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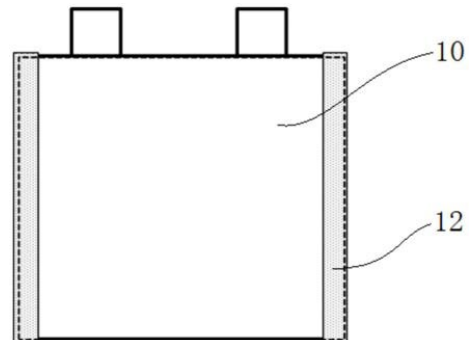
Claims: 1 page Description: 5 pages Drawings: 5 pages

(54) Name of Invention

ELECTRODE ASSEMBLY AND LITHIUM ION CELL USING THE ELECTRODE ASSEMBLY

(57) Abstract

The present application relates to the field of energy storage devices, and in particular relates to an electrode assembly and a lithium ion cell using the electrode assembly. The electrode assembly comprises a bare cell and an anti-puncture cushion; the bare cell comprises at least one electrode unit, the electrode unit comprising a cathode sheet, an anode sheet, and a separator, wherein the cathode sheet is separated from the anode sheet by the separator; and the anti-puncture cushion is arranged on two sides along a width direction of the bare cell and covers an edge of the anode sheet. The lithium ion cell comprises a laminated aluminum film and the electrode assembly, and the electrode assembly is wrapped by the laminated aluminum film. A lithium ion cell according to the present application is capable of adding a layer of protection and separation structure between an anode current collector and a laminated aluminum film by using an anti-puncture cushion arranged outside the anode current collector on two sides of a bare cell, thereby significantly lowers the probability that the laminated aluminum film is punctured by an electrode sheet.



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1. An electrode assembly, comprising a bare cell and an anti-puncture cushion; wherein

the bare cell comprises at least one electrode unit, the electrode unit comprising a cathode sheet, an anode sheet, and a separator, wherein the cathode sheet is separated from the anode sheet by the separator; and

the anti-puncture cushion is arranged on two sides along a width direction of the bare cell, and covers an edge of the anode sheet.
2. The electrode assembly according to claim 1, wherein the bare cell comprises a plurality of electrode units, the plurality of electrode units being sequentially arranged in a stacking manner along a thickness direction, and the anode sheet in each of the plurality of electrode units being covered by the anti-puncture cushion.
3. The electrode assembly according to claim 2, wherein an edge of the anti-puncture cushion along a top and/or bottom direction of the bare cell extends beyond the anode sheet.
4. The electrode assembly according to claim 2, wherein in the bare cell, a rib structure is formed on two sides or on one side along the width direction of the bare cell by at least one group of two adjacent electrode units, and the anti-puncture cushion further wraps the rib structure.
5. The electrode assembly according to claim 4, wherein the widths of the adjacent electrode units are different.
6. The electrode assembly according to claim 4, wherein the adjacent electrode units are partially staggered along a width direction.
7. The electrode assembly according to claim 4, wherein the electrode units comprise one or more of: lamination-type electrode units, convolution-type electrode units, and folding-type electrode units.
8. The electrode assembly according to claim 4, wherein the anti-puncture cushion is adhered on two sides along the width direction of the bare cell and completely wraps the two sides of the bare cell.
9. The electrode assembly according to claim 8, wherein the anti-puncture cushion is a tape.
10. A lithium ion cell, comprising a laminated aluminum film and the electrode assembly according to any one of claims 1 through 9, wherein the electrode assembly is wrapped by the laminated aluminum film.

ELECTRODE ASSEMBLY AND LITHIUM ION CELL USING THE ELECTRODE ASSEMBLY**TECHNICAL FIELD**

[0001] The present application relates to the field of energy storage devices, and in particular relates to an electrode assembly and a lithium ion cell using the electrode assembly.

BACKGROUND

[0002] With the development of science and technology, a variety of electronic products emerge and almost become an indispensable part of daily life. With advantages of high energy density, long cycle life, environmental friendliness and renewability, lithium ion batteries have been widely used in various electronic products.

[0003] Generally, lithium secondary batteries are formed through setting an electrode assembly and electrolyte in a battery shell, and sealing the battery shell. Electrode units used in the electrode assembly may be categorized into convolution (winding)-type electrode units, a stacking-type electrode units, and folding-type electrode units according to their structure.

[0004] In the related art, a polypropylene layer of a laminated aluminum film is generally used to isolate an anode current collector in an anode sheet. Since the requirements of energy density of a cell at the market become higher and higher, the polypropylene layer of the laminated aluminum film and the anode current collector become thinner. In one aspect, an anti-puncture strength of the thinner polypropylene layer becomes lower. In another aspect, since the anode current collector of the lithium ion battery is a copper foil, with the restriction of process conditions in the related art, burrs may exist on an end edge of the copper foil, which may cause the case where the burrs on the end edge of the anode puncture a separator and a laminated aluminum film under extreme conditions. However, in a lamination-type or stacking-type lithium ion cell, the edge of the thinner anode current collector will become sharper, which increases the probability that the polypropylene layer of the laminated aluminum film is punctured by the anode current collector.

[0005] After the polypropylene layer of the laminated aluminum film is punctured, which may cause battery leakage, and, in a more serious case, it may result in that the anode is conducted with the aluminum foil layer via contact. In the latter case, an electrochemical reaction may occur and thus the polypropylene layer of the laminated aluminum film may be subjected to corrosion, which also causes battery leakage and corrosion.

SUMMARY

[0006] The present application provides an electrode assembly and a lithium ion cell using the electrode assembly and is capable of effectively reducing the probability that a packaged laminated aluminum film is punctured by an electrode sheet.

[0007] A first aspect of the present application provides an electrode assembly, comprising a bare cell and an anti-puncture cushion;

[0008] the bare cell comprises at least one electrode unit, the electrode unit comprising a cathode sheet, an anode sheet, and a separator, wherein the cathode sheet is separated from the anode sheet by the separator; and

[0009] the anti-puncture cushion is arranged on two sides along a width direction of the bare cell, and covers an edge of the anode sheet.

[0010] Preferably, the bare cell comprises a plurality of electrode units, the plurality of electrode units being sequentially arranged in a stacking manner along a thickness direction, and the anode sheet in each of the plurality of electrode units being covered by the anti-puncture cushion.

[0011] Preferably, an edge of the anti-puncture cushion along a top and/or bottom direction of the bare cell extends beyond the anode sheet.

[0012] Preferably, in the bare cell, a rib structure is formed on two sides or on one side along the width direction of the bare cell by at least one group of two adjacent electrode units, and the anti-puncture cushion further wraps the rib structure.

[0013] Preferably, the widths of the adjacent electrode units are different.

[0014] Preferably, the adjacent electrode units are partially staggered along a width direction.

[0015] Preferably, the electrode units comprise one or more of: lamination-type electrode units, convolution-type electrode units, and folding-type electrode units.

[0016] Preferably, the anti-puncture cushion is adhered on two sides along the width direction of the bare cell and completely wraps the two sides of the bare cell.

[0017] Preferably, the anti-puncture cushion is a tape.

[0018] A second aspect of the present application provides a lithium ion cell, comprising a laminated aluminum film and the above mentioned electrode assembly, wherein the electrode assembly is wrapped by the laminated aluminum film.

[0019] The technical solutions provided in the present application may achieve the following beneficial effects:

[0020] A lithium ion cell according to the present application is capable of adding a layer of protection and separation structure between an anode current collector and a laminated aluminum film by using an anti-puncture cushion arranged outside the anode current collector on two sides of a bare cell, thereby significantly lowering the probability of that the laminated aluminum film is punctured by an electrode sheet.

[0021] It shall be appreciated that the above general description and the detailed description hereinafter are only illustrative but not for limiting the present application.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022] FIG. 1 is a schematic diagram of an overall structure of a lithium ion battery according to the present application;

[0023] FIG. 2 is a schematic diagram of an exterior structure of an electrode assembly formed by a single lamination-type electrode unit according to the present application;

[0024] FIG. 3 is a schematic structural diagram of a cross section of FIG. 2;

[0025] FIG. 4 is a schematic diagram of an exterior structure of an electrode assembly formed by stacking a plurality of lamination-type electrode units according to the present application;

[0026] FIG. 5 is a schematic structural diagram of a cross section of FIG. 4;

[0027] FIG. 6 is a schematic diagram of an exterior structure of an electrode assembly formed by stacking a plurality of convolution-type electrode units according to the present application;

[0028] FIG. 7 is a schematic structural diagram of a cross section of FIG. 6;

[0029] FIG. 8 is a schematic diagram of an exterior structure of an electrode assembly of a single folding-type electrode unit according to the present application;

[0030] FIG. 9 is a schematic diagram of an exterior structure formed by hybrid stacking of a plurality of types of electrode units according to the present application; and

[0031] FIG. 10 is a schematic diagram illustrating partially staggering of adjacent electrode units along a width direction according to the present application.

[0032] Brief description of the drawings

[0033] 1-Electrode assembly

[0034] 10-Bare cell

[0035] 100-Electrode unit

[0036] 100a-Cathode sheet

[0037] 100b-Anode sheet

[0038] 100c-Separator

[0039] 100d-Rib structure

[0040] 12-Anti-puncture cushion

[0041] 2-Laminated aluminum film

[0042] The accompanying drawings herein, which are incorporated into and constitute a part of the specification, illustrate embodiments consistent with the present application and, together with the specification, serve to explain the principles of the present application.

DETAILED DESCRIPTION

[0043] The present application is further described with reference to specific embodiments and accompanying drawings. The terms "front," "behind," "left," "right," "upper" and "lower" described in

the present application are given with reference to the state where a lithium ion cell is disposed in the accompanying drawings.

[0044] As illustrated in FIG. 1, a lithium ion cell is provided according to an embodiment of the present application, wherein the lithium ion cell comprises an electrode assembly 1 and a laminated aluminum film 2. As illustrated in FIG. 2, the electrode assembly 1 comprises a bare cell 10 and an anti-puncture cushion 12; the bare cell 10 is a main electric energy generating component of the lithium ion cell and generally comprises at least one electrode unit 100, each electrode unit 100 including a cathode sheet 100a, an anode sheet 100b, and a separator 100c; the cathode sheet 100a is separated from the anode sheet 100b by the separator 100c, such that the cathode sheet 100a and the anode sheet 100b are subjected to an electrochemical reaction under the effect of an electrolyte. The anti-puncture cushion 12 is arranged on two sides along a width direction of the bare cell 10 (extending left-right along the paper surface in FIG. 2), and covers an edge of the anode sheet 100b. Finally, the electrode assembly 1 is entirely wrapped by the laminated aluminum film 2 from the outer side. In this case, the anti-puncture cushion 12 serves as a barrier between the laminated aluminum film 2 and the anode sheet 100b. With the protection separation structure, the anode sheet 100b may be separated by the anti-puncture cushion 12 and thus cannot be in direct contact with the laminated aluminum film 2, thereby reducing the probability that the laminated aluminum film 2 is punctured (referring to FIG. 1).

[0045] Corners at the top and bottom of the anode sheet 100b are sharp, and when the anode sheet 100b is covered by the anti-puncture cushion 12 along a width direction, a polypropylene layer of the laminated aluminum film 2 may still be punctured by the anode sheet 100b along the top or bottom direction. In this case, this embodiment provides a corresponding measure to protect the polypropylene layer of the laminated aluminum film 2. To be specific, as illustrated in FIGS. 2, 4, and 6, in this embodiment, both edges of the anti-puncture cushion 12 along a top and/or bottom direction of the bare cell 10 extend beyond the anode sheet 100b. In this way, after the electrode assembly 1 is wrapped by the laminated aluminum film 2, portions of the edges of the anti-puncture cushion 12 extending beyond the anode sheet 100b can be bent, such that the corners of the anode sheet 100b are completely wrapped by the anti-puncture cushion 12, thereby preventing the corners from piercing through the polypropylene layer.

[0046] Considering manufacture difficulty, cell capacity and the like, preferably, a plurality of electrode units 100 are simultaneously used for the bare cell 10, and these electrode units are sequentially arranged in a stacking manner along a thickness direction. To ensure that the anode sheet 100b in each of the electrode units 100 is separated from the laminated aluminum film 2, the anode sheet 100b in each of the electrode units 100 needs to be covered by the anti-puncture cushion 12.

[0047] The thicknesses of the electrode units 100 may be different, and meanwhile, the area perpendicular to the thickness direction may be adjusted according to the capacity of the cell or the regional spatial structure and volume of the space in which the cell is to be placed. For example, the widths of two adjacent electrode units 100 are different (as illustrated in FIG. 7). For another example, as illustrated in FIG. 10, the widths of four electrode units 100 are the same, but the thicknesses thereof are different; when the electrode units 100 are arranged in a stacking manner, the electrode unit 100 in each layer is partially staggered rightward relative to the electrode unit 100 below along a width direction. Nevertheless, there are more complicated situations: for example, the plurality of electrode units 100 are different in size or partially staggered along a length direction (a direction perpendicular to the paper surface in FIG. 10), which is not described herein any further.

[0048] When the above case occurs, a rib structure 100d is formed on two sides or on one side along a width direction of the two adjacent electrode units 100. Since an edge of the rib structure 100d projects outwards and is sharp, it can easily puncture the polypropylene layer of the laminated aluminum film 2. In order to cope with this situation, the rib structure 100d is also wrapped with the anti-puncture cushion 12 in this embodiment.

[0049] In this embodiment, the electrode unit 100 may be of various types, such as lamination type, convolution type, folding type, and the like. For example, the electrode assembly 1 as illustrated in FIGS. 2 and 3 only comprises a lamination-type electrode unit 100. In the electrode unit 100, the cathode sheet 100a, the separator 100c, and the anode sheet 100b are alternately stacked. However, the electrode assembly 1 as illustrated in FIGS. 4 and 5 comprises three lamination-type electrode units 100 with the lengths and widths sequentially decreasing. For another example, the electrode assembly 1 as illustrated in FIGS. 6 and 7 comprises two convolution-type electrode units 100 with the lengths and widths sequentially decreasing, such that the bare cell 10 forms an edge structure similar to a step-like shape. Still for another example, in the electrode assembly 1 illustrated in FIGS. 8, the cathode sheet 100a and the anode sheet 100b are arranged in a laminated manner, and the separator 100c serves as a barrier sequentially between adjacent cathode sheets 100a and anode sheets 100b in a folding manner, forming a folding-type electrode unit.

[0050] In addition, when a plurality of electrode units 100 are present simultaneously in one bare cell 10, each of the plurality of electrode units 100 may be selected to be a different type according to actual requirements. For example, the electrode assembly 1 as illustrated in FIG. 9 comprises one lamination-type electrode unit 100 with a smaller width, and one convolution-type electrode unit 100 with a greater width. The right sides of two electrode units 100 are aligned.

[0051] In this embodiment, the anti-puncture cushion 12 may have multiple sections, for example, an upper section and a lower section, or a number of parallel sections along the thickness direction; each section of the anti-puncture cushion 12 is separately adhered on two sides along the width direction of the bare cell. Or, the anti-puncture cushion 12 may be directly adhered on two sides along the width direction of the bare cell 1, completely wrapping the two sides of the bare cell 10. In this manner, the anode sheet 100b and the rib structure 100d may be all covered together; and, compared with the multi-section process, this process is simple and easy to operate. The anti-puncture cushion 12 may be directly selected to be a sticky tape; for example, a biaxially oriented polypropylene (BOPP) tape, which is commonly used on lithium ion batteries and commonly known as green tape, is selected.

[0052] The probability that the laminated aluminum film 2 is punctured by the anode current collector of the anode sheet is significantly reduced by the lithium ion cell of this embodiment.

[0053] Described above are merely preferred embodiments of the present application, but are not intended to limit the present application. A person skilled in the art may derive various modifications and variations. Any modification, equivalent replacement, or improvement made without departing from the spirit and principle of the present application should fall within the protection scope of the present application.

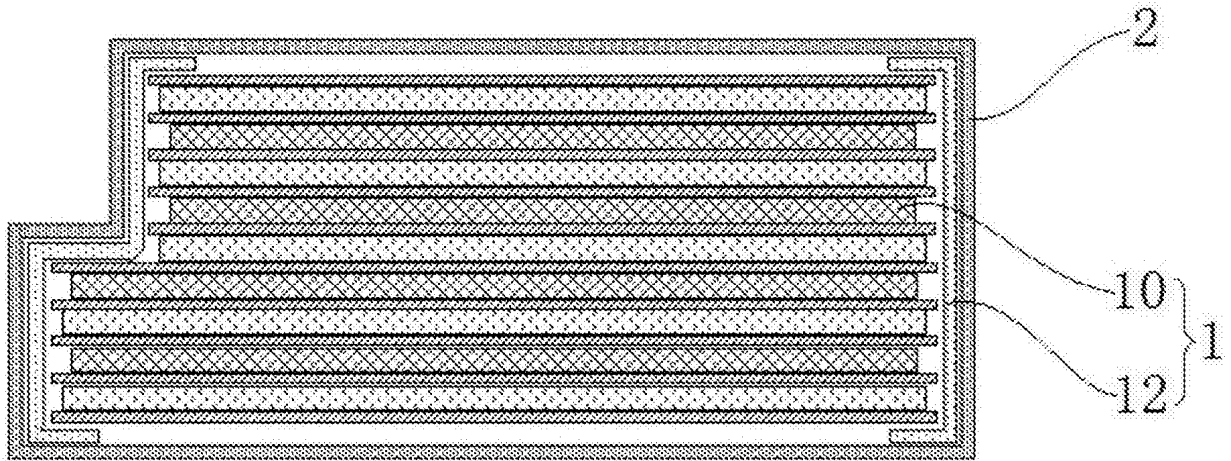


FIG. 1

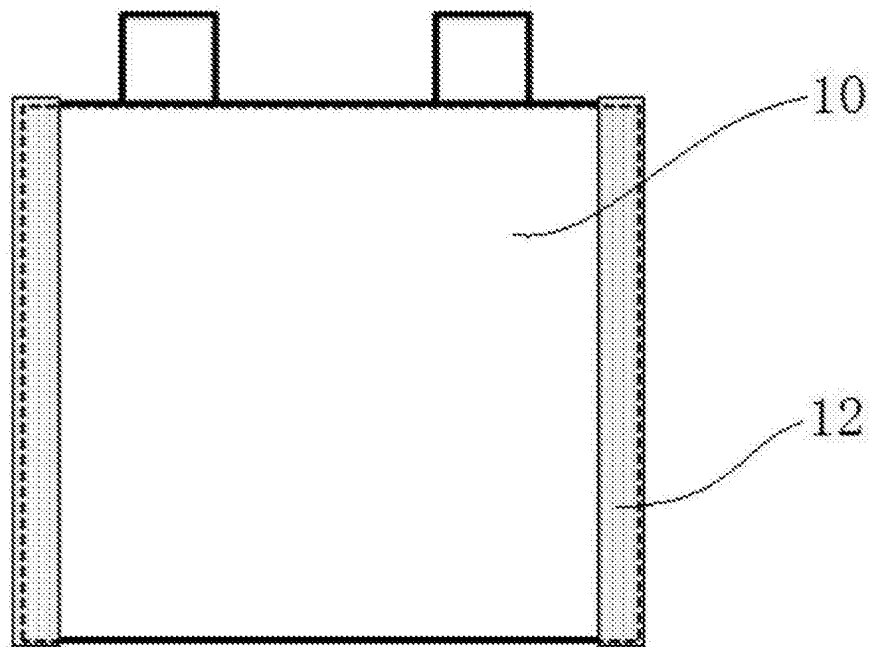


FIG. 2

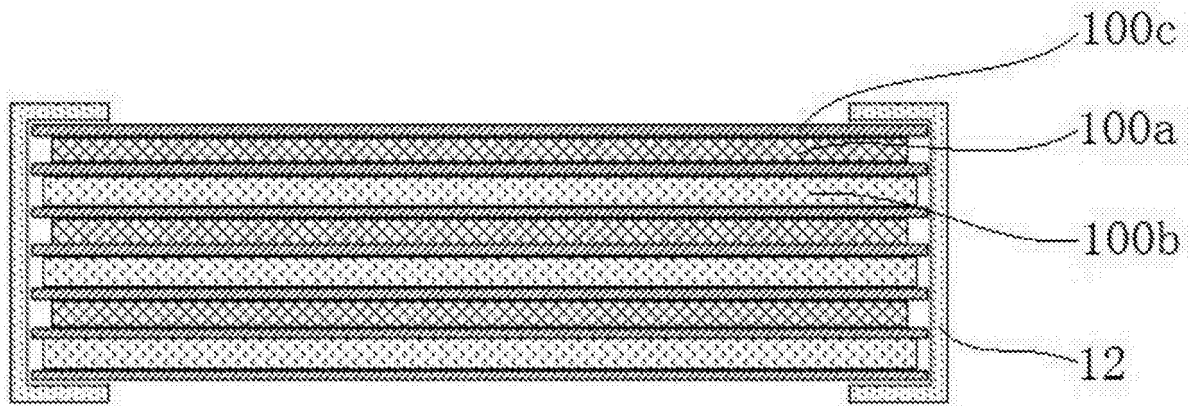


FIG. 3

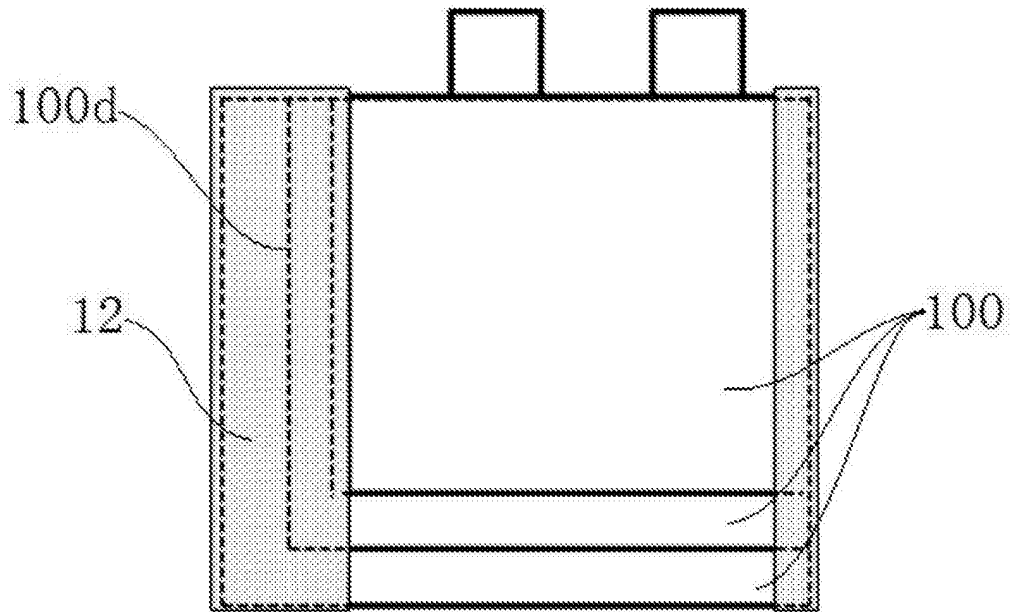


FIG. 4

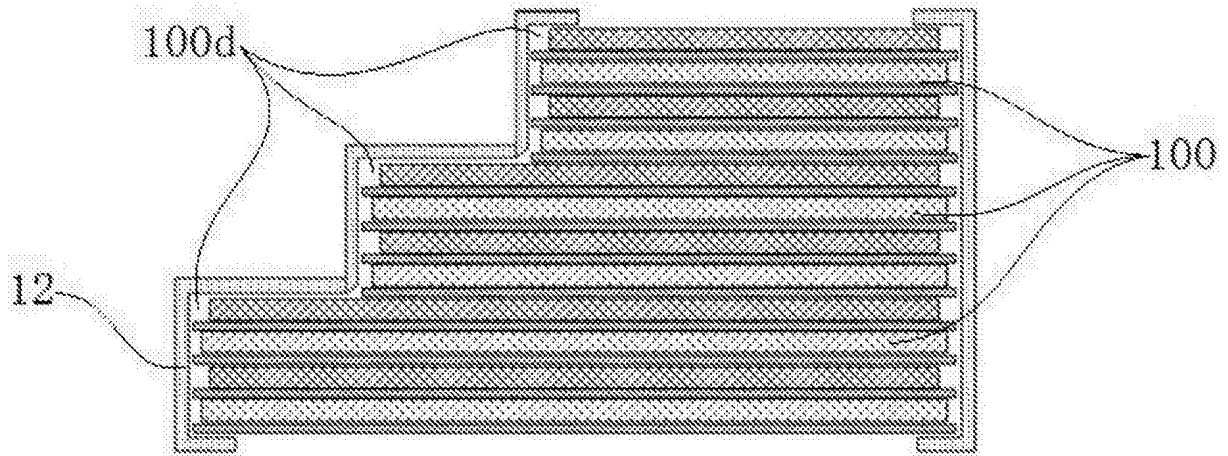


FIG. 5

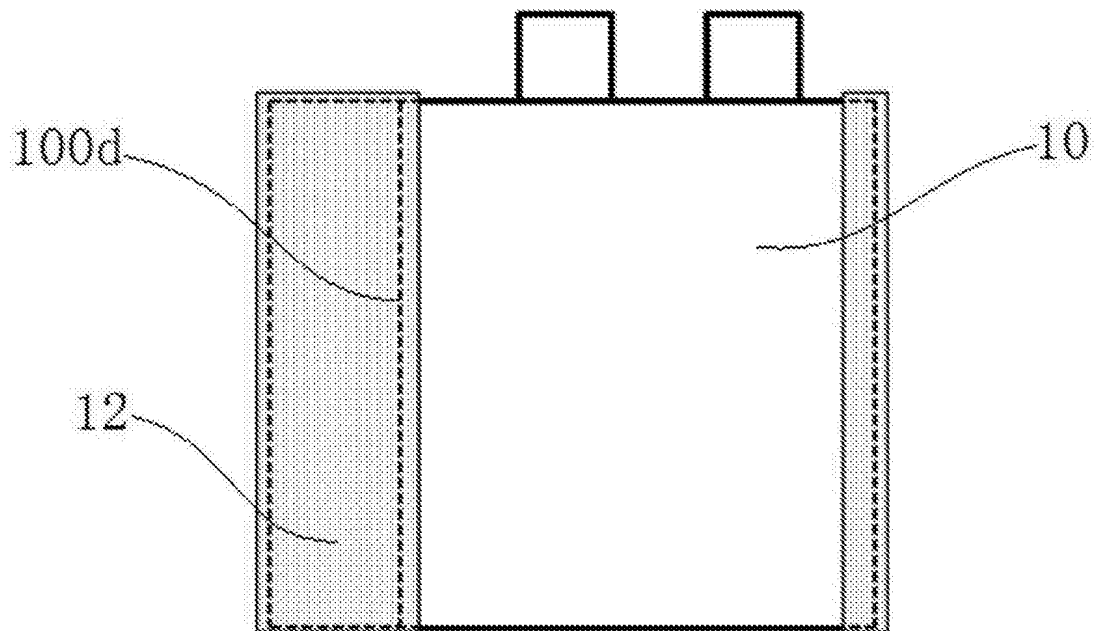


FIG. 6

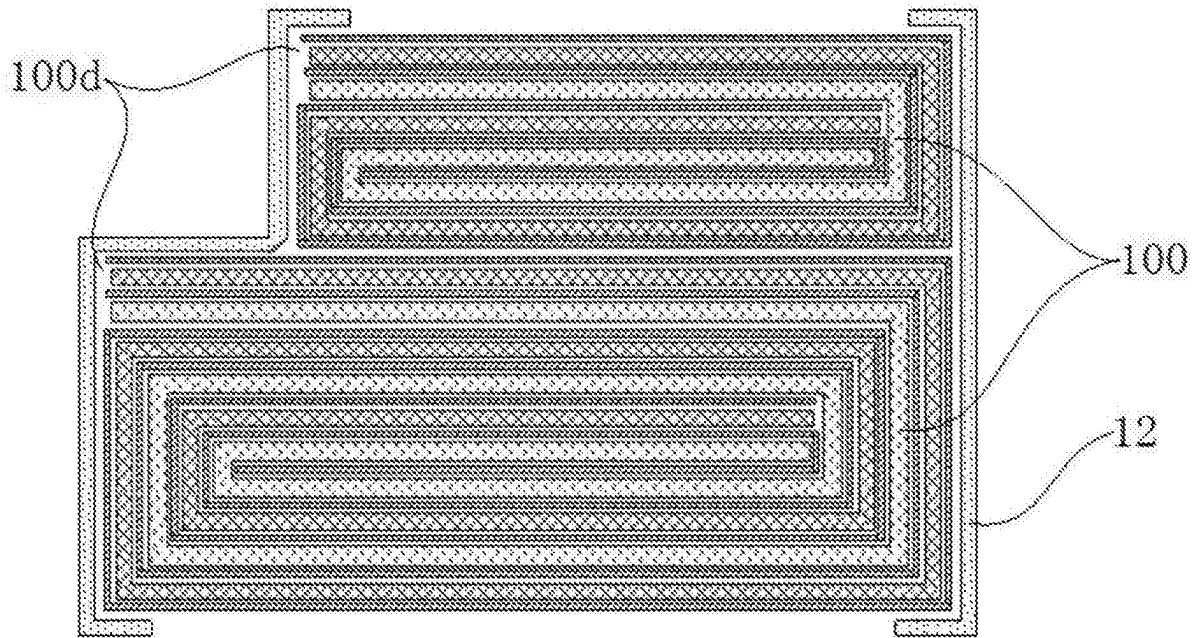


FIG. 7

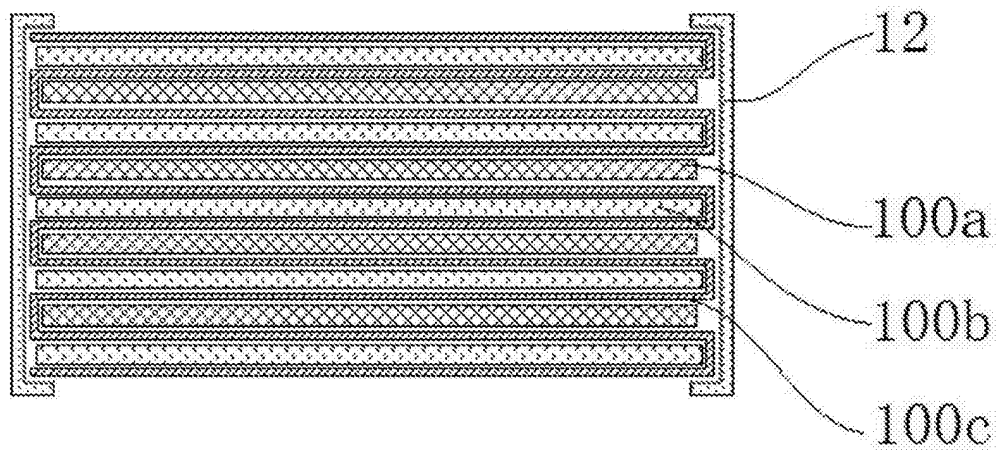


FIG. 8

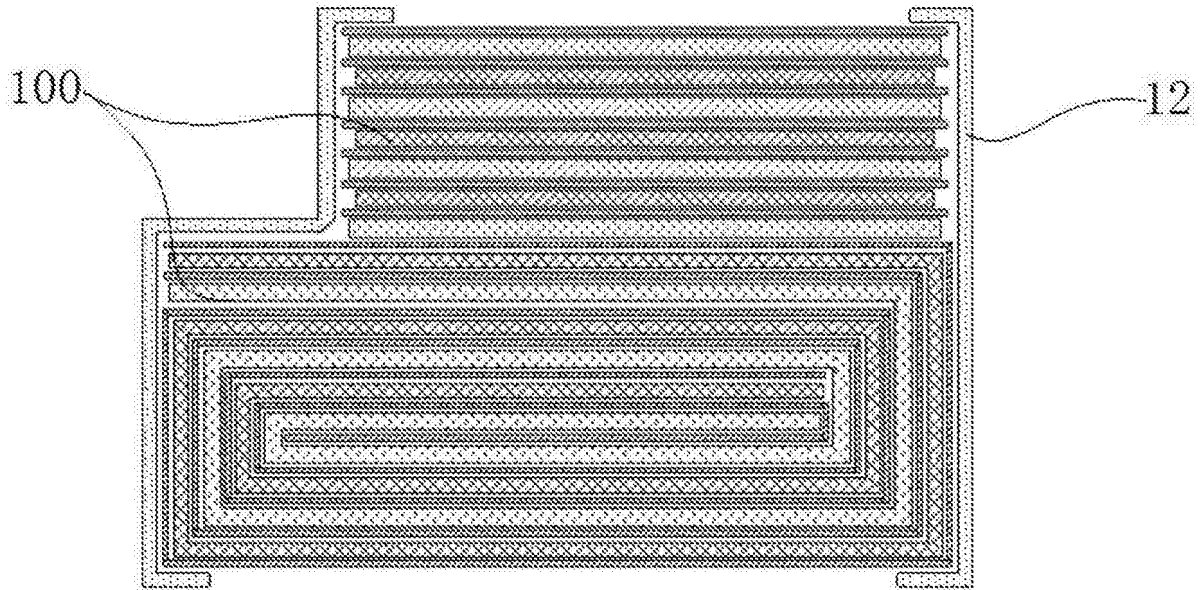


FIG. 9

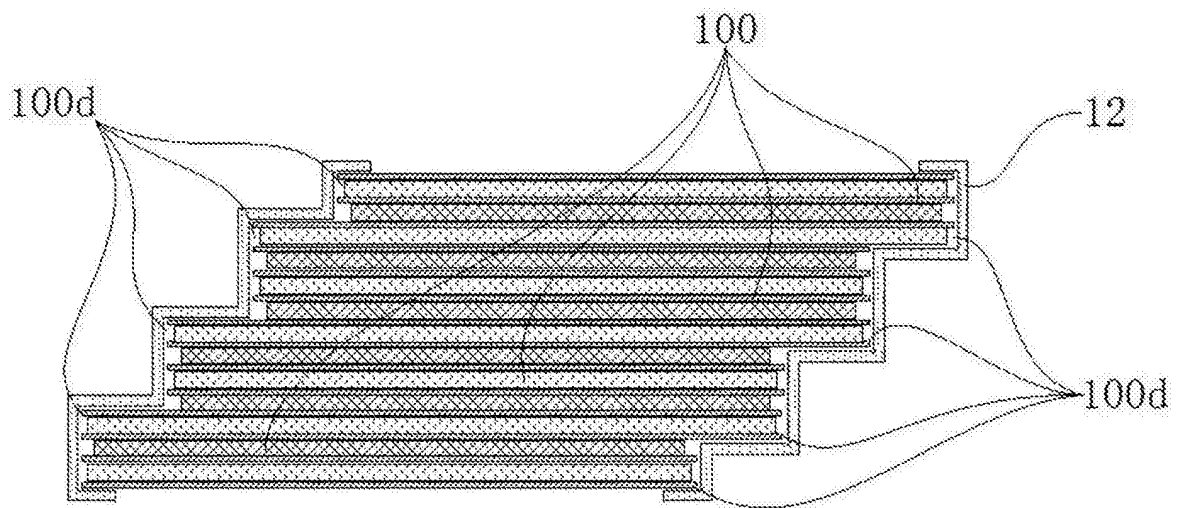


FIG. 10



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CERTIFICATE OF ACCURACY

I, Evelyn Garland, am competent to translate from Chinese into English and certify that the attached English language document(s) is a true and accurate translation of the original Chinese language document(s) CN105514352A to the best of my abilities.

I further declare that the statement in the preceding paragraph is true, and I understand that false statements and the like are punishable by fine and imprisonment, or both, under Section 1001 of Title 18 of the United States Code.

Date: February 14, 2023

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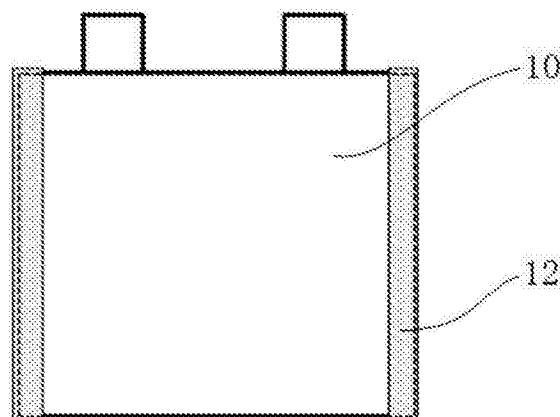
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(54) 发明名称

电极组件及采用该电极组件的锂离子电芯

(57) 摘要

本申请涉及储能器件领域,尤其涉及一种电极组件及采用该电极组件的锂离子电芯。电极组件包括裸电芯以及防穿刺垫层,所述裸电芯包括至少一个电极单元,所述电极单元包括阴极极片、阳极极片以及隔离膜,其中,所述阴极极片以及所述阳极极片通过所述隔离膜隔离,所述防穿刺垫层设置在所述裸电芯宽度方向的两侧,并覆盖所述阳极极片的边缘。锂离子电芯包括铝塑膜以及所述电极组件,所述铝塑膜包裹所述电极组件。本申请所提供的锂离子电芯通过在裸电芯的两侧设置位于阳极集流体外侧的防穿刺垫层,能够在阳极集流体与铝塑膜之间增加了一层保护隔离结构,大幅降低了铝塑膜被极片刺穿的几率。



1. 一种电极组件,其特征在于,包括裸电芯以及防穿刺垫层,
所述裸电芯包括至少一个电极单元,所述电极单元包括阴极极片、阳极极片以及隔离膜,其中,所述阴极极片以及所述阳极极片通过所述隔离膜隔离,
所述防穿刺垫层设置在所述裸电芯宽度方向的两侧,并覆盖所述阳极极片的边缘。
2. 根据权利要求1所述的电极组件,其特征在于,所述裸电芯包括多个所述电极单元,多个所述电极单元沿厚度方向依次堆叠设置,每个所述电极单元内的所述阳极极片均被所述防穿刺垫层所覆盖。
3. 根据权利要求2所述的电极组件,其特征在于,所述防穿刺垫层位于所述裸电芯顶部和/或底部方向的边缘超出所述阳极极片。
4. 根据权利要求2或3所述的电极组件,其特征在于,所述裸电芯中,至少存在一组相邻的两个所述电极单元在裸电芯的宽度方向的一侧或两侧形成有凸棱结构,所述防穿刺垫层还包覆该凸棱结构。
5. 根据权利要求4所述的电极组件,其特征在于,相邻的所述电极单元的宽度不同。
6. 根据权利要求4所述的电极组件,其特征在于,相邻的所述电极单元在宽度方向上部分错开。
7. 根据权利要求4所述的电极组件,其特征在于,所述电极单元包括层叠类型、包卷类型以及折叠类型的电极单元中的一种或多种。
8. 根据权利要求4所述的电极组件,其特征在于,所述防穿刺垫层粘贴于所述裸电芯宽度方向的两侧,并将所述裸电芯的两侧完整包裹。
9. 根据权利要求8所述的电极组件,其特征在于,所述防穿刺垫层为胶带。
10. 一种锂离子电芯,其特征在于,包括铝塑膜以及权利要求1至9任一项所述的电极组件,所述铝塑膜包裹所述电极组件。

电极组件及采用该电极组件的锂离子电芯

技术领域

[0001] 本申请涉及储能器件领域,尤其涉及一种电极组件及采用该电极组件的锂离子电芯。

背景技术

[0002] 随着科学技术的发展,各类电子产品层出不穷,几乎成为日常生活中不可或缺的组成,而锂离子电池具有能量密度高、循环寿命长、环境友好及可再生产等诸多优点,目前已被广泛应用于各类电子产品中。

[0003] 通常,通过在电池壳体中布置电极组件和电解液并且密封电池壳体来形成锂二次电池。在电极组件中使用的电极单元可以根据其结构被分类为包卷(缠绕)类型、堆叠类型以及折叠类型等。

[0004] 相关技术中,一般是通过铝塑膜上的聚丙烯层起到隔绝阳极极片中的阳极集流体的作用,由于市场对电芯能量密度的要求越来越高,铝塑膜的聚丙烯层厚度、阳极集流体厚度也随着变薄。一方面,变薄的聚丙烯层耐穿刺强度随之降低,另一方面,由于锂电池阳极集流体为铜箔,而相关技术中工艺条件的限制,铜箔的端面会存在毛刺,极限条件下可能造成阳极端面毛刺刺穿隔离膜与铝塑膜的情况发生,而在层叠或堆叠类型的锂离子电芯中,变薄后的阳极集流体边缘处会更尖锐,因此更加剧了阳极集流体刺穿铝塑膜的聚丙烯层的可能性。

[0005] 铝塑膜的聚丙烯层被刺穿后会导致漏液,更严重的会导致阳极与铝塑膜的铝箔层接触导通,发生电化学反应导致该位置产生腐蚀现象,同样导致漏液和腐蚀。

发明内容

[0006] 本申请提供了一种电极组件及采用该电极组件的锂离子电芯,能够有效降低包装铝塑膜被极片刺穿的几率。

[0007] 本申请的第一方面提供了一种电极组件,包括裸电芯以及防穿刺垫层,

[0008] 所述裸电芯包括至少一个电极单元,所述电极单元包括阴极极片、阳极极片以及隔离膜,其中,所述阴极极片以及所述阳极极片通过所述隔离膜隔离,

[0009] 所述防穿刺垫层设置在所述裸电芯宽度方向的两侧,并覆盖所述阳极极片的边缘。

[0010] 优选地,所述裸电芯包括多个所述电极单元,多个所述电极单元沿厚度方向依次堆叠设置,每个所述电极单元内的所述阳极极片均被所述防穿刺垫层所覆盖。

[0011] 优选地,所述防穿刺垫层位于所述裸电芯顶部和/或底部方向的边缘超出所述阳极极片。

[0012] 优选地,所述裸电芯中,至少存在一组相邻的两个所述电极单元在裸电芯的宽度方向的一侧或两侧形成有凸棱结构,所述防穿刺垫层还包覆该凸棱结构。

[0013] 优选地,相邻的所述电极单元的宽度不同。

- [0014] 优选地,相邻的所述电极单元在宽度方向上部分错开。
- [0015] 优选地,所述电极单元包括层叠类型、包卷类型以及折叠类型的电极单元中的一种或多种。
- [0016] 优选地,所述防刺穿垫层粘贴于所述裸电芯宽度方向的两侧,并将所述裸电芯的两侧完整包裹。
- [0017] 优选地,所述防穿刺垫层为胶带。
- [0018] 本申请的第二方面提供了一种锂离子电芯,包括铝塑膜以及上述的电极组件,所述铝塑膜包裹所述电极组件。
- [0019] 本申请提供的技术方案可以达到以下有益效果:
- [0020] 本申请所提供的锂离子电芯通过在裸电芯的两侧设置位于阳极集流体外侧的防穿刺垫层,能够在阳极集流体与铝塑膜之间增加了一层保护隔离结构,大幅降低了铝塑膜被极片刺穿的几率。
- [0021] 应当理解的是,以上的一般描述和后文的细节描述仅是示例性的,并不能限制本申请。

附图说明

- [0022] 图1为本申请所提供的锂离子电池的整体结构示意图;
- [0023] 图2为本申请所提供单一层叠类型电极单元的电极组件的外部结构示意图;
- [0024] 图3为图2的横截面结构示意图;
- [0025] 图4为本申请所提供多个层叠类型电极单元堆叠的电极组件的外部结构示意图;
- [0026] 图5为图4的横截面结构示意图;
- [0027] 图6为本申请所提供多个包卷类型电极单元堆叠的电极组件的外部结构示意图;
- [0028] 图7为图6的横截面结构示意图;
- [0029] 图8为本申请所提供的单一折叠类型电极单元的电极组件的外部结构示意图;
- [0030] 图9为本申请所提供的多种类型电极单元混合堆叠的电极组件的外部结构示意图;
- [0031] 图10为本申请所提供的相邻电极单元在宽度方向上部分错开的示意图。
- [0032] 附图说明:
- [0033] 1-电极组件;
- [0034] 10-裸电芯;
- [0035] 100-电极单元;
- [0036] 100a-阴极极片;
- [0037] 100b-阳极极片;
- [0038] 100c-隔离膜;
- [0039] 100d-凸棱结构;
- [0040] 12-防穿刺垫层;
- [0041] 2-铝塑膜。
- [0042] 此处的附图被并入说明书中并构成本说明书的一部分,示出了符合本申请的实施例,并与说明书一起用于解释本申请的原理。

具体实施方式

[0043] 下面通过具体的实施例并结合附图对本申请做进一步的详细描述。文中所述“前”、“后”、“左”、“右”、“上”、“下”均以附图中的锂离子电芯的放置状态为参照。

[0044] 如图1所示,本申请的实施例提供了一种锂离子电芯,包括电极组件1以及铝塑膜2。其中,如图2所示,电极组件1包括裸电芯10以及防穿刺垫层12,裸电芯10是锂离子电芯主要的电能产生部件,其一般包括一个或多个电极单元100,每个电极单元100均由阴极极片100a、阳极极片100b以及隔离膜100c所组成,阴极极片100a以及阳极极片100b通过隔离膜100c隔离,使二者在电解液的作用下发生电化学反应。防穿刺垫层12设置在裸电芯10宽度方向(图2中沿纸面左右延伸)的两侧,并覆盖阳极极片100b的边缘。最后,铝塑膜2则整体由外侧包裹电极组件1,此时防穿刺垫层12会阻隔在铝塑膜2以及阳极极片100b之间,由于这层保护隔离结构的存在,阳极极片100b能够被防穿刺垫层12所阻隔,无法直接与铝塑膜2发生接触,因此降低了铝塑膜2被刺穿的几率(参见图1)。

[0045] 阳极极片100b的顶部以及底部的拐角处比较尖锐,在宽度方向被防穿刺垫层12覆盖的情况下,仍有可能由顶部或底部方向刺破铝塑膜2的聚丙烯层,对此,在本实施例中也对该处进行了相应防护措施。具体地,如图2、4、6所示,在本实施例中,防穿刺垫层12位于裸电芯10顶部和底部方向的边缘均超出阳极极片100b。这样,在用铝塑膜2包裹电极组件1之后,防穿刺垫层12的边缘超出阳极极片100b的部分能够弯曲,使阳极极片100b的拐角完全被防穿刺垫层12所包覆,防止拐角刺破聚丙烯层。

[0046] 考虑到制作难度、电芯容量等,裸电芯10最好同时采用多个电极单元100,这些电极单元100均沿着厚度方向依次堆叠设置。为了保证每个电极单元100内的阳极极片100b均能够与铝塑膜2之间形成隔离,需要这些电极单元100内的阳极极片100b均被防穿刺垫层12所覆盖。

[0047] 这些电极单元100厚度均可不同,同时,在垂直于厚度方向上的面积也可以根据电芯的容量或者电芯所要放置的区域空间结构、容积等进行调整。例如,相邻两个电极单元100之间的宽度不同(参见图7),或者又如图10所示,四个电极单元100的宽度相同,但厚度各异,在堆叠时,每层电极单元100均相对其下方的电极单元100沿着宽度方向上向右部分错开。当然还有更为复杂的情况,例如多个电极单元100之间还在长度方向(图10中沿垂直于纸面方向延伸)上存在尺寸差异,亦或者部分错开,在此不再赘述。

[0048] 在上述情况发生时,相邻的两个电极单元100在宽度方向的一侧或两侧会形成凸棱结构100d,由于该凸棱结构100d的边缘向外凸出,而且也较为锋利,因此也很容易割破铝塑膜2的聚丙烯层。为了应对这种情况,本实施例中的防穿刺垫层12也包覆该凸棱结构100d。

[0049] 在本实施例中,电极单元100可以采用各种类型,例如层叠类型、包卷类型以及折叠类型等,例如,在图2、3所示的电极组件1中,仅包括层叠类型的电极单元100,在该电极单元100中阴极极片100a、隔离膜100c、阳极极片100b交替堆叠。而在图4、5所示的电极组件1中则包括三个长度以及宽度均依次减小的层叠类型的电极单元100。又如,在图6、7所示的电极组件1中,包括两个长度以及宽度均依次减小的包卷类型的电极单元100,使裸电芯10形成类似阶梯状的边缘结构。再如,在图8所示的电极组件1中,阴极极片100a与阳极极片

100b层叠设置,而隔离膜100c则通过折叠的方式依次阻隔在相邻的阴极极片100a与阳极极片100b之间,形成折叠类型的电极单元。

[0050] 除此之外,当一个裸电芯10中同时存在多个电极单元100时,每个电极单元100均可根据需求选择不同的类型。例如,图9所示的电极组件1中,包含一个宽度较小的层叠类型的电极单元100以及一个宽度较大的包卷类型的电极单元100,两个电极单元100的右侧对齐。

[0051] 在本实施例中,防穿刺垫层12可以分为多段,例如分为上、下两段,或者沿厚度方向平行排布的几段等,将每段防穿刺垫层12分别粘贴在裸电芯1的宽度方向的两侧。或者也可以直接粘贴在裸电芯1宽度方向的两侧,并将裸电芯10的两侧完整包裹,采用这种方式时,无论是阳极极片100b还是凸棱结构100d均可被一并覆盖,而且较之多段的方式,工艺简便,易于操作。防穿刺垫层12可以直接选择带有粘性的胶带,例如选择锂离子电池上常用的BOPP(双向拉伸聚丙烯薄膜)胶带,如俗称的绿胶。

[0052] 本实施例所提供的锂离子电芯大幅降低了铝塑膜2被阳极极片100b的阳极集流体刺穿的几率。

[0053] 以上所述仅为本申请的优选实施例而已,并不用于限制本申请,对于本领域的技术人员来说,本申请可以有各种更改和变化。凡在本申请的精神和原则之内,所作的任何修改、等同替换、改进等,均应包含在本申请的保护范围之内。

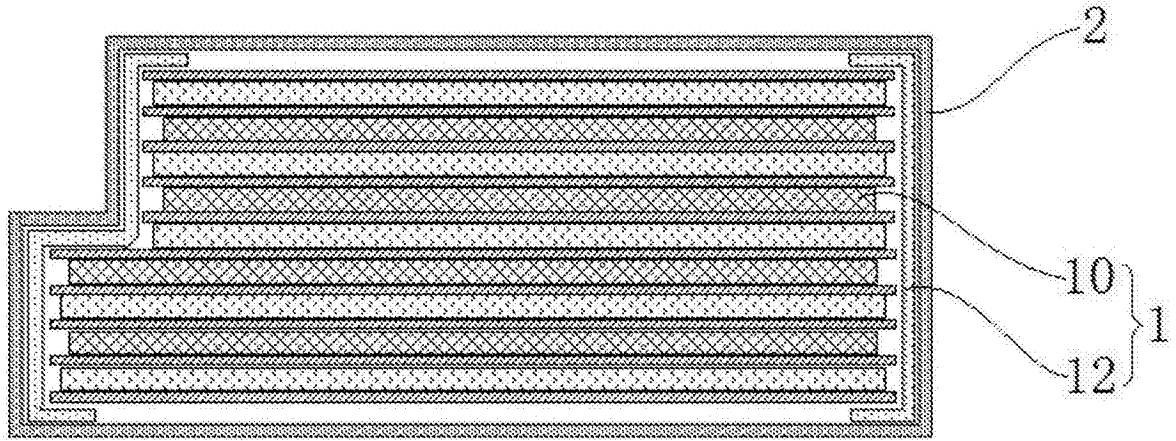


图1

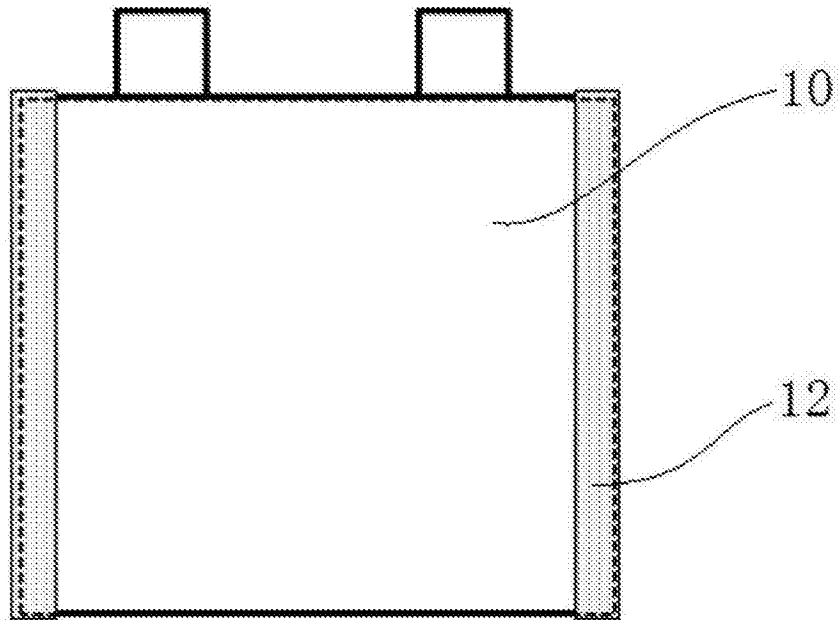


图2

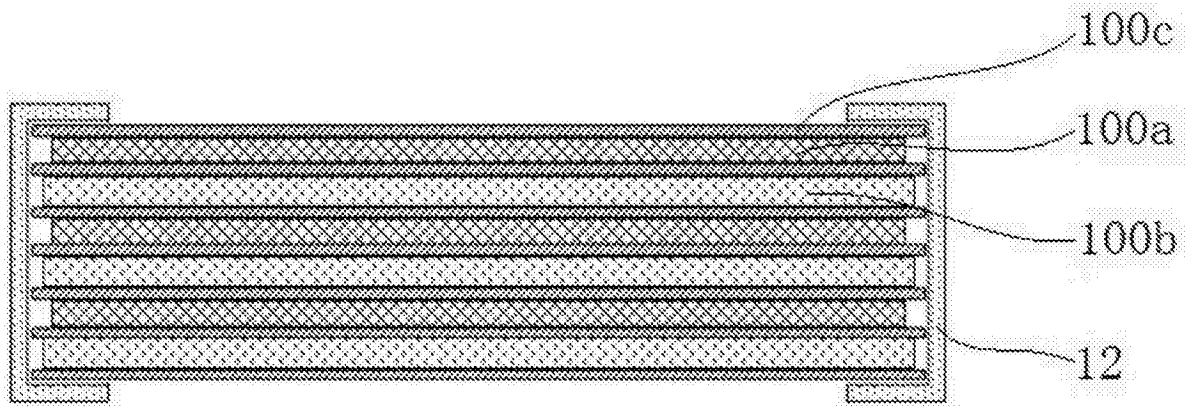


图3

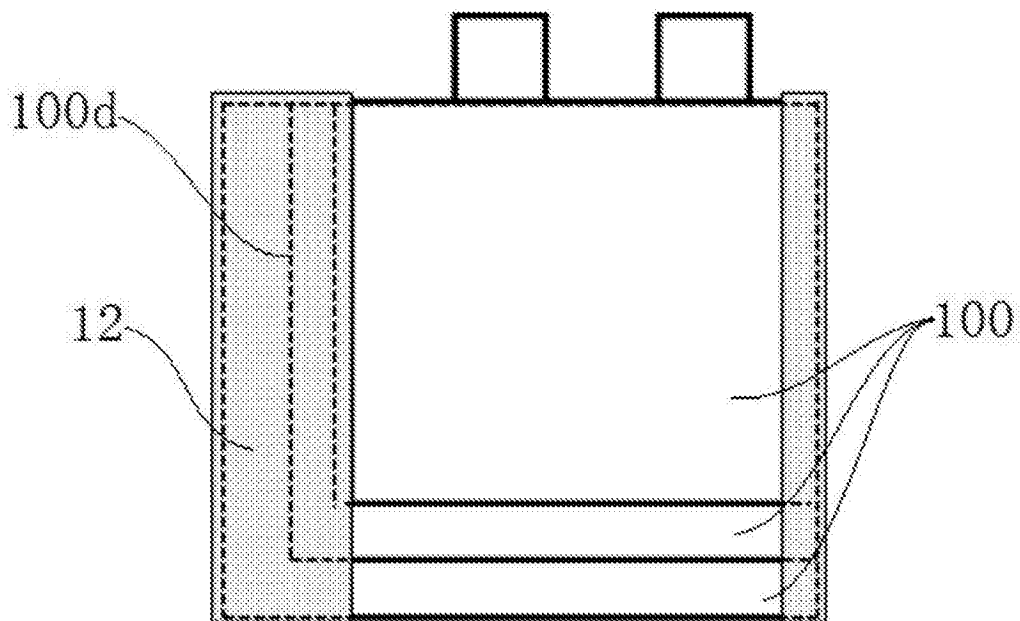


图4

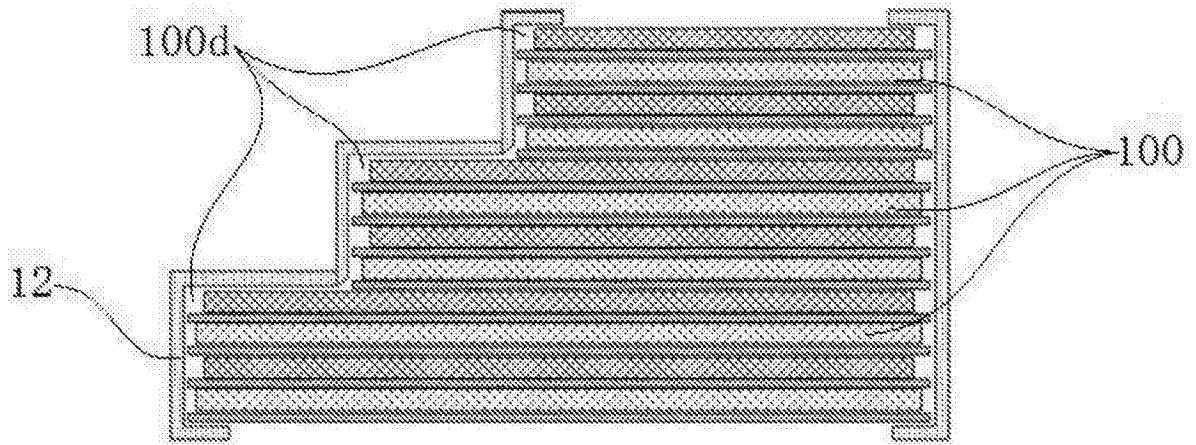


图5

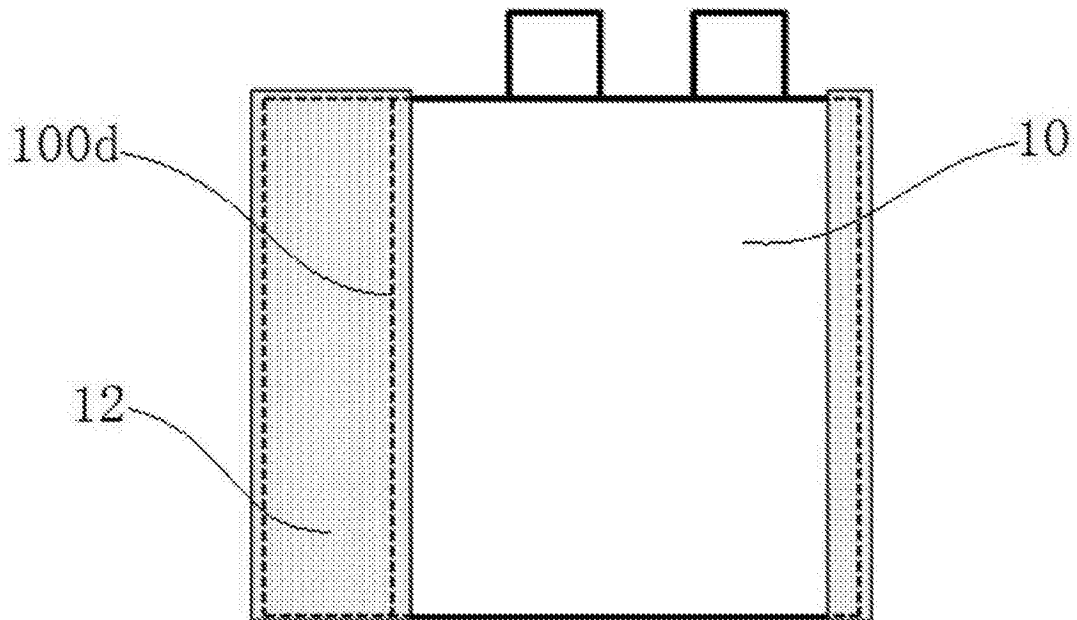


图6

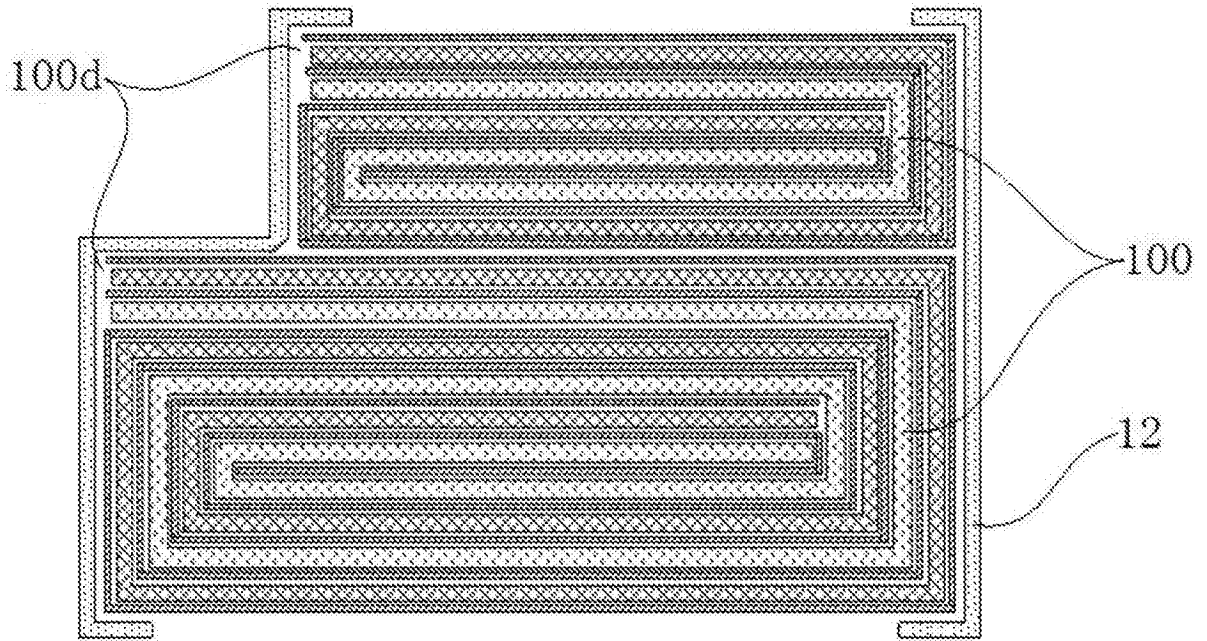


图7

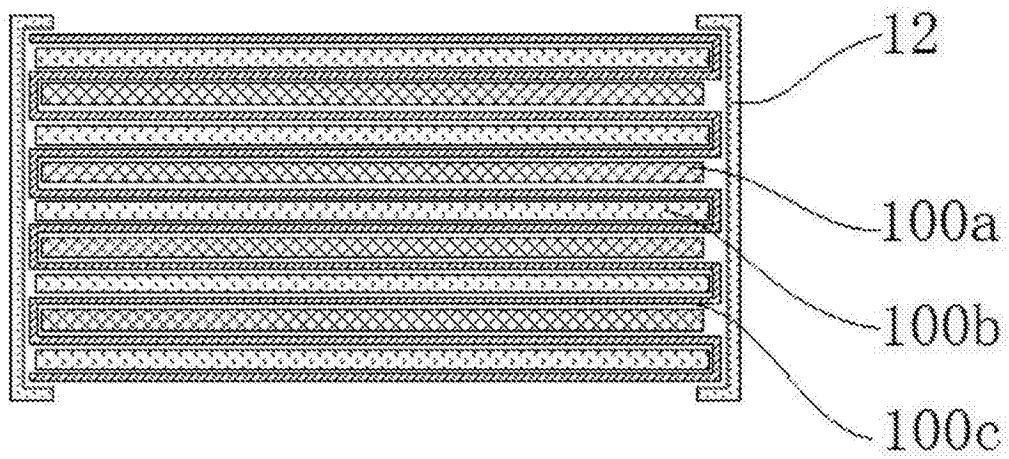


图8

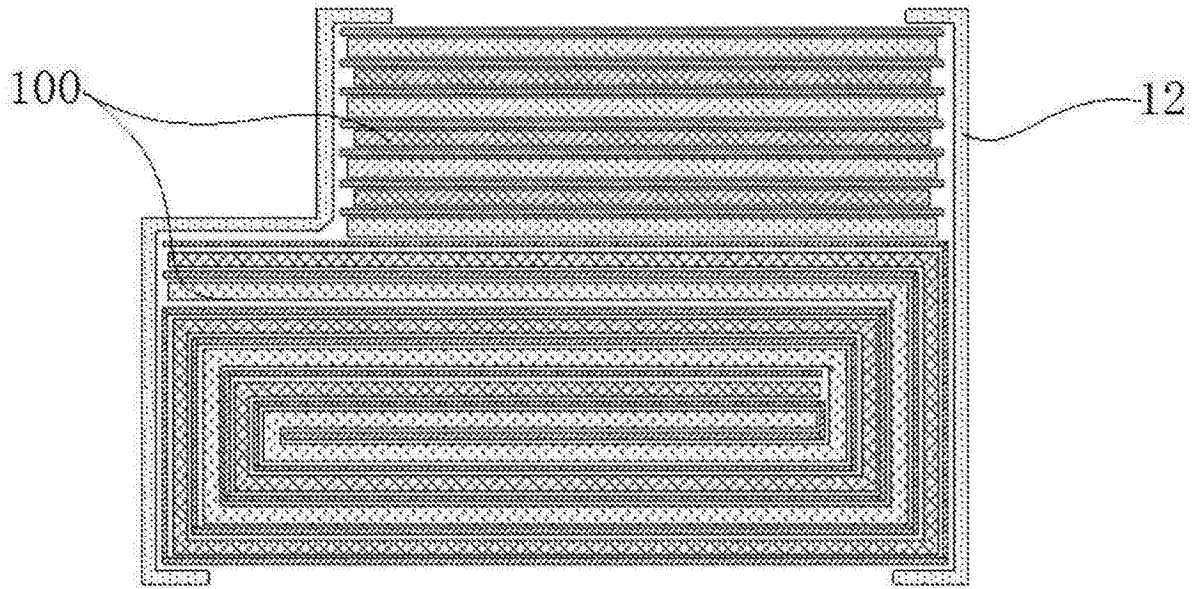


图9

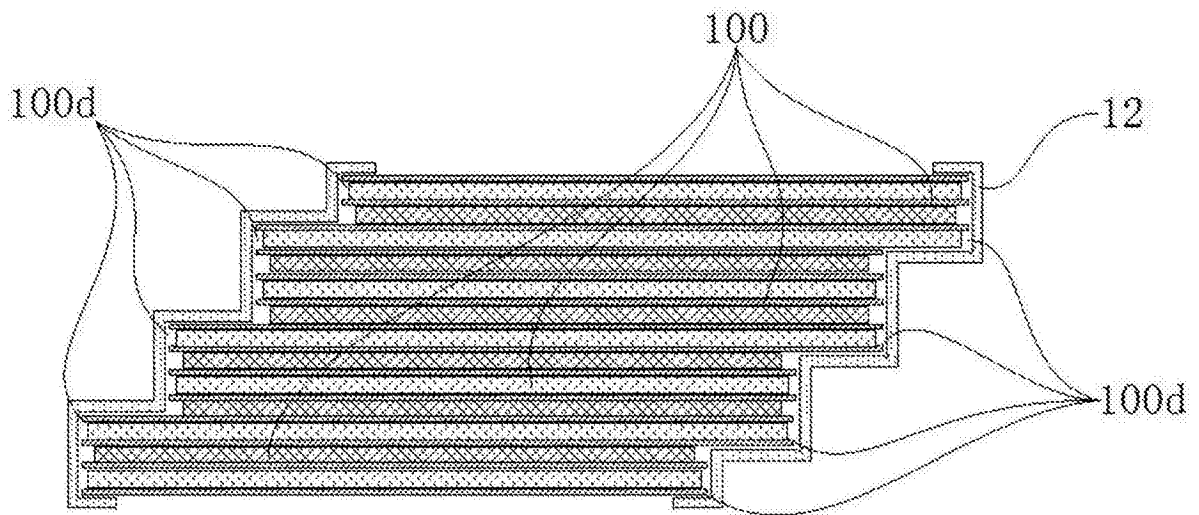


图10