



Claims

1. An electrode, comprising:

a current collector;

a first active material layer comprising a first active material; and

a second active material layer comprising a second active material;

wherein the first active material layer is arranged between the current collector and the second active material layer; the first active material layer is formed on at least one surface of the current collector, and an average particle size of the first active material layer is less than an average particle size of the second active material layer; wherein a total compaction density of the first active material layer and the second active material layer is greater than 3.2 g/cc; a compaction density of the first active material layer is lower than a compaction density of the second active material layer; and the first active material comprises lithium iron phosphate.

2. The electrode according to claim 1, wherein a ratio of the average particle size of the second active material to the average particle size of the first active material is greater than 1 and smaller than or equal to 40.

3. The electrode according to claim 1, wherein the first active material has an average particle size in a range of 0.2 μm to 15 μm .

4. The electrode according to claim 1, wherein a compaction density of the first active material layer is greater than 2.8 g/cc, and a compaction density of the second active material layer is greater than 3.3 g/cc.

5. The electrode according to claim 1, wherein the first active material layer has a particle size of 90% accumulative volume of less than 40 μm .

6. The electrode according to claim 1, wherein the first active material layer has a thickness of 2 μm -30 μm .

7. The electrode according to claim 1, wherein the second active material layer has a thickness of more than 30 μm .

8. The electrode according to claim 1, wherein the first active material further comprises one or more of lithium cobaltate, lithium manganate, lithium nickelate, lithium nickel cobalt manganese oxide, lithium iron manganese phosphate, lithium vanadium phosphate, lithium vanadyl phosphate, lithium-rich manganese-based materials, lithium nickel cobalt aluminate, and lithium titanate.

9. The electrode according to claim 1, wherein the second active material comprises one selected from the group consisting of: lithium cobaltate, lithium nickel cobalt manganese oxide, lithium nickel cobalt aluminum oxide, lithium-rich manganese-based material, lithium iron phosphate, and combinations thereof.

10. The electrode according to claim 1, wherein the first active material comprises one selected from the group consisting of: artificial graphite, natural graphite, mesocarbon microbeads, soft carbon, hard carbon, silicon, silicon carbide, lithium titanate, and combinations thereof.

11. The electrode according to claim 1, wherein each of the first active material layer and



the second active material layer further comprises a binder; a content of the binder in the first active material layer is greater than a content of the binder in the second active material layer.

12. The electrode according to claim 11, wherein the binder comprises one selected from the group consisting of: polyvinylidene fluoride, vinylidene fluoride-hexafluoropropylene copolymer, polyamide, polyacrylonitrile, polyacrylates, polyacrylic acids, polyacrylic acid salt, carboxymethylcellulose sodium, polyethylene pyrrolidone, polyvinyl ether, polymethyl methacrylate, polytetrafluoroethylene, poly-hexafluoropropylene and styrene butadiene rubber, and combinations thereof.

13. A lithium-ion battery, comprising the electrode of any one of claims 1-12.



510070

Issuing Date:

January 12, 2022



Application No. or Patent No.: 202110531289.X

Issuing No.: 2022010702005930

Applicant or Patentee: NINGDE AMPEREX TECHNOLOGY LTD

Title of Invention-Creation: ELECTRODE AND
LITHIUM-ION BATTERY**THE FIRST OFFICE ACTION**

1. ☒ Upon the request for a substantive examination filed by the applicant, the China National Intellectual Property Administration (hereafter referred to as "CNIPA") conducts a substantive examination to the above-captioned invention patent application according to the provision of Article 35.1 of the Patent Law.

☐ According to the provision of Article 35.2 of the Patent Law, CNIPA decides on its own initiative to conduct a substantive examination to the above-captioned invention patent application.

2. ☐ The applicant requests to the filing date of:

☐ The applicant has submitted the copy of the earlier patent application documents which were first filed and certified by the competent authority.

☐ The applicant has not submitted the copy of the earlier patent application documents which were first filed and certified by the competent authority, and the claim to the right of priority is deemed not to have been made according to the provision of Article 30 of the Patent Law.

3. ☐ After examination, the amended document(s) filed on _____ by the applicant is/are not accepted because the amendment(s) do(es) not comply with the provision of Rule 51.1 of the Implementing Regulations of the Patent Law.

4. The examination is conducted on the basis of

☐ The application text as originally filed. ☒ The application text filed on the filing date of divisional application. ☐ The following application text(s):

5. ☐ The present Office Action is issued without making any searches.

☒ The present Office Action is issued with making a search.

☒ The following reference document(s) is/are cited: (the reference numeral(s) thereof will be used in the examination procedure hereafter):

No.	Reference No. or Title	Publication Date (or Filing Date of a Conflicting Application)
1	CN105074967A	20151118

6. Concluding comments

On the description:

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2021.6 For electronic application, the relevant documents shall be filed in the form of electronic documents through the system of electronic patent application. The application documents filed by paper or other forms are deemed not to have been submitted, unless otherwise specified.



- ☐ The contents of the application are within the scope where no patent right shall be granted as prescribed in the provision of Article 5 of the Patent Law.
- ☐ The description does not comply with the provision of Article 26.3 of the Patent Law.
- ☐ The description does not comply with Article 33 of the Patent Law.
- ☐ The drafting of the description does not comply with the provision of Rule 17 of the Implementing Regulations of the Patent Law.

☐ _____

On the Claims:

- ☐ Claim(s) _____ do(es) not comply with Article 2.2 of the Patent Law.
- ☐ Claim(s) _____ do(es) not comply with Article 9.1 of the Patent law.
- ☐ Claim(s) _____ do(es) not possess novelty as required under Article 22.2 of the Patent Law.
- ☒ Claim(s) 1-13 do(es) not possess inventiveness as required under Article 22.3 of the Patent Law.
- ☐ Claim(s) _____ do(es) possess applicability as prescribed in Article 22.4 of the Patent law.
- ☐ Claim(s) _____ are(is) within the scope where no patent right shall be granted as prescribed in the provision of Article 25 of the Patent law.
- ☐ Claim(s) _____ do(es) not comply with Article 26.4 of the Patent law.
- ☐ Claim(s) _____ do(es) not comply with Article 31.1 of the Patent law.
- ☐ Claim(s) _____ do(es) not comply with the provision of Article 33 of the Patent law.
- ☐ Claim(s) _____ do(es) not comply with the provision of Rule 19 of the Implementing Regulations of the Patent law.
- ☐ Claim(s) _____ do(es) not comply with the provision of Rule 20 of the Implementing Regulations of the Patent law.
- ☐ Claim(s) _____ do(es) not comply with the provision of Rule 21 of the Implementing Regulations of the Patent law.
- ☐ Claim(s) _____ do(es) not comply with the provision of Rule 22 of the Implementing Regulations of the Patent law.

☐ _____

- ☐ The application does not comply with the provision of Article 26.5 of the Patent Law or Rule 26 of the Implementing Regulations of the Patent Law.
- ☐ The application does not comply with the provision of Article 19.1 of the Patent Law.
- ☐ The divisional application does not comply with the provision of Rule 43.1 of the Implementing Regulations of the Patent Law.

The detailed analysis on the above concluding comments is presented in the text of the Office Action.

7. Based on the above concluding comments, the examiner holds that:

- ☐ The applicant should amend the application document(s) in accordance with the requirement(s) as presented in the text of the Office Action.
- ☐ The applicant should, in the observations, state reasons indicating the patentability of the application and amend the defects pointed out in the text of the Office Action. Otherwise, the application shall not be granted the patent right.
- ☒ The patent application lacks substantive contents that deserve the patent right. Therefore, the application shall be rejected if the applicant fails to make observations or the observations are not sufficient.

☐ _____

8. The applicant shall pay attention to the following matters:

- (1) In accordance with Article 37 of the Patent Law, the applicant shall submit the Statement of Opinion within four (4) months from the date of receiving this Office Action. If the applicant does not respond before this deadline without a reasonable explanation, the application will be considered to have been withdrawn.
- (2) Amendments made to the application by the applicant shall comply with Article 33 of the Patent Law and may not exceed the scope of the disclosure of the original description and list of claims. Amendments made by the applicant to the patent application documents shall also comply with Rule 51.3 of the Implementing Regulations of the Patent Law, and the amendments shall be prepared in

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2021.6 For electronic application, the relevant documents shall be filed in the form of electronic documents through the system of electronic patent application. The application documents filed by paper or other forms are deemed not to have been submitted, unless otherwise specified.



accordance with the requirements in this Office Action.

(3) The applicant's observations and/or the amended text(s) shall be mailed or delivered to the Reception Department of CNIPA. Any document(s) which are not mailed or delivered to the Reception Department do not acquire legal effect.

(4) Any applicant and/or agent shall not directly go to CNIPA to have an interview with the examiner without having an appointment.

(5) As for an invention patent application upon entry into a phase of substantive examination, the applicant could request to refund 50% fee for substantive examination of the patent application if the applicant voluntarily withdraws the present application before expiration of the time limit for responding to the First Office Action (except that a response to the First Office Action of the present application has been submitted).

9. The text of the Office Action contains 3 page(s), and has the following attachment(s):

☐ copy (copies) of the cited reference(s), all together page(s).

☐

Examiner: SUN Siyuan

Contact number: 022-
84868387

Examination Department: Electricity Patent
Examination Department of Tianjin Patent
Examination Cooperation Center

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THE FIRST OFFICE ACTION

Application No.: 202110531289X

Upon examination, the following examination opinions are hereby put forward.

1. Claim 1 does not involve an inventive step as defined in Article 22.3 of the Patent Law.

Claim 1 sets forth an electrode. Reference Document 1 (CN105074967A) discloses a lithium-ion battery and discloses an electrode, and specifically discloses the following content (see claims 1-15, paragraphs [0005]-[0015], [0026]-[0072], and FIGS. 1A-2C of the description): in the multi-layer cathode structure 103, a first slurry mixture comprising a cathodically active material is deposited on the current collector 113 to form a first cathode material layer 210; a second slurry mixture comprising a cathodically active material is deposited on the first cathode material layer 210 to form a second cathode material layer 220; the cathodically active material of the first slurry mixture comprises particles having a first average diameter and the cathodically active material of the second slurry mixture comprises particles having a second average diameter; wherein the second average diameter is greater than the first average diameter; the first average diameter is between about 2 μm and about 15 μm and the second average diameter is between about 5 μm and about 15 μm ; the cathodically active material of the first slurry mixture is selected from the group comprising of: lithium cobalt dioxide (LiCoO_2), lithium manganese dioxide (LiMnO_2), titanium disulfide (TiS_2), $\text{LiNi}_x\text{Co}_{1-2x}\text{MnO}_2$, LiMn_2O_4 , **LiFePO_4** , $\text{LiFe}_{1-x}\text{MgPO}_4$, LiMoPO_4 , LiCoPO_4 , $\text{Li}_3\text{V}_2(\text{PO}_4)_3$, LiVOPO_4 , LiMP_2O_7 , $\text{LiFe}_{1.5}\text{P}_2\text{O}_7$, LiVPO_4F , LiAlPO_4F , $\text{Li}_5\text{V}(\text{PO}_4)_2\text{F}_2$, $\text{Li}_5\text{Cr}(\text{PO}_4)_2\text{F}_2$, $\text{Li}_2\text{CoPO}_4\text{F}$, $\text{Li}_2\text{NiPO}_4\text{F}$, $\text{Na}_5\text{V}_2(\text{PO}_4)_2\text{F}_3$, $\text{Li}_2\text{FeSiO}_4$, $\text{Li}_2\text{MnSiO}_4$, $\text{Li}_2\text{VOSiO}_4$, LiNiO_2 , and combinations thereof.

Claim 1 differs from Reference Document 1 in that a total compaction density of the first active material layer and the second active material layer is greater than 3.2 g/cc. Based on the aforesaid distinguishing technical feature, the technical problem to be actually solved by the technical solution of claim 1 is how to obtain the required battery energy density and thickness of the active material layer.

A compaction density of the active material layer is closely correlated to the corresponding battery energy density and the thickness of the active material layer; when the compaction density increases, the battery energy density will increase therewith, and the thickness of the active material layer will decrease therewith; these are common knowledge in the art. To obtain a proper battery energy density and thickness of the active material layer, those skilled in the art could readily conceive of selecting a proper total compaction density of the active material layers according to the practical requirements without any inventive labor, and also could expect the effect.

As such, it would have been obvious for those skilled in the art to arrive at the technical solution set forth in claim 1 on the basis of Reference Document 1 in combination with common knowledge in the art. Therefore, claim 1 neither has prominent substantive features nor represents a notable progress, and thus does not involve an inventive step as defined in Article 22.3 of the Patent Law.

2. Claims 2-12 do not involve an inventive step as defined in Article 22.3 of the Patent Law.

Claims 2-11 further define claim 1; claim 12 further defines claim 1. Reference Document 1 further discloses: the second average diameter is greater than the first average diameter; the first average diameter is between about 2 μm and about 15 μm and the second average diameter is between about 5 μm and about 15 μm ; the cathodically active material of the first slurry mixture and the cathodically active material of the second slurry mixture are each independently selected from the

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group comprising of: lithium cobalt dioxide (LiCoO_2), lithium manganese dioxide (LiMnO_2), titanium disulfide (TiS_2), $\text{LiNi}_x\text{Co}_{1-2x}\text{MnO}_2$, LiMn_2O_4 , LiFePO_4 , $\text{LiFe}_{1-x}\text{MgPO}_4$, LiMoPO_4 , LiCoPO_4 , $\text{Li}_3\text{V}_2(\text{PO}_4)_3$, LiVOPO_4 , LiMP_2O_7 , $\text{LiFe}_{1.5}\text{P}_2\text{O}_7$, LiVPO_4F , LiAlPO_4F , $\text{Li}_5\text{V}(\text{PO}_4)_2\text{F}_2$, $\text{Li}_5\text{Cr}(\text{PO}_4)_2\text{F}_2$, $\text{Li}_2\text{CoPO}_4\text{F}$, $\text{Li}_2\text{NiPO}_4\text{F}$, $\text{Na}_5\text{V}_2(\text{PO}_4)_2\text{F}_3$, $\text{Li}_2\text{FeSiO}_4$, $\text{Li}_2\text{MnSiO}_4$, $\text{Li}_2\text{VOSiO}_4$, LiNiO_2 , and combinations thereof. The active material of the first cathode material layer 210 and the active material of the second cathode material layer 220 are same or different materials. Active materials on the cathode side of the battery cell 100, 120 or positive electrode, may comprise a lithium-containing metal oxide, such as $\text{LiNi}_x\text{Co}_y\text{Al}_z\text{O}_2$; the first cathode material layer 210 has a thickness between 10 μm and 150 μm , and the second cathode material layer 220 has have a thickness from about 10 to 80 microns; the active anode material may be selected from a graphite material, silicon, lithium titanate, etc.; the binding agent in the first slurry mixture may be selected from a styrene butadiene rubber (SBR), and a polyvinylidene fluoride (PVDF); the second slurry mixture may comprise a binding agent; the first and second slurry mixtures may have a solid of about 50% to about 80% based on the weight percent; the solids comprise between about 1 wt. % and about 10 wt. % of the binding agent; alternatively, may have a solid of about 55% to about 65% based on the weight percent, and the solids comprise between about 1 wt. % and about 4 wt. % of the binding agent; in some implementations, the solid content of the first cathode material layer 210 may be greater than 60% based on the weight percent; the solid content of the second cathode material layer 220 may be between about 50% and 60% based on the weight percent. On the basis of the disclosure of Reference Document 1, as for the cathodically active material contained in the first and second slurry mixtures disclosed in Reference Document 1, the diameter is an average diameter. When the first cathode active material has an average particle size of 2 μm , the ratio of the average particle size of the second cathode active material to the average particle size of the first cathode active material ranges from 5:2-15:2. A compaction density of the active material layer is closely correlated to the corresponding battery energy density and the thickness of the active material layer; when the compaction density increases, the battery energy density will increase therewith, and the thickness of the active material layer will decrease therewith; these are common knowledge in the art. To obtain a proper battery energy density and thickness of the active material layer, those skilled in the art could readily conceive of selecting a proper compaction density of the first active material layer and a proper compaction density of the second active material layer according to the practical requirements without any inventive labor; and could expect the effect. Moreover, as can be seen from “the first active material layer has a particle size of 90% accumulative volume of less than 40 μm ”, most of particles in the first active material of the present application have a particle size of 40 μm below, and there are a small amount of particles having a particle size of more than 40 μm . Based on paragraph [0046] of the description in Reference Document 1, “in one implementation, the particles are nanoscale particles. In another implementation, the nanoscale particles have a diameter between about 1 nm and about 100 nm; and the micro-scale particles have a diameter between about 1 μm and about 20 μm ”. As such, most of particles in Reference Document 1 have a particle size of 40 μm below. The particle size of 90% accumulative volume (the particle size of $\text{Dv}90$) is a common measurement standard of average particle size in the art. On this basis, those skilled in the art could readily conceive of adopting the particle size standard of $\text{Dv}90$ to select the particle size of the first active material without any inventive labor; and its technical effect could be expected. In addition, lithium iron manganese phosphate, lithium-rich manganese-based materials, and lithium titanate are also conventional selections in the art. Mesocarbon microbeads, soft carbon, hard carbon, silicon carbide, etc. are also conventional selections in the art. Reference Document 1 discloses a cathodically bi-layer structure capable of achieving properties such as faster charging and larger capacity. Based on the understandings to the performances of the cathode and anode of lithium-ion batteries, those skilled in the art could readily

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conceive of configuring a bilayer structure on the anode and using the above active materials. Reference Document 1 discloses the solid content of each active material layer and the content of the binder in the solid. When the solid content in the first active material layer is greater than the solid content in the second active material layer, those skilled in the art could readily conceive that the content of the binder in the first active material layer is greater than the content of the binder in the second active material layer; moreover, those skilled in the art could readily conceive of using the binding agent disclosed in Reference Document 1 to the second slurry mixture. Further, other binding agents not disclosed in Reference Document 1 are also conventional selections in the art.

Therefore, insofar as the claim to which claims 2-12 refer is not inventive, dependent claims 2-12 likewise do not involve an inventive step.

3. Claim 13 does not involve an inventive step as provided in Article 22.3 of the Patent Law.

Claim 13 sets forth a lithium-ion battery. Reference Document 1 further discloses (paragraph [0005] of the description): the lithium-ion battery comprises electrodes. Insofar as the preceding claims 1-12 are not inventive, claim 13 does not involve an inventive step as defined in Article 22.3 of the Patent Law.

Based on the above reasons, neither independent claims nor dependent claims of the present application involve an inventive step. In the meantime, no other substantive content that deserves a patent right is disclosed in the description. Therefore, even if the applicant rearranges and/or further defines the claims in accordance with the disclosure of the description, the present application still does not have a prospect of being granted a patent right. If the applicant is unable to provide sufficient reasons for that the present application involves an inventive step within the response time limit specified in the present Office Action, the present application will be finally rejected.

Should you have any questions on the examination opinions, please contact the examiner of this case in the following ways: phone number of the examiner: 022-84868387, or phone on-duty: 022-84868233 (for transfer), and consulting mailbox: tjscfk@cnipa.gov.cn. Please note: the Observation and/or amendment text fed back through the mailbox should not have legal force and should not replace a formal response.

Separately: According to the *Announcement of the China National Intellectual Property Administration on Suspending and Adjusting Certain Patent-Related Charges* (No. 272), since August 01, 2018, for eligible invention patent applications, 50% of the fee for substantive examination of the patent application can be refunded if the application is voluntarily withdrawn before the deadline to reply to the First Office Action (except when the response therefor has already been submitted).

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2022.6 For electronic application, the relevant documents shall be filed in the form of electronic documents through the system of electronic patent application. The application documents filed by paper or other forms are deemed not to have been submitted, unless otherwise specified

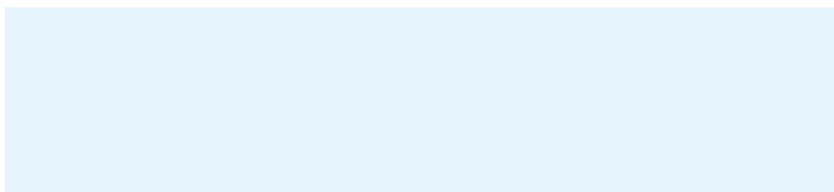


Examiner: SUN Siyuan

Code: 728223

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2022.6 For electronic application, the relevant documents shall be filed in the form of electronic documents through the system of electronic patent application. The application documents filed by paper or other forms are deemed not to have been submitted, unless otherwise specified

**510070**

Issuing Date:

June 09, 2022**Application No. or Patent No.: 202110531289.X****Issuing No.: 2022060602002880****Applicant or Patentee:** NINGDE AMPEREX
TECHNOLOGY LTD**Title of Invention-Creation:** ELECTRODE AND
LITHIUM-ION BATTERY**TEXT OF THE SECOND OFFICE ACTION**

1. ☒ The examiner has received the observations submitted by the applicant on April 22, 2022. On this basis, the examiner continues to conduct a substantive examination on the above-captioned application.

☐ The examiner continues to conduct a substantive examination on the above-captioned patent application according to the Reexamination Decision made by CNIPA on Year _____ Month _____ Day _____.

☐

2. ☐ After examination, the amended document(s) filed on _____ by the applicant is/are not accepted because said amendment(s) do(es) not comply with the provision of Rule 51.3 of the Implementing Regulations of the Patent Law.

3. The continued examination is conducted on the basis of:

☐ The amended application documents attached to the above observations.

☒ The application documents based on which the foregoing office action is issued and the replacement sheet of the amended documents attached to the above observations.

☐ The application documents based on which the foregoing office action is issued.

☐ The application documents determined in the above Reexamination Decision.

☐

4. ☒ No new reference document(s) is/are cited in the office action.

☐ The following reference document(s) is/are cited in the office action: (the reference numeral(s) thereof will be used in the examination procedure hereafter)

No.	Reference No. or Title	Publication Date (or Filing Date of Conflicting Application)
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5. Concluding comments

On the description:

☐ The contents of the application are within the scope where no patent right shall be granted as required by the provision of Article 5 of the Patent Law.

☐ The description does not comply with the provision of Article 26.3 of the Patent Law.

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2021.6 For electronic applications, related documents should be submitted by means of the electronic patent application system in the form of electronic documents. The application documents filed by paper or other forms are deemed not to have been submitted, unless otherwise specified.



☐ The amendment(s) made to the description does not comply with the provision of Article 33 of the Patent Law.

☐ The drafting of the description does not comply with the provision of Rule 17 of the Implementing Regulations of the Patent Law.

☐ _____

On the Claims:

☐ Claim(s) _____ do(es) not comply with the provision of Article 2.2 of the Patent Law.

☐ Claim(s) _____ do(es) not comply with the provision of Article 9.1 of the Patent Law.

☐ Claim(s) _____ do(es) not possess novelty as required under Article 22.2 of the Patent Law.

☒ Claim(s) 1-13 do not involve an inventive step as required by Article 22.3 of the Patent Law.

☐ Claim(s) _____ do(es) not possess practical applicability as required under Article 22.4 of the Patent Law.

☐ Claim(s) _____ fall(s) within the unpatentable scope as required by Article 25 of the Patent Law.

☐ Claim(s) _____ do(es) not comply with the provision of Article 26.4 of the Patent Law.

☐ Claim(s) _____ do(es) not comply with the provision of Article 31.1 of the Patent Law.

☐ Amendments to claim(s) _____ do(es) not comply with the provision of Article 33 of the Patent Law.

☐ Claim(s) _____ do(es) not comply with Rule 19 of the Implementing Regulations of the Patent Law.

☐ Claim(s) _____ do(es) not comply with Rule 20 of the Implementing Regulations of the Patent Law.

☐ Claim(s) _____ do(es) not comply with Rule 21 of the Implementing Regulations of the Patent Law.

☐ Claim(s) _____ do(es) not comply with Rule 22 of the Implementing Regulations of the Patent Law.

☐ _____

☐ The application does not comply with the provision of Article 26.5 of the Patent Law or Rule 26 of the Implementing Regulations of the Patent Law.

☐ The application does not comply with the provision of Article 19.1 of the Patent Law.

☐ The divisional application does not comply with the provision of Rule 43.1 of the Implementing Regulations of the Patent Law.

The detailed analysis on the above concluding comments is presented in the text of the Office Action.

6. Based on the above concluding comments, the examiner holds that:

☐ The applicant should amend the application document(s) in accordance with the requirement(s) as presented in the text of the Office Action.

☐ The applicant should, in the observations, state reasons indicating the patentability of the application and amend the defects pointed out in the text of the Office Action. Otherwise, the application shall not be granted the patent right.

☒ The patent application lacks substantive contents that deserve the patent right. Therefore, the application shall be rejected if the applicant fails to make observations or the observations are not sufficient.

☐ _____

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2021.6 For electronic applications, related documents should be submitted by means of the electronic patent application system in the form of electronic documents. The application documents filed by paper or other forms are deemed not to have been submitted, unless otherwise specified.



7. The applicant shall pay attention to the following matters:

(1) In accordance with Article 37 of the Patent Law, the applicant shall submit the Observation within two (2) months from the date of receiving this Office Action. If the applicant does not respond before this deadline without a reasonable explanation, the application will be considered to have been withdrawn.

(2) Amendments made to the application by the applicant shall comply with Article 33 of the Patent Law and may not exceed the scope of the disclosure of the original description and list of claims. Amendments to the patent application documents shall also comply with Rule 51.3 of the Implementing Regulations of the Patent Law, and the amendments shall be prepared in accordance with the requirements in this Office Action.

(3) The applicant's observations and/or the amended text(s) shall be mailed or delivered to the Reception Department of CNIPA. Any document(s) which are not mailed or delivered to the Reception Department do not acquire legal effect.

(4) Any applicant and/or agent shall not directly go to CNIPA to have an interview with the examiner without having an appointment.

8. The text of this Office Action contains 4 page, and has the following attachment(s):

☐ _____ copy (copies) of the cited reference(s), all together _____ page(s).

☐ _____

Examiner: SUN Siyuan Contact number: 022-84868387

Examination Department: Electricity Patent
Examination Department of Tianjin Patent
Examination Cooperation Center

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2021.6 For electronic applications, related documents should be submitted by means of the electronic patent application system in the form of electronic documents. The application documents filed by paper or other forms are deemed not to have been submitted, unless otherwise specified.



TEXT OF THE SECOND OFFICE ACTION

Application No.: 202110531289X

The applicant filed an Observation and the amended claims on April 22, 2022. After reading the aforesaid documents seriously, the examiner put forward the following examination opinions again.

1. Claim 1 does not involve an inventive step as defined in Article 22.3 of the Patent Law.

Claim 1 sets forth an electrode. Reference Document 1 (CN105074967A) discloses a lithium-ion battery and discloses an electrode, and specifically discloses the following content (see claims 1-15, paragraphs [0005]-[0015], [0026]-[0072], and FIGS. 1A-2C of the description): in the multi-layer cathode structure 103, a first slurry mixture comprising a cathodically active material is deposited on the current collector 113 to form a first cathode material layer 210; a second slurry mixture comprising a cathodically active material is deposited on the first cathode material layer 210 to form a second cathode material layer 220; the cathodically active material of the first slurry mixture comprises particles having a first average diameter and the cathodically active material of the second slurry mixture comprises particles having a second average diameter; wherein the second average diameter is greater than the first average diameter; the first average diameter is between about 2 μm and about 15 μm and the second average diameter is between about 5 μm and about 15 μm ; the cathodically active material of the first slurry mixture is selected from the group comprising of: lithium cobalt dioxide (LiCoO_2), lithium manganese dioxide (LiMnO_2), titanium disulfide (TiS_2), $\text{LiNi}_x\text{Co}_{1-2x}\text{MnO}_2$, LiMn_2O_4 , **LiFePO_4** , $\text{LiFe}_{1-x}\text{MgPO}_4$, LiMoPO_4 , LiCoPO_4 , $\text{Li}_3\text{V}_2(\text{PO}_4)_3$, LiVOPO_4 , LiMP_2O_7 , $\text{LiFe}_{1.5}\text{P}_2\text{O}_7$, LiVPO_4F , LiAlPO_4F , $\text{Li}_5\text{V}(\text{PO}_4)_2\text{F}_2$, $\text{Li}_5\text{Cr}(\text{PO}_4)_2\text{F}_2$, $\text{Li}_2\text{CoPO}_4\text{F}$, $\text{Li}_2\text{NiPO}_4\text{F}$, $\text{Na}_5\text{V}_2(\text{PO}_4)_2\text{F}_3$, $\text{Li}_2\text{FeSiO}_4$, $\text{Li}_2\text{MnSiO}_4$, $\text{Li}_2\text{VOSiO}_4$, LiNiO_2 , and combinations thereof. In certain implementations, the first cathode material layer 210 comprises a cathodically active material having an average particle size of about 3 μm and a tap density of about 2.5 g/cm^3 and the second cathode material layer 220 comprises a cathodically active material having an average particle size of about 10 μm and a tap density of about 2.8 g/cm^3 .

Claim 1 differs from Reference Document 1 in that a total compaction density of the first active material layer and the second active material layer is greater than 3.2 g/cc. Based on the aforesaid distinguishing technical feature, the technical problem to be actually solved by the technical solution of claim 1 is how to obtain the required battery energy density and thickness of the active material layer.

A compaction density of the active material layer is closely correlated to the corresponding battery energy density and the thickness of the active material layer; when the compaction density increases, the battery energy density will increase therewith, and the thickness of the active material layer will decrease therewith; these are common knowledge in the art. To obtain a proper battery energy density and thickness of the active material layer, those skilled in the art could readily conceive of selecting a proper total compaction density of the active material layers according to the practical requirements without any inventive labor, and also could expect the effect.

As such, it would have been obvious for those skilled in the art to arrive at the technical solution set forth in claim 1 on the basis of Reference Document 1 in combination with common

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knowledge in the art. Therefore, claim 1 neither has prominent substantive features nor represents a notable progress, and thus does not involve an inventive step as defined in Article 22.3 of the Patent Law.

2. Claims 2-12 do not involve an inventive step as defined in Article 22.3 of the Patent Law.

Claims 2-11 further define claim 1; claim 12 further defines claim 1. Reference Document 1 further discloses: the second average diameter is greater than the first average diameter; the first average diameter is between about 2 μm and about 15 μm and the second average diameter is between about 5 μm and about 15 μm ; the cathodically active material of the first slurry mixture and the cathodically active material of the second slurry mixture are each independently selected from the group comprising of: lithium cobalt dioxide (**LiCoO₂**), lithium manganese dioxide (**LiMnO₂**), titanium disulfide (**TiS₂**), **LiNi_xCo_{1-2x}MnO₂**, **LiMn₂O₄**, **LiFePO₄**, **LiFe_{1-x}MgPO₄**, **LiMoPO₄**, **LiCoPO₄**, **Li₃V₂(PO₄)₃**, **LiVOPO₄**, **LiMP₂O₇**, **LiFe_{1.5}P₂O₇**, **LiVPO₄F**, **LiAlPO₄F**, **Li₅V(PO₄)₂F₂**, **Li₅Cr(PO₄)₂F₂**, **Li₂CoPO₄F**, **Li₂NiPO₄F**, **Na₅V₂(PO₄)₂F₃**, **Li₂FeSiO₄**, **Li₂MnSiO₄**, **Li₂VOSiO₄**, **LiNiO₂**, and combinations thereof. The active material of the first cathode material layer 210 and the active material of the second cathode material layer 220 are same or different materials. Active materials on the cathode side of the battery cell 100, 120 or positive electrode, may comprise a lithium-containing metal oxide, such as **LiNi_xCo_yAlO₂**; the first cathode material layer 210 has a thickness between 10 μm and 150 μm , and the second cathode material layer 220 has have a thickness from about 10 to 80 microns; the active anode material may be selected from a graphite material, silicon, lithium titanate, etc.; the binding agent in the first slurry mixture may be selected from a styrene butadiene rubber (SBR), and a polyvinylidene fluoride (PVDF); the second slurry mixture may comprise a binding agent; the first and second slurry mixtures may have a solid of about 50% to about 80% based on the weight percent; the solids comprise between about 1 wt.% and about 10 wt.% of the binding agent; alternatively, may have a solid of about 55% to about 65% based on the weight percent, and the solids comprise between about 1 wt.% and about 4 wt.% of the binding agent; in some implementations, the solid content of the first cathode material layer 210 may be greater than 60% based on the weight percent; the solid content of the second cathode material layer 220 may be between about 50% and 60% based on the weight percent. On the basis of the disclosure of Reference Document 1, as for the cathodically active material contained in the first and second slurry mixtures disclosed in Reference Document 1, the diameter is an average diameter. When the first cathode active material has an average particle size of 2 μm , the ratio of the average particle size of the second cathode active material to the average particle size of the first cathode active material ranges from 5:2-15:2. A compaction density of the active material layer is closely correlated to the corresponding battery energy density and the thickness of the active material layer; when the compaction density increases, the battery energy density will increase therewith, and the thickness of the active material layer will decrease therewith; these are common knowledge in the art. To obtain a proper battery energy density and thickness of the active material layer, those skilled in the art could readily conceive of selecting a proper compaction density of the first active material layer and a proper compaction density of the second active material layer according to the practical requirements without any inventive labor; and could expect the effect. Moreover, as can be seen from “the first active material layer has a particle size of 90% accumulative volume of less than 40 μm ”, most of particles in the first active material of the present application have a particle size of 40 μm below, and there are

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a small amount of particles having a particle size of more than 40 μm . Based on paragraph [0046] of the description in Reference Document 1, “in one implementation, the particles are nanoscale particles. In another implementation, the nanoscale particles have a diameter between about 1 nm and about 100 nm; and the micro-scale particles have a diameter between about 1 μm and about 20 μm ”. As such, most of particles in Reference Document 1 have a particle size of 40 μm below. The particle size of 90% accumulative volume (the particle size of Dv90) is a common measurement standard of average particle size in the art. On this basis, those skilled in the art could readily conceive of adopting the particle size standard of Dv90 to select the particle size of the first active material without any inventive labor; and its technical effect could be expected. In addition, lithium iron manganese phosphate, lithium-rich manganese-based materials, and lithium titanate are also conventional selections in the art. Mesocarbon microbeads, soft carbon, hard carbon, silicon carbide, etc. are also conventional selections in the art. Reference Document 1 discloses a cathodically bi-layer structure capable of achieving properties such as faster charging and larger capacity. Based on the understandings to the performances of the cathode and anode of lithium-ion batteries, those skilled in the art could readily conceive of configuring a bilayer structure on the anode and using the above active materials. Reference Document 1 discloses the solid content of each active material layer and the content of the binder in the solid. When the solid content in the first active material layer is greater than the solid content in the second active material layer, those skilled in the art could readily conceive that the content of the binder in the first active material layer is greater than the content of the binder in the second active material layer; moreover, those skilled in the art could readily conceive of using the binding agent disclosed in Reference Document 1 to the second slurry mixture. Further, other binding agents not disclosed in Reference Document 1 are also conventional selections in the art.

Therefore, insofar as the claim to which claims 2-12 refer is not inventive, dependent claims 2-12 likewise do not involve an inventive step.

3. Claim 13 does not involve an inventive step as defined in Article 22.3 of the Patent Law.

Claim 13 sets forth a lithium-ion battery. Reference Document 1 further discloses (paragraph [0005] of the description): the lithium-ion battery comprises electrodes. Insofar as the preceding claims 1-12 are not inventive, claim 13 does not involve an inventive step as defined in Article 22.3 of the Patent Law.

4. The applicant indicated in the observation as follows: the first active material layer includes lithium iron phosphate. This is because lithium iron phosphate has a poor electrical conductivity such that the first active material layer has a larger resistance, which can avoid the direct contact between the negative electrode active material layer and the positive electrode current collector when the lithium-ion battery is pressed by an external force, thus avoiding generating the most dangerous short circuit mode. The purpose of the invention of Reference Document 1 is merely to improve the proportion of the active material in the total components of the battery by manufacturing a thicker active material layer, thus improving the battery energy density. Reference Document 1 neither studies the particle diameter of the active material, and the correlation between the specific active material and the battery mechanical safety performance, nor studies the overall compaction density of the first and second active material layers, as well as the correlation of the compaction density of the two layers. Therefore, Reference Document 1 cannot provide any technical suggestion for the safety performance of the battery. The range of the average particle size of the active material provided by Reference

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Document 1 includes a possibility that the average diameter of the first active material is smaller than the average diameter of the second active material, and lithium iron phosphate is also one of the numerous active materials. However, Reference Document 1 neither defines that the average particle size of the first active material must be smaller than the average particle size of the second active material and the first active material comprises lithium iron phosphate, nor gives any advantage brought thereby. In case of no other technical suggestions, those skilled in the art can be neither motivated to select that the average particle size of the first active material is smaller than the average particle size of the second active material and the first active material comprises lithium iron phosphate on the basis of Reference Document 1 in the face of the technical problem of the present application, nor to further define that a total compaction density of the first active material layer and the second active material layer is greater than 3.2 g/cc, and the first active material layer has a compaction density of lower than that of the second active material layer. Therefore, Reference Document 1 cannot be improved to arrive at the technical solution set forth in claim 1 of the present application.

In view of this, the examiner made the following response: the original application document does not recite that selecting lithium iron phosphate as the first active material achieves any unexpected technical effect as compared to the selection of other active materials; moreover, the experimental data likewise does not tell that selecting lithium iron phosphate as the first active material achieves any unexpected technical effect. Therefore, the observations of the applicant cannot be approved by the examiner. Reference Document 1 does not give the advantage that the average particle size of the first active material layer is less than the average particle size of the second active material layer, but has explicitly disclosed the technical solution “the first cathode material layer 210 comprises a cathodically active material having an average particle size of about 3 μm and a tap density of about 2.5 g/cm³, and the second cathode material layer 220 comprises a cathodically active material having an average particle size of about 10 μm and a tap density of about 2.8 g/cm³”. Hence, Reference Document 1 inevitably can achieve the technical effect the same as that in the present application. Therefore, the observations of the applicant are not convincing.

Based on the above reasons, neither independent claims nor dependent claims of the present application involve an inventive step. In the meantime, no other substantive content that deserves a patent right is disclosed in the description. Therefore, even if the applicant rearranges and/or further defines the claims in accordance with the disclosure of the description, the present application still does not have a prospect of being granted a patent right. If the applicant fails to provide sufficient reasons to prove that the present application involves an inventive step within the reply period specified in the present First Office Action, the present application will be rejected.

Should you have any questions on the examination opinions, please contact the examiner of this case in the following ways: phone number of the examiner: 022-84868387, or phone on-duty: 022-84868233 (for transfer), and consulting mailbox: tjscfk@cnipa.gov.cn. Please note: the Observation and/or amendment text fed back through the mailbox should not have legal force and should not replace a formal response.

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Examiner: SUN Siyuan

Code: 728223

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Claims

1. An electrode, comprising:
a current collector;
a first active material layer comprising a first active material; the first active material layer having a thickness of 2 μm -7 μm ; and
a second active material layer comprising a second active material; the second active material layer having a thickness of more than 30 μm ;
wherein the first active material layer is arranged between the current collector and the second active material layer; the first active material layer is formed on at least one surface of the current collector, and an average particle size of the first active material layer is less than an average particle size of the second active material layer; wherein a total compaction density of the first active material layer and the second active material layer is greater than 3.2 g/cc; and the first active material comprises lithium iron phosphate.
2. The electrode according to claim 1, wherein a ratio of the average particle size of the second active material to the average particle size of the first active material is greater than 1 and smaller than or equal to 40.
3. The electrode according to claim 1, wherein the first active material has an average particle size in a range of 0.2 μm to 15 μm .
4. The electrode according to claim 1, wherein a compaction density of the first active material layer is greater than 2.8 g/cc, and a compaction density of the second active material layer is greater than 3.3 g/cc.
5. The electrode according to claim 1, wherein the first active material layer has a particle size of 90% accumulative volume of less than 40 μm .
6. The electrode according to claim 1, wherein the first active material further comprises one or more of lithium cobaltate, lithium manganate, lithium nickelate, lithium nickel cobalt manganese oxide, lithium iron manganese phosphate, lithium vanadium phosphate, lithium vanadyl phosphate, lithium-rich manganese-based materials, lithium nickel cobalt aluminate, and lithium titanate.
7. The electrode according to claim 1, wherein the second active material comprises one selected from the group consisting of: lithium cobaltate, lithium nickel cobalt manganese oxide, lithium nickel cobalt aluminum oxide, lithium-rich manganese-based material, lithium iron phosphate, and combinations thereof.
8. The electrode according to claim 1, wherein the first active material comprises one selected from the group consisting of: artificial graphite, natural graphite, mesocarbon microbeads, soft carbon, hard carbon, silicon, silicon carbide, lithium titanate, and combinations thereof.
9. The electrode according to claim 1, wherein each of the first active material layer and the second active material layer further comprises a binder; a content of the binder in the first active material layer is greater than a content of the binder in the second active material layer.
10. The electrode according to claim 9, wherein the binder comprises one selected from the group consisting of: polyvinylidene fluoride, vinylidene fluoride-hexafluoropropylene copolymer, polyamide, polyacrylonitrile, polyacrylates, polyacrylic acids, polyacrylic acid salt,



carboxymethylcellulose sodium, polyethylene pyrrolidone, polyvinyl ether, polymethyl methacrylate, polytetrafluoroethylene, poly-hexafluoropropylene and styrene butadiene rubber, and combinations thereof.

11. A lithium-ion battery, comprising the electrode of any one of claims 1-10.



510070



Issuing Date:

October 09, 2022

Application No. or Patent No.: 202110531289.X

Issuing No.: 2022092902709050

Applicant or Patentee: NINGDE AMPEREX
TECHNOLOGY LTD

Title of Invention-Creation: ELECTRODE AND
LITHIUM-ION BATTERY

Rejection Decision

1. According to the provisions of Article 38 of the Patent Law and Rule 53 of the Implementing Regulations of the Patent Law, the above-captioned patent application is rejected on the basis of the following grounds:

The application does not comply with the provision of Article 22.3 of the Patent Law.

Please refer to the text of the Rejection Decision for the details, all together.

2. The Rejection Decision is made on the basis of the following application text(s):

Abstract of the description, paragraphs 1-167 of the description, and accompanying drawings of the description, and drawing of the abstract filed on the filing date of the divisional application; and claims 1-11 filed on August 23, 2022.

3. According to the provisions of Article 41 of the Patent Law and Rule 60 of the Implementing Regulations of the Patent Law, where an applicant is not satisfied with the Rejection Decision, he or it may file a request for reexamination to the Reexamination and Invalidation Examination Department of the CNIPA within three months from the date of receipt of the present decision. In accordance with the provision of Rule 96 of the Implementing Regulations of the Patent Law, the reexamination fee should be paid within the above-mentioned time limit; if the fee is not paid or not paid in full within the time limit, the request shall be deemed not to have been made.

Examiner: SUN Siyuan Examination Department: Electricity Patent Examination Department of Tianjin Patent Examination Cooperation Center

Contact number: 022-84868387

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Rejection Decision

Application No.: 202110531289X

This decision relates to the invention patent application with the application number of 202110531289.X and title of “ELECTRODE AND LITHIUM-ION BATTERY”, filed by the applicant NINGDE AMPEREX TECHNOLOGY LTD on February 26, 2018.

I. Cause of action

The Claims of the original application documents of the present application include two independent claims, i.e., claims 1 and 13, and eleven dependent claims, i.e., claims 2-12.

Upon the request for substantive examination filed by the applicant on May 14, 2021, the examiner conducted a substantive examination on the present application and issued the First Office Action on January 12, 2022, indicating that claims 1-13 do not involve an inventive step. The following reference document is cited in the First Office Action:

Reference Document 1: CN105074967A, published on November 18, 2015, also published as WO2014149766A1.

The applicant filed an Observation and amended the claims in regard to the First Office Action on April 22, 2022. It is summarized as follows:

The first active material layer includes lithium iron phosphate. This is because lithium iron phosphate has a poor electrical conductivity such that the first active material layer has a larger resistance, which can avoid the direct contact between the negative electrode active material layer and the positive electrode current collector when the lithium-ion battery is pressed by an external force, thus avoiding generating the most dangerous short circuit mode. The purpose of the invention of Reference Document 1 is merely to improve the proportion of the active material in the total components of the battery by manufacturing a thicker active material layer, thus improving the battery energy density. Reference Document 1 neither studies the particle diameter of the active material, and the correlation between the specific active material and the battery mechanical safety performance, nor studies the overall compaction density of the first and second active material layers, as well as the correlation of the compaction density of the two layers. Therefore, Reference Document 1 cannot provide any technical suggestion for the safety performance of the battery. The range of the average particle size of the active material provided by Reference Document 1 includes a possibility that the average diameter of the first active material is smaller than the average diameter of the second active material, and lithium iron phosphate is also one of the numerous active materials. However, Reference Document 1 neither defines that the average particle size of the first active material must be smaller than the average particle size of the second active material and the first active material comprises lithium iron phosphate, nor gives any advantage brought thereby. In case of no other technical suggestions, those skilled in the art can be neither motivated to select that the average particle size of the first active material is smaller than the average particle size of the second active material and the first active material comprises lithium iron phosphate on the basis of Reference Document 1 in the face of the technical problem of the present application, nor to further define that a total compaction density of the first active material layer and the second active material layer is greater than 3.2 g/cc, and the first active material layer has a compaction density of lower than that of the second active material layer. Therefore, Reference Document 1 cannot be improved to arrive at the technical solution set forth in claim 1 of the present application.

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The examiner proceeded to examine this case and issued the Second Office Action on June 09, 2022, indicating that claims 1-13 do not involve an inventive step.

In regard to the aforesaid Second Office Action, the applicant filed an Observation and the amended claims on August 23, 2022 to indicate that the reason why the first active material layer includes lithium iron phosphate is because lithium iron phosphate has a poor electrical conductivity such that the first active material layer has a larger resistance, which can avoid the direct contact between the negative electrode active material layer and the positive electrode current collector when the lithium-ion battery is pressed by an external force, thus avoiding generating the most dangerous short circuit mode. To minimize the impact of the first active material layer on the cycle performance, the present application defines the thickness of the first active material layer as 2 μm -7 μm , which thus can ensure the better cycle performance of the battery while ensuring the safety of the lithium-ion battery. As can be seen from the description of Reference Document 1, it mainly requires that the porosity of the first active material layer is greater than that of the second active material layer, but does not require the comparison of the thickness between the two active material layers and the specific component of the active material in the two active material layers at all. Therefore, Reference Document 1 impossibly provides any technical suggestion that the thickness of the second active material layer defined in the present application is much greater than the thickness (obtained by comparing the thickness data) of the first active material layer. Moreover, just because the objective of the invention in Reference Document 1 is to increase the proportion of the active material in the total component of the battery by manufacturing a thicker active material layer, those skilled in the art cannot be motivated to reduce the thickness (between 10-150 microns) of the first cathode material layer (this is inconsistent with the objective of the invention) and thus, cannot arrive at the technical solution set forth in claim 1 of the present application via improving Reference Document 1.

The examiner deemed that the facts of this case are clear. Therefore, the present Rejection Decision is made on the basis of the abstract of the specification, and paragraphs 1-167 of the specification, accompanying drawings of the specification, and drawing of the abstract filed on the filing date of the divisional application, and

claims 1-11 filed on August 23, 2022.

II. Grounds for rejection

1. Claim 1 does not involve an inventive step as defined in Article 22.3 of the Patent Law.

Claim 1 sets forth an electrode. Reference Document 1 (CN105074967A) discloses a lithium-ion battery and discloses an electrode, and specifically discloses the following content (see claims 1-15, paragraphs [0005]-[0015], [0026]-[0072], and FIGS. 1A-2C of the description): in the multi-layer cathode structure 103, a first slurry mixture comprising a cathodically active material is deposited on the current collector 113 to form a first cathode material layer 210; a second slurry mixture comprising a cathodically active material is deposited on the first cathode material layer 210 to form a second cathode material layer 220; the cathodically active material of the first slurry mixture comprises particles having a first average diameter and the cathodically active material of the second slurry mixture comprises particles having a second average diameter; wherein the second average diameter is greater than the first average diameter; the first average diameter is between about 2 μm and about 15 μm and the second average diameter is between about 5 μm and about 15 μm ; the cathodically

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active material of the first slurry mixture is selected from the group comprising of: lithium cobalt dioxide (LiCoO_2), lithium manganese dioxide (LiMnO_2), titanium disulfide (TiS_2), $\text{LiNi}_x\text{Co}_{1-2x}\text{MnO}_2$, LiMn_2O_4 , LiFePO_4 , $\text{LiFe}_{1-x}\text{MgPO}_4$, LiMoPO_4 , LiCoPO_4 , $\text{Li}_3\text{V}_2(\text{PO}_4)_3$, LiVOPO_4 , LiMP_2O_7 , $\text{LiFe}_{1.5}\text{P}_2\text{O}_7$, LiVPO_4F , LiAlPO_4F , $\text{Li}_5\text{V}(\text{PO}_4)_2\text{F}_2$, $\text{Li}_5\text{Cr}(\text{PO}_4)_2\text{F}_2$, $\text{Li}_2\text{CoPO}_4\text{F}$, $\text{Li}_2\text{NiPO}_4\text{F}$, $\text{Na}_5\text{V}_2(\text{PO}_4)_2\text{F}_3$, $\text{Li}_2\text{FeSiO}_4$, $\text{Li}_2\text{MnSiO}_4$, $\text{Li}_2\text{VOSiO}_4$, LiNiO_2 , and combinations thereof. In certain implementations, the first cathode material layer 210 comprises a cathodically active material having an average particle size of about $3\text{ }\mu\text{m}$ and a tap density of about 2.5 g/cm^3 and the second cathode material layer 220 comprises a cathodically active material having an average particle size of about $10\text{ }\mu\text{m}$ and a tap density of about 2.8 g/cm^3 . Exemplary Structure (A) discloses that the first cathode material layer may have an average thickness from about 1 to 80 microns, and the second cathode material layer may have a thickness from about 10 to 80 microns.

Claim 1 differs from Reference Document 1 in that a total compaction density of the first active material layer and the second active material layer is greater than 3.2 g/cc . Based on the aforesaid distinguishing technical feature, the technical problem to be actually solved by the technical solution of claim 1 is how to obtain the required battery energy density and thickness of the active material layer.

A compaction density of the active material layer is closely correlated to the corresponding battery energy density and the thickness of the active material layer; when the compaction density increases, the battery energy density will increase therewith, and the thickness of the active material layer will decrease therewith; these are common knowledge in the art. To obtain a proper battery energy density and thickness of the active material layer, those skilled in the art could readily conceive of selecting a proper total compaction density of the active material layers according to the practical requirements without any inventive labor, and also could expect the effect.

As such, it would have been obvious for those skilled in the art to arrive at the technical solution set forth in claim 1 on the basis of Reference Document 1 in combination with common knowledge in the art. Therefore, claim 1 neither has prominent substantive features nor represents a notable progress, and thus does not involve an inventive step as defined in Article 22.3 of the Patent Law.

2. Claims 2-10 do not involve an inventive step as defined in Article 22.3 of the Patent Law.

Claims 2-9 further define claim 1; claim 10 further defines claim 9. Reference Document 1 further discloses: the second average diameter is greater than the first average diameter; the first average diameter is between about $2\text{ }\mu\text{m}$ and about $15\text{ }\mu\text{m}$ and the second average diameter is between about $5\text{ }\mu\text{m}$ and about $15\text{ }\mu\text{m}$; the cathodically active material of the first slurry mixture and the cathodically active material of the second slurry mixture are each independently selected from the group comprising of: lithium cobalt dioxide (LiCoO_2), lithium manganese dioxide (LiMnO_2), titanium disulfide (TiS_2), $\text{LiNi}_x\text{Co}_{1-2x}\text{MnO}_2$, LiMn_2O_4 , LiFePO_4 , $\text{LiFe}_{1-x}\text{MgPO}_4$, LiMoPO_4 , LiCoPO_4 , $\text{Li}_3\text{V}_2(\text{PO}_4)_3$, LiVOPO_4 , LiMP_2O_7 , $\text{LiFe}_{1.5}\text{P}_2\text{O}_7$, LiVPO_4F , LiAlPO_4F , $\text{Li}_5\text{V}(\text{PO}_4)_2\text{F}_2$, $\text{Li}_5\text{Cr}(\text{PO}_4)_2\text{F}_2$, $\text{Li}_2\text{CoPO}_4\text{F}$, $\text{Li}_2\text{NiPO}_4\text{F}$, $\text{Na}_5\text{V}_2(\text{PO}_4)_2\text{F}_3$, $\text{Li}_2\text{FeSiO}_4$, $\text{Li}_2\text{MnSiO}_4$, $\text{Li}_2\text{VOSiO}_4$, LiNiO_2 , and combinations thereof. The active material of the first cathode material layer 210 and the active material of the second cathode material layer 220 are same or different materials. Active materials on the cathode side of the battery cell 100, 120 or positive electrode, may comprise a lithium-containing metal oxide, such as $\text{LiNi}_x\text{Co}_y\text{Al}_z\text{O}_2$; the active anode material may be selected from a graphite material, silicon, lithium titanate, etc.; the binding agent in the first slurry mixture may be selected from a styrene butadiene rubber (SBR), and a polyvinylidene fluoride (PVDF); the second slurry

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mixture may comprise a binding agent; the first and second slurry mixtures may have a solid of about 50% to about 80% based on the weight percent; the solids comprise between about 1 wt. % and about 10 wt. % of the binding agent; alternatively, may have a solid of about 55% to about 65% based on the weight percent, and the solids comprise between about 1 wt. % and about 4 wt. % of the binding agent; in some implementations, the solid content of the first cathode material layer 210 may be greater than 60% based on the weight percent; the solid content of the second cathode material layer 220 may be between about 50% and 60% based on the weight percent. On the basis of the disclosure of Reference Document 1, as for the cathodically active material contained in the first and second slurry mixtures disclosed in Reference Document 1, the diameter is an average diameter. When the first cathode active material has an average particle size of 2 μm , the ratio of the average particle size of the second cathode active material to the average particle size of the first cathode active material ranges from 5:2-15:2. A compaction density of the active material layer is closely correlated to the corresponding battery energy density and the thickness of the active material layer; when the compaction density increases, the battery energy density will increase therewith, and the thickness of the active material layer will decrease therewith; these are common knowledge in the art. To obtain a proper battery energy density and thickness of the active material layer, those skilled in the art could readily conceive of selecting a proper compaction density of the first active material layer and a proper compaction density of the second active material layer according to the practical requirements without any inventive labor; and could expect the effect. Moreover, as can be seen from “the first active material layer has a particle size of 90% accumulative volume of less than 40 μm ”, most of particles in the first active material of the present application have a particle size of 40 μm below, and there are a small amount of particles having a particle size of more than 40 μm . Based on paragraph [0046] of the description in Reference Document 1, “in one implementation, the particles are nanoscale particles. In another implementation, the nanoscale particles have a diameter between about 1 nm and about 100 nm; and the micro-scale particles have a diameter between about 1 μm and about 20 μm ”. As such, most of particles in Reference Document 1 have a particle size of 40 μm below. The particle size of 90% accumulative volume (the particle size of Dv90) is a common measurement standard of average particle size in the art. On this basis, those skilled in the art could readily conceive of adopting the particle size standard of Dv90 to select the particle size of the first active material without any inventive labor; and its technical effect could be expected. In addition, lithium iron manganese phosphate, lithium-rich manganese-based materials, and lithium titanate are also conventional selections in the art. Mesocarbon microbeads, soft carbon, hard carbon, silicon carbide, etc. are also conventional selections in the art. Reference Document 1 discloses a cathodically bi-layer structure capable of achieving properties such as faster charging and larger capacity. Based on the understandings to the performances of the cathode and anode of lithium-ion batteries, those skilled in the art could readily conceive of configuring a bilayer structure on the anode and using the above active materials. Reference Document 1 discloses the solid content of each active material layer and the content of the binder in the solid. When the solid content in the first active material layer is greater than the solid content in the second active material layer, those skilled in the art could readily conceive that the content of the binder in the first active material layer is greater than the content of the binder in the second active material layer; moreover, those skilled in the art could readily conceive of using the binding agent disclosed in Reference Document 1 to the second slurry mixture. Further, other binding agents not disclosed in Reference Document 1 are also conventional selections in the art.

Therefore, insofar as the claim to which claims 2-10 refer is not inventive, dependent claims 2-10 likewise do not involve an inventive step.

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3. Claim 11 does not involve an inventive step as defined in Article 22.3 of the Patent Law.

Claim 11 sets forth a lithium-ion battery. Reference Document 1 further discloses (paragraph [0005] of the description): the lithium-ion battery comprises electrodes. Insofar as the preceding claims 1-10 are not inventive, claim 11 does not involve an inventive step as defined in Article 22.3 of the Patent Law.

4. The applicant indicated in the observations as follows: the reason why the first active material layer includes lithium iron phosphate is because lithium iron phosphate has a poor electrical conductivity such that the first active material layer has a larger resistance, which can avoid the direct contact between the negative electrode active material layer and the positive electrode current collector when the lithium-ion battery is pressed by an external force, thus avoiding generating the most dangerous short circuit mode. To minimize the impact of the first active material layer on the cycle performance, the present application defines the thickness of the first active material layer as 2 μm -7 μm , which thus can ensure the better cycle performance of the battery while ensuring the safety of the lithium-ion battery. As can be seen from the description of Reference Document 1, it mainly requires that the porosity of the first active material layer is greater than that of the second active material layer, but does not require the comparison of the thickness between the two active material layers and the specific component of the active material in the two active material layers at all. Therefore, Reference Document 1 impossibly provides any technical suggestion that the thickness of the second active material layer defined in the present application is much greater than the thickness (obtained by comparing the thickness data) of the first active material layer. Moreover, just because the objective of the invention in Reference Document 1 is to increase the proportion of the active material in the total component of the battery by manufacturing a thicker active material layer, those skilled in the art cannot be motivated to reduce the thickness (between 10-150 microns) of the first cathode material layer (this is inconsistent with the objective of the invention) and thus, cannot arrive at the technical solution set forth in claim 1 of the present application via improving Reference Document 1.

In view of this, the examiner made the following response: the original application document does not recite that selecting lithium iron phosphate as the first active material achieves any unexpected technical effect as compared to the selection of other active materials; moreover, the experimental data likewise does not tell that selecting lithium iron phosphate as the first active material achieves any unexpected technical effect. Therefore, the observations of the applicant cannot be approved by the examiner. Furthermore, the application documents do not recite a correlation between the thickness of the first active material layer and the cycle performance. The examples merely tell that there exists a certain difference in energy density of the first active material layer when its thickness is different. Moreover, Exemplary Structure (A) of Reference Document 1 discloses that the first cathode material layer may have an average thickness from about 1 to 80 microns, and the second cathode material layer may have a thickness from about 10 to 80 microns. There exists no problem, i.e., lack of a motivation to reduce the thickness. Therefore, the observations of the applicant are not convincing.

III. Decision

In conclusion, the present invention patent application does not comply with Article 22.3 of the Patent Law, and falls into the circumstances under Rule 53.2 of the Implementing Regulations of the Patent Law. Therefore, the present invention patent application is rejected according to Article 38 of

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the Patent Law.

Pursuant to the provision as defined in Article 41.1 of the Patent Law, where the applicant is not satisfied with the Rejection Decision of the above patent application, he or she may, within three months from the date of receipt of this Decision, request the Reexamination and Invalidation Examination Department of the Patent Office to conduct a reexamination.

Examiner: SUN Siyuan

Code: 728223

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Issuing Date:

November 24, 2023



Application No. or Patent No.: 202110531289.X

Issuing No.: 2023112101017370

Case Number: 1F566174

Title of Invention-Creation: ELECTRODE AND
LITHIUM-ION BATTERY

Reexamination petitioner: NINGDE AMPEREX
TECHNOLOGY LTD

The Decision of Reexamination

(No. 1476801)

☐ In accordance with the opinions of the preceding examination, the Rejection Decision made by China National Intellectual Property Administration (CNIPA) on _____ is withdrawn; and the original examination department proceeds to conduct the examination procedure.

☒ The Rejection Decision made by CNIPA on October 09, 2022 is maintained.

☐ Upon examination, the Rejection Decision made by CNIPA on _____ is withdrawn.

In accordance with the provision of Article 41.2 of the Patent Law, the reexamination petitioner who is not satisfied with this rejection, within three months upon receipt of this decision, may file a lawsuit to Beijing Intellectual Property Court.

☒ Appendix: The main body of the decision, containing 9 pages (counting from page 2).

Leader of the Panel: DU Kai

Participant: JIANG Feng Reexamination and Invalidation Examination Department of the Patent
Office

Attendant: JIAO Yanfeng



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CHINA NATIONAL INTELLECTUAL PROPERTY ADMINISTRATION

Decision of Examination to the Request for Reexamination (No.1476801)

Case No.	No. 1F566174
Date of Decision	November 20, 2023
Title of Invention	ELECTRODE AND LITHIUM-ION BATTERY
International Classification Number	H01M4/13, H01M4/131, H01M4/136, H01M10/0525, H01M10/0587
Reexamination Petitioner	NINGDE AMPEREX TECHNOLOGY LTD
Application No.	202110531289.X
Date of Application	February 26, 2018
Date of Publication	August 24, 2021
Date of Request for Reexamination	January 18, 2023
Whether the decision of examination is made on the basis of the amended text	☒ Yes ☐ No
Legal Ground	Article 22.3 of the Patent Law
Key point of the decision: Given that there exists a distinguishing technical feature between the technical solution set forth in a claim and the closest prior art, and the distinguishing technical feature is readily obtained on the basis of the disclosure of the reference document in combination with the common knowledge in the art, the technical solution set forth in the claim does not possess prominent substantive features over the combination of the reference document and common knowledge in the art and thus, does not involve an inventive step.	



I. Cause of action

This request for reexamination relates to the invention patent application (hereinafter referred to as the present application) with the application number of 202110531289.X and title of “ELECTRODE AND LITHIUM-ION BATTERY”. The parent application number is 201810162494.1 and the date of application is February 26, 2018; the submission date of the divisional application is May 14, 2021. The applicant of the present application is NINGDE AMPEREX TECHNOLOGY LTD and the date of publication is August 24, 2021.

Upon substantive examination, the substantive examination department of the CNIPA issued a Rejection Decision on October 09, 2022 to reject the present application on the ground that claims 1-11 do not involve an inventive step as defined in Article 22.3 of the Patent Law. The text examined in the Rejection Decision is as follows: pages 1-19 of the description, page 1 of the accompanying drawings of the description, abstract of the description, and the drawing of the abstract filed on May 14, 2021; and claims 1-11 filed on August 23, 2022. Claims directed to the Rejection Decision are as follows:

“1. An electrode, comprising:

a current collector;

a first active material layer comprising a first active material; the first active material layer having a thickness of 2 μm -7 μm ; and

a second active material layer comprising a second active material; the second active material layer having a thickness of more than 30 μm ;

wherein the first active material layer is arranged between the current collector and the second active material layer; the first active material layer is formed on at least one surface of the current collector, and an average particle size of the first active material layer is less than an average particle size of the second active material layer; wherein a total compaction density of the first active material layer and the second active material layer is greater than 3.2 g/cc; and the first active material comprises lithium iron phosphate.

2. The electrode according to claim 1, wherein a ratio of the average particle size of the second active material to the average particle size of the first active material is greater than 1 and smaller than or equal to 40.

3. The electrode according to claim 1, wherein the first active material has an average particle size in a range of 0.2 μm to 15 μm .

4. The electrode according to claim 1, wherein a compaction density of the first active material layer is greater than 2.8 g/cc, and a compaction density of the second active material layer is greater than 3.3 g/cc.

5. The electrode according to claim 1, wherein the first active material layer has a particle size of 90% accumulative volume of less than 40 μm .

6. The electrode according to claim 1, wherein the first active material further comprises one or more of lithium cobaltate, lithium manganate, lithium nickelate, lithium nickel cobalt manganese oxide, lithium iron manganese phosphate, lithium vanadium phosphate, lithium vanadyl phosphate, lithium-rich manganese-based materials, lithium nickel cobalt aluminate, and lithium titanate.

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7. The electrode according to claim 1, wherein the second active material comprises one selected from the group consisting of: lithium cobaltate, lithium nickel cobalt manganese oxide, lithium nickel cobalt aluminum oxide, lithium-rich manganese-based material, lithium iron phosphate, and combinations thereof.

8. The electrode according to claim 1, wherein the first active material comprises one selected from the group consisting of: artificial graphite, natural graphite, mesocarbon microbeads, soft carbon, hard carbon, silicon, silicon carbide, lithium titanate, and combinations thereof.

9. The electrode according to claim 1, wherein each of the first active material layer and the second active material layer further comprises a binder; a content of the binder in the first active material layer is greater than a content of the binder in the second active material layer.

10. The electrode according to claim 9, wherein the binder comprises one selected from the group consisting of: polyvinylidene fluoride, vinylidene fluoride-hexafluoropropylene copolymer, polyamide, polyacrylonitrile, polyacrylates, polyacrylic acids, polyacrylic acid salt, carboxymethylcellulose sodium, polyethylene pyrrolidone, polyvinyl ether, polymethyl methacrylate, polytetrafluoroethylene, poly-hexafluoropropylene and styrene butadiene rubber, and combinations thereof.

11. A lithium-ion battery, comprising the electrode of any one of claims 1-10.

The following reference document is cited in the Rejection Decision:

Reference Document 1: CN105074967A, published on November 18, 2015, also published as WO2014149766A1.

The Rejection Decision deemed as follows: (1) claim 1 differs from Reference Document 1 in that a total compaction density of the first active material layer and the second active material layer is greater than 3.2 g/cc. The aforesaid distinguishing technical feature is readily obtained on the basis of the disclosure of Reference Document 1 in combination with the common knowledge in the art. Therefore, claim 1 does not involve an inventive step over the combination of Reference Document 1 and common knowledge in the art. (2) The additional technical features of claims 2-10 are disclosed by Reference Document 1 or are common knowledge in the art. Therefore, claims 2-10 do not involve an inventive step. (3) Insofar as claims 1-10 are not inventive, claim 11 likewise does not involve an inventive step.

The applicant (hereinafter referred to as the reexamination petitioner) refused to obey the aforesaid Rejection Decision, filed a request for reexamination to CNIPA, and meanwhile, submitted the replacement sheet of the amended full text (inclusive of claims 1-9) on January 18, 2023. The amendments include: as for claim 1, the technical features “a total compaction density of the first active material layer and the second active material layer is greater than 3.2 g/cc; and the first active material comprises lithium iron phosphate” are deleted and incorporated into the additional technical features of claims 2-3; the technical feature “the average particle size refers to a particle size that reaches a volume accumulation of 50% from the small particle size side in a volume-based granularity distribution” is added; claims 2-3 are deleted; the technical feature “lithium iron phosphate” is added in claim 4; number and citing relationships among the claims are adaptively amended. The filed amended claims 1 and 4 are as follows:

“1. An electrode, comprising:

a current collector;

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a first active material layer comprising a first active material; the first active material layer having a thickness of 2 μm -30 μm ; and

a second active material layer comprising a second active material; the second active material layer having a thickness of more than 30 μm ;

wherein the first active material layer is arranged between the current collector and the second active material layer; the first active material layer is formed on at least one surface of the current collector, and an average particle size of the first active material layer is less than an average particle size of the second active material layer; a ratio of the average particle size of the second active material to the average particle size of the first active material is greater than 1 and smaller than or equal to 40; the first active material has an average particle size in a range of 0.2 μm to 15 μm ; and the average particle size refers to a particle size that reaches a volume accumulation of 50% from the small particle size side in a volume-based granularity distribution.”

“4. The electrode according to claim 1, wherein the first active material further comprises one or more of lithium cobaltate, lithium manganate, lithium nickelate, lithium nickel cobalt manganese oxide, lithium iron phosphate, lithium iron manganese phosphate, lithium vanadium phosphate, lithium vanadyl phosphate, lithium-rich manganese-based materials, lithium nickel cobalt aluminate, and lithium titanate.”

The reexamination petitioner stated the following observations: 1) Reference Document 1 does not disclose a ratio of the average particle size of the second active material to the average particle size of the first active material layer given that the average particle size of the first active material layer is less than the average particle size of the second active material layer, and the first active material has an average particle size in a range of 0.2 μm to 15 μm . Therefore, Reference Document 1 does not disclose the correlated distinguishing technical features: an average particle size of the first active material layer is less than an average particle size of the second active material layer; a ratio of the average particle size of the second active material to the average particle size of the first active material is greater than 1 and smaller than or equal to 40; the first active material has an average particle size in a range of 0.2 μm to 15 μm ; and the average particle size refers to a particle size that reaches a volume accumulation of 50% from the small particle size side in a volume-based granularity distribution. Reference Document 1 is mainly to regulate a porosity, thus improving power and cycle performance of a battery. In the present application, according to the aforesaid distinguishing technical feature A, the first active material layer is not easy to fall off during the nail process, which can improve the safety problems of the battery caused by a short circuit of the positive electrode current collector-negative electrode active material layer, thus improving the safety performance of the battery. 2) Reference Document 1 does not disclose that the first active material layer has a thickness of 2 μm -30 μm , and the second active material layer has a thickness of more than 30 μm such that the first active material layer achieves full coverage of the positive electrode current collector to improve the battery safety performance while the second active material layer ensures a higher energy density of the battery.

After the formal examination is qualified, CNIPA accepted the request for reexamination in accordance with the law on March 30, 2023, and forwarded it to the substantive examination department for a prepositive preposition.

The substantive examination department insisted the Rejection Decision in the prepositive office action.

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Afterwards, CNIPA established a panel to hear this case.

The panel issued a notification of reexamination on September 01, 2023, indicating that claims 1-9 do not involve an inventive step as defined in Article 22.3 of the Patent Law. Regarding the opinions of the reexamination petitioner, the panel deemed as follows: 1) Reference Document 1 has disclosed the relationship of the average particle size of the two layers, the scope of the average particle size of the first layer, and the ratio of average particle size of the two layers. The problem to be solved in the present application already can be already solved objectively. The particle size of 50% accumulative volume (i.e., the particle size of Dv50) is a common measurement standard of average particle size in the art; this is the common knowledge in the art. On this basis, those skilled in the art could readily conceive of adopting the particle size standard of Dv50 as a standard to select that the second average diameter is greater than the first average diameter without any inventive labor; and its technical effect could be expected. 2) Given that the content of the first layer of binder is greater than the content of the second layer of binder, the present application obtains the required energy density by limiting the thickness of the first layer. Reference Document 1 provides the technical suggestion of improving the adhesive force between the material layer and the substrate (i.e., the current collector) by a binder. Those skilled in the art can be motivated to use more binders in the first layer under such a technical suggestion. In the meanwhile, Reference Document 1 discloses that the second cathode material layer has a final thickness of 110 microns, and additionally provides the technical suggestion that other proper thickness of material layer can be configured for the first cathode material layer. Therefore, based on the actual demand for battery energy density, those skilled in the art could conventionally select a proper first layer of thickness and also could expect its effect.

In regard to the notification of reexamination, the reexamination petitioner filed an Observation, and meanwhile submitted the replacement sheet of the amended full claims (including claims 1-8) on October 13, 2023. The amendments include: the original claim 7 is incorporated into the original claim 1 and deleted; the technical feature “the mass content of the binder in the first active material layer is in the range of 1.5% to 6%, and the mass content of the binder in the second active material layer is in the range of 0.5% to 4%” is added to claim 1; number and citing relationships among the claims are adaptively amended. The filed amended claim 1 is as follows:

“1. An electrode, comprising:

a current collector;

a first active material layer comprising a first active material; the first active material layer having a thickness of 2 μm -30 μm ; and

a second active material layer comprising a second active material; the second active material layer having a thickness of more than 30 μm ;

wherein the first active material layer is arranged between the current collector and the second active material layer; the first active material layer is formed on at least one surface of the current collector, and an average particle size of the first active material layer is less than an average particle size of the second active material layer; a ratio of the average particle size of the second active material to the average particle size of the first active material is greater than 1 and smaller than or equal to 40; the first active material has an average particle size in a range of 0.2 μm to 15 μm ; and the average particle size refers to a particle size that reaches a volume accumulation of 50% from the small particle size side in a volume-based granularity distribution;

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each of the first active material layer and the second active material layer further comprises a binder; a content of the binder in the first active material layer is greater than a content of the binder in the second active material layer; and a mass content of the binder in the first active material layer is in the range of 1.5% to 6%, and a mass content of the binder in the second active material layer is in the range of 0.5% to 4%.”

The reexamination petitioner contended as follows: 1) Reference Document 1 does not disclose an average particle size of Dv50; hence, Reference Document 1 does not disclose the following technical features: an average particle size of the first active material layer is less than an average particle size of the second active material layer; a ratio of the average particle size of the second active material to the average particle size of the first active material is greater than 1 and smaller than or equal to 40; the first active material has an average particle size in a range of 0.2 μm to 15 μm ; and the average particle size refers to a particle size that reaches a volume accumulation of 50% from the small particle size side in a volume-based granularity distribution. The present application regulates and controls the thickness of the first active material layer and the scope of the ratio of the particle size such that the first active material layer achieves full coverage of the positive electrode current collector and has a higher adhesion effect, thus reducing the probability of short circuit occurrence and improving the mechanical and safety performance of the battery (see paragraphs [0029]-[0030] of the description). Reference Document 1 is mainly to regulate and control porosity via the regulation of the particle size and thickness, thus improving the battery power and cycle performance. Based on Reference Document 1, it is impossible to conceive of regulating and controlling the average particle size and the ratio of particle size at the same time to improve the adhesiveness between layers. Reference Document 1 does not define the relationship

of the average particle size; moreover, the examples prove that the average particle size of the first layer is smaller or larger than that of the second layer available. 2) The present application can improve the nail test of the lithium-ion battery while ensuring the energy density by regulating and controlling the correlation between the content of the binder in the first active material layer and the content of the binder in the second active material layer as well as each content scope, which is different from the effect of merely achieving adhesion in Reference Document 1. Based on Reference Document 1, it is impossible to conceive of regulating and controlling the correlation between the content of the first cathode material layer and the content of the second cathode material layer to improve the nail test of the battery while ensuring the energy density.

On the basis of the aforesaid procedures, the panel deeded that the fact of this case is clear, thereby making a decision of examination.

II. Grounds of the decision

1 Text for examination

The reexamination petitioner filed the replacement sheet of amended full claims (inclusive of 8 claims in total) on October 13, 2023. Upon examination, the amendments comply with the provisions of Article 61.1 of the Implementing Regulations of the Patent Law and Article 33 of the Patent Law. The text examined in the decision of examination to the request for reexamination is as follows: pages 1-19 of the description, page 1 of the accompanying drawings of the description, abstract of the description, and the drawing of the abstract filed on the submission date of the divisional application, i.e., May 14, 2021; and claims 1-8 filed on October 13, 2023.

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2. Regrading Article 22.3 of the Patent Law

It is stipulated under Article 22.3 of the Patent Law that: an inventive step means that, as compared with the prior art, the invention has prominent substantive features and represents notable progress, and the utility model has substantive features and represents progress.

Given that there exists a distinguishing technical feature between the technical solution set forth in a claim and the closest prior art, and the distinguishing technical feature is readily obtained on the basis of the disclosure of the reference document in combination with the common knowledge in the art, the technical solution set forth in the claim does not possess prominent substantive features over the combination of the reference document and common knowledge in the art and thus, does not involve an inventive step.

The reference document cited in the decision of examination to the request for reexamination is the same as that in the Rejection Decision and the notification of reexamination, namely:

Reference Document 1: CN105074967A, published on November 18, 2015, also published as WO2014149766A1.

2.1. Claim 1 sets forth an electrode. Reference Document 1 discloses a lithium-ion battery and discloses an electrode, and specifically discloses the following content (see claims 1-15, paragraphs [0005]-[0015], [0026]-[0072], [0106], [0109]-[0110], and FIGS. 1A-2C of the description): in the multi-layer cathode structure 103, a first slurry mixture comprising a cathodically active material is deposited on the current collector 113 to form a first cathode material layer 210; a second slurry mixture comprising a cathodically active material is deposited on the first cathode material layer 210 to form a second cathode material layer 220; the cathodically active material of the first slurry mixture comprises particles having a first average diameter and the cathodically active material of the second slurry mixture comprises particles having a second average diameter, wherein the second average diameter is greater than the first average diameter (equivalent to “the first active material layer is arranged between the current collector and the second active material layer; the first active material layer is formed on at least one surface of the current collector, and an average particle size of the first active material layer is less than an average particle size of the second active material layer”); the first average diameter is between 2 μm and 15 μm (within the numerical range of 0.2 μm -15 μm), and the second average diameter is between 5 μm and 15 μm (see details in claims 1-2, 4, and 13-14). In certain implementations, the first cathode material layer 210 comprises a cathodically active material having an average particle size of about 3 μm and a tap density of about 2.5 g/cm^3 and the second cathode material layer 220 comprises a cathodically active material having an average particle size of about 10 μm and a tap density of about 2.8 g/cm^3 . Examples: a first and second slurry composition having 65 wt.% solid content and comprising 4 wt.% PVDF, 3.2 wt.% carbon black (CB), and 92.8 wt.% lithium nickel-manganese-cobalt oxide (NMC) was used for the following examples. The NMC labeled MX-3 had an average particle size of 3 microns and the NMC labeled MX-10 had an average particle size of 10 microns. A first slurry mixture having MX-3 was deposited using a doctor blade process over an aluminum foil current collector having a thickness of 18.8 microns. The aluminum foil current collector and first slurry mixture were heated to 80 degrees Celsius to evaporate off solvent and form a first cathode material layer. A second slurry mixture having MX-10 was deposited over the first cathode material layer. The aluminum foil current collector, first cathode material layer and second slurry mixture were heated to 80 degrees Celsius to evaporate off solvent and form a second cathode material layer (i.e., the average particle size of the first cathode material layer is 3 μm , and the average particle size of the second cathode material layer is 10 μm , and through

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conversion, the ratio of the average particle size of the first cathode material layer to the average particle size of the second cathode material layer is equal to 10:3, i.e., falling within the numerical range of greater than 1 and less than or equal to 40). The first cathode material layer had a final thickness of 64.6 microns, and the second cathode material layer had a final thickness of 110 microns (falling within the numerical range of the second active material layer having a thickness of more than 30 μm). The binding agent in the first slurry mixture may be selected from a styrene butadiene rubber (SBR) and a polyvinylidene fluoride (PVDF); with reference to the first slurry mixture, the second slurry mixture may comprise a binding agent.

Claim 1 differs from Reference Document 1 in the follows: 1) the first active material layer having a thickness of 2 μm -30 μm ; and the average particle size refers to a particle size that reaches a volume accumulation of 50% from the small particle size side in a volume-based granularity distribution; 2) a content of the binder in the first active material layer is greater than a content of the binder in the second active material layer; and a mass content of the binder in the first active material layer is in the range of 1.5% to 6%, and a mass content of the binder in the second active material layer is in the range of 0.5% to 4%. Thus as can be seen, the technical problem to be practically solved by claim 1 is how to balance the adhesion between the active material layer and the current collector, and battery energy density.

In regard to the distinguishing technical feature 1), Reference Document 1 discloses (see above) that the first cathode material layer has a final thickness of 64.6 microns, and the second cathode material layer has a final thickness of 110 microns. Reference Document 1 further discloses (paragraphs [0041] and [0072] of the description): the first cathode material layer has a thickness between 10 μm and 150 μm (overlapping the numerical range of 2 μm -30 μm). Exemplary Structure (A) discloses that the first cathode material layer may have an average thickness from about 1 to 80 microns, and the second cathode material layer may have a thickness from about 10 to 80 microns. That is, Reference Document 1 provides the technical suggestion of configuring other proper thickness of material layer. Under such a technical suggestion, those skilled in the art could select a proper thickness of the first cathode material layer according to the practical requirements for battery energy density.

Reference Document 1 discloses that the second average diameter is greater than the first average diameter (claim 13); the first average diameter is between 2 μm and 15 μm (claim 14), specifically as follows: the first cathode material layer has an average particle size of 3 μm ; the second cathode material layer has an average particle size of 10 μm ; the ratio of the average particle size of the second cathode material layer to the average particle size of the first cathode material layer is equal to 10:3 (see paragraphs [0106]-[0110] of the description). That is, Reference Document 1 discloses the relationship of the average particle size of the two layers, the average particle size of the first layer, and the ratio of average particle size of the two layers. The particle size of 50% accumulative volume (the particle size of Dv50) is a common measurement standard of average particle size; this is the common knowledge in the art. On this basis, according to the numerical value and scope of the average particle size disclosed in Reference Document 1, those skilled in the art could readily conceive of adopting the common particle size standard of Dv50 as a standard to select the aforesaid numerical value of particle size in D1 without any inventive labor; and its technical effect could be expected.

In regard to the distinguishing technical feature 2), those skilled in the art could understand that a binder is an inactive material, and its too high content will affect the overall energy density of the

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battery. Reference Document 1 discloses (see above) that a first and second slurry composition has 65 wt.% solid content and comprising 4 wt.% PVDF; the binding agent facilitates binding of the cathodically active material with the substrate. That is, Reference Document 1 provides the technical suggestion of facilitating binding of the cathodically active material with the substrate by a binder. Under such a technical suggestion, through the overall consideration of adhesiveness, energy density, and other factors, those skilled in the art could readily conceive that the content of the binder used in the first layer in contact with the current collector is greater than the content of the binder in the second layer, thus enhancing the adhesion between the cathodically active material and the substrate while ensuring the energy density, and accordingly could select a proper content through limited number of tests. Moreover, these can be readily envisaged and achieved to those skilled in the art.

As such, it would have been obvious for those skilled in the art to arrive at the technical solution set forth in claim 1 on the basis of Reference Document 1 in combination with common knowledge in the art. Therefore, claim 1 does not possess prominent substantive features, and thus does not involve an inventive step as defined in Article 22.3 of the Patent Law.

2.2. Claim 2 is a dependent claim. A compaction density of an active material layer is closely correlated to the corresponding battery energy density and the thickness of the active material layer; when the compaction density increases, the battery energy density will increase therewith, and the thickness of the active material layer will decrease therewith; these are common knowledge in the art. To obtain a proper battery energy density and thickness of the active material layer, those skilled in the art could readily conceive of selecting a proper compaction density of the first active material layer and a proper compaction density of the second active material layer according to the practical requirements without any inventive labor; and could expect the effect thereof. Therefore, insofar as claim 1 to which claim 2 refers is not inventive, claim 2 likewise does not involve an inventive step.

2.3. Claim 3 is a dependent claim. As can be seen from “the first active material has a particle size of 90% accumulative volume of less than 40 μm ”, most of particles in the first active material of the present application have a particle size of 40 μm below, and there are a small amount of particles having a particle size of more than 40 μm . Based on paragraph [0046] of the description in Reference Document 1, “in one implementation, the particles are nanoscale particles. In another implementation, the nanoscale particles have a diameter between about 1 nm and about 100 nm... In one implementation, the micro-scale particles have a diameter between about 1 μm and about 20 μm ”. As such, most of particles in Reference Document 1 also have a particle size of 40 μm below. The particle size of 90% accumulative volume (i.e., the particle size of D_{v90}) is a common measurement standard of average particle size in the art. On this basis, those skilled in the art could readily conceive of adopting the particle size standard of D_{v90} to select the particle size of the first active material without any inventive labor; and its technical effect could be expected. Therefore, insofar as the claim to which claim 3 refers is not inventive, claim 3 likewise does not involve an inventive step.

2.4. Claims 4-5 are dependent claims. Reference Document 1 further discloses (claim 11, paragraphs [0033], [0044], and [0066] of the description): the cathodically active material of the first slurry mixture and the cathodically active material of the second slurry mixture are each independently selected from the group comprising of: lithium cobalt dioxide (LiCoO_2), lithium manganese dioxide (LiMnO_2), titanium disulfide (TiS_2), $\text{LiNi}_x\text{Co}_{1-2x}\text{MnO}_2$, $\text{Li}(\text{Ni}_{0.8}\text{Co}_{0.15}\text{Al}_{0.05})\text{O}_2$, LiMn_2O_4 , LiFePO_4 , $\text{LiFe}_{1-x}\text{MgPO}_4$, LiMoPO_4 , LiCoPO_4 , $\text{Li}_3\text{V}_2(\text{PO}_4)_3$, LiVOPO_4 , LiMP_2O_7 , $\text{LiFe}_{1.5}\text{P}_2\text{O}_7$, LiVPO_4F , LiAlPO_4F , $\text{Li}_5\text{V}(\text{PO}_4)_2\text{F}_2$, $\text{Li}_5\text{Cr}(\text{PO}_4)_2\text{F}_2$, $\text{Li}_2\text{CoPO}_4\text{F}$, $\text{Li}_2\text{NiPO}_4\text{F}$, $\text{Na}_5\text{V}_2(\text{PO}_4)_2\text{F}_3$, $\text{Li}_2\text{FeSiO}_4$, $\text{Li}_2\text{MnSiO}_4$, $\text{Li}_2\text{VOSiO}_4$, LiNiO_2 , and combinations thereof. The active

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material of the first cathode material layer 210 and the active material of the second cathode material layer 220 are same or different materials. In addition, lithium iron manganese phosphate, lithium-rich manganese-based materials, and lithium titanate are also conventional selections in the art. Therefore, insofar as the claim to which claims 4-5 refer is not inventive, claims 4-5 likewise do not involve an inventive step.

2.5. Claim 6 is a dependent claim. Reference Document 1 further discloses (paragraph [0034] of the description): the active anode material may be selected from a graphite material, silicon, lithium titanate, etc.; moreover, mesocarbon microbeads, soft carbon, hard carbon, silicon carbide, etc. are also conventional selections in the art. Reference Document 1 discloses a cathodically bi-layer structure capable of achieving the properties such as faster charging and larger capacity. Based on the understandings to the performances of the cathode and anode of lithium-ion batteries, those skilled in the art could readily conceive of configuring a bi-layer structure on the anode and using the above active materials. Therefore, insofar as the claim to which claim 6 refer is not inventive, claim 6 likewise does not involve an inventive step.

2.6. Claim 7 is a dependent claim. Reference Document 1 further discloses (paragraphs [0047] and [0056] of the description): the binding agent in the first slurry mixture may be selected from a styrene butadiene rubber (SBR), and a polyvinylidene fluoride (PVDF); with reference to the first slurry mixture, the second slurry mixture may comprise a binding agent. The binding agent facilitates binding of the cathodically active material with the substrate. Other binders are also conventional selections in the art. Therefore, insofar as the claim to which claim 7 refer is not inventive, claim 7 likewise does not involve an inventive step.

2.7. Claim 8 sets forth a lithium-ion battery. Reference Document 1 (paragraph [0005] of the description) further discloses: the lithium-ion battery comprises electrodes. Therefore, insofar as the preceding claims 1-7 are not inventive, claim 8 does not involve an inventive step.

3. Response to the observations of the reexamination petitioner

With regard to the opinions of the reexamination petitioner put forward in response to the notification of reexamination, the panel deemed as follows:

1) Reference Document 1 discloses that the second average diameter is greater than the first average diameter (claim 13); the first average diameter is between 2 μm and 15 μm (claim 14), specifically as follows: the first layer has an average particle size of 3 μm ; the second layer has an average particle size of 10 μm ; the first cathode material layer has a final thickness of 64.6 microns, and the second cathode material layer has a final thickness of 110 microns (see paragraphs [0070], [0106], and [0109]-[0110] of the description). That is, Reference Document 1 has disclosed the relationship of the average particle size of the two layers, the scope of the average particle size of the first layer, and the ratio of average particle size of the two layers. The problem to be solved in the present application has been already solved objectively, which can achieve the advantageous effects brought by the value of the particle size and the relationship between particle sizes in the present application. The particle size of 50% accumulative volume (i.e., the particle size of Dv50) is a common measurement standard of average particle size in the art; this is a measuring standard commonly acknowledged by those skilled in the art. On this basis, those skilled in the art could readily conceive of adopting the particle size standard of Dv50 as a measurement standard to select that the second average diameter is greater than the first average diameter in Reference Document 1 without any inventive labor; and its technical effect could be expected.

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2) As can be seen from paragraph [0030] of the description of the present application, given that the content of the first layer of binder is greater than the content of the second layer of binder, the present application obtains the required energy density by limiting the thickness of the first layer.

Those skilled in the art could understand that a binder is an inactive material, and its major function is adhesion to prevent the active material layer from falling off; too high content of a binder will relatively reduce the content of the active material, thus affecting the overall energy density of the battery. Reference Document 1 discloses (see above) that a first and second slurry composition has 65 wt.% solid content and comprising 4 wt.% PVDF; the binding agent facilitates binding of the cathodically active material with the substrate. That is, Reference Document 1 provides the technical suggestion of facilitating binding of the cathodically active material with the substrate by a binder. Under such a technical suggestion, through the overall consideration of the factors such as mechanical safety brought by adhesiveness and impact on the energy density, those skilled in the art could readily conceive that a larger content of binder is used in the first layer in contact with the current collector to improve the adhesion between the active material and substrate; and meanwhile, the content of the binder in the second layer is reduced to relatively increase the proportion of the active material in the second layer, thus improving the adhesion between the cathodically active material and substrate while ensuring the energy density, and accordingly could select a proper content through limited number of tests. Moreover, these can be readily envisaged and achieved to those skilled in the art.

In conclusion, the observations of the reexamination petitioner are not convincing and thus, cannot be approved by the panel.

Based on the above facts and grounds, the panel of this case made the following decision in accordance with the law.

III. Decision

The Rejection Decision made by CNIPA to the present application on October 09, 2022 is maintained.

Should you refuse to obey the decision of examination to the present request for reexamination, the reexamination petitioner may file a lawsuit to Beijing Intellectual Property Court within three months upon the receipt of this decision in accordance with the provision of Article 41.2 of the Patent Law.

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Leader of the Panel: DU Kai

Participant: JIANG Feng Reexamination and Invalidation Examination Department of the Patent Office

Attendant: JIAO Yanfeng



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权 利 要 求 书

1. 一种极片, 包括:

集流体;

5 第一活性物质层, 包括第一活性物质; 以及

第二活性物质层, 包括第二活性物质;

其中, 所述第一活性物质层设置于所述集流体和所述第二活性物质层之间, 所述第一活性物质层形成在所述集流体的至少一个表面上, 所述第一活性物质的平均粒径小于所述第二活性物质的平均粒径, 所述第一活性物质层和所述第二活性物质层整体的压实密度大于 3.2g/cc, 第一活性物质层的压实密度较第二活性物质层低; 所述第一活性物质包括磷酸铁锂。

2. 根据权利要求 1 所述的极片, 其中, 所述第二活性物质的平均粒径与所述第一活性物质的平均粒径的比值大于 1 且小于或等于 40。

3. 根据权利要求 1 所述的极片, 其中, 所述第一活性物质的平均粒径在 0.2 μ m~15 μ m 的范围内。

4. 根据权利要求 1 所述的极片, 其中, 所述第一活性物质层的压实密度大于 2.8g/cc, 所述第二活性物质层的压实密度大于 3.3g/cc。

5. 根据权利要求 1 所述的极片, 其中, 所述第一活性物质的体积累积 90% 的粒径为 40 μ m 以下。

6. 根据权利要求 1 所述的极片, 其中, 所述第一活性物质层的厚度为 2 μ m~30 μ m。

7. 根据权利要求 1 所述的极片, 其中, 所述第二活性物质层的厚度为 30 μ m 以上。

8. 根据权利要求 1 所述的极片, 其中, 所述第一活性物质还包括钴酸锂、锰酸锂、镍酸锂、镍钴锰酸锂、磷酸锰铁锂、磷酸钒锂、磷酸钒氧锂、富锂锰基材料、镍钴铝酸锂和钛酸锂中的一种或几种。

9. 根据权利要求 1 所述的极片, 其中, 所述第二活性物质包括选自钴酸锂、镍钴锰酸锂、镍钴铝酸锂、富锂锰基材料、磷酸铁锂中的一种及其组合。



10. 根据权利要求 1 所述的极片，其中，所述第一活性物质包括选自人造石墨、天然石墨、中间相碳微球、软碳、硬碳、硅、硅碳化合物、钛酸锂中的一种及其组合。

11. 根据权利要求 1 所述的极片，其中，所述第一活性物质层和所述
5 第二活性物质层均还包括粘结剂，所述第一活性物质层中的粘结剂含量大于所述第二活性物质层中的粘结剂含量。

12. 根据权利要求 11 所述的极片，其中，所述粘结剂包括选自聚偏氟
乙烯、偏氟乙烯-六氟丙烯的共聚物、聚酰胺、聚丙烯腈、聚丙烯酸酯、聚
丙烯酸、聚丙烯酸盐、羧甲基纤维素钠、聚乙烯吡咯烷酮、聚乙烯醚、聚
10 甲基丙烯酸甲酯、聚四氟乙烯、聚六氟丙烯和丁苯橡胶中的一种及其组合。

13. 一种锂离子电池，包括根据权利要求 1-12 中任一项所述的极片。



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申请人或专利权人: 宁德新能源科技有限公司

发明创造名称: 极片和锂离子电池

第一次审查意见通知书

1. ☒ 应申请人提出的实质审查请求, 根据专利法第 35 条第 1 款的规定, 国家知识产权局对上述发明专利申请进行实质审查。

☐ 根据专利法第 35 条第 2 款的规定, 国家知识产权局决定自行对上述发明专利申请进行审查。

2. ☐ 申请人要求以其在:

☐ 申请人已经提交了经原受理机构证明的第一次提出的在先申请文件的副本。

☐ 申请人尚未提交经原受理机构证明的第一次提出的在先申请文件的副本, 根据专利法第 30 条的规定视为未要求优先权要求。

3. ☐ 经审查, 申请人于____提交的修改文件, 不符合专利法实施细则第 51 条第 1 款的规定, 不予接受。

4. 审查针对的申请文件:

☐ 原始申请文件。 ☒ 分案申请递交日提交的文件。 ☐ 下列申请文件:

5. ☐ 本通知书是在未进行检索的情况下作出的。

☒ 本通知书是在进行了检索的情况下作出的。

☒ 本通知书引用下列对比文件(其编号在今后的审查过程中继续沿用):

编号	文 件 号 或 名 称	公开日期 (或抵触申请的申请日)
1	CN 105074967A	20151118

6. 审查的结论性意见:

关于说明书:

☐ 申请的内容属于专利法第 5 条规定的不授予专利权的范围。

☐ 说明书不符合专利法第 26 条第 3 款的规定。

☐ 说明书不符合专利法第 33 条的规定。

☐ 说明书的撰写不符合专利法实施细则第 17 条的规定。

☐ _____



关于权利要求书：

- ☐ 权利要求_____不符合专利法第 2 条第 2 款的规定。
- ☐ 权利要求_____不符合专利法第 9 条第 1 款的规定。
- ☐ 权利要求_____不具备专利法第 22 条第 2 款规定的新颖性。
- ☒ 权利要求 1-13 不具备专利法第 22 条第 3 款规定的创造性。
- ☐ 权利要求_____不具备专利法第 22 条第 4 款规定的实用性。
- ☐ 权利要求_____属于专利法第 25 条规定的不授予专利权的范围。
- ☐ 权利要求_____不符合专利法第 26 条第 4 款的规定。
- ☐ 权利要求_____不符合专利法第 31 条第 1 款的规定。
- ☐ 权利要求_____不符合专利法第 33 条的规定。
- ☐ 权利要求_____不符合专利法实施细则第 19 条的规定。
- ☐ 权利要求_____不符合专利法实施细则第 20 条的规定。
- ☐ 权利要求_____不符合专利法实施细则第 21 条的规定。
- ☐ 权利要求_____不符合专利法实施细则第 22 条的规定。
- ☐ _____

- ☐ 申请不符合专利法第 26 条第 5 款或者实施细则第 26 条的规定。
- ☐ 申请不符合专利法第 19 条第 1 款的规定。
- ☐ 分案申请不符合专利法实施细则第 43 条第 1 款的规定。

上述结论性意见的具体分析见本通知书的正文部分。

7. 基于上述结论性意见，审查员认为：

- ☐ 申请人应当按照通知书正文部分提出的要求，对申请文件进行修改。
- ☐ 申请人应当在意见陈述书中论述其专利申请可以被授予专利权的理由，并对通知书正文部分中指出的不符合规定之处进行修改，否则将不能授予专利权。
- ☒ 专利申请中没有可以被授予专利权的实质性内容，如果申请人没有陈述理由或者陈述理由不充分，其申请将被驳回。
- ☐ _____

8. 申请人应注意下列事项：

(1) 根据专利法第 37 条的规定，申请人应在收到本通知书之日起的 4 个月内陈述意见，如果申请人无正当理由逾期不答复，其申请被视为撤回。

(2) 申请人对其申请的修改应当符合专利法第 33 条的规定，不得超出原说明书和权利要求书记载的范围，同时申请人对专利申请文件进行的修改应当符合专利法实施细则第 51 条第 3 款的规定，按照本通知书的要求进行修改。

(3) 申请人的意见陈述书和/或修改文本应邮寄或递交国家知识产权局专利局受理处，凡未邮寄或递交给受理处的文件不具备法律效力。

(4) 未经预约，申请人和/或代理人不得前来国家知识产权局专利局与审查员举行会晤。

(5) 对进入实质审查阶段的发明专利申请，在第一次审查意见通知书答复期限届满前（已提交答复意见的除外），主动申请撤回的，可以请求退还 50% 的专利申请实质审查费。

9. 本通知书正文部分共有 3 页，并附有下列附件：

- ☐ 引用的对比文件的复印件共_____份_____页。
- ☐ _____

审查员：孙思远

联系电话：022-84868387

审查部门：专利审查协作天津中心电学发明审查部



第一次审查意见通知书

申请号:202110531289X

经审查,现提出如下审查意见:

1.权利要求1不具备专利法第22条第3款规定的创造性。

权利要求1请求保护一种极片,对比文件1(CN105074967A)公开一种锂离子电池,其中公开了一种电极,并具体公开以下内容(见权利要求1-15,说明书第0005-0015,0026-0072段,附图1A-2C):多层阴极结构103中,在集电器113上沉积包含阴极活性材料的第一浆料混合物以形成第一阴极材料层210,将包含阴极活性材料的第二浆料混合物沉积在第一阴极材料层210上以形成第二阴极材料层220,第一浆料混合物的阴极活性材料包含具有第一平均直径的颗粒,及所述第二浆料混合物的阴极活性材料包含具有第二平均直径的颗粒,其中所述第二平均直径大于所述第一平均直径,第一、二平均直径分别为约2-15微米、5-15微米;第一浆料混合物的阴极活性材料选自由以下材料组成的群组:氧化锂钴(LiCoO₂)、氧化锂锰(LiMnO₂)、二硫化钛(TiS₂)、LiNi_xCo_{1-2x}MnO₂、LiMn₂O₄、**LiFePO₄**、LiFe_{1-x}MgPO₄、LiMoPO₄、LiCoPO₄、Li₃V₂(PO₄)₃、LiVPO₄、LiMP₂O₇、LiFe_{1.5}P₂O₇、LiVPO₄F、LiAlPO₄F、Li₅V(PO₄)₂F₂、Li₅Cr(PO₄)₂F₂、Li₂CoPO₄F、Li₂NiPO₄F、Na₅V₂(PO₄)₂F₃、Li₂FeSiO₄、Li₂MnSiO₄、Li₂VOSiO₄、LiNiO₂,及上述材料的组合。

权利要求1与对比文件1的区别技术特征为:第一活性物质层和所述第二活性物质层的整体压实密度大于3.2g/cc。基于上述区别技术特征,权利要求1的技术方案实际解决的技术问题是:如何获取所需的电池能量密度和活性物质层厚度。

活性物质层的压实密度与相应电池能量密度和活性物质层的厚度密切相关,当压实密度增大时,电池能量密度随之增大,活性物质层的厚度随之减小,这是本领域的公知常识。为了获得合适的电池能量密度和活性物质层厚度,本领域技术人员容易想到可以根据实际需要选择合适的活性物质层整体压实密度,这不需要付出创造性的劳动,其效果也是可以预期的。

可见,在对比文件1的基础上结合本领域的公知常识,得到权利要求1的技术方案对于本领域技术人员而言是显而易见的。因此,权利要求1不具有突出的实质性特点和显著的进步,不具备专利法第22条第3款规定的创造性。

2.权利要求2-12不具备专利法第22条第3款规定的创造性。

权利要求2-11是对权利要求1的进一步限定,权利要求12是对权利要求1的进一步限定,对比文件1还公开了:第一、二平均直径分别为约2-15微米、5-15微米;第一浆料混合物的阴极活性材料及第二浆料混合物的阴极活性材料中的每一个单独选自由以下材料组成的群组:氧化锂钴(**LiCoO₂**)、氧化锂锰(LiMnO₂)、二硫化钛(TiS₂)、**LiNi_xCo_{1-2x}MnO₂**、**LiMn₂O₄**、**LiFePO₄**、LiFe_{1-x}MgPO₄、LiMoPO₄、LiCoPO₄、**Li₃V₂(PO₄)₃**、**LiVPO₄**、LiMP₂O₇、LiFe_{1.5}P₂O₇、LiVPO₄F、LiAlPO₄F、Li₅V(PO₄)₂F₂、Li₅Cr(PO₄)₂F₂、



Li₂CoPO₄F、Li₂NiPO₄F、Na₅V₂(PO₄)₂F₃、Li₂FeSiO₄、Li₂MnSiO₄、Li₂VOSiO₄、**LiNiO₂**，及上述材料的组合，第一、二阴极材料层 210、220 的活性材料为相同材料或不同材料；位于电池单元 100、120 的阴极侧或正电极上的活性材料可包含含锂金属氧化物，例如 **LiNi_xCo_yAl_zO₂**；第一阴极材料层 210 厚度在约 10-150 微米之间，第二阴极材料层 220 厚度约 10-80 微米；阳极活性材料可选石墨材料、硅、钛酸锂等；第一浆料混合物中粘合剂可选择苯乙烯丁二烯橡胶(丁苯橡胶)、聚偏二氟乙烯(聚偏氟乙烯)；第二浆料混合物中可包含粘合剂；第一、第二浆料混合物均可包含重量百分比在约 50%至 80%之间的固体，所述固体包含重量百分比为约 1%至 10%的黏合剂或可包含重量百分比在约 55%至 65%之间的固体，所述固体包含重量百分比为约 1%至 4%的黏合剂，在某些实施例中，第一阴极材料层 210 的固体含量的重量百分比可大于 60%，及第二阴极材料层 220 的固体含量的重量百分比可在约 50%至 60%之间。在对比文件公开的内容的基础上，对比文件 1 公开的第一、二浆料混合物中包含的阴极活性材料，其直径为平均直径，当第一阴极活性材料平均粒径为 2 微米时，第二阴极活性材料与第一阴极活性材料平均粒径的比值范围为 5:2-15:2；活性物质层的压实密度与相应电池能量密度和活性物质层的厚度密切相关，当压实密度增大时，电池能量密度随之增大，活性物质层的厚度随之减小，这是本领域的公知常识，为了获得合适的电池能量密度和活性物质层厚度，本领域技术人员容易想到可以根据实际需要选择合适的第一活性物质层压实密度和第二活性物质层压实密度，这不需要付出创造性的劳动，其效果也是可以预期的；由“第一活性物质的体积累积 90%的粒径为 40 μm 以下”可知，本申请的第一活性物质中大部分粒子的粒径是 40 μm 以下的，粒径为 40 μm 以上的粒子为少部分，根据对比文件 1 说明书第 [0046]段“在一个实施例中，颗粒为纳米尺度颗粒。在另一个实施例中，纳米尺度颗粒的直径在约 1nm 与约 100nm 之间……在一个实施例中，微米尺度颗粒的直径在约 1 微米与约 20 微米之间”可知，对比文件 1 中大部分颗粒的粒径也是在 40 μm 以下的，本领域中，体积累积 90%的粒径(即 D_v90 的粒径)也是常见的粒径测量标准，在此基础上，本领域技术人员可以采用 D_v90 的粒径标准去选择第一活性物质的粒径，这是容易想到的，不需要付出创造性的劳动，其效果也是可以预期的；磷酸锰铁锂、富锂锰基材料和钛酸锂也都属于本领域中的常规选择；中间相碳微球、软碳、硬碳、硅碳化合物等也属于本领域中的常规选择，对比文件 1 公开了阴极双层结构，能够实现更快充电、更大容量等性能，基于本领域技术人员对锂离子电池阴极、阳极性能的了解，容易想到在阳极设置双层结构并采用上述活性材料；对比文件 1 公开了各活性物质层的固体含量和固体中粘合剂的含量，当第一活性物质层中的固体含量大于第二活性物质层中的固体含量是，本领域技术人员容易想到第一活性物质层中的粘合剂含量大于第二活性物质层中的粘合剂含量；本领域技术人员容易想到将对比文件 1 公开的粘合剂用于第二浆料混合物；未被对比文件 1 公开的其他粘结剂也属于本领域中的常规选择。

因此，当其引用的权利要求不具备创造性时，该从属权利要求也不具备创造性。

3.权利要求 13 不具备专利法第 22 条第 3 款规定的创造性。



权利要求 13 请求保护一种锂离子电池, 对比文件 1 还公开了(说明书第 0005 段):锂离子电池包含电极。在前述权利要求 1-12 不具备创造性的基础上, 权利要求 13 不具备专利法第 22 条第 3 款规定的创造性。

基于上述理由, 本申请的独立权利要求以及从属权利要求都不具备创造性, 同时说明书中也没有记载其他任何可以授予专利权的实质性内容, 因而即使申请人对权利要求进行重新组合和 / 或根据说明书记载的内容作进一步的限定, 本申请也不具备被授予专利权的前景。如果申请人不能在本通知书规定的答复期限内提出表明本申请具有创造性的充分理由, 本申请将被驳回。

如对审查意见有疑问, 可联系本案审查员, 审查员电话 022-84868387; 值班电话 022-84868233 (代为转达); 咨询邮箱 tjscfk@cnipa.gov.cn。请申请人注意, 通过本邮箱反馈的意见陈述书和/或修改文本不具备法律效力, 不能代替正式答复。

另: 根据国家知识产权局《关于停征和调整部分专利收费的公告》(第 272 号), 从 2018 年 8 月 1 日起, 对符合条件的发明专利申请, 在第一次审查意见通知书答复期限届满前 (已提交答复意见的除外), 主动申请撤回的, 允许退还 50% 的专利申请实质审查费。

审查员姓名: 孙思远
审查员代码: 728223



510070

发文日:

2022 年 06 月 09 日



申请号或专利号: 202110531289.X

发文序号: 2022060602002880

申请人或专利权人: 宁德新能源科技有限公司

发明创造名称: 极片和锂离子电池

第二次审查意见通知书

1. ☒ 审查员已经收到申请人于 2022 年 4 月 22 日提交的意见陈述书, 在此基础上审查员对上述专利申请继续进行实质审查。

☐ 根据国家知识产权局于 _____ 年 _____ 月 _____ 日作出的复审决定, 审查员对上述专利申请继续进行实质审查。

☐ _____

2. ☐ 经审查, 申请人于 _____ 提交的修改文件, 不符合专利法实施细则第 51 条第 3 款的规定, 不予接受。

3. 继续审查是针对下列申请文件进行的:

☐ 上述意见陈述书中所附的经修改的申请文件。

☒ 前次审查意见通知书所针对的申请文件以及上述意见陈述书中所附的经修改的申请文件替换文件。

☐ 前次审查意见通知书所针对的申请文件。

☐ 上述复审决定所确定的申请文件。

☐ _____

4. ☒ 本通知书未引用新的对比文件。

☐ 本通知书引用下列对比文件(其编号续前, 并在今后的审查过程中继续沿用):

编号	文 件 号 或 名 称	公开日期 (或抵触申请的申请日)
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5. 审查的结论性意见:

关于说明书:

☐ 申请的内容属于专利法第 5 条规定的不授予专利权的范围。

☐ 说明书不符合专利法第 26 条第 3 款的规定。

☐ 说明书的修改不符合专利法第 33 条的规定。

☐ 说明书的撰写不符合专利法实施细则第 17 条的规定。

☐ _____

关于权利要求书:

☐ 权利要求 _____ 不符合专利法第 2 条第 2 款的规定。

☐ 权利要求 _____ 不符合专利法第 9 条第 1 款的规定。



- ☐ 权利要求____不具备专利法第 22 条第 2 款规定的新颖性。
- ☒ 权利要求 1-13 不具备专利法第 22 条第 3 款规定的创造性。
- ☐ 权利要求____不具备专利法第 22 条第 4 款规定的实用性。
- ☐ 权利要求____属于专利法第 25 条规定的不授予专利权的范围。
- ☐ 权利要求____不符合专利法第 26 条第 4 款的规定。
- ☐ 权利要求____不符合专利法第 31 条第 1 款的规定。
- ☐ 权利要求____的修改不符合专利法第 33 条的规定。
- ☐ 权利要求____不符合专利法实施细则第 19 条的规定。
- ☐ 权利要求____不符合专利法实施细则第 20 条的规定。
- ☐ 权利要求____不符合专利法实施细则第 21 条的规定。
- ☐ 权利要求____不符合专利法实施细则第 22 条的规定。
- ☐ _____

☐ 申请不符合专利法第 26 条第 5 款或者实施细则第 26 条的规定。

☐ 申请不符合专利法第 19 条第 1 款的规定。

☐ 分案申请不符合专利法实施细则第 43 条第 1 款的规定。

上述结论性意见的具体分析见本通知书的正文部分。

6. 基于上述结论性意见，审查员认为：

☐ 申请人应当按照通知书正文部分提出的要求，对申请文件进行修改。

☐ 申请人应当在意见陈述书中论述其专利申请可以被授予专利权的理由，并对通知书正文部分中指出的不符合规定之处进行修改，否则将不能授予专利权。

☒ 专利申请中没有可以被授予专利权的实质性内容，如果申请人没有陈述理由或者陈述理由不充分，其申请将被驳回。

☐ _____

7. 申请人应注意下列事项：

(1) 根据专利法第 37 条的规定，申请人应在收到本通知书之日起的 2 个月内陈述意见，如果申请人无正当理由逾期不答复，其申请被视为撤回。

(2) 申请人对其申请的修改应当符合专利法第 33 条的规定，不得超出原说明书和权利要求书记载的范围，同时申请人对专利申请文件进行的修改应当符合专利法实施细则第 51 条第 3 款的规定，按照本通知书的要求进行修改。

(3) 申请人的意见陈述书和/或修改文本应当邮寄或递交国家知识产权局专利局受理处，凡未邮寄或递交给受理处的文件不具备法律效力。

(4) 未经预约，申请人和/或代理人不得前来国家知识产权局与审查员举行会晤。

8. 本通知书正文部分共有 4 页，并附有下列附件：

☐ 引用的对比文件的复印件共____份____页。

☐ _____

审查员：孙思远

联系电话：022-84868387

审查部门：专利审查协作天津中心电学发明审查部



第二次审查意见通知书

申请号:202110531289X

申请人于 2022 年 4 月 22 日提交了意见陈述书和修改后的权利要求书, 审查员在仔细阅读了上述文件后, 再次提出如下审查意见:

1. 权利要求 1 不具备专利法第 22 条第 3 款规定的创造性。

权利要求 1 请求保护一种极片, 对比文件 1 (CN105074967A) 公开一种锂离子电池, 其中公开了一种电极, 并具体公开以下内容(见权利要求 1-15, 说明书第 0005-0015, 0026-0072 段, 附图 1A-2C): 多层阴极结构 103 中, 在集电器 113 上沉积包含阴极活性材料的第一浆料混合物以形成第一阴极材料层 210, 将包含阴极活性材料的第二浆料混合物沉积在第一阴极材料层 210 上以形成第二阴极材料层 220, 第一浆料混合物的阴极活性材料包含具有第一平均直径的颗粒, 及所述第二浆料混合物的阴极活性材料包含具有第二平均直径的颗粒, 其中所述第二平均直径大于所述第一平均直径, 第一、二平均直径分别为约 2-15 微米、5-15 微米; 第一浆料混合物的阴极活性材料选自由以下材料组成的群组: 氧化锂钴(LiCoO_2)、氧化锂锰(LiMnO_2)、二硫化钛(TiS_2)、 $\text{LiNi}_x\text{Co}_{1-2x}\text{MnO}_2$ 、 LiMn_2O_4 、 **LiFePO_4** 、 $\text{LiFe}_{1-x}\text{MgPO}_4$ 、 LiMoPO_4 、 LiCoPO_4 、 $\text{Li}_3\text{V}_2(\text{PO}_4)_3$ 、 LiVOPO_4 、 LiMP_2O_7 、 $\text{LiFe}_{1.5}\text{P}_2\text{O}_7$ 、 LiVPO_4F 、 LiAlPO_4F 、 $\text{Li}_5\text{V}(\text{PO}_4)_2\text{F}_2$ 、 $\text{Li}_5\text{Cr}(\text{PO}_4)_2\text{F}_2$ 、 $\text{Li}_2\text{CoPO}_4\text{F}$ 、 $\text{Li}_2\text{NiPO}_4\text{F}$ 、 $\text{Na}_5\text{V}_2(\text{PO}_4)_2\text{F}_3$ 、 $\text{Li}_2\text{FeSiO}_4$ 、 $\text{Li}_2\text{MnSiO}_4$ 、 $\text{Li}_2\text{VOSiO}_4$ 、 LiNiO_2 , 及上述材料的组合; 在某些实施例中, 第一阴极材料层 210 包含平均粒度为约 $3\mu\text{m}$ 及振实密度为约 2.5g/cm^3 的阴极活性材料, 及第二阴极材料层 220 包含平均粒度为约 $10\mu\text{m}$ 及振实密度为约 2.8g/cm^3 的阴极活性材料。

权利要求 1 与对比文件 1 的区别技术特征为: 第一活性物质层和所述第二活性物质层的整体压实密度大于 3.2g/cc 。基于上述区别技术特征, 权利要求 1 的技术方案实际解决的技术问题是: 如何获取所需的电池能量密度和活性物质层厚度。

活性物质层的压实密度与相应电池能量密度和活性物质层的厚度密切相关, 当压实密度增大时, 电池能量密度随之增大, 活性物质层的厚度随之减小, 这是本领域的公知常识。为了获得合适的电池能量密度和活性物质层厚度, 本领域技术人员容易想到可以根据实际需要选择合适的活性物质层整体压实密度, 这不需要付出创造性的劳动, 其效果也是可以预期的。

可见, 在对比文件 1 的基础上结合本领域的公知常识, 得到权利要求 1 的技术方案对于本领域技术人员而言是显而易见的。因此, 权利要求 1 不具有突出的实质性特点和显著的进步, 不具备专利法第 22 条第 3 款规定的创造性。

2. 权利要求 2-12 不具备专利法第 22 条第 3 款规定的创造性。

权利要求 2-11 是对权利要求 1 的进一步限定, 权利要求 12 是对权利要求 1 的进一步限定, 对比文件 1 还公开了: 第一、二平均直径分别为约 2-15 微米、5-15 微米; 第一浆料混合物的阴极活性材料及第二浆料混



合物的阴极活性材料中的每一个单独选自以下材料组成的群组：二氧化钴(LiCoO_2)、二氧化锰(LiMnO_2)、二硫化钛(TiS_2)、 $\text{LiNi}_x\text{Co}_{1-2x}\text{MnO}_2$ 、 LiMn_2O_4 、 LiFePO_4 、 $\text{LiFe}_{1-x}\text{MgPO}_4$ 、 LiMoPO_4 、 LiCoPO_4 、 $\text{Li}_3\text{V}_2(\text{PO}_4)_3$ 、 LiVOPO_4 、 LiMP_2O_7 、 $\text{LiFe}_{1.5}\text{P}_2\text{O}_7$ 、 LiVPO_4F 、 LiAlPO_4F 、 $\text{Li}_5\text{V}(\text{PO}_4)_2\text{F}_2$ 、 $\text{Li}_5\text{Cr}(\text{PO}_4)_2\text{F}_2$ 、 $\text{Li}_2\text{CoPO}_4\text{F}$ 、 $\text{Li}_2\text{NiPO}_4\text{F}$ 、 $\text{Na}_5\text{V}_2(\text{PO}_4)_2\text{F}_3$ 、 $\text{Li}_2\text{FeSiO}_4$ 、 $\text{Li}_2\text{MnSiO}_4$ 、 $\text{Li}_2\text{VOSiO}_4$ 、 LiNiO_2 ，及上述材料的组合，第一、二阴极材料层 210、220 的活性材料为相同材料或不同材料；位于电池单元 100、120 的阴极侧或正电极上的活性材料可包含含锂金属氧化物，例如 $\text{LiNi}_x\text{Co}_y\text{Al}_z\text{O}_2$ ；第一阴极材料层 210 厚度在约 10-150 微米之间，第二阴极材料层 220 厚度约 10-80 微米；阳极活性材料可选石墨材料、硅、钛酸锂等；第一浆料混合物中粘合剂可选择苯乙烯丁二烯橡胶(丁苯橡胶)、聚偏二氟乙烯(聚偏氟乙烯)；第二浆料混合物中可包含粘合剂；第一、第二浆料混合物均可包含重量百分比在约 50% 至 80% 之间的固体，所述固体包含重量百分比为约 1% 至 10% 的黏合剂或可包含重量百分比在约 55% 至 65% 之间的固体，所述固体包含重量百分比为约 1% 至 4% 的黏合剂，在某些实施例中，第一阴极材料层 210 的固体含量的重量百分比可大于 60%，及第二阴极材料层 220 的固体含量的重量百分比可在约 50% 至 60% 之间。在对比文件公开的内容的基础上，对比文件 1 公开的第一、二浆料混合物中包含的阴极活性材料，其直径为平均直径，当第一阴极活性材料平均粒径为 2 微米时，第二阴极活性材料与第一阴极活性材料平均粒径的比值范围为 5:2-15:2；活性物质层的压实密度与相应电池能量密度和活性物质层的厚度密切相关，当压实密度增大时，电池能量密度随之增大，活性物质层的厚度随之减小，这是本领域的公知常识，为了获得合适的电池能量密度和活性物质层厚度，本领域技术人员容易想到可以根据实际需要选择合适的第一活性物质层压实密度和第二活性物质层压实密度，这不需要付出创造性的劳动，其效果也是可以预期的；由“第一活性物质的体积累积 90% 的粒径为 $40\mu\text{m}$ 以下”可知，本申请的第一活性物质中大部分粒子的粒径是 $40\mu\text{m}$ 以下的，粒径为 $40\mu\text{mm}$ 以上的粒子为少部分，根据对比文件 1 说明书第 [0046] 段“在一个实施例中，颗粒为纳米尺度颗粒。在另一个实施例中，纳米尺度颗粒的直径在约 1nm 与约 100nm 之间……在一个实施例中，微米尺度颗粒的直径在约 1 微米与约 20 微米之间”可知，对比文件 1 中大部分颗粒的粒径也是在 $40\mu\text{m}$ 以下的，本领域中，体积累积 90% 的粒径(即 D_{v90} 的粒径)也是常见的粒径测量标准，在此基础上，本领域技术人员可以采用 D_{v90} 的粒径标准去选择第一活性物质的粒径，这是容易想到的，不需要付出创造性的劳动，其效果也是可以预期的；磷酸铁锂、富锂锰基材料和钛酸锂也都属于本领域中的常规选择；中间相碳微球、软碳、硬碳、硅碳化合物等也属于本领域中的常规选择，对比文件 1 公开了阴极双层结构，能够实现更快充电、更大容量等性能，基于本领域技术人员对锂离子电池阴极、阳极性能的了解，容易想到在阳极设置双层结构并采用上述活性材料；对比文件 1 公开了各活性物质层的固体含量和固体中粘合剂的含量，当第一活性物质层中的固体含量大于第二活性物质层中的固体含量是，本领域技术人员容易想到第一活性物质层中的粘合剂含量大于第二活性物质层中的粘合剂含量；本领域技术人员容易想到将对比文件 1 公开的粘合剂用于第二浆料混合物；未被对比文件 1 公开的其他粘结剂也属于本



领域中的常规选择。

因此，当其引用的权利要求不具备创造性时，该从属权利要求也不具备创造性。

3.权利要求 13 不具备专利法第 22 条第 3 款规定的创造性。

权利要求 13 请求保护一种锂离子电池，对比文件 1 还公开了(说明书第 0005 段):锂离子电池包含电极。在前述权利要求 1-12 不具备创造性的基础上，权利要求 13 不具备专利法第 22 条第 3 款规定的创造性。

4.申请人在意见陈述中指出：第一活性物质层包括磷酸铁锂是因为磷酸铁锂的导电性较差，可以使得第一活性物质层中的电阻较大，能够在锂离子电池受到外力挤压时避免负极活性物质层和正极集流体直接接触，从而避免产生最危险的短路模式；对比文件 1 的发明目的仅仅是为了通过制造较厚的活性物质层来提高活性材料在电池总成分的占比，进而提高电池的能量密度，却并没有对活性物质颗粒直径、具体活性材料与电池机械安全性能之间的关系进行研究，也没有对第一活性物质层和第二活性物质层的整体压实密度及两层的压实密度之间的关系进行研究，因此无法对提高电池的安全性能提供技术启示；虽然对比文件 1 给出的活性物质的平均粒径范围包括了第一活性物质平均直径小于第二活性物质平均直径的可能，磷酸铁锂也是其活性物质的众多选择之一，但其并没有限定第一活性物质的平均粒径必须小于所述第二活性物质的平均粒径和第一活性物质包括磷酸铁锂，也没有给出第一活性物质的平均粒径小于所述第二活性物质的平均粒径和第一活性物质包括磷酸铁锂的优点，在没有其他技术启示的前提下，本领域技术人员在面对本申请的技术问题时，是没有动机在对比文件 1 的基础上，选择所述第一活性物质的平均粒径小于所述第二活性物质的平均粒径、第一活性物质包括磷酸铁锂的，也没有动机进一步限定第一活性物质层和所述第二活性物质层整体的压实密度大于 3.2g/cc，第一活性物质层的压实密度较第二活性物质层低，因此无法对对比文件 1 改进而得到本申请权利要求 1 要求保护的技术方案。

对此审查员答复如下：原始申请文件中没有记载第一活性物质选择磷酸铁锂与选择其他活性物质相比有任何预料不到的技术效果，根据实验数据也不能看出第一活性物质选择磷酸铁锂具有预料不到的技术效果，因此申请人的意见陈述审查员不能接受；对比文件 1 虽然没有给出第一活性物质的平均粒径小于所述第二活性物质的平均粒径的优点，但对比文件 1 已经明确公开了“第一阴极材料层 210 包含平均粒度为约 3 μm 及振实密度为约 2.5g/cm³ 的阴极活性材料，及第二阴极材料层 220 包含平均粒度为约 10 μm 及振实密度为约 2.8g/cm³ 的阴极活性材料”的技术方案，其必然能够达到与本申请相同的技术效果。因此，申请人的意见陈述不具有说服力。

基于上述理由，本申请的独立权利要求以及从属权利要求都不具备创造性，同时说明书中也没有记载其他任何可以授予专利权的实质性内容，因而即使申请人对权利要求进行重新组合和 / 或根据说明书记载的内容作进一步的限定，本申请也不具备被授予专利权的前景。如果申请人不能在本通知书规定的答复期限内提



国家知识产权局

出表明本申请具有创造性的充分理由，本申请将被驳回。

如对审查意见有疑问，可联系本案审查员，审查员电话 022-84868387；值班电话 022-84868233（代为转达）；咨询邮箱 tjscfk@cnipa.gov.cn。请申请人注意，通过本邮箱反馈的意见陈述书和/或修改文本不具备法律效力，不能代替正式答复。

审查员姓名:孙思远

审查员代码:728223

210403
2021.6

纸件申请，回函请寄：100088 北京市海淀区蓟门桥西土城路6号 国家知识产权局专利局受理处收
电子申请，应当通过电子专利申请系统以电子文件形式提交相关文件。除另有规定外，以纸件等其他形式提交的文件视为未提交。

权 利 要 求 书

1. 一种极片, 包括:

集流体;

5 第一活性物质层, 包括第一活性物质; 所述第一活性物质层的厚度为 $2\mu\text{m}\sim 7\mu\text{m}$; 以及

第二活性物质层, 包括第二活性物质; 所述第二活性物质层的厚度为 $30\mu\text{m}$ 以上;

10 其中, 所述第一活性物质层设置于所述集流体和所述第二活性物质层之间, 所述第一活性物质层形成在所述集流体的至少一个表面上, 所述第一活性物质的平均粒径小于所述第二活性物质的平均粒径, 所述第一活性物质层和所述第二活性物质层整体的压实密度大于 3.2g/cc , 所述第一活性物质包括磷酸铁锂。

15 2. 根据权利要求 1 所述的极片, 其中, 所述第二活性物质的平均粒径与所述第一活性物质的平均粒径的比值大于 1 且小于或等于 40。

3. 根据权利要求 1 所述的极片, 其中, 所述第一活性物质的平均粒径在 $0.2\mu\text{m}\sim 15\mu\text{m}$ 的范围内。

4. 根据权利要求 1 所述的极片, 其中, 所述第一活性物质层的压实密度大于 2.8g/cc , 所述第二活性物质层的压实密度大于 3.3g/cc 。

20 5. 根据权利要求 1 所述的极片, 其中, 所述第一活性物质的体积累积 90% 的粒径为 $40\mu\text{m}$ 以下。

6. 根据权利要求 1 所述的极片, 其中, 所述第一活性物质还包括钴酸锂、锰酸锂、镍酸锂、镍钴锰酸锂、磷酸锰铁锂、磷酸钒锂、磷酸钒氧锂、富锂锰基材料、镍钴铝酸锂和钛酸锂中的一种或几种。

25 7. 根据权利要求 1 所述的极片, 其中, 所述第二活性物质包括选自钴酸锂、镍钴锰酸锂、镍钴铝酸锂、富锂锰基材料、磷酸铁锂中的一种及其组合。

8. 根据权利要求 1 所述的极片, 其中, 所述第一活性物质包括选自人造石墨、天然石墨、中间相碳微球、软碳、硬碳、硅、硅碳化合物、钛酸



锂中的一种及其组合。

9. 根据权利要求 1 所述的极片，其中，所述第一活性物质层和所述第二活性物质层均还包括粘结剂，所述第一活性物质层中的粘结剂含量大于所述第二活性物质层中的粘结剂含量。

5 10. 根据权利要求 9 所述的极片，其中，所述粘结剂包括选自聚偏氟乙烯、偏氟乙烯-六氟丙烯的共聚物、聚酰胺、聚丙烯腈、聚丙烯酸酯、聚丙烯酸、聚丙烯酸盐、羧甲基纤维素钠、聚乙烯吡咯烷酮、聚乙烯醚、聚甲基丙烯酸甲酯、聚四氟乙烯、聚六氟丙烯和丁苯橡胶中的一种及其组合。

11. 一种锂离子电池，包括根据权利要求 1-10 中任一项所述的极片。



510070



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2022年10月09日

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发文序号: 2022092902709050

申请人或专利权人: 宁德新能源科技有限公司

发明创造名称: 极片和锂离子电池

驳 回 决 定

1. 根据专利法第 38 条及其实施细则第 53 条的规定, 决定驳回上述专利申请, 驳回的依据是:
申请不符合专利法第 22 条第 3 款的规定。
详细的驳回理由见驳回决定正文部分。
2. 本驳回决定是针对下列申请文件作出的:
分案申请递交日提交的说明书摘要、说明书第 1-167 段、说明书附图、摘要附图;
2022 年 8 月 23 日提交的权利要求第 1-11 项。
3. 根据专利法第 41 条及实施细则第 60 条的规定, 申请人对本驳回决定不服的, 可以在收到本决定之日起 3 个月内向专利局复审和无效审理部请求复审。根据专利法实施细则第 96 条的规定, 复审费应在上述期限内缴纳, 期满未缴纳或者未缴足的, 视为未提出请求。

审查员: 孙思远

审查部门: 专利审查协作天津中心电学发明审查部

联系电话: 022-84868387

210407 纸件申请 回函请寄: 100088 北京市海淀区蓟门桥西土城路 6 号 国家知识产权局专利局受理处收
2019.4 电子申请, 应当通过电子专利申请系统以电子文件形式提交相关文件。除另有规定外, 以纸件等其他形式提交的文件视为未提交。



驳 回 决 定

申请号：202110531289X

本决定涉及的是申请号为 202110531289.X 的名称为“极片和锂离子电池”的发明专利申请，申请人为宁德新能源科技有限公司，申请日为 2018 年 02 月 26 日。

一、案由

本申请原申请文件权利要求书包括 2 项独立权利要求 1、13 以及 11 项从属权利要求 2-12。

应申请人于 2021 年 05 月 14 日提出的实质审查请求，审查员对本申请进行了实质审查，并于 2022 年 01 月 12 日发出了第一次审查意见通知书，指出权利要求 1-13 不具备创造性。通知书中引用了如下对比文件：

对比文件 1：CN105074967A，公开日为 2015 年 11 月 18 日。

申请人于 2022 年 04 月 22 日针对第一次审查意见通知书提交了意见陈述书并修改权利要求书。概述如下：

第一活性物质层包括磷酸铁锂是因为磷酸铁锂的导电性较差，可以使得第一活性物质层中的电阻较大，能够在锂离子电池受到外力挤压时避免负极活性物质层和正极集流体直接接触，从而避免产生最危险的短路模式；对比文件 1 的发明目的仅仅是为了通过制造较厚的活性物质层来提高活性材料在电池总成分的占比，进而提高电池的能量密度，却并没有对活性物质颗粒直径、具体活性材料与电池机械安全性能之间的关系进行研究，也没有对第一活性物质层和第二活性物质层的整体压实密度及两层的压实密度之间的关系进行研究，因此无法对提高电池的安全性能提供技术启示；虽然对比文件 1 给出的活性物质的平均粒径范围包括了第一活性物质平均直径小于第二活性物质平均直径的可能，磷酸铁锂也是其活性物质的众多选择之一，但其并没有限定第一活性物质的平均粒径必须小于所述第二活性物质的平均粒径和第一活性物质包括磷酸铁锂，也没有给出第一活性物质的平均粒径小于所述第二活性物质的平均粒径和第一活性物质包括磷酸铁锂的优点，在没有其他技术启示的前提下，本领域技术人员在面对本申请的技术问题时，是没有动机在对比文件 1 的基础上，选择所述第一活性物质的平均粒径小于所述第二活性物质的平均粒径、第一活性物质包括磷酸铁锂的，也没有动机进一步限定第一活性物质层和所述第二活性物质层整体的压实密度大于 3.2g/cc，第一活性物质层的压实密度较第二活性物质层低，因此无法对对比文件 1 改进而得到本申请权利要求 1 要求保护的技术方案。

审查员继续审查，并于 2022 年 06 月 09 日发出第二次审查意见通知书，指出权利要求 1-13 不具备创造性。

针对上述审查意见通知书，申请人于 2022 年 08 月 23 日递交了意见陈述书并修改权利要求书，认为第一活性物质层包括磷酸铁锂是因为磷酸铁锂的导电性较差，可以使得第一活性物质层中的电阻较大，能够在锂离子电池受到外力挤压时避免负极活性物质层和正极集流体直接接触，从而避免产生最危险的短路模式；为了将第一活性物质层对循环性能的影响降低到最小，本申请将第一活性物质层的厚度限定为 $2\mu\text{m}\sim 7\mu\text{m}$ ，如此，可以在保证锂离子电池安全性能的同时，确保电池具有更好的循环性能；从对比文件 1 的描述来看，其主要要求第一活性物质层的孔隙率大于第二活性物质层，但对于两层活性物质层的厚度对比、两层活性物质层中活性物质的具体成分，都没有任何要求，因此不可能对本申请限定的第二活性物质层的厚度远大于第一活性物质层的厚度（通过厚度数据的对比可以得到）提供任何技术启示。而且，也正是因为对比文件 1 的发明目的是为了通过制造较厚的活性物质层来提高活性材料在电池总成分的占比，因此本领域技术人员没有动机去将对比文件 1 中厚度在 10-150 微米之间的第一阴极材料层的厚度减薄（这与其发明目的相悖），也就无法在对比文件 1 的基础上改进而得到本申请权利要求 1 要求保护的技术方案。

审查员认为，本案事实已经清楚，因此针对分案申请递交日提交的说明书摘要、说明书第 1-167 段、说明书附图、摘要附图；

2022 年 8 月 23 日提交的权利要求第 1-11 项作出本驳回决定。



二、驳回理由

1. 权利要求 1 不具备专利法第 22 条第 3 款规定的创造性。

权利要求 1 请求保护一种极片, 对比文件 1 (CN105074967A) 公开一种锂离子电池, 其中公开了一种电极, 并具体公开以下内容(见权利要求 1-15, 说明书第 0005-0015, 0026-0072 段, 附图 1A-2C): 多层阴极结构 103 中, 在集电器 113 上沉积包含阴极活性材料的第一浆料混合物以形成第一阴极材料层 210, 将包含阴极活性材料的第二浆料混合物沉积在第一阴极材料层 210 上以形成第二阴极材料层 220, 第一浆料混合物的阴极活性材料包含具有第一平均直径的颗粒, 及所述第二浆料混合物的阴极活性材料包含具有第二平均直径的颗粒, 其中所述第二平均直径大于所述第一平均直径, 第一、二平均直径分别为约 2-15 微米、5-15 微米; 第一浆料混合物的阴极活性材料选自由以下材料组成的群组: 二氧化钴(LiCoO₂)、二氧化锰(LiMnO₂)、二硫化钛(TiS₂)、LiNi_xCo_{1-2x}MnO₂、LiMn₂O₄、LiFePO₄、LiFe_{1-x}MgPO₄、LiMoPO₄、LiCoPO₄、Li₃V₂(PO₄)₃、LiVPO₄、LiMP₂O₇、LiFe_{1.5}P₂O₇、LiVP₄F、LiAlP₄F、Li₅V(PO₄)₂F₂、Li₅Cr(PO₄)₂F₂、Li₂CoPO₄F、Li₂NiPO₄F、Na₅V₂(PO₄)₂F₃、Li₂FeSiO₄、Li₂MnSiO₄、Li₂VOSiO₄、LiNiO₂, 及上述材料的组合; 在某些实施例中, 第一阴极材料层 210 包含平均粒度为约 3 μm 及振实密度为约 2.5g/cm³ 的阴极活性材料, 及第二阴极材料层 220 包含平均粒度为约 10 μm 及振实密度为约 2.8g/cm³ 的阴极活性材料; 示例性结构(A) 中公开了第一阴极材料层的平均厚度可自约 1 微米至 80 微米, 第二阴极材料层的厚度可自约 10 微米至 80 微米。

权利要求 1 与对比文件 1 的区别技术特征为: 第一活性物质层和所述第二活性物质层的整体压实密度大于 3.2g/cc。基于上述区别技术特征, 权利要求 1 的技术方案实际解决的技术问题是: 如何获取所需的电池能量密度和活性物质层厚度。

活性物质层的压实密度与相应电池能量密度和活性物质层的厚度密切相关, 当压实密度增大时, 电池能量密度随之增大, 活性物质层的厚度随之减小, 这是本领域的公知常识。为了获得合适的电池能量密度和活性物质层厚度, 本领域技术人员容易想到可以根据实际需要选择合适的活性物质层整体压实密度, 这不需要付出创造性的劳动, 其效果也是可以预期的。

可见, 在对比文件 1 的基础上结合本领域的公知常识, 得到权利要求 1 的技术方案对于本领域技术人员而言是显而易见的。因此, 权利要求 1 不具有突出的实质性特点和显著的进步, 不具备专利法第 22 条第 3 款规定的创造性。

2. 权利要求 2-10 不具备专利法第 22 条第 3 款规定的创造性。

权利要求 2-9 是对权利要求 1 的进一步限定, 权利要求 10 是对权利要求 9 的进一步限定, 对比文件 1 还公开了: 第一、二平均直径分别为约 2-15 微米、5-15 微米; 第一浆料混合物的阴极活性材料及第二浆料混合物的阴极活性材料中的每一个单独选自由以下材料组成的群组: 二氧化钴(LiCoO₂)、二氧化锰(LiMnO₂)、二硫化钛(TiS₂)、LiNi_xCo_{1-2x}MnO₂、LiMn₂O₄、LiFePO₄、LiFe_{1-x}MgPO₄、LiMoPO₄、LiCoPO₄、Li₃V₂(PO₄)₃、LiVPO₄、LiMP₂O₇、LiFe_{1.5}P₂O₇、LiVP₄F、LiAlP₄F、Li₅V(PO₄)₂F₂、Li₅Cr(PO₄)₂F₂、Li₂CoPO₄F、Li₂NiPO₄F、Na₅V₂(PO₄)₂F₃、Li₂FeSiO₄、Li₂MnSiO₄、Li₂VOSiO₄、LiNiO₂, 及上述材料的组合, 第一、二阴极材料层 210, 220 的活性材料为相同材料或不同材料; 位于电池单元 100、120 的阴极侧或正电极上的活性材料可包含含锂金属氧化物, 例如 LiNi_xCoyAlzO₂; 阳极活性材料可选石墨材料、硅、钛酸锂等; 第一浆料混合物中粘合剂可选择苯乙烯丁二烯橡胶(丁苯橡胶)、聚偏二氟乙烯(聚偏氟乙烯); 第二浆料混合物中可包含粘合剂; 第一、第二浆料混合物均可包含重量百分比在约 50% 至 80% 之间的固体, 所述固体包含重量百分比为约 1% 至 10% 的黏合剂或可包含重量百分比在约 55% 至 65% 之间的固体, 所述固体包含重量百分比为约 1% 至 4% 的黏合剂, 在某些实施例中, 第一阴极材料层 210 的固体含量的重量百分比可大于 60%, 及第二阴极材料层 220 的固体含量的重量百分比可在约 50% 至 60% 之间。在对比文件公开的内容的基础上, 对比文件 1 公开的第一、二浆料混合物中包含的阴极活性材料, 其直径为平均直径, 当第一阴极活性材料平均粒径为 2 微米时, 第二阴极活性材料与第一阴极活性材料平均粒径的比值范围为 5:2-15:2; 活性物质层的压实密度与相应电池能量密度和活性物质层的厚度密切相关, 当压实密度增大时, 电池能量密度随之增大, 活性物质层的厚度随之减小, 这是本领域的公知常识, 为了获得合适的电池能量密度和活性物质层厚度, 本领域技术人员容易想到可以根据实际需要选择合适的第一活性物质层压实密度和第二活性物质层压实密度, 这不需要付



出创造性的劳动，其效果也是可以预期的；由“第一活性物质的体积累积 90% 的粒径为 $40\mu\text{m}$ 以下”可知，本申请的第一活性物质中大部分粒子的粒径是 $40\mu\text{m}$ 以下的，粒径为 $40\mu\text{m}$ 以上的粒子为少部分，根据对比文件 1 说明书第「0046」段“在一个实施例中，颗粒为纳米尺度颗粒。在另一个实施例中，纳米尺度颗粒的直径在约 1nm 与约 100nm 之间……在一个实施例中，微米尺度颗粒的直径在约 1 微米与约 20 微米之间”可知，对比文件 1 中大部分颗粒的粒径也是在 $40\mu\text{m}$ 以下的，本领域中，体积累积 90% 的粒径（即 D_{v90} 的粒径）也是常见的粒径测量标准，在此基础上，本领域技术人员可以采用 D_{v90} 的粒径标准去选择第一活性物质的粒径，这是容易想到的，不需要付出创造性的劳动，其效果也是可以预期的；磷酸锰铁锂、富锂锰基材料和钛酸锂也都属于本领域中的常规选择；中间相碳微球、软碳、硬碳、硅碳化合物等也属于本领域中的常规选择，对比文件 1 公开了阴极双层结构，能够实现更快充电、更大容量等性能，基于本领域技术人员对锂离子电池阴极、阳极性能的了解，容易想到在阳极设置双层结构并采用上述活性材料；对比文件 1 公开了各活性物质层的固体含量和固体中粘合剂的含量，当第一活性物质层中的固体含量大于第二活性物质层中的固体含量是，本领域技术人员容易想到第一活性物质层中的粘合剂含量大于第二活性物质层中的粘合剂含量；本领域技术人员容易想到将对比文件 1 公开的粘合剂用于第二浆料混合物；未被对比文件 1 公开的其他粘结剂也属于本领域中的常规选择。

因此，当其引用的权利要求不具备创造性时，该从属权利要求也不具备创造性。

3. 权利要求 11 不具备专利法第 22 条第 3 款规定的创造性。

权利要求 11 请求保护一种锂离子电池，对比文件 1 还公开了（说明书第 0005 段）：锂离子电池包含电极。在前述权利要求 1-10 不具备创造性的基础上，权利要求 11 不具备专利法第 22 条第 3 款规定的创造性。

4. 申请人在意见陈述中指出：第一活性物质层包括磷酸铁锂是因为磷酸铁锂的导电性较差，可以使得第一活性物质层中的电阻较大，能够在锂离子电池受到外力挤压时避免负极活性物质层和正极集流体直接接触，从而避免产生最危险的短路模式；为了将第一活性物质层对循环性能的影响降低到最小，本申请将第一活性物质层的厚度限定为 $2\mu\text{m}\sim 7\mu\text{m}$ ，如此，可以在保证锂离子电池安全性能的同时，确保电池具有更好的循环性能；从对比文件 1 的描述来看，其主要要求第一活性物质层的孔隙率大于第二活性物质层，但对于两层活性物质层的厚度对比、两层活性物质层中活性物质的具体成分，都没有任何要求，因此不可能对本申请限定的第二活性物质层的厚度远大于第一活性物质层的厚度（通过厚度数据的对比可以得到）提供任何技术启示。而且，也正是因为对比文件 1 的发明目的是为了通过制造较厚的活性物质层来提高活性材料在电池总成分的占比，因此本领域技术人员没有动机去将对比文件 1 中厚度在 10-150 微米之间的第一阴极材料层的厚度减薄（这与其发明目的相悖），也就无法在对比文件 1 的基础上改进而得到本申请权利要求 1 要求保护的技术方案。

对此审查员答复如下：原始申请文件中没有记载第一活性物质选择磷酸铁锂与选择其他活性物质相比有任何预料不到的技术效果，根据实验数据也不能看出第一活性物质选择磷酸铁锂具有预料不到的技术效果，因此申请人的意见陈述审查员不能接受；申请文件中也没有记载第一活性物质层厚度与循环性能的关联，根据实施例也仅能看出第一活性物质层厚度不同时其能量密度有一定区别，且对比文件 1 示例性结构（A）中公开了第一阴极材料层的平均厚度可自约 1 微米至 80 微米，第二阴极材料层的厚度可自约 10 微米至 80 微米，不存在没有动机将厚度减薄的问题。因此，申请人的意见陈述不具有说服力。

三、决定

综上所述，本发明专利申请不符合专利法第二十二条第三款的规定，属于专利法实施细则第五十三条第二项的情况，因此根据专利法第三十八条予以驳回。

根据专利法第四十一条第一款的规定，申请人如果对本驳回决定不服，可以在收到本驳回决定之日起三个月内，向专利局复审和无效审理部请求复审。

审查员姓名：孙思远

审查员代码：728223



合议组组长：杜凯

主审员：姜峰

参审员：焦延峰



200912 纸件申请，回函请寄：100088 北京市海淀区蓟门桥西土城路6号 国家知识产权局专利局复审和无效审理部收
2021.X 电子申请，应当通过电子专利申请系统以电子文件形式提交相关文件。除另有规定外，以纸件等其他形式提交的文件视为未提交。