denied,* 469 U.S. 830, 225 USPQ 232 (1984).

In the instant case, it does not appear that there would be any difference between the claimed device and the prior art device of Sugita in view of Matsushita and Atsuo. For at least these reasons, it would have been obvious before the effective filing date of the claimed invention to have arrived at the claimed invention of claim 27 because changes in proportion are within ordinary skill in the art.

15. **Regarding claim 37**, Sugita teaches a lithium-ion battery ([001]-[002]), comprising:

a positive electrode (positive electrode plate 1a, FIG. 2a; [029]) comprising a positive current collector (see [027]) and a positive electrode active material layer (the active material is coated on the current collector, see [027]; FIG. 2a shows the "film" as the dark portion (no reference sign is provided)) being formed on the positive current collector (see [027]), the positive electrode active material layer being provided with a first recess (exposed portion 22, FIG. 2A; [027]) accommodating a positive lead being coupled with the positive current collector (see FIG. 2a);

a negative electrode (negative electrode plate 2a, FIG. 13; [030], [056]) comprising a negative current collector (see [027]) and a negative electrode active material layer (the active material is coated on the collector, see [027]) being formed on the negative current collector (see [027]), the negative electrode active material layer being provided with a second recess (exposed portion 31, FIG. 2b) accommodating a negative lead being coupled with the negative current collector (see FIG. 2b);

a separator (separator 3, FIG. 1; [069]) disposed between the positive electrode and the negative electrode (see FIG. 1); and

an electrolyte ([071]).

Sugita does not teach wherein, (**limitation 1**) a top surface of the positive lead is provided with a first insulating glue layer, (**limitation 2**) a surface of the positive electrode active material layer opposite to the second recess across the separator in a thickness direction of the positive plate and the negative plate is pasted with a second insulating glue layer, the second insulating glue layer has a width larger than a width of the second recess, and the second insulating glue layer has a length larger than a length of the second recess. However, Sugita does advise to provide insulation between current collecting tabs ([045]). Accordingly, the skilled person would have been motivated to provide insulation to the battery of Sugita.

However, Matsushita and Atsuo teach the deficient limitations. Matsushita relates to electrodes having exposed portions with a lead bonded thereto (abstract) and is thus analogous art. Atsuo relates to secondary batteries having tape and heat-resisting protective membranes to prevent short circuiting and is thus analogous art (abstract and pg. 2, ¶1).

Limitation 1

Matsushita teaches a top surface of the positive lead (lead 25, see any of embodiments of Figs 4-7; in particular, see Fig. 4a) is provided with a first insulating glue layer (resin tape of protective tape 27, see [0052]).

Thus, it would have been obvious before the effective filing date of the claimed invention to incorporated the insulating glue (protective tape 27) of Matsushita to Sugita to arrive at the claimed invention wherein a top surface of the positive lead is provided with a first insulating glue layer. The skilled person would have been motivated to modify Sugita with Matsushita to insulate the electrode lead and prevent thermal runaway of the battery when, for example, the separator or the like is split in an abnormal case (Matsushita, [0052]).

Limitation 2

Atsuo teaches a surface of the electrode active material layer opposite to the recess across the separator in a thickness direction of the positive plate and the negative plate is pasted with a second insulating glue layer (see annotated FIG. 1 given above in relation to claim 20)

The disclosure of Atsuo does not explicitly teach the verbose limitation of a second insulating glue layer has a width larger than a width of the second recess, and the second insulating glue layer has a length larger than a length of the second recess. However, Atsuo teaches that, "[a] heat resistant protective film is formed on the surface of the negative electrode plate facing the uncoated portion. By doing so, it is possible to suppress heat generation at the time of an internal short circuit occurring between the uncoated portion of the positive electrode current collector and the negative electrode plate coated with the negative electrode active material," (pg. 3, ¶¶2-3). This disclosure is held to teach the limitation because without appropriately sizing the insulating layer, it is common sense that the protective film would not be capable of performing the intended function of preventing short circuiting.

Atsuo does not specifically teach a surface of the positive electrode active material layer opposite to the second recess across the separator in a thickness direction of the positive plate in the negative plate. Rather, the opposite configuration is used as claimed by Applicant. However, Atsuo does not specifically teach that the prevention of short-circuiting is limited to when the negative electrode plate is covered with the alleged second insulating layer. Accordingly, the skilled person would have modified Sugita with Atsuo to include either (1) the second insulating layer on the positive electrode active material or, and perhaps more likely, (2) the second insulating layer on both of the positive electrode active material and the negative electrode active material (i.e., both electrode leads are protected by inclusion of the alleged second insulating layer).

Thus, it would have been obvious before the effective filing date of the claimed invention to incorporated the second insulating glue layer (porous insulating film 8) of Atsuo with Sugita to arrive at the claimed invention. In modifying Sugita with Atsuo, the skilled person would have arrived at the claimed invention wherein a surface of the positive electrode active material layer opposite to the second recess across the separator in a thickness direction of the positive plate and the negative plate is pasted with a second insulating glue layer, the second insulating glue layer has a width larger than a width of the second recess, and the second insulating glue layer has a length larger than a length of the second recess. The skilled person would have been motivated to combine Sugita with Atsuo to prevent short-circuiting (Atsuo, pg. 7, ¶9).

16. **Regarding claim 38**, Sugita in view of Matsushita and Atsuo teach the lithium-ion battery of claim 37 as described above.

Sugita also teaches wherein a length of a portion of the positive lead in the first recess is less than a width of a remaining portion of the positive electrode active material layer from an edge of the first insulating glue layer covering the positive electrode active material layer to an edge of

the positive electrode active material layer opposite to the first recess (see FIG. 2a; since the length of the alleged first lead covers ~1/4 of the width of the current collecting plate (top-to-bottom), the limitation is held to be met).

17. **Regarding claim 39**, Sugita in view of Matsushita and Atsuo teach the lithium-ion battery of claim 37 as described above.

None of Sugita, Matsushita or Atsuo teach wherein a width of a portion of the positive lead in the first recess is greater than a width of a remaining portion of the first recess not occupied by the positive lead located on one side of the positive lead.

However, it has been held that changes in dimension are generally recognized as being within the level of ordinary skill in the art. *In re Rose*, 220 F.2d 459, 105 USPQ 237 (CCPA 1955). Where the only difference between the prior art and the claims is a recitation of relative dimensions of the claimed device, and the device having the claimed dimensions would not perform differently than the prior art device, the claimed device is not patentably distinct from the prior art device. *Gardner v. TEC Syst., Inc.*, 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), *cert. denied*, 469 U.S. 830, 225 USPQ 232 (1984).

In the instant case, it does not appear that there would be any difference between the claimed device and the prior art device of Sugita in view of Matsushita and Atsuo. For at least these reasons, it would have been obvious before the effective filing date of the claimed invention to have arrived at the claimed invention of claim 39 because changes in proportion are within ordinary skill in the art.

18. Claims 29-36 are rejected under 35 U.S.C. 103 as being unpatentable over Sugita (WO2013038677A1) in view of Matsushita (US20140120417A1), Atsuo (JP2007165224A) and Kwak (US20060051662A1).

19. **Regarding claim 29**, Sugita teaches a lithium-ion battery ([001]-[002]), comprising:

a positive electrode (positive electrode plate 1a, FIG. 2a; [029]) comprising a positive current collector (see [027]) and a positive electrode active material layer (the active material is coated on the current collector, see [027]; FIG. 2a shows the "film" as the dark portion (no reference sign is provided)) being formed on the positive current collector (see [027]), the positive electrode active material layer being provided with a first recess (exposed portion 22, FIG. 2A; [027]) accommodating a positive lead being coupled with the positive current collector (see FIG. 2a);

a negative electrode (negative electrode plate 2a, FIG. 13; [030], [056]) comprising a negative current collector (see [027]) and a negative electrode active material layer (the active material is coated on the collector, see [027]) being formed on the negative current collector (see [027]), the negative electrode active material layer being provided with a second recess (exposed portion 31, FIG. 2b) accommodating a negative lead being coupled with the negative current collector (see FIG. 2b);

a separator (separator 3, FIG. 1; [069]) disposed between the positive electrode and the negative electrode (see FIG. 1); and

an electrolyte ([071]).

Sugita does not teach wherein (**limitation 1**) a first location of a top surface of the positive lead is provided with a first insulating glue layer, (**limitation 2**) a second location of a surface of the positive electrode active material layer opposite to the second recess across the separator in a thickness direction of the positive plate and the negative plate is pasted with a second insulating glue layer, the second insulating glue layer has a width larger than a width of the second recess, and the second insulating glue layer has a length larger than a length of the second recess; and

(**limitation 3**) a third location of a surface of the positive current collector opposite to the surface of the positive current collector where the positive lead is coupled is covered with another first insulating glue layer.

However, Sugita does advise to provide insulation between current collecting tabs ([045]). Accordingly, the skilled person would have been motivated to provide insulation to the battery of Sugita, which relates to deficient limitations 1-3.

However, Matsushita, Atsuo and Kwak teach the deficient limitations. Matsushita relates to electrodes having exposed portions with a lead bonded thereto (abstract) and is thus analogous art. Atsuo relates to secondary batteries having tape and heat-resisting protective membranes to prevent short circuiting and is thus analogous art (abstract and pg. 2, ¶1). Kwak relates to a wound electrode assembly (FIG. 6) that prevents short circuiting (abstract) and is thus analogous art.

Limitation 1

Matsushita teaches (**limitation 1**) a first location of a top surface of the positive lead (lead 25, see any of embodiments of Figs 4-7; in particular, see Fig. 4a) is provided with a first insulating glue layer (resin tape of protective tape 27, see [0052]).

Thus, it would have been obvious before the effective filing date of the claimed invention to incorporated the insulating glue (protective tape 27) of Matsushita to Sugita to arrive at the claimed invention. The skilled person would have been motivated to modify Sugita with Matsushita to insulate the electrode lead and prevent thermal runaway of the battery when, for example, the separator or the like is split in an abnormal case (Matsushita, [0052]).

Limitation 2

Atsuo teaches a surface of the electrode active material layer opposite to the recess across the separator in a thickness direction of the positive plate and the negative plate is pasted with a

second insulating glue layer (see annotated FIG. 1 above provided in relation to independent claim 20).

The disclosure of Atsuo does not explicitly teach the verbose limitation of a second insulating glue layer has a width larger than a width of the second recess, and the second insulating glue layer has a length larger than a length of the second recess. However, Atsuo teaches that, "[a] heat resistant protective film is formed on the surface of the negative electrode plate facing the uncoated portion. By doing so, it is possible to suppress heat generation at the time of an internal short circuit occurring between the uncoated portion of the positive electrode current collector and the negative electrode plate coated with the negative electrode active material," (pg. 3, ¶¶2-3). This disclosure is held to teach the limitation because without appropriately sizing the insulating layer, it is common sense that the protective film would not be capable of performing the intended function of preventing short circuiting.

Atsuo does not specifically teach a surface of the positive electrode active material layer opposite to the second recess across the separator in a thickness direction of the positive plate in the negative plate. Rather, the opposite configuration is used as claimed by Applicant. However, Atsuo does not specifically teach that the prevention of short-circuiting is limited to when the negative electrode plate is covered with the alleged second insulating layer. Accordingly, the skilled person would have modified Sugita with Atsuo to include either (1) the second insulating layer on the positive electrode active material or, and perhaps more likely, (2) the second insulating layer on both of the positive electrode active material and the negative electrode active material (i.e., both electrode leads are protected by inclusion of the alleged second insulating layer).

Thus, it would have been obvious before the effective filing date of the claimed invention to incorporated the second insulating glue layer (porous insulating film 8) of Atsuo with Sugita to

arrive at the claimed invention. In modifying Sugita with Atsuo, the skilled person would have arrived at the claimed invention wherein a surface of the positive electrode active material layer opposite to the second recess across the separator in a thickness direction of the positive plate and the negative plate is pasted with a second insulating glue layer, the second insulating glue layer has a width larger than a width of the second recess, and the second insulating glue layer has a length larger than a length of the second recess. The skilled person would have been motivated to combine Sugita with Atsuo to prevent short-circuiting (Atsuo, pg. 7, ¶9).

Limitation 3

Kwak teaches (**limitation 3**) wherein a third location of a surface of the positive current collector where the positive lead is coupled is covered with another first insulating glue layer (see [040], the separator 150 has insulation tape 160 that when the battery is assembled faces the positive or negative electrode plate 130/140 after being wound; FIG. 6; "the insulation tape 160 may be coupled with the separator in a position facing the first electrode plate uncoated portion corresponding to the position of the first electrode tab." ([0041])).

Thus, it would have been obvious before the effective filing date of the claimed invention to incorporated the insulation tape (160) of Kwak to Sugita to arrive at the claimed invention. The skilled person would have been motivated to modify Sugita with Kwak to prevent short-circuiting between the first electrode plate 140 and the second electrode plate 130 (Kwak, [0060]) and to prevent heat that is generated from the electrode tab from being transferred to the separator ([0041]).

20. **Regarding claim 30,** Sugita in view of Matsushita, Atsuo and Kwak teach the lithium-ion battery of claim 29 as described above.

Sugita also teaches wherein a distance between a center of the first recess and one end of the positive electrode active material layer is 1/4-3/4 of a length of the positive electrode active material layer (see FIG. 2a; since the length of the alleged first lead covers ~1/4 of the width of the current collecting plate (top-to-bottom), the limitation is held to be met); and a distance between a center of the second recess and one end of the negative electrode active material layer is 1/4-3/4 of a length of the negative electrode active material layer (see FIG. 13 and claim mapping above).

21. **Regarding claim 31,** Sugita in view of Matsushita, Atsuo and Kwak teach the lithium-ion battery of claim 29 as described above.

Sugita also teaches wherein a distance between a center of the first recess and one end of the positive electrode active material layer is half of a length of the positive electrode active material layer, and a distance between a center of the second recess and one end of the negative electrode active material layer is half of a length of the negative electrode active material layer. See FIGS. 2a and 13, the first recess 22 (FIG. 2a) is located in the center and the second recess (see FIG. 13, the recess is not denoted by a reference numeral but is below tab 6) is also located in the center of the active material layer.

22. **Regarding claims 32, 33, and 34**, Sugita in view of Matsushita, Atsuo and Kwak teach the lithium-ion battery of claim 29 as described above.

None of Sugita, Matsushita, Atsuo or Kwak teach the limitations of claim 32, 33 and 34.

Claim 32 requires wherein the first recess has a length of 1- 100mm less than a length of the positive lead, the first recess has a width of 1-10mm larger than a width of the positive lead, the second recess has a length of 1-100mm less than a length of the negative lead, and the second recess has a width of 1-10mm larger than a width of the negative lead.

Claim 33 requires wherein the first recess has a length of 1- 100mm less than a width of the positive electrode active material layer, and the second recess has a length of 1-100mm less than a width of the negative electrode active material layer.

Claim 34 requires wherein the first recess has a depth of 0.005-0.1mm larger than a thickness of the positive lead, and the second recess has a depth of 0.005-0. 1mm larger than a thickness of the negative lead.

However, it has been held that changes in size (dimension) are generally recognized as being within the level of ordinary skill in the art. *In re Rose*, 220 F.2d 459, 105 USPQ 237 (CCPA 1955). Where the only difference between the prior art and the claims is a recitation of relative dimensions of the claimed device, and the device having the claimed dimensions would not perform differently than the prior art device, the claimed device is not patentably distinct from the prior art device. *Gardner v. TEC Syst., Inc.*, 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), *cert. denied*, 469 U.S. 830, 225 USPQ 232 (1984).

In the instant case, it appears that the prior art device (i.e., the combination of Sugita with Matsushita, Atsuo and Kwak) have the same claimed features and any relative difference in size, dimensions, or proportions would not lead to a device that performs differently from the claimed device. Moreover, the present claims cover very broad ranges (two or three orders of magnitude) and there is no indication in the specification that such broad ranges establish the criticality of the ranges. Thus, the claimed device of claims 32, 33 and 34 are not patentably distinct from Sugita in view of Matsushita, Atsuo and Kwak. Accordingly, it would have been obvious before the effective filing date of the claimed invention to have arrived at the claimed invention of claims 32, 33 and 34 because changes in proportion (size) are within ordinary skill in the art.

23. **Regarding claim 35**, Sugita in view of Matsushita, Atsuo and Kwak teach the lithium-ion battery of claim 29 as described above.

Sugita also teaches wherein a length of a portion of the positive lead in the first recess is less than a width of a remaining portion of the positive electrode active material layer from an edge of the first insulating glue layer covering the positive electrode active material layer to an edge of the positive electrode active material layer opposite to the first recess (see FIG. 2a; since the length of the alleged first lead covers ~1/4 of the width of the current collecting plate (top-to-bottom), the limitation is held to be met).

24. **Regarding claim 36**, Sugita in view of Matsushita, Atsuo and Kwak teach the lithium-ion battery of claim 29 as described above.

None of Sugita, Matsushita, Atsuo or Kwak teach wherein a width of a portion of the positive lead in the first recess is greater than a width of a remaining portion of the first recess not occupied by the positive lead located on one side of the positive lead.

However, it has been held that changes in dimension are generally recognized as being within the level of ordinary skill in the art. *In re Rose*, 220 F.2d 459, 105 USPQ 237 (CCPA 1955). Where the only difference between the prior art and the claims is a recitation of relative dimensions of the claimed device, and the device having the claimed dimensions would not perform differently than the prior art device, the claimed device is not patentably distinct from the prior art device. *Gardner v. TEC Syst., Inc.*, 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), *cert. denied*, 469 U.S. 830, 225 USPQ 232 (1984).

In the instant case, it does not appear that there would be any difference between the claimed device and the prior art device of Sugita in view of Matsushita, Atsuo and Kwak. For at least these reasons, it would have been obvious before the effective filing date of the claimed

invention to have arrived at the claimed invention of claim 36 because changes in proportion are within ordinary skill in the art.

Conclusion

25. Any inquiry concerning this communication or earlier communications from the examiner should be directed to JASON AARON BARTON whose telephone number is (571)270-3551 and email is jason.barton@uspto.gov. The examiner can normally be reached 9:00 AM to 5:00 PM.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Allison Bourke can be reached on (303)297-4684. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of published or unpublished applications may be obtained from Patent Center. Unpublished application information in Patent Center is available to registered users. To file and manage patent submissions in Patent Center, visit: https://patentcenter.uspto.gov. Visit https://www.uspto.gov/patents/apply/patent-center for more information about Patent Center and https://www.uspto.gov/patents/docx for information about filing in DOCX format. For additional questions, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/JASON BARTON/
Examiner, Art Unit 1721

/WILLIAM E MCCLAIN/
Primary Examiner, Art Unit 1721

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/746,755	05/17/2022	Tao TAO	024607-02-5119-US	8911

24341 7590 05/11/2023

Morgan, Lewis & Bockius LLP (PA)
1400 Page Mill Road
Palo Alto, CA 94304-1124

EXAMINER	
BARTON, JASON AARON	

ART UNIT	PAPER NUMBER
1721	

NOTIFICATION DATE	DELIVERY MODE
05/11/2023	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

donald.mixon@morganlewis.com
padocketingdepartment@morganlewis.com

Applicant-Initiated Interview Summary	**Application No.** 17/746,755	**Applicant(s)** TAO et al.		
	Examiner JASON A BARTON	**Art Unit** 1721	**AIA (First Inventor to File) Status** Yes	**Page** 1 of 1

All Participants (applicant, applicants representative, PTO personnel)	**Title**	**Type**
JASON A BARTON	Examiner	Video Conference
YALEI SUN	Attorney of Record	

Date of Interview: 04 May 2023

Issues Discussed:

35 U.S.C. 103

Examiner and Applicant's counsel discussed the draft declaration of TAO TAO (see attachment) in relation to related application 17/407,081. Examiner indicated that the arguments presented at section 7 of the declaration could advance prosecution if accompanied by amendment. Examiner suggested to advance prosecution by requiring the positive electrode does not include an insulating glue layer across the separator.

Applicant's counsel followed-up the interview with proposed claim language. Examiner indicated the proposed claim language would overcome the rejection of record and advance prosecution. See attachments.

☑ Attachment

/JASON BARTON/ Examiner, Art Unit 1721	/WILLIAM E MCCLAIN/ Primary Examiner, Art Unit 1721

Applicant is reminded that a complete written statement as to the substance of the interview must be made of record in the application file. It is the applicants responsibility to provide the written statement, unless the interview was initiated by the Examiner and the Examiner has indicated that a written summary will be provided. See MPEP 713.04
Please further see:
MPEP 713.04
Title 37 Code of Federal Regulations (CFR) § 1.133 Interviews, paragraph (b)
37 CFR § 1.2 Business to be transacted in writing

Applicant recordation instructions: The formal written reply to the last Office action must include the substance of the interview. (See MPEP section 713.04). If a reply to the last Office action has already been filed, applicant is given a non-extendable period of the longer of one month or thirty days from this interview date, or the mailing date of this interview summary form, whichever is later, to file a statement of the substance of the interview.

Examiner recordation instructions: Examiners must summarize the substance of any interview of record. A complete and proper recordation of the substance of an interview should include the items listed in MPEP 713.04 for complete and proper recordation including the identification of the general thrust of each argument or issue discussed, a general indication of any other pertinent matters discussed regarding patentability and the general results or outcome of the interview, to include an indication as to whether or not agreement was reached on the issues raised.

Application of:	Tao Tao et al.	Confirmation No.:	2876
Serial No.:	17/407,081	Art Unit:	1721
Filed:	August 19, 2021	Examiner:	Barton, Jason Aaron
For:	*Lithium-Ion Battery Having Desirable Safety Performance*	Attorney Docket No.:	024607-02-5113-US

1. (Currently Amended) A lithium-ion battery, comprising:

a first plate comprising a first current collector, a first film and a first lead, wherein the first film is disposed on the first current collector and is provided with a first recess configured to receive the first lead, and the first lead is electrically connected to the first current collector;

a first insulating glue layer, disposed on a first location of a surface of the first lead;

a second plate comprising a second current collector, a second film and a second lead, wherein the second film is disposed on the second current collector and is provided with a second recess configured to receive the second lead, and the second lead is electrically connected to the second current collector; and

a separator disposed between the first plate and the second plate;

wherein a length of a portion of the first lead in the first recess is less than a width of a remaining portion of the first film from an edge of the first insulating glue layer covering the first film to an edge of the first film opposite to the first recess; and a second insulating glue layer is disposed on a second location of the surface of the first film ~~corresponding~~ opposite to the second lead across the separator in a thickness direction of the first plate and the second plate and there is no insulating glue layer disposed on the surface of the second film opposite to the first lead across the separator in the thickness direction of the first plate and the second plate;

the first plate is a positive plate, the first current collector is a positive current collector, the first film is a positive film, the first lead is a positive lead; and

the second plate is a negative plate, the second current collector is a negative current collector, the second film is a negative film and the second lead is a negative lead.

Application of:	Tao Tao et al.	Confirmation No.:	8911
Serial No.:	17/746,755	Art Unit:	1721
Filed:	May 17, 2022	Examiner:	Barton, Jason Aaron
For:	*Lithium-Ion Battery Having Desirable Safety Performance*	Attorney Docket No.:	024607-02-5119-US

20. (Currently Amended) A lithium-ion battery, comprising:

a positive electrode comprising a positive current collector and a positive electrode active material layer containing $LiCoO_2$, wherein the positive electrode active material layer is formed on the positive current collector, the positive electrode active material layer being provided with a first recess accommodating a positive lead being coupled with the positive current collector;

a negative electrode comprising a negative current collector and a negative electrode active material layer containing graphite or silicon, wherein the negative electrode active material layer is formed on the negative current collector, the negative electrode active material layer being provided with a second recess accommodating a negative lead being coupled with the negative current collector;

a separator disposed between the positive electrode and the negative electrode; and

an electrolyte,

wherein, a top surface of the positive lead is provided with a first insulating glue layer, a surface of the positive electrode active material layer opposite to the second recess across the separator in a thickness direction of the positive plate and the negative plate is pasted with a second insulating glue layer, the second insulating glue layer has a width larger than a width of the second recess, and the second insulating glue layer has a length larger than a length of the second recess, and there is no insulating glue layer disposed on the surface of the negative electrode active material layer opposite to the second lead across the separator in the thickness direction of the positive plate and the negative plate.

Barton, Jason

From: Barton, Jason
Sent: Thursday, May 4, 2023 12:48 PM
To: Sun, Yalei
Subject: RE: Phone Interview Agenda for US Application No. 17/407,081

Hi Mr. Sun,

These amendments will advance prosecution of both applications and are supported by the specification. Since we ended up discussing both applications today I will submit an interview summary in both cases.

Please let me know if you have any further questions. Otherwise, I look forward to reviewing the amendments upon formal filing. Thank you.

Best regards,

Jason Barton
Junior Patent Examiner | AU 1721
Email: jason.barton@uspto.gov
Ph.: (571)-270-3551

From: Sun, Yalei <yalei.sun@morganlewis.com>
Sent: Thursday, May 4, 2023 12:32 PM
To: Barton, Jason <Jason.Barton@uspto.gov>
Subject: RE: Phone Interview Agenda for US Application No. 17/407,081

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Examiner Barton,

Thanks for your time for having the phone interview.

Please find the proposed amendments to claim 1 of the '081 application and claim 20 of the '755 application (which has incorporated claim 21).

I highlighted the claim language we discussed today during the phone interview.

Thanks,

Yalei Sun | 孙亚雷
Morgan, Lewis & Bockius LLP
1400 Page Mill Road | Palo Alto, CA 94304
Direct: +1.650.843.7558 | Main: +1.650.843.4000 | Fax: +1.650.843.4001
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Assistant: Cheryl A. Rogers | +1.650.843.7839 | cheryl.rogers@morganlewis.com

From: Barton, Jason <jason.Barton@uspto.gov>
Sent: Monday, May 1, 2023 9:02 AM
To: Sun, Yalei <yalei.sun@morganlewis.com>
Subject: RE: Phone Interview Agenda for US Application No. 17/407,081

[EXTERNAL EMAIL]
Hi Mr. Sun,

I just sent you a meeting request for 11:00 AM PT on Thursday.

Best regards,

Jason Barton
Junior Patent Examiner | AU 1721
Email: jason.barton@uspto.gov
Ph.: (571)-270-3551

From: Sun, Yalei <yalei.sun@morganlewis.com>
Sent: Monday, May 1, 2023 9:58 AM
To: Barton, Jason <jason.Barton@uspto.gov>
Subject: RE: Phone Interview Agenda for US Application No. 17/407,081

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Examiner Barton,

I got your voicemail.

I am available for the phone interview on Wednesday or Thursday morning before 12 PM PT.

Please let me know if this works for you.

Thanks,
Yalei Sun | 孙亚雷
Morgan, Lewis & Bockius LLP
1400 Page Mill Road | Palo Alto, CA 94304
Direct: +1.650.843.7558 | Main: +1.650.843.4000 | Fax: +1.650.843.4001
yalei.sun@morganlewis.com | www.morganlewis.com
Assistant: Cheryl A. Rogers | +1.650.843.7839 | cheryl.rogers@morganlewis.com

From: Barton, Jason <jason.Barton@uspto.gov>
Sent: Sunday, April 30, 2023 8:15 PM
To: Sun, Yalei <yalei.sun@morganlewis.com>
Subject: RE: Phone Interview Agenda for US Application No. 17/407,081

[EXTERNAL EMAIL]

Hi Mr. Sun,

I apologize but I need to cancel our interview for tomorrow.

I will contact you on Monday to reschedule. If you don't hear from me, please give me a call. Thanks.

Best regards,

Jason Barton
Junior Patent Examiner | AU 1721
Email: jason.barton@uspto.gov
Ph.: (571)-270-3551

From: Barton, Jason
Sent: Wednesday, April 19, 2023 1:06 PM
To: Sun, Yalei <yalei.sun@morganlewis.com>
Subject: RE: Phone Interview Agenda for US Application No. 17/407,081

Mr. Sun,

Sure, I just sent you a MS Teams meeting invite for 4 PM ET next Monday, April 24.

Best regards,

Jason Barton
Junior Patent Examiner | AU 1721
Email: jason.barton@uspto.gov
Ph.: (571)-270-3551

From: Sun, Yalei <yalei.sun@morganlewis.com>
Sent: Wednesday, April 19, 2023 12:20 PM
To: Barton, Jason <Jason.Barton@uspto.gov>
Subject: RE: Phone Interview Agenda for US Application No. 17/407,081

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Examiner Barton,

How about 4 PM ET, 1 PM PT on Monday, April 24? Is it okay if we can discuss this case over Teams?

Thanks,

Yalei Sun | 孙亚雷
Morgan, Lewis & Bockius LLP
1400 Page Mill Road | Palo Alto, CA 94304
Direct: +1.650.843.7558 | Main: +1.650.843.4000 | Fax: +1.650.843.4001
yalei.sun@morganlewis.com | www.morganlewis.com
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From: Barton, Jason <jason.Barton@uspto.gov>
Sent: Wednesday, April 19, 2023 10:39 AM
To: Sun, Yalei <yalei.sun@morganlewis.com>
Subject: RE: Phone Interview Agenda for US Application No. 17/407,081

[EXTERNAL EMAIL]
Hi Mr. Sun,

Do you have availability between 2:00-4:30 PM ET for an interview on next Monday, April 24th?

Best regards,

Jason Barton
Junior Patent Examiner | AU 1721
Email: jason.barton@uspto.gov
Ph.: (571)-270-3551

From: Sun, Yalei <yalei.sun@morganlewis.com>
Sent: Saturday, April 15, 2023 5:44 PM
To: Barton, Jason <jason.Barton@uspto.gov>
Subject: RE: Phone Interview Agenda for US Application No. 17/407,081

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Examiner Barton,

I am following up with you about the outstanding OA.

Last week, I left you a voicemail to have a phone interview for the above-identified matter.

Attached is a 1.132 declaration from Mr. Tao TAO, the first inventor of the pending application. I would like to discuss it with you during the phone interview.

Thanks,

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yalei.sun@morganlewis.com | www.morganlewis.com
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From: Sun, Yalei
Sent: Monday, September 12, 2022 5:47 PM
To: jason.barton@uspto.gov
Subject: Phone Interview Agenda for US Application No. 17/407,081

Examiner Barton,

Please find the phone interview agenda for this matter.

Looking forward to talking to you on Wednesday at 1 PM ET and 10 AM PT.

Thanks,

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application of:	Tao Tao et al.	Confirmation No.:	2876
Serial No.:	17/407,081	Art Unit:	1721
Filed:	August 19, 2021	Examiner:	Barton, Jason Aaron
For:	*Lithium-Ion Battery Having Desirable Safety Performance*	Attorney Docket No.:	024607-02-5113-US

DECLARATION OF TAO TAO UNDER 37 C.F.R. § 1.132

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

I, TAO TAO, declare that:

1. I am currently employed at the department of battery core design of Amperex Technology Co., Limited (ATL). My current title is Senior Manager.
2. I have a technical background in support of the statements made herein below. My qualifications include a BS degree and a MS degree at Harbin Engineering University, majoring in chemical engineering and approximately 14 years of experience developing secondary batteries. I have been listed as a named inventor for 13 US and Chinese patents/patent applications.
3. I am familiar with the instant application, Serial No. 16/453,789, and am listed as the first-named inventor.
4. I have read and reviewed the English translation of JP 2007165224A (Atsuo), which was cited by the Examiner.
5. I intend this declaration to highlight, for the Examiner's consideration, the differences between (i) the technical problem addressed by the pending

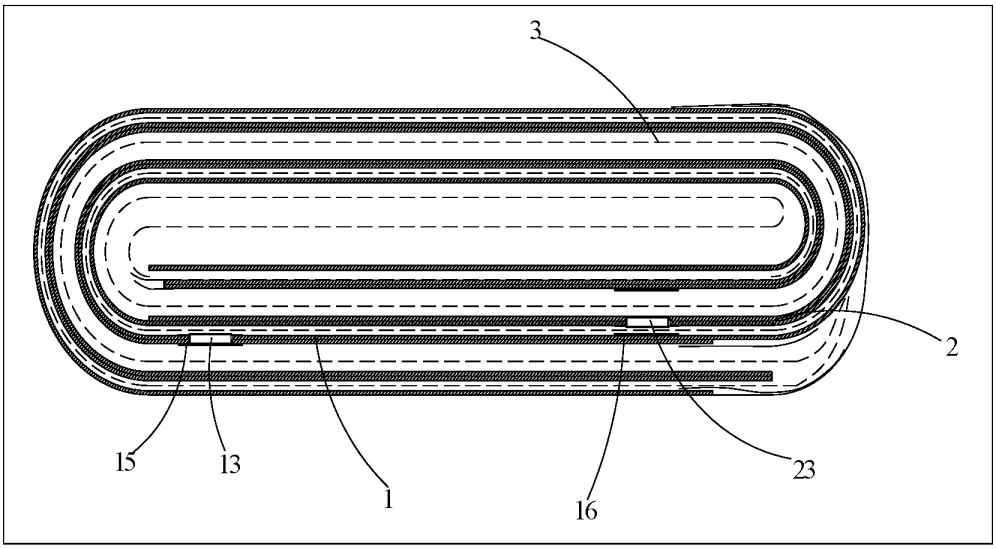
application and its associated solution covered by the pending claims and (ii) the technical problem addressed by Atsuo.

6. The experimental data, as discussed in paragraphs [0005], [0024], and [0078] of the instant application and illustrated in Table 1 of the instant application, demonstrates that there is a strong correlation between internal short circuit and lithium precipitation in the conventional design of secondary battery (e.g., Comparative Example 1). For reference, Table 1 of the instant application is reproduced below (with emphasis).

Table 1 **Short circuit** and **lithium precipitation** on the negative plate occurs to lithium-ion batteries according to Examples 1 to 3 and Comparative Example 1 after cycle test

Group	Number of batteries occurring **short circuit** after 300 cycles	Number of batteries occurring **lithium precipitation** on the negative plate after 100 cycles
Example 1	0	0
Example 2	0	1
Example 3	1	0
Comparative Example 1	**5**	**7**

7. It is my personal knowledge and belief that one cause behind the frequent short circuits occurring in the Comparative Example 1 is that "[t]he surface of the positive film 12 corresponding to the second recess 24 has **no second insulating glue layer 16** pasted thereon." [0074] of the instant application. For reference, FIG. 5 of the instant application is reproduced below to highlight the location of the second insulating glue layer 16 according to the invention of the instant application.



8. During the charging process of a lithium-ion battery, lithium ions migrate from the positive plate 1 to the negative plate 2 through the electrolyte and the separator (represented by the dashed line in FIG. 5). At the negative plate 2, the lithium ions become embedded in the porous electrode material in a process known as intercalation. But when there is not sufficient amount of porous electrode material at the negative plate 2 for intercalating the lithium ions, the extra amount of lithium ions end up being combined with electrons on the surface of the negative plate 2, therefore triggering lithium precipitation.
9. As shown in FIG. 5 of the instant application above, the negative film of the negative plate 2 corresponding to the location of the negative lead 23 has been removed to form the second recess 24 for hosting the negative lead 23. Therefore, there is a reduction of negative active material on the negative plate 2 when compared with the positive active material on the positive plate 1 located on other side of the second insulating glue layer 16. Without the second insulating glue layer 16 covering the surface of the positive plate 1 at the location specified in the claim 1 of the instant application, an extra amount of lithium ions would arrive at the surface of the negative plate 2 and result in lithium precipitation near the negative lead 23.
10. In contrast, with the second insulating glue layer 16 covering the surface of the positive plate 1 at the location specified in the claim 1 of the instant application,

most of lithium ions in the positive active material of the positive plate 1 covered by the second insulating glue layer 16 would not be able to arrive at the surface of the negative plate 2 and cause lithium precipitation on the negative plate 2 near the negative lead 23.

11. It is my understanding and belief that our innovative secondary battery design of deploying the second insulating glue layer 16 on the surface of the positive plate 1 opposite to the second recess 24 across the separator as claimed in the independent claim 1 is the key to the significant reduction of internal short circuit as demonstrated by the experimental data shown in Table 1 above, which is the result of 1 year of complicated and extensive design and experimentation.
12. It is my understanding and belief that the technical problem addressed by Atsuo is different from ours as described above. For reference, the English translation of the "problem to be solved" and the "solution" of the abstract Atsuo is provided below (with emphasis):

> "Problem to be solved - When an **internal short circuit occurs between the uncoated part of the positive current collector and the negative electrode plate coated with negative active material**, a large current may flow and there is a possibility of causing a significant decrease in open circuit voltage and generating heat."
>
> "Solution - In a non-aqueous electrolyte secondary battery with an electrode group wound via a separator, comprising a positive electrode plate coated with a positive active material and a negative electrode plate coated with a negative active material on a negative current collector, an uncoated part is provided on the positive electrode plate except for the longitudinal end. **A positive lead is connected to the uncoated part of the positive electrode plate, the positive lead is covered with tape, and a heat-resistant protective film is formed on the surface of the negative electrode plate facing the uncoated part of the positive electrode plate.**"

13. As highlighted above and illustrated in FIG. 4 of Atsuo (reproduced below with annotation), the location of the short circuit to be addressed by Atsuo is near the uncoated part of the **positive current collector** 4 and the **negative electrode plate** 1 coated with negative active material 2. Note that this location is completely opposite to the location of internal short circuit to be addressed by the instant application, i.e., near the uncoated part of the **negative current collector**