

Lithium ion battery cell and contain lithium ion battery of this electricity core

Abstract

The utility model relates to a lithium ion battery field specifically, relates to a lithium ion battery cell and contain lithium ion battery of this electricity core. The electricity core includes superpose in proper order and first pole piece, diaphragm and the second pole piece of coiling, the afterbody of first pole piece leaves sky paper tinsel district, empty paper tinsel position in the outer peripheral face and the at least parcel of naked electric core naked electric core round, the surface of the face that the afterbody of second pole piece is relative with empty paper tinsel district the 2nd active material that does not coat to it forms the vest district to make between the mass flow body of the mass flow body and the second pole piece of first pole piece. When electric core suffered to abuse, the vest district can have priority and take place short circuit or the contact of through bolt formula, avoids safety problems such as burning or explosion. The head in the active material coating district of first pole piece be single face, afterbody for two-sided in this application, and it is the single face that head that the coating of the active material of second pole piece was distinguished is two-sided, afterbody to realize energy density's promotion.

Classifications

Y02E60/10 Energy storage using batteries

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Secondary Cells

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Claims (10)

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1. A lithium-ion battery cell, comprising a shell, a bare cell composed of a first pole piece, a diaphragm and a second pole piece stacked and wound in sequence inside the shell, The first pole piece includes a first current collector and a first active material coated on both surfaces of the first current collector, The second pole piece includes a second current collector and a second active material coated on both surfaces of the second current collector, It is characterized in that an empty foil area is left at the tail of the first pole piece, the empty foil area of the first pole piece is located on the outer peripheral surface of the bare cell and wraps the bare cell at least once, the The surface of the tail of the second pole piece opposite to the empty foil area of the first pole piece is not coated with the second active material. 2. The lithium-ion battery cell according to claim 1, wherein the outer peripheral surface of the cell is wound and wrapped by the empty foil area of the first pole piece for one to two turns. 3. The lithium-ion battery cell according to claim 1, characterized in that, inside the cell, the heads of the first pole piece and the second pole piece overlap to form the first pole piece and the second pole piece The half circle formed by the first pole piece winding is the first circle of the electric core, and the first pole piece is wound as the inner ring to form the second circle and the third circle of the electric core in turn; the first pole piece and the Both surfaces of the first ring of the second pole piece are not coated with active material. 4. The lithium-ion battery cell according to claim 3, wherein both surfaces of the second circle of the second pole piece are coated with the second active material. 5. The lithium-ion battery cell according to claim 3, wherein the surface of the second circle of the first pole piece opposite to the first circle is not coated with the first active material. 6. The lithium-ion battery cell according to claim 5, wherein both surfaces of the third circle of the first pole piece are coated with the first active material. 7. The lithium-ion battery cell according to any one of claims 1-6, wherein the first active material is continuously coated on both surfaces of the first current collector, and the second active material is continuously coated on both surfaces of the second current collector. 8. The lithium-ion battery cell according to any one of claims 1-6, wherein the first pole piece is a positive pole piece, and the second pole piece is a negative pole piece; The first current collector is a positive current collector, and the second current collector is a negative current collector; The first active material is a positive active material, and the second active material is a negative active material. 9. The lithium-ion battery cell according to any one of claims 1-6, wherein the first pole piece is a negative pole piece, and the second pole piece is a positive pole piece; The first current collector is a negative current collector, and the second current collector is a positive current collector; The first active material is a negative active material, and the second active material is a positive active material. 10. A lithium-ion battery, characterized in that the battery comprises a battery casing and a lithium-ion battery cell sealed in the battery casing, wherein the lithium-ion battery cell is one of claims 1-6. The lithium-ion battery cell described above.

Description

A lithium-ion battery cell and a lithium-ion battery containing the cell

technical field

The present application relates to the field of lithium-ion batteries, in particular, to a lithium-ion battery cell and a lithium-ion battery containing the cell.

Background technique

Lithium-ion battery is a new type of secondary rechargeable battery. Lithium-ion batteries widely used in the market are composed of bare cells and shells. Among them, the battery core is an active component, and is generally formed by laminating or winding a positive electrode sheet, a negative electrode sheet, and a separator arranged between the positive electrode sheet and the negative electrode sheet. The positive electrode sheet includes a positive electrode collector and a positive electrode active material coated on the surface of the positive electrode collector; the negative electrode sheet includes a negative electrode collector and a negative electrode active material coated on the surface of the negative electrode collector.

With the further development of commercial batteries, the requirements for energy density and abuse performance of lithium-ion batteries have been further improved, but some of the current abuse improvement methods need to sacrifice energy density. In the current traditional winding method, the head of the bare cell negative electrode is a single-sided area coated with active materials, and the tail is a double-sided area coated with active materials; the head of the positive electrode is a double-sided area coated with active materials, and the tail is Single-sided area coated with active material and finished with aluminum foil. This winding method has the disadvantage of sacrificing energy density.

In view of the defects in the prior art, this application is proposed.

Contents of the invention

The utility model provides a lithium-ion battery cell, which can improve the anti-abuse performance of the cell.

The lithium-ion battery cell proposed in the first aspect of the utility model includes a shell, a bare cell formed by stacking and winding a first pole piece, a diaphragm and a second pole piece inside the shell; the first pole piece Including a first current collector and a first active material coated on both surfaces of the first current collector, the second pole piece includes a second current collector and a second active material coated on both surfaces of the second current collector;

There is an empty foil area at the tail of the first pole piece, the empty foil area of the first pole piece is located on the outer peripheral surface of the bare cell and wraps the bare cell at least once, the tail of the second pole piece is connected to the The surface of the surface opposite to the empty foil region of the first pole piece is not coated with the second active material.

Preferably, the outer peripheral surface of the electric core is wrapped one to two times by the empty foil area of the first pole piece.

Preferably, inside the battery core, the heads of the first pole piece and the second pole piece overlap, and the first pole piece and the second pole piece start to be wound to form a half circle as the first pole piece of the battery core. circle, and the first pole piece is wound as the inner ring to form the second circle and the third circle of the electric core in turn; both surfaces of the first pole piece and the first circle of the second pole piece are not coated with active substance.

Preferably, both surfaces of the second ring of the second pole piece are coated with the second active material.

Preferably, the surface of the second circle of the first pole piece opposite to the first circle is not coated with the first active material.

Preferably, both surfaces of the third circle of the first pole piece are coated with the first active material.

Preferably, the first active material is continuously coated on both surfaces of the first current collector, and the second active material is continuously coated on both surfaces of the second current collector.

Preferably, the first pole piece is a positive pole piece, the second pole piece is a negative pole piece; the first current collector is a positive current collector, and the second current collector is a negative current collector; the first active The material is a positive electrode active material, and the second active material is a negative electrode active material.

Preferably, the first pole piece is a negative pole piece, the second pole piece is a positive pole piece; the first current collector is a negative current collector, and the second current collector is a positive current collector; the first active The material is a negative active material, and the second active material is a positive active material.

Another aspect of the utility model proposes a lithium-ion battery, the battery includes a battery casing and a lithium-ion battery cell sealed in the battery casing, wherein the lithium-ion battery cell is the lithium-ion battery cell of the present application .

The technical solution provided by the application can achieve the following beneficial effects:

In order to take both energy density and abuse performance into consideration, this application adopts a new winding method. First, the tail of the battery core is wound 1 to 2 times around the empty foil area of the first pole piece without active material, and is connected with the first pole piece. The second pole piece corresponding to the empty foil area is coated on one side, that is, the tail of the second pole piece is a single-side area, so that a vest area is formed between the current collector of the first pole piece and the current collector of the second pole piece . When the battery core is abused, the vest area can give priority to short circuit to avoid safety problems such as burning or explosion.

Secondly, in order to further increase the energy density of the battery cell, the present application also improves the winding method of the center of the battery cell. In this application, the head of the first pole piece is a single-sided area, and the tail is a double-sided area; the head of the second pole piece is a double-sided area, and the tail is a single-sided area, and the head of the first pole piece is a single-sided area Installed on the head, the film length of the single-side area of the first pole piece becomes smaller, that is, the length of the short film can be increased, thereby achieving an increase in energy density.

Description of drawings

Figure 1 is a schematic diagram of a traditional winding method;

Fig. 2 is a schematic diagram of a positive pole piece of a traditional winding method;

Fig. 3 is a schematic diagram of a negative pole piece of a traditional winding method;

Fig. 4 is a schematic view of the winding method in a specific embodiment of the present application;

Fig. 5 is a schematic diagram of the positive pole piece of the winding method of the present application;

Fig. 6 is a schematic diagram of the negative pole piece of the winding method of the present application;

Fig. 7 is the Nail test result curve of embodiment 1;

Fig. 8 is the Nail test result curve of comparative example 1;

Fig. 9 is a schematic diagram of a winding method in another specific embodiment of the present application.

Description of drawings:

1 - the first pole piece;

2- second pole piece;

3- Diaphragm.

The accompanying drawings, which are incorporated in and constitute a part of this specification, illustrate embodiments consistent with the application and together with the description serve to explain the principles of the application.

detailed description

The present application will be described in further detail below through specific embodiments and in conjunction with the accompanying drawings. The "front", "rear", "left", "right", "upper" and "lower" mentioned in the text are all based on the placement state of the lithium-ion battery bare cells and pole pieces in the attached drawings.

The bare cell in this application is formed by stacking and winding the first pole piece, the diaphragm and the second pole piece in sequence, wherein the end of the pole piece winding is the head of the pole piece, and the end of the pole piece winding is One end of the pole piece is the tail.

Figure 1 shows the current traditional winding method, which includes sequentially stacked and wound positive pole pieces, separators, and negative pole pieces. A small section of the uncoated area of the sheet is wrapped and sealed, and the length of the uncoated area is less than the perimeter of the battery core, generally 1/4 to 1/2 of the perimeter of the battery core. Figure 2 is a schematic diagram of a positive pole piece in a traditional winding method. The head of the positive pole piece is a double-sided area, and the tail is a single-sided dislocation area. The head of the pole piece has an empty aluminum area, and the pole piece has a section of empty aluminum area. . FIG. 3 is a schematic diagram of a negative electrode sheet in a traditional winding method. The head of the negative electrode sheet is a single-sided dislocation area, and the tail is a double-sided area. In the traditional winding method, the positive pole piece and the negative pole piece are overlapped to start winding, and the negative pole piece is used as the inner ring for winding.

The lithium-ion battery cell proposed in the first aspect of the utility model, as shown in Figure 4 and Figure 9, the bare cell includes a positive electrode sheet, a separator and a negative electrode sheet that are stacked and wound in sequence; the positive electrode sheet includes a positive electrode current collector and a coating. The positive electrode active material coated on both surfaces of the positive electrode current collector, the negative electrode sheet includes the negative electrode current collector and the negative electrode active material coated on both surfaces of the negative electrode current collector; the current collector of the positive electrode sheet is an aluminum sheet, and the current collector of the negative electrode sheet is a copper sheet.

In this application, there is an empty aluminum area at the tail of the positive electrode sheet in the bare cell, and the tail of the negative electrode sheet is coated on one side; The surface opposite to the aluminum area is not coated with negative electrode active material, that is, the negative electrode sheet corresponding to the empty aluminum area is a single-sided coating area, and a waistcoat area is formed between the empty aluminum area and the copper sheet without active materials. Short circuits or nail-through contacts are prioritized to avoid safety issues such as burns or explosions. And it has been proved by experiments that copper foil and aluminum have nail-penetrating contact, and the safety performance is the highest. The formation of the vest only adds at least one layer of aluminum foil, which greatly reduces the loss of energy density. Although at least one layer of aluminum foil is added in terms of thickness, there is no loss in energy density due to the increase in the length of the positive electrode film.

Preferably, the outer periphery of the cell is wrapped by the empty aluminum area for 1-2 weeks, and preferably 1.25-1.5 weeks. The length of the empty aluminum area is at least one week to meet the above functional requirements. In the product design, it can be extended by 1/4 week to 1/2 week according to actual needs for finishing and fixing to ensure complete coverage of the empty aluminum area. As shown in Figure 9, the empty aluminum area is wrapped for about 1.5 weeks, which can bypass the bending of the battery core, so that the empty aluminum area can be better fixed to the surface of the battery core.

Preferably, in the interior of the cell, the heads of the positive electrode sheet and the negative electrode sheet overlap, and the half circle formed by winding the positive electrode sheet and the negative electrode sheet is the first circle of the cell, and the positive electrode sheet is used as the inner ring to wind in turn The second circle and the third circle of the battery cell are formed; the first circle of the positive electrode sheet and the negative electrode sheet are blank areas, and the two surfaces are not coated with active materials. Starting from the second circle of the negative electrode sheet, both surfaces are coated with active material. The surface of the second circle of the positive electrode sheet opposite to the first circle is not coated with active material, that is, the second circle of the positive electrode sheet is single-piece coated. Starting from the third circle of the positive electrode sheet, both surfaces are coated with active materials. The positive single-sided area is placed on the head, and the film length of the positive single-sided area becomes smaller, that is, the length of the short film can be increased, thereby achieving an increase in energy density.

As shown in Figure 5, the head of the positive electrode sheet is a single-sided dislocation area, while the tail is a double-sided area, and the blank aluminum foil at the tail increases the field. As shown in Figure 6, the head of the negative electrode sheet is a double-sided area, while the tail is a single-sided dislocation area. Wherein, the lengths of the single-sided area and the blank area can be adjusted accordingly according to the size of the battery.

In the above electric core, both the positive electrode active material and the negative electrode active material are continuously coated. Wherein, according to the specific needs of the battery, the positive electrode sheet and the negative electrode sheet can be interchanged.

Example 1

Preparation of the positive electrode sheet: Using NMP as the solvent, add 95wt% positive electrode active material lithium cobaltate, 2wt% binder PVDF, and 3wt% conductive agent graphite to NMO in proportion, and stir until the viscosity range is 2500 ~8000pa·s cathode slurry. The positive electrode slurry was coated on an aluminum foil, dried, and cold-pressed to obtain a compacted density of 4.15 g/cc. As shown in Figure 5, the A mask is 388.5mm long, and the B thick film is 326mm long.

The preparation of negative plate: with deionized water as solvent, 95wt% negative electrode active material graphite, 2wt% binder SBR, 2wt% conductive agent graphite and 1wt% thickener CMC are added to deionized water, stirred to form Negative electrode slurry with a viscosity ranging from 1000 to 3500 Pa·s. The negative electrode slurry was coated on the copper foil, dried, and cold-pressed to obtain a compacted density of 1.65 g/cc. As shown in Fig. 6, the head of the negative electrode sheet is a double-sided area, while the tail is a single-sided dislocation area. A mask is 324.5mm long, and B thick film is 400mm long.

The thickness of the separator used is a PP/PE/PP three-layer composite porous separator with a thickness of 11 μ m.

The electrolyte is a LiPF₆ solution with a concentration of 1mol/L. The solvent is a mixed solvent of EC, PC and DEC, and the ratio of the three is 1:1:1.

Battery assembly: wind the positive electrode sheet, separator and negative electrode sheet, package, liquid injection, chemical formation, and pumping to form a secondary battery with high energy density.

The winding method is shown in Figure 4: inside the cell, the heads of the positive and negative electrodes overlap. The ring winding forms the second and third circles of the battery in turn; the first circle of the positive electrode sheet and the negative electrode sheet are blank areas; starting from the second circle of the negative electrode sheet, both surfaces are coated with active materials; the positive electrode sheet The second circle is coated on one side, and the surface opposite to the first circle is not coated with active material, and starting from the third circle, both surfaces are coated with active material. The outer periphery of the cell is wrapped by the empty aluminum area at the tail of the positive electrode sheet for one week, and a section is extended as the end, that is, the negative electrode sheet corresponding to the empty aluminum area is a single-sided coating area.

Comparative example 1:

Prepare lithium-ion battery according to the method for embodiment 1, difference is:

As shown in Figure 2, the head of the positive electrode sheet is a double-sided area, and the tail is a single-sided dislocation area. The length of the A mask is 390mm, the length of the B mask is 313mm, and the length of the empty aluminum foil at the tail is 23mm.

As shown in Figure 3, the head of the negative electrode sheet is a single-sided dislocation area, and the tail is a double-sided area. The length of the A mask is 325mm, and the length of the B mask is 392mm.

The winding method is shown in Figure 1. In the traditional winding method, the positive pole piece and the negative pole piece are overlapped before winding, and the negative pole piece is used as the inner ring for winding, and the half circle formed by the positive pole piece and the negative pole piece is the first circle of the cell. The second and third circles of the cell are formed by winding the negative electrode sheet as the inner ring; the first circle of the positive electrode sheet and the negative electrode sheet are blank areas; starting from the second circle of the positive electrode sheet, both surfaces are coated with active material; the second circle of the negative plate is coated on one side, and the surface opposite to the first circle is not coated with active material, and from the third circle, both surfaces are coated with active material. The outer periphery of the battery cell is wound and wrapped by the single-sided coating area of the positive electrode sheet, and is wrapped and sealed by a small section of the uncoated area of the positive electrode sheet. 1/4 to 1/2 of the outer circumference.

The batteries prepared in Example 1 and Comparative Example 1 were subjected to the Nail test:

The detection method is: temperature 25°C, nail diameter 2.5mm, puncture speed 100mm/s.

The experimental results are: the pass rate of the comparative example is 0/5, and the pass rate of the embodiment 1 is 5/5.

Wherein Fig. 7 and Fig. 8 are respectively the Nail test curve of embodiment 1 and comparative example 1.

Although the present application is disclosed as above with preferred embodiments, it is not used to limit the claims. Any person skilled in the art can make some possible changes and modifications without departing from the concept of the present application. Therefore, the present application The scope of protection shall be based on the scope defined by the claims of the present application.

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CN109244556A *	2018-10-16	2019-01-18	联动天翼新能源有限公司	A kind of rectangular lithium ion battery core that improves is crumpled the anode ring forming device and method of deformation
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Family To Family Citations				

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Priority And Related Applications

Priority Applications (1)

Application	Priority date	Filing date	Title
CN201620099936.9U	2016-02-01	2016-02-01	Lithium ion battery cell and contain lithium ion battery of this electricity core

Applications Claiming Priority (1)

Application	Filing date	Title
CN201620099936.9U	2016-02-01	Lithium ion battery cell and contain lithium ion battery of this electricity core

Legal Events

Date	Code	Title	Description
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2016-07-06	GR01	Patent grant	
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2026-02-17	CX01	Expiry of patent term	