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(12) **Utility Model Patent**

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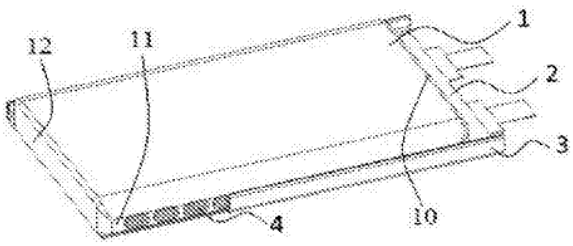
**(54) Title of Utility Model**

Pouch Lithium-ion Battery

**(57) Abstract**

This utility model discloses a pouch lithium-ion battery, which includes a battery main body, side seals, and an adhesive layer. The side seals extend from the battery main body, and the adhesive layer bonds the side seals to the sides of the battery main body. Said adhesive layer is a non-continuous structure formed by the curing of glue. Compared with existing technologies, the pouch lithium-ion battery of this utility model utilizes a non-continuous adhesive layer formed by cured glue to tightly bond the side seals to the battery main body. This adhesive layer provides high bonding stability and has a relatively small thickness, which is more conducive to improving the volumetric energy density of the battery.

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Zhuhai CosMX Battery Co. EX1009
Zhuhai CosMX Battery Co. v. Ningde Amperex Tech. Ltd.

# Claims



1. A pouch lithium-ion battery, comprising a battery main body, side seals, and an adhesive layer, wherein the side seals extend from the battery main body, and the adhesive layer bonds the side seals to the sides of the battery main body, characterized in that said adhesive layer is a non-continuous structure formed by the curing of glue.
2. The pouch lithium-ion battery according to claim 1, characterized in that the non-continuous structure of said adhesive layer is composed of a plurality of glue droplets or glue segments that are separated and independent from each other.
3. The pouch lithium-ion battery according to claim 2, characterized in that the width of said individual glue droplet or glue segment is 0.1–4 mm and the length is not greater than 50 mm, and the interval distance between adjacent glue droplets or glue segments is not greater than 50 mm.
4. The pouch lithium-ion battery according to claim 2, characterized in that the width of said individual glue droplet or glue segment is 0.2–1.5 mm and the length is 0.5–5 mm, and the interval distance between adjacent glue droplets or glue segments is 0.2–5 mm.
5. The pouch lithium-ion battery according to claim 1, characterized in that said battery main body includes a top surface and a bottom surface, the distance between the starting position of the adhesive layer and the top surface of the battery main body is 0–10 mm, and the distance between the ending position of the adhesive layer and the bottom surface of the battery main body is 0–10 mm.
6. The pouch lithium-ion battery according to claim 1, characterized in that said battery main body includes a top surface and a bottom surface, the distance between the starting position of the adhesive layer and the top surface of the battery main body is 0.5–5 mm, and the distance between the ending position of the adhesive layer and the bottom surface of the battery main body is 0.5–5 mm.
7. The pouch lithium-ion battery according to any one of claims 1 to 6, characterized in that said adhesive layer is made of acrylate structural adhesive, polyurethane reactive (PUR) hot melt adhesive, or epoxy resin structural adhesive.
8. The pouch lithium-ion battery according to any one of claims 1 to 6, characterized in that said side seal is a single-layer side seal, or a double-layer folded edge formed by folding a single-layer side seal.
9. The pouch lithium-ion battery according to claim 8, characterized in that the cut edge of said single-layer side seal is covered with adhesive tape.
10. The pouch lithium-ion battery according to claim 8, characterized in that the width of said double-layer folded edge is 1–5 mm.

# Pouch Lithium-ion Battery

## Technical Field

[0001] The present utility model relates to the field of lithium-ion batteries, and more specifically, to a pouch lithium-ion battery.

## Background Technology

[0002] To meet the requirements for high energy density in pouch lithium-ion batteries, the two side seals of the battery are generally folded and bonded to the side of the battery main body to reduce the width occupied by the side seals.

[0003] Existing folding methods involve first wrapping the side seal with adhesive tape, and then using double-sided tape to fix the wrapped fold to the side of the battery main body. However, the folding structure obtained by this method has defects such as a large folding width and a complex process; furthermore, it is prone to the problem of the side seal opening up after storage.

[0004] In view of this, it is necessary to provide a pouch lithium-ion battery capable of solving the aforementioned problems.

## Utility Model Content

[0005] The objective of the present utility model is to provide a pouch lithium-ion battery with a small folding width and stable bonding, so as to improve the volumetric energy density and storage stability of the pouch lithium-ion battery.

[0006] To achieve the above objective, the present utility model provides a pouch lithium-ion battery, which includes a battery main body, a side seal, and a bonding layer; the side seal extends from the battery main body, and the bonding layer bonds the side seal to the side of the battery main body; the bonding layer is a discontinuous structure formed by the curing of glue.

[0007] As an improvement of the pouch lithium-ion battery of the present utility model, the discontinuous structure of the bonding layer is composed of a plurality of glue droplets or glue segments that are separated and independent from each other.

[0008] As an improvement of the pouch lithium-ion battery of the present utility model, the width of the individual glue droplet or glue segment is 0.1–4 mm, and the length is no greater than 50 mm; the interval distance between adjacent glue droplets or glue segments is no greater than 50 mm.

[0009] As an improvement of the pouch lithium-ion battery of the present utility model, the width of the individual glue droplet or glue segment is 0.2–1.5 mm, and the length is 0.5–5 mm; the interval distance between adjacent glue droplets or glue segments is 0.2–5 mm.

[0010] As an improvement of the pouch lithium-ion battery of the present utility model, the battery main body includes a top surface and a bottom surface; the distance between the starting position of the bonding layer and the top surface of the battery main body is 0–10 mm, and the distance between the ending position of the bonding layer and the bottom surface of the battery main body is 0–10 mm.

[0011] As an improvement of the pouch lithium-ion battery of the present utility model, the battery main body includes a top surface and a bottom surface; the distance between the starting position of the bonding layer and the top surface of the battery main body is 0.5–5 mm, and the distance between the ending position of the bonding layer and the bottom surface of the battery main body is 0.5–5 mm.

[0012] As an improvement of the pouch lithium-ion battery of the present utility model, the bonding layer is made of acrylate structural adhesive, polyurethane hot melt adhesive, or epoxy resin structural adhesive, preferably polyurethane hot melt adhesive.

[0013] As an improvement of the pouch lithium-ion battery of the present utility model, the side seal is a single-layer side seal, or a double-layer fold formed by folding a single-layer side seal in half.

[0014] As an improvement of the pouch lithium-ion battery of the present utility model, the cut edge of the single-layer side seal is wrapped with adhesive tape.

[0015] As an improvement of the pouch lithium-ion battery of the present utility model, the width of the double-layer fold is 1–5 mm.

[0016] Compared with the prior art, the pouch lithium-ion battery of the present utility model utilizes a discontinuous bonding layer formed by glue curing to tightly bond the side seal to the battery main body. The bonding stability of this bonding layer is high and its thickness is relatively small, which is more conducive to improving the volumetric energy density of the battery.

[0017] To achieve the above objective, the present utility model also provides a preparation method for a pouch lithium-ion battery, which includes the following steps:

[0018] 1) Trimming the side seal of the pouch lithium-ion battery, and performing insulation treatment or no treatment on the cut edge of the side seal as required; the insulation treatment method for the cut edge involves folding the single-layer side seal in half to form a double-layer fold, or wrapping the edge of the single-layer side seal with adhesive tape;

[0019] 2) Using a glue dispenser to arrange a bonding layer on the side seal or the side edge of the battery main body, folding the side seal up to fit against the side of the battery main body, whereby the bonding layer bonds the side seal and the battery main body together;

[0020] 3) Using a hot-sealing head to press the side seal and performing thermal pressure holding on the side seal to make the bonding layer tightly fit with the side of the battery main body and the side seal, and then using a cold-sealing head to press the side seal for cold pressure holding to allow the bonding layer to cool and cure rapidly, obtaining a stable folding structure.

[0021] As an improvement of the preparation method for the pouch lithium-ion battery of the present utility model, the trimming operation in step 1) involves cutting off the excess parts of the side seals on both sides of the battery; the width of the single-layer side seal retained after trimming is 1–10 mm, preferably 2–5 mm.

[0022] As an improvement of the preparation method for the pouch lithium-ion battery of the present utility model, the width of the double-layer fold formed by folding the single-layer side seal in half in step 1) is 1–5 mm, preferably 1–3.5 mm.

[0023] As an improvement of the preparation method for the pouch lithium-ion battery of the present utility model, the frequency of glue droplets ejected by the glue dispenser is 10–350 Hz, preferably 90–180 Hz, and the diameter of each glue droplet is 0.4–1.5 mm.

[0024] As an improvement of the preparation method for the pouch lithium-ion battery of the present utility model, the method of arranging the bonding layer in step 2) is non-contact spraying; the glue can be sprayed onto the side seal, or onto the side of the battery main body, or onto both the side seal and the side of the battery main body simultaneously.

[0025] As an improvement of the preparation method for the pouch lithium-ion battery of the present utility model, the nozzle diameter of the glue dispenser is 0.05–1.0 mm, preferably 0.1–0.5 mm.

[0026] As an improvement of the preparation method for the pouch lithium-ion battery of the present utility model, the distance between the glue dispenser nozzle and the glue application area is 0.2–10 mm, preferably 0.5–3 mm.

[0027] As an improvement of the preparation method for the pouch lithium-ion battery of the present utility model, when arranging the bonding layer in step 2), the relative movement speed between the glue dispenser nozzle and the battery is 50–400 mm/s, preferably 80–200 mm/s.

[0028] As an improvement of the preparation method for the pouch lithium-ion battery of the present utility model, the thermal pressure holding temperature in step 3) is 70–220°C, preferably 100–180°C; the thermal pressure holding time is 1–15 s, preferably 2–8 s; the thermal pressure holding pressure is 0.1–50 N/mm, preferably 0.5–5 N/mm.

[0029] As an improvement of the preparation method for the pouch lithium-ion battery of the present utility model, the cold pressure holding temperature in step 3) is 5–40°C, preferably 10–25°C; the cold pressure holding time is 1–60 s, preferably 3–15 s; the cold pressure holding pressure is 0.1–50 N/mm, preferably 0.5–5 N/mm.

[0030] Compared with the prior art, the preparation method for the pouch lithium-ion battery of the present utility model adopts a dot-matrix glue dispensing method to apply the adhesive on the battery main body or the side seal, which can effectively avoid the problems of glue lumps and adhesive stringing. In addition, dot-matrix glue dispensing uses stroke control to regulate the amount of glue, and its control precision is significantly superior to the temperature and air pressure control methods used in conventional continuous adhesive coating; furthermore, the non-contact glue application method offers higher reliability.

**Description of Drawings**

[0031] The following detailed description of the pouch lithium-ion battery of the present utility model and its beneficial effects is provided in conjunction with the accompanying drawings and specific embodiments.

[0032] Fig. 1 is a schematic structural diagram of a first embodiment of the pouch lithium-ion battery of the present utility model.

[0033] Fig. 2 is a partial perspective sectional view of the first embodiment of the pouch lithium-ion battery of the present utility model.

[0034] Fig. 3 to Fig. 8 are schematic diagrams of the manufacturing process of the first embodiment of the pouch lithium-ion battery of the present utility model.

[0035] Fig. 9 is a partial perspective sectional view of a second embodiment of the pouch lithium-ion battery of the present utility model.

[0036] Fig. 10 is a schematic diagram of the glue arrangement of a third embodiment of the pouch lithium-ion battery of the present utility model.

[0037] Fig. 11 is a schematic diagram of the glue arrangement of a fourth embodiment of the pouch lithium-ion battery of the present utility model.

[0038] Fig. 12 to Fig. 14 are schematic diagrams of the manufacturing process of a comparative pouch lithium-ion battery.

**Detailed Description of Embodiments**

[0039] To make the objectives, technical solutions, and beneficial effects of the present utility model clearer, the present utility model is further described in detail below in conjunction with the accompanying drawings and specific embodiments. It should be understood that the specific embodiments described in this specification are merely intended to explain the present utility model and are not intended to limit it.

[0040] Please refer to Fig. 1 and Fig. 2. A first embodiment of the pouch lithium-ion battery of the present utility model includes a battery main body 1, a top seal 2, a side seal 3, and a bonding layer 4. Therein, the top seal 2 and the side seal 3 both extend from the battery main body 1, and are respectively folded and fitted to the top surface 10 (shown in Figs. 1–2 in a state before folding) and the side surface 11 of the battery main body 1. The side seal 3 is a double-layer fold formed by folding a single-layer side seal in half, and the bonding layer 4 is located between the battery main body 1 and the side seal 3 to tightly bond the two together.

[0041] The bonding layer 4 is a discontinuous structure formed by a plurality of point-like glue droplets that are independent and separated from each other; the width of each glue droplet is 2 mm, and the length is 2.5 mm. The distance between the starting position of the bonding layer 4 (i.e., the front edge of the foremost glue droplet) and the top surface 10 of the battery main body 1 is 2 mm, and the distance between the ending position (i.e., the rear edge of the hindmost glue droplet) and the bottom surface 12 of the battery main body 1 is 3 mm.

[0042] Please refer to Fig. 3 to Fig. 8. The manufacturing process of the first embodiment of the pouch lithium-ion battery of the present utility model is as follows:

[0043] 1) As shown in Fig. 3, a cutter 5 is used to cut off the excess part of the battery side seal 3; the width of the side seal 3 retained after trimming is 4.5 mm;

[0044] 2) As shown in Fig. 4, a folding component 6 is used to fold the battery side seal 3 in half, so that the edge of the side seal 3 where metal is exposed (i.e., the cut edge of the cutter 5) is folded inward, forming a side seal 3 with a double-layer folding structure;

[0045] 3) As shown in Fig. 5 and Fig. 6, an external glue dispenser 7 is used to arrange a bonding layer 4 on the side seal 3; the vertical distance between the nozzle of the glue dispenser 7 and the side seal 3 is 0.6 mm, and the relative movement speed is 120 mm/s. The battery after the completion of glue dispensing is shown in Fig. 6;

[0046] 4) As shown in Fig. 7, the side seal 3 is folded up and fitted to the side surface 11 of the battery main body 1, such that the glue droplets of the bonding layer 4 all come into contact with the side surface 11 of the battery main body 1; subsequently, a hot-sealing head 8 is used to perform thermal pressure holding on the side seal 3, with a thermal pressure holding temperature of 130°C, a pressure holding time of 6 s, and a pressure of 1.5 N/mm. The hot-sealing head 8 is heated and kept warm via a heating resistance wire 81 provided inside it;

[0047] 5) As shown in Fig. 8, a cold-sealing head 9 is used to perform cold pressure holding on the side seal 3, with a cold pressure holding temperature of 20°C, a pressure holding time of 6 s, and a pressure of 1.5 N/mm. The cold-sealing head 9 dissipates heat via a cooling pipe 91 provided inside it.

[0048] Please refer to Fig. 9. A second embodiment of the pouch lithium-ion battery of the present utility model includes a battery main body 1, a top seal 2, and a bonding layer 4 with the same structures as those in the first embodiment. The difference from the first embodiment is that the side seal 3 of this embodiment is a single-layer structure that is not folded; therefore, its edge with exposed metal is wrapped with adhesive tape 5. Since the specific structures of other parts and the battery manufacturing process—except for step 2)—are the same as those in the first embodiment, they are not repeated here.

[0049] Please refer to Fig. 10. The structure of a third embodiment of the pouch lithium-ion battery of the present utility model is exactly the same as that of the first embodiment, except that in step 3) of the manufacturing process, the bonding layer 4 is arranged on the side surface 11 of the battery main body 1 instead

of on the side seal 3. Since the other steps of the battery manufacturing process are the same as those in the second embodiment, they are not repeated here.

[0050] Please refer to Fig. 11. A fourth embodiment of the pouch lithium-ion battery of the present utility model includes a battery main body 1, a top seal 2, and a side seal 3 with the same structures as those in the first embodiment. The difference from the first embodiment is that the bonding layer 4 of this embodiment is formed by three independent glue segments, each 10 mm long; the three glue segments are respectively arranged at the head, middle, and tail parts of the battery side seal 3. Since the specific structures of other parts of the battery and the battery manufacturing process—except for step 3)—are the same as those in the first embodiment, they are not repeated here.

[0051] It should be noted that in other different embodiments, one or more of the following changes can be made according to the actual situation: 1) The width of the glue droplets or glue segments of the bonding layer 4 can be any value within 0.1–4 mm, preferably 0.2–1.5 mm; the length of the glue droplets or glue segments can be any value within a range no greater than 50 mm, preferably 0.5–5 mm; when the glue droplets or glue segments are arranged in a completely discrete manner, the interval distance between adjacent glue droplets or glue segments is no greater than 50 mm, preferably 0.2–5 mm; 2) The distance between the starting position of the bonding layer 4 and the top surface 10 of the battery main body 1 is 0–10 mm, preferably 0.5–5 mm; the distance between the ending position of the bonding layer 4 and the bottom surface 12 of the battery main body 1 is 0–10 mm, preferably 0.5–5 mm; 3) The bonding layer 4 can be made of acrylate structural adhesive, polyurethane hot melt adhesive, or epoxy resin structural adhesive, preferably polyurethane hot melt adhesive.

[0052] To verify the beneficial effects of the pouch lithium-ion battery of the present utility model, please refer to Fig. 12 to Fig. 14. A comparative battery was prepared according to existing folding methods, with the steps as follows:

[0053] 1) Preparing a side composite adhesive: As shown in Fig. 12, the side composite adhesive 80 used in the existing folding method is composed of adhesive tape 82 and double-sided tape 84 bonded to one side of the adhesive tape;

[0054] 2) Sticking the adhesive tape 82 of the side composite adhesive 80 onto the battery side seal 3;

[0055] 3) As shown in Fig. 13, wrapping the battery side seal 3 with the adhesive tape 82 of the side composite adhesive 80, completely covering the exposed metal layer of the side seal 3;

[0056] 4) As shown in Fig. 14, folding the battery side seal 3 with the side composite adhesive 80 toward the side surface 11 of the battery main body 1, and bonding the side seal 3 to the battery main body 1 via the double-sided tape 84.

[0057] Seventy-five pouch lithium-ion batteries each from the above first embodiment and the comparative example were taken for high-temperature and high-humidity storage tests. The mean width before and after storage and the mean change in width of the batteries were measured to confirm the stability of the folds. The test data are shown in Table 1. From the test results, it can be clearly seen that both the mean initial width and the mean width change after storage of the pouch lithium-ion battery of the present utility model are smaller than the corresponding values for the battery prepared by the existing folding method.

[0058] Table 1. Storage test results of batteries under high temperature and high humidity at 70°C and 90% RH

[0059]

| Battery | Storage time | Width Before Storage | Width After Storage | Difference |
|---|---|---|---|---|
| First Embodiment | 7 days | 47.885 mm | 47.94 2mm | 0.057 mm |
| Comparative Battery | 7 days | 47.990 mm | 48.128 mm | 0.138 mm |
| First Embodiment | 60 days | 47.904 mm | 47.969 mm | 0.065 mm |
| Comparative Battery | 60 days | 48.000 mm | 48.191 mm | 0.191 mm |

[0060] Compared with the prior art, the pouch lithium-ion battery of the present utility model utilizes a discontinuous bonding layer 4 formed by the curing of glue to tightly bond the side seal 3 to the battery main body 1. The bonding stability of this bonding layer 4 is very high, and the thickness is relatively small, which is more conducive to improving the volumetric energy density of the battery.

[0061] Based on the disclosure and teachings of the above specification, those skilled in the art to which this utility model belongs may also make appropriate changes and modifications to the aforementioned embodiments. Therefore, the present utility model is not limited to the specific embodiments disclosed and described above, and some modifications and changes to the present utility model should also fall within the scope of protection of the claims of the present utility model. Furthermore, although some specific terms are used in this specification, these terms are only for the convenience of description and do not constitute any limitation on the present utility model.

# Description of Drawings



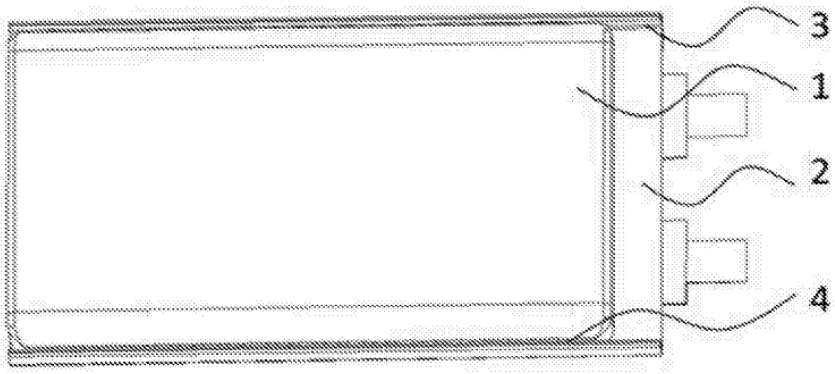


Fig. 1

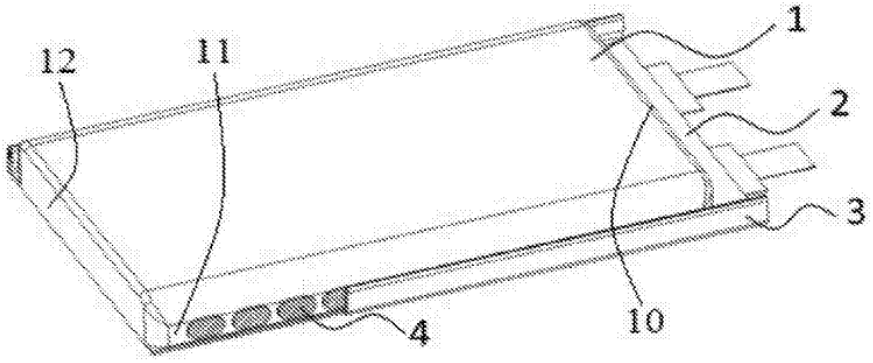


Fig. 2

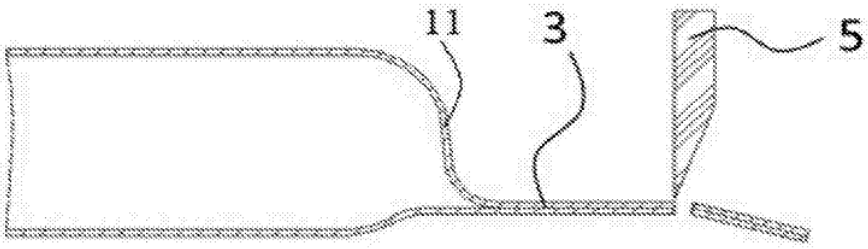


Fig. 3

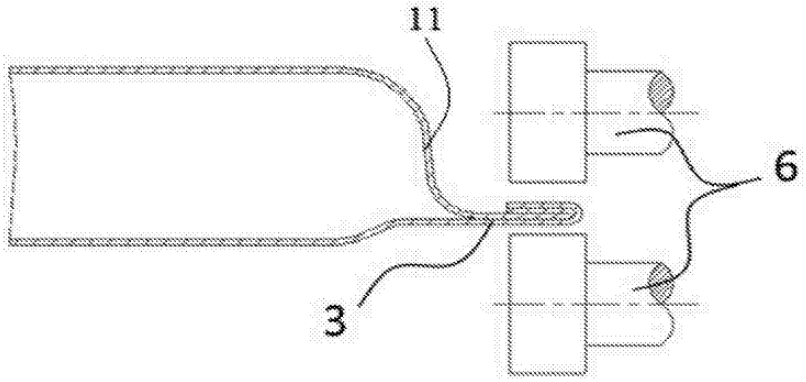


Fig. 4

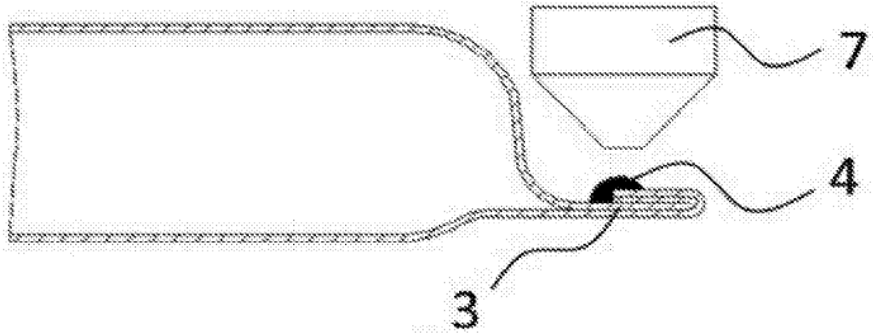


Fig. 5

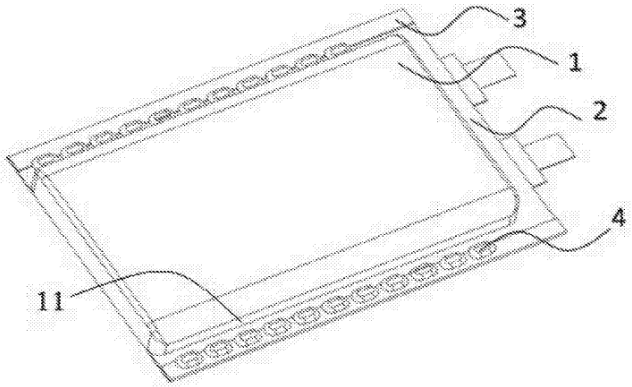


Fig. 6

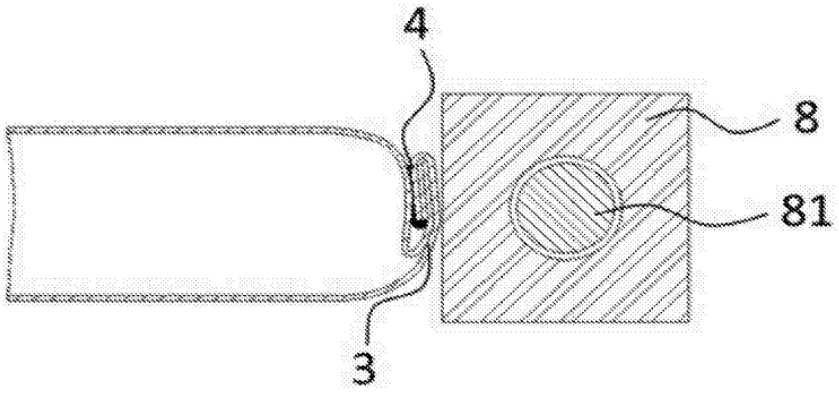


Fig. 7

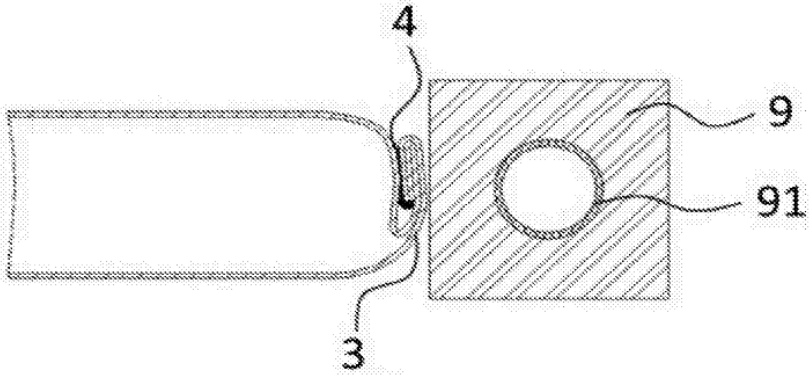


Fig. 8

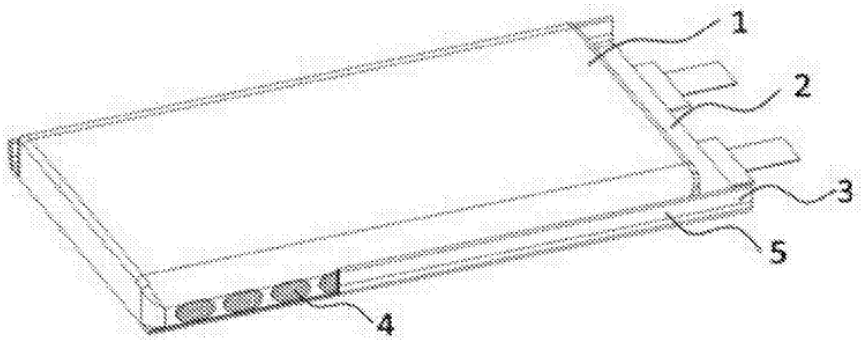


Fig. 9

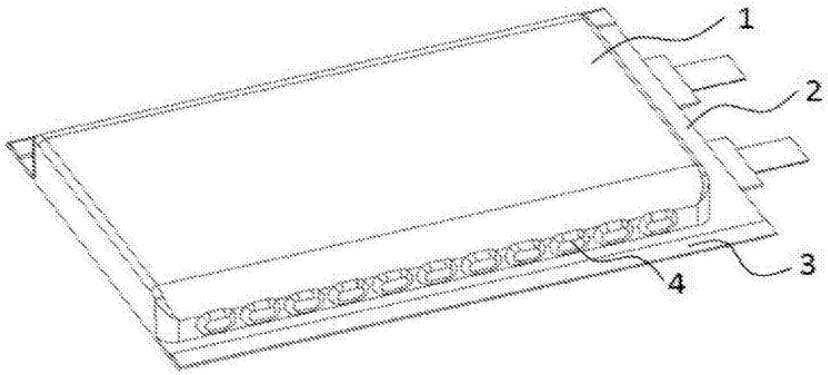


Fig. 10

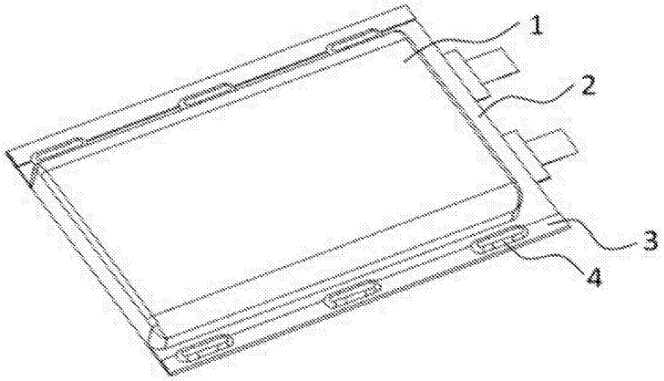


Fig. 11

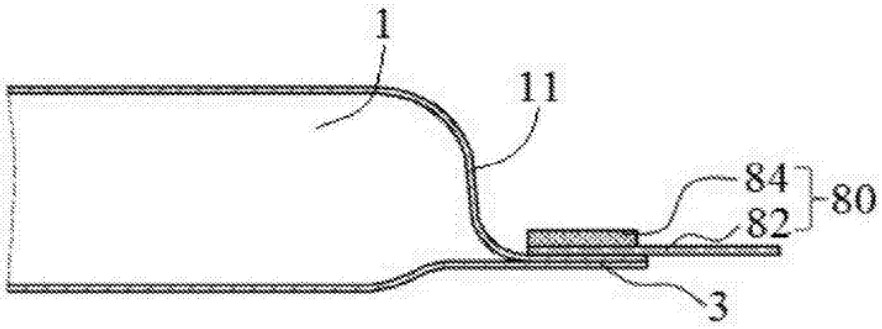


Fig. 12

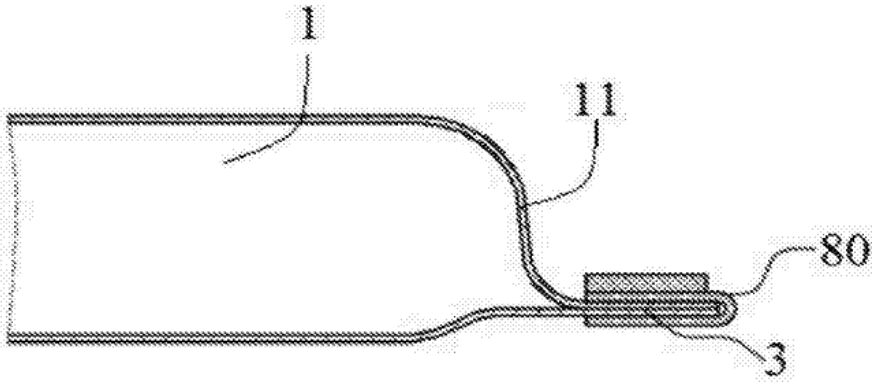


Fig. 13

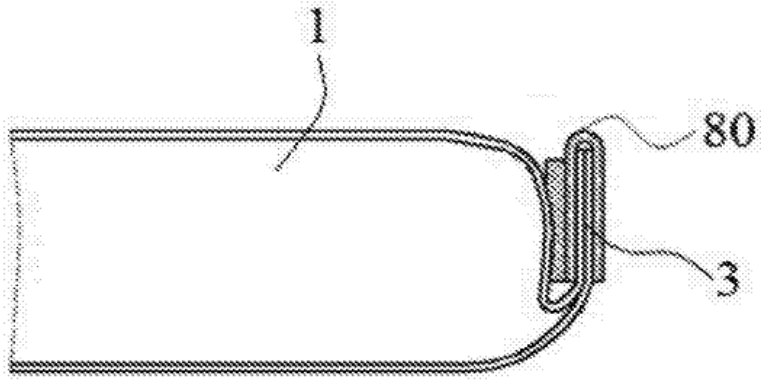


Fig. 14

(19)中华人民共和国国家知识产权局

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*H01M 10/0525*(2010.01)
*H01M 10/058*(2010.01)

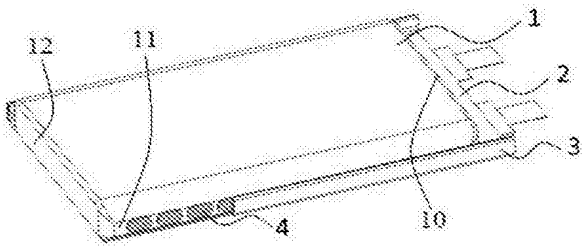
权利要求书1页 说明书5页 附图5页

(54)实用新型名称

软包装锂离子电池

(57)摘要

本实用新型公开了一种软包装锂离子电池，其包括电池主体、侧封边和粘接层；侧封边自电池主体伸出，粘接层将侧封边粘接在电池主体的侧面；所述粘接层为胶水固化形成的非连续性结构。与现有技术相比，本实用新型软包装锂离子电池利用胶水固化形成的非连续性粘接层将侧封边与电池主体紧密粘接起来，这种粘接层的粘接稳固性很高，而且厚度也比较小，更有利于提高电池的体积能量密度。

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1. 一种软包装锂离子电池，其包括电池主体、侧封边和粘接层；侧封边自电池主体伸出，粘接层将侧封边粘接在电池主体的侧面；其特征在于：所述粘接层为胶水固化形成的非连续性结构。

2. 根据权利要求 1 所述的软包装锂离子电池，其特征在于：所述粘接层的非连续性结构由多个彼此分隔独立的胶滴或胶段组成。

3. 根据权利要求 2 所述的软包装锂离子电池，其特征在于：所述单个的胶滴或胶段的宽度为 0.1 ～ 4mm，长度不大于 50mm；相邻胶滴或胶段之间的间隔距离不大于 50mm。

4. 根据权利要求 2 所述的软包装锂离子电池，其特征在于：所述单个的胶滴或胶段的宽度为 0.2 ～ 1.5mm，长度为 0.5 ～ 5mm；相邻胶滴或胶段之间的间隔距离为 0.2 ～ 5mm。

5. 根据权利要求 1 所述的软包装锂离子电池，其特征在于：所述电池主体包括顶面和底面，粘接层的起始位置与电池主体的顶面之间的距离为 0 ～ 10mm，粘接层的终止位置与电池主体的底面之间的距离为 0 ～ 10mm。

6. 根据权利要求 1 所述的软包装锂离子电池，其特征在于：所述电池主体包括顶面和底面，粘接层的起始位置与电池主体的顶面之间的距离为 0.5 ～ 5mm，粘接层的终止位置与电池主体的底面之间的距离为 0.5 ～ 5mm。

7. 根据权利要求 1 至 6 中任一项所述的软包装锂离子电池，其特征在于：所述粘接层以丙烯酸酯结构胶、聚氨酯热熔胶或环氧树脂结构胶制成。

8. 根据权利要求 1 至 6 中任一项所述的软包装锂离子电池，其特征在于：所述侧封边为单层侧封边，或是由单层侧封边对折而形成的双层折边。

9. 根据权利要求 8 所述的软包装锂离子电池，其特征在于：所述单层侧封边的切割边沿用胶纸包覆。

10. 根据权利要求 8 所述的软包装锂离子电池，其特征在于：所述双层折边的宽度为 1 ～ 5mm。

# 软包装锂离子电池

## 技术领域

[0001] 本实用新型属于锂离子电池领域，更具体地说，本实用新型涉及一种软包装锂离子电池。

## 背景技术

[0002] 为了满足软包装锂离子电池对高能量密度的要求，电池的两个侧封边一般是弯折后与电池主体侧面粘接贴合，以减小两侧封边所占的宽度尺寸。

[0003] 现有的折边方法是先用胶纸将侧封边包覆住，然后用双面胶将包好的折边固定到电池主体侧面。但是，这种方法处理得到的折边结构存在折边宽度大、工艺复杂等缺陷，而且很容易出现存储后侧封边张开的问题。

[0004] 有鉴于此，有必要提供一种能够解决上述问题的软包装锂离子电池。

## 实用新型内容

[0005] 本实用新型的目的在于：提供一种折边宽度小且粘接稳固的软包装锂离子电池，以提高软包装锂离子电池的体积能量密度和存储稳定性。

[0006] 为了实现上述目的，本实用新型提供了一种软包装锂离子电池，其包括电池主体、侧封边和粘接层；侧封边自电池主体伸出，粘接层将侧封边粘接在电池主体的侧面；所述粘接层为胶水固化形成的非连续性结构。

[0007] 作为本实用新型软包装锂离子电池的一种改进，所述粘接层的非连续性结构由多个彼此分隔独立的胶滴或胶段组成。

[0008] 作为本实用新型软包装锂离子电池的一种改进，所述单个的胶滴或胶段的宽度为0.1～4mm，长度不大于50mm；相邻胶滴或胶段之间的间隔距离不大于50mm。

[0009] 作为本实用新型软包装锂离子电池的一种改进，所述单个的胶滴或胶段的宽度为0.2～1.5mm，长度为0.5～5mm；相邻胶滴或胶段之间的间隔距离为0.2～5mm。

[0010] 作为本实用新型软包装锂离子电池的一种改进，所述电池主体包括顶面和底面，粘接层的起始位置与电池主体的顶面之间的距离为0～10mm，粘接层的终止位置与电池主体的底面之间的距离为0～10mm。

[0011] 作为本实用新型软包装锂离子电池的一种改进，所述电池主体包括顶面和底面，粘接层的起始位置与电池主体的顶面之间的距离为0.5～5mm，粘接层的终止位置与电池主体的底面之间的距离为0.5～5mm。

[0012] 作为本实用新型软包装锂离子电池的一种改进，所述粘接层以丙烯酸酯结构胶、聚氨酯热熔胶或环氧树脂结构胶制成，优选为聚氨酯热熔胶。

[0013] 作为本实用新型软包装锂离子电池的一种改进，所述侧封边为单层侧封边，或是由单层侧封边对折而形成的双层折边。

[0014] 作为本实用新型软包装锂离子电池的一种改进，所述单层侧封边的切割边沿用胶纸包覆。

[0015] 作为本实用新型软包装锂离子电池的一种改进，所述双层折边的宽度为 1 ～ 5mm。

[0016] 与现有技术相比，本实用新型软包装锂离子电池利用胶水固化形成的非连续性粘接层将侧封边与电池主体紧密粘接起来，这种粘接层的粘接稳固性很高，而且厚度也比较小，更有利于提高电池的体积能量密度。

[0017] 为了实现上述目的，本实用新型还提供了一种软包装锂离子电池制备方法，其包括以下步骤：

[0018] 1）将软包装锂离子电池的侧封边进行切边，并根据需要对侧封边的切割边缘进行绝缘处理或者不处理；切割边缘的绝缘处理方法是将单层侧封边对折形成双层折边，或是用胶纸将单层侧封边的边沿包覆起来；

[0019] 2）使用滴胶机在侧封边或是电池主体的侧边上布置粘接层，将侧封边折起而贴合在电池主体的侧面，粘接层将侧封边与电池主体粘连在一起；

[0020] 3）利用热封头压紧侧封边而对侧封边进行热保压，使粘接层与电池主体的侧面及侧封边紧密贴合，再用冷封头压紧侧封边对其进行冷保压，使粘接层迅速降温固化，得到稳固的折边结构。

[0021] 作为本实用新型软包装锂离子电池制备方法的一种改进，所述步骤 1）的切边操作是将电池两侧的侧封边多余部分切除，切边后保留的单层侧封边宽度为 1 ～ 10mm，优选为 2 ～ 5mm。

[0022] 作为本实用新型软包装锂离子电池制备方法的一种改进，所述步骤 1）将单层侧封边对折形成的双层折边的宽度为 1 ～ 5mm，优选为 1 ～ 3.5mm。

[0023] 作为本实用新型软包装锂离子电池制备方法的一种改进，所述滴胶机喷出胶滴的频率为 10 ～ 350Hz，优选为 90 ～ 180Hz，每个胶滴的直径为 0.4 ～ 1.5mm。

[0024] 作为本实用新型软包装锂离子电池制备方法的一种改进，所述步骤 2）中布置粘接层的方式为非接触式喷涂，胶水可以喷涂到侧封边上，也可以喷涂到电池主体的侧面，或者同时喷涂到侧封边和电池主体的侧面上。

[0025] 作为本实用新型软包装锂离子电池制备方法的一种改进，所述滴胶机的出胶口孔径为 0.05 ～ 1.0mm，优选为 0.1 ～ 0.5mm。

[0026] 作为本实用新型软包装锂离子电池制备方法的一种改进，所述滴胶机的出胶口与布置胶水区域的距离为 0.2 ～ 10mm，优选为 0.5 ～ 3mm。

[0027] 作为本实用新型软包装锂离子电池制备方法的一种改进，所述步骤 2）布置粘接层时，滴胶机的出胶口与电池的相对移动速度为 50 ～ 400mm/s，优选为 80 ～ 200mm/s。

[0028] 作为本实用新型软包装锂离子电池制备方法的一种改进，所述步骤 3）中的热保压温度为 70 ～ 220℃，优选为 100 ～ 180℃；热保压时间为 1 ～ 15S，优选为 2 ～ 8s；热保压压力为 0.1 ～ 50N/mm，优选为 0.5 ～ 5N/mm。

[0029] 作为本实用新型软包装锂离子电池制备方法的一种改进，所述步骤 3）中的冷保压温度为 5 ～ 40℃，优选为 10 ～ 25℃；冷保压时间为 1 ～ 60S，优选为 3 ～ 15s；冷保压压力为 0.1 ～ 50N/mm，优选为 0.5 ～ 5N/mm。

[0030] 与现有技术相比，本实用新型软包装锂离子电池制备方法采用点阵滴胶的方式在电池主体或侧封边上涂覆粘接剂，能够有效地避免胶团和粘接剂拉丝问题。此外，点阵滴胶采用行程控制滴胶量，其控制精度也会显著优于常规连续涂覆粘接剂所采用的温度和气压

控制涂胶量的方式；而且非接触布胶方式的可靠性更高。

## 附图说明

[0031] 下面结合附图和具体实施方式，对本实用新型软包装锂离子电池及其有益效果进行详细说明。

[0032] 图 1 为本实用新型软包装锂离子电池第一实施方式的结构示意图。

[0033] 图 2 为本实用新型软包装锂离子电池第一实施方式的轴侧局部剖视图。

[0034] 图 3 至图 8 为本实用新型软包装锂离子电池第一实施方式的制作过程示意图。

[0035] 图 9 为本实用新型软包装锂离子电池第二实施方式的轴侧局部剖视图。

[0036] 图 10 为本实用新型软包装锂离子电池第三实施方式的胶水布置示意图。

[0037] 图 11 为本实用新型软包装锂离子电池第四实施方式的胶水布置示意图。

[0038] 图 12 至图 14 为对比例软包装锂离子电池的制作过程示意图。

## 具体实施方式

[0039] 为了使本实用新型的发明目的、技术方案及其有益技术效果更加清晰，以下结合附图和具体实施方式，对本实用新型进行进一步详细说明。应当理解的是，本说明书中描述的具体实施方式仅仅是为了解释本实用新型，并非为了限定本实用新型。

[0040] 请参阅图 1 和图 2，本实用新型软包装锂离子电池第一实施方式包括电池主体 1、顶封边 2、侧封边 3 和粘接层 4。其中，顶封边 2 和侧封边 3 均自电池主体 1 伸出，并分别弯折后贴合在电池主体 1 的顶面 10（图 1 ～ 2 中所示为顶封边 2 弯折前的状态）和侧面 11。侧封边 3 是由单层侧封边对折后形成的双层折边，粘接层 4 位于电池主体 1 和侧封边 3 之间而将两者紧密粘接在一起。

[0041] 粘接层 4 为非连续性结构，由彼此分隔独立的多个点状胶滴形成；每一胶滴的宽度为 2mm，长度为 2.5mm。粘接层 4 的起始位置（即最前端胶滴的前边缘）与电池主体 1 的顶面 10 之间的距离为 2mm，终止位置（即最后端胶滴的后边缘）与电池主体 1 的底面 12 之间的距离为 3mm。

[0042] 请参阅图 3 至图 8，本实用新型软包装锂离子电池第一实施方式的制作过程为：

[0043] 1) 如图 3 所示，利用切刀 5 将电池侧封边 3 的多余部分切除，切边后保留的侧封边 3 宽度为 4.5mm；

[0044] 2) 如图 4 所示，利用折边部件 6 将电池侧封边 3 进行对折处理，使侧封边 3 裸露金属的边沿（即切刀 5 的切割边沿）弯折到内部，形成双层折边结构的侧封边 3；

[0045] 3) 如图 5 和图 6 所示，使用外置滴胶机 7 在侧封边 3 上布置粘接层 4，滴胶机 7 的滴胶口与侧封边 3 的垂直距离为 0.6mm，相对移动速度为 120mm/s，滴胶完成后的电池如图 6 所示；

[0046] 4) 如图 7 所示，将侧封边 3 弯折抬起并贴合在电池主体 1 的侧面 11，粘接层 4 的胶滴均与电池主体 1 的侧面 11 接触；之后利用热封头 8 对侧封边 3 进行热保压，热保压温度为 130℃，保压时间为 6s，压力为 1.5N/mm；热封头 8 通过设于其内部的加热电阻丝 81 进行加热和保温；

[0047] 5) 如图 8 所示，利用冷封头 9 对侧封边 3 进行冷保压，冷保压温度为 20℃，保压时

间为6s，压力为1.5N/mm；冷封头9通过设于其内部的冷却管道91进行散热。

[0048] 请参阅图9，本实用新型软包装锂离子电池第二实施方式包括与第一实施方式结构相同的电池主体1、顶封边2和粘接层4，与第一实施方式不同的是，本实施方式的侧封边3为未对折的单层结构，因此其裸露金属的边沿用胶纸5包覆起来。由于其他部分的具体结构及除步骤2）外的电池制作过程均与第一实施方式相同，此处不再赘述。

[0049] 请参阅图10，本实用新型软包装锂离子电池第三实施方式的结构与第一实施方式完全相同，只是制作过程的步骤3）中，是将粘接层4布置在电池主体1的侧面11上，而不是布置在侧封边3上。由于电池制作过程的其他步骤均与第二实施方式相同，此处不再赘述。

[0050] 请参阅图11，本实用新型软包装锂离子电池第四实施方式包括与第一实施方式结构相同的电池主体1、顶封边2和侧封边3，与第一实施方式不同的是，本实施方式的粘接层4由彼此分隔独立的三条胶段形成，每条胶段长10mm，三条胶段分别布置在电池侧封边3的头、中、尾三个部位。由于电池其他部分的具体结构及除步骤3）外的电池制作过程均与第一实施方式相同，此处不再赘述。

[0051] 需要说明的是，在其他不同的实施方式中，可以根据实际情况进行以下一种或多种变更：1）粘接层4的胶滴或胶段的宽度可在0.1～4mm中任意取值，优选为0.2～1.5mm；胶滴或胶段的长度可在不大于50mm的范围内任意取值，优选为0.5～5mm；按完全离散的方式布置胶滴或胶段时，相邻胶滴或胶段之间的间隔距离不大于50mm，优选为0.2～5mm；2）粘接层4的起始位置与电池主体1的顶面10之间的距离为0～10mm，优选为0.5～5mm；粘接层4的终止位置与电池主体1的底面12之间的距离为0～10mm，优选为0.5～5mm；3）粘接层4可以由丙烯酸酯结构胶、聚氨酯热熔胶或环氧树脂结构胶制成，优选为聚氨酯热熔胶。

[0052] 为了验证本实用新型软包装锂离子电池的有益效果，请参阅图12至图14，按照现有折边方法制备对比例电池，步骤如下：

[0053] 1）准备侧边组合胶：如图12所示，现有折边方法中使用的侧边组合胶80由胶纸82和粘接在其胶纸一面的双面胶84组合而成；

[0054] 2）将侧边组合胶80的胶纸82粘贴在电池侧封边3上；

[0055] 3）如图13所示，用侧边组合胶80的胶纸82包覆电池侧封边3，并完全遮盖住侧封边3的裸露金属层；

[0056] 4）如图14所示，将粘接了侧边组合胶80的电池侧封边3向电池主体1的侧面11弯折，并通过双面胶84将侧封边3粘接到电池主体1。

[0057] 将上述第一实施方式和对比例所制备的软包装锂离子电池各取75个进行高温高湿存储测试，测量电池的存储前后的宽度均值以及宽度变化均值，以确认折边的稳固性，测试数据如表1所示。从测试结果可以明显看出，本实用新型软包装锂离子电池的初始宽度均值和存储后的宽度变化均值，都小于现有折边方法所制备电池的对应数值。

[0058] 表1、电池在70℃、90％ RH高温高湿下的存储测试结果

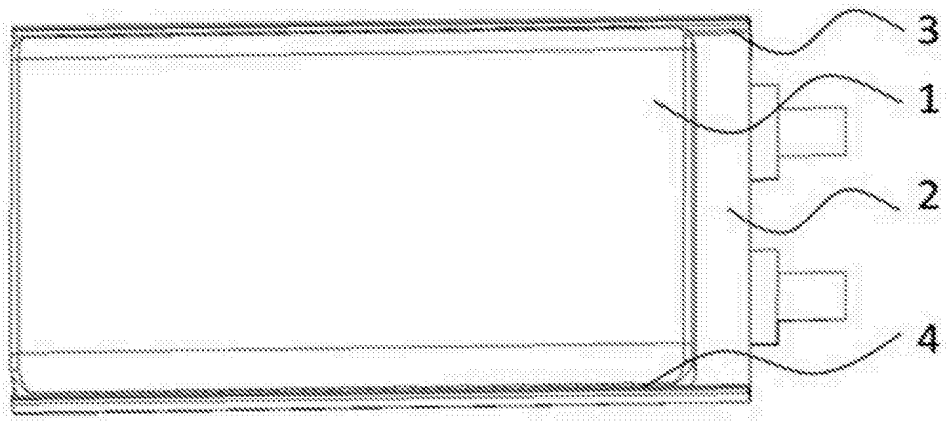
[0059]

| 电池 | 存储时间 | 存储前宽度 | 存储后宽度 | 差值 |
|---|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| 第一实施方式 | 7 天 | 47.885mm | 47.942mm | 0.057mm |
| 对比例 | 7 天 | 47.990mm | 48.128mm | 0.138mm |
| 第一实施方式 | 60 天 | 47.904mm | 47.969mm | 0.065mm |
| 对比例 | 60 天 | 48.000mm | 48.191mm | 0.191mm |

[0060] 与现有技术相比，本实用新型软包装锂离子电池利用胶水固化形成的非连续性粘接层 4 将侧封边 3 与电池主体 1 紧密粘接起来，这种粘接层 4 的粘接稳固性很高，而且厚度也比较小，更有利于提高电池的体积能量密度。

[0061] 根据上述说明书的揭示和教导，本实用新型所属领域的技术人员还可以对上述实施方式进行适当的变更和修改。因此，本实用新型并不局限于上面揭示和描述的具体实施方式，对本实用新型的一些修改和变更也应当落入本实用新型的权利要求的保护范围内。此外，尽管本说明书中使用了一些特定的术语，但这些术语只是为了方便说明，并不对本实用新型构成任何限制。

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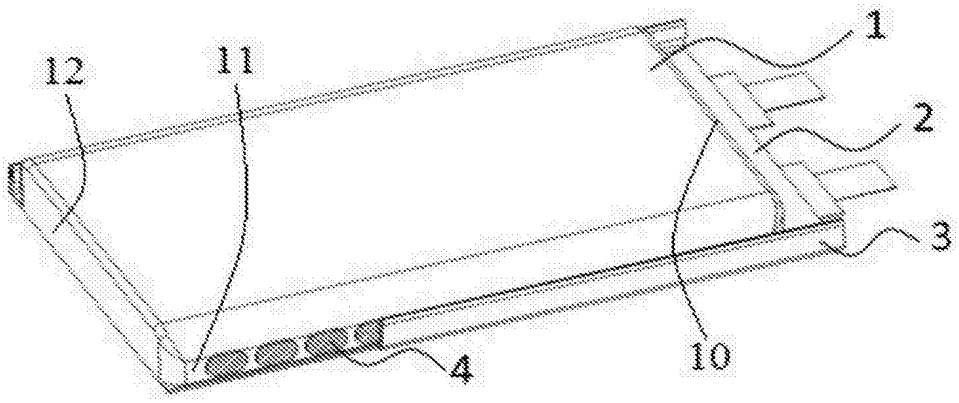


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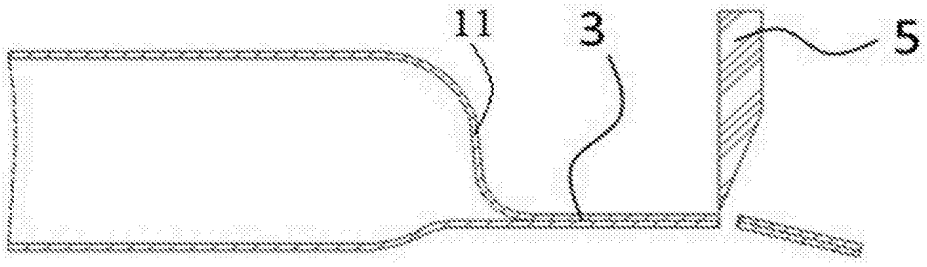


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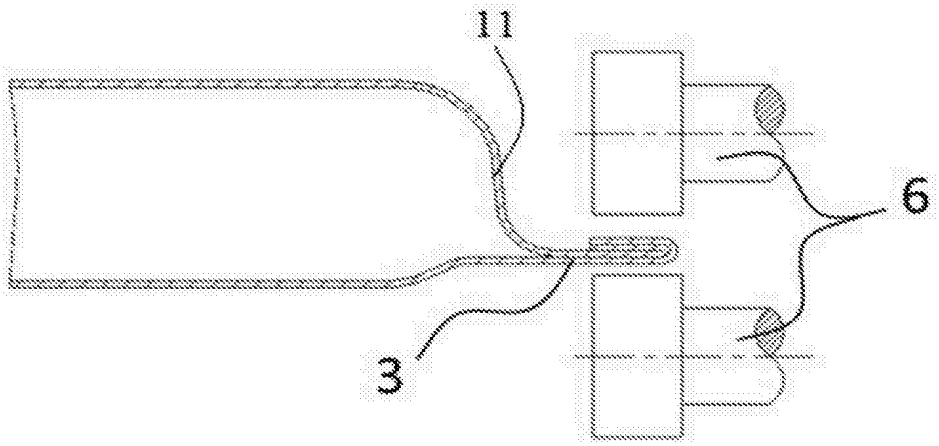


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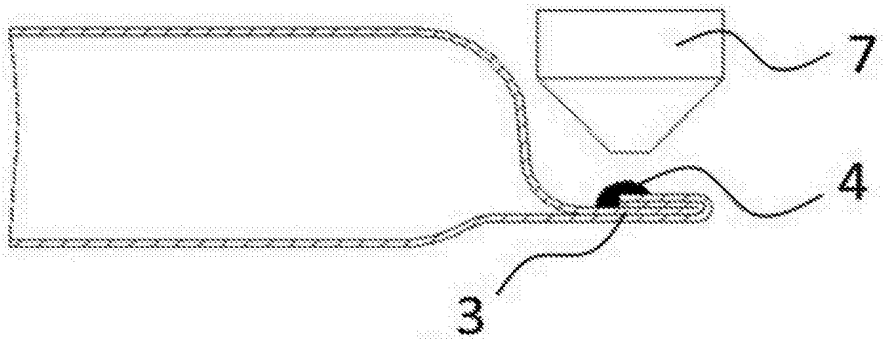


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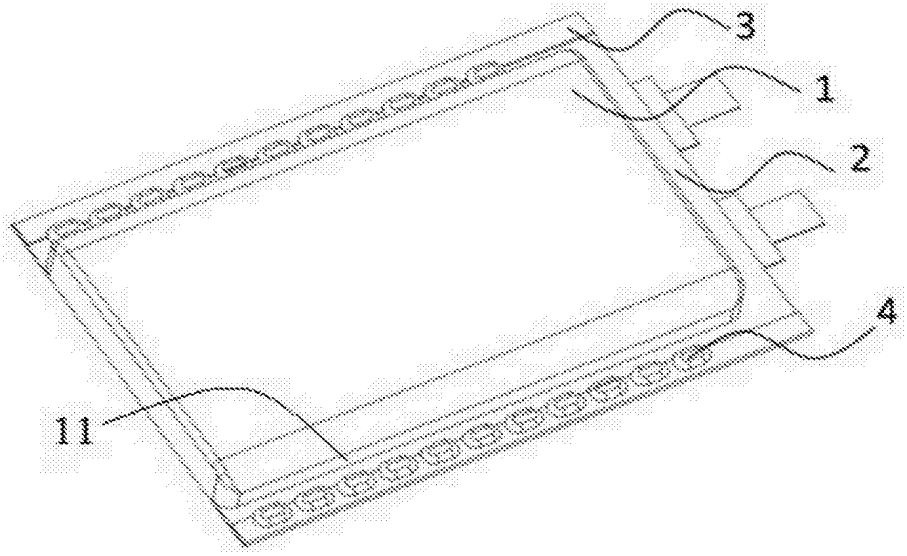


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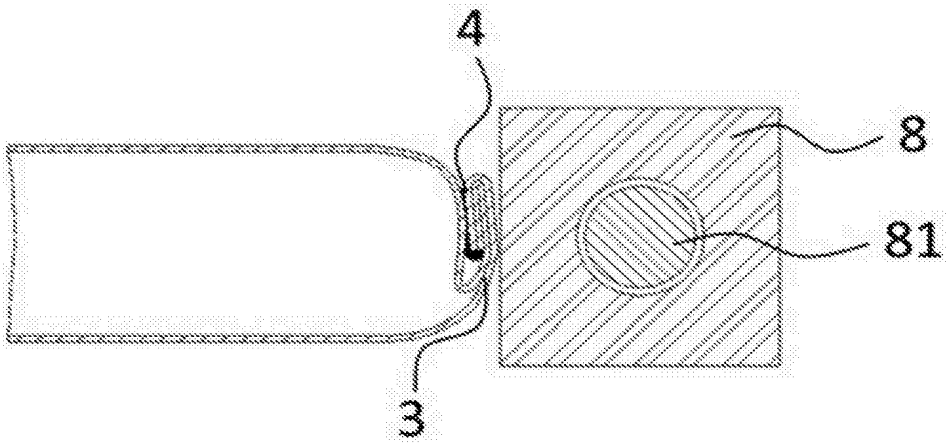


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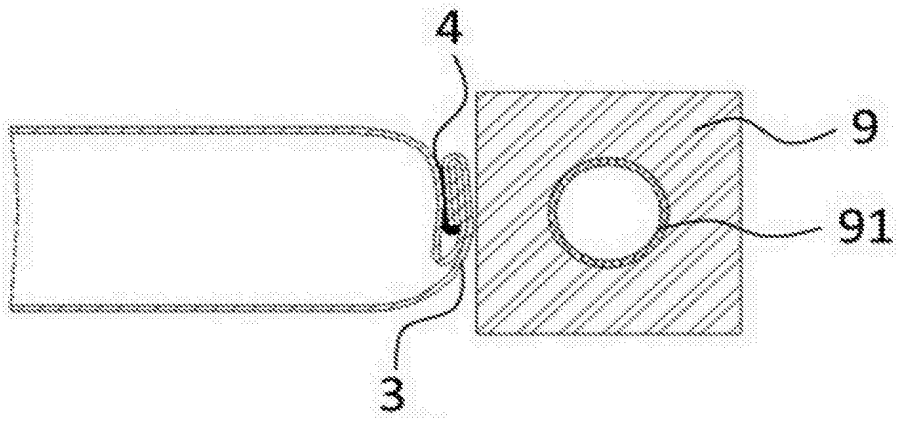


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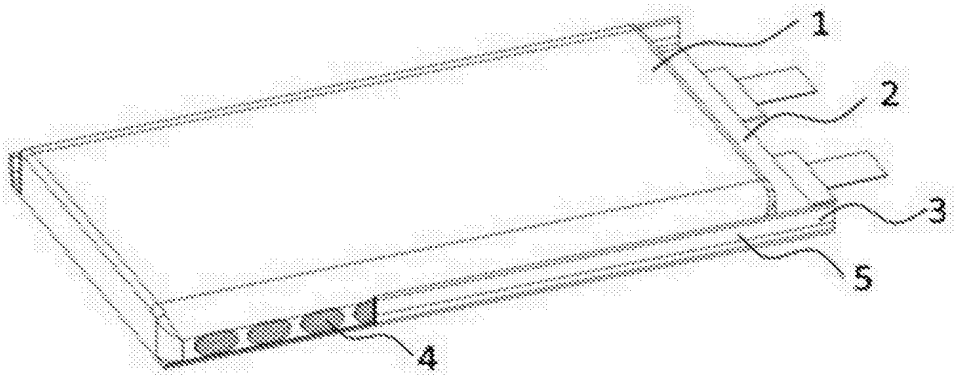


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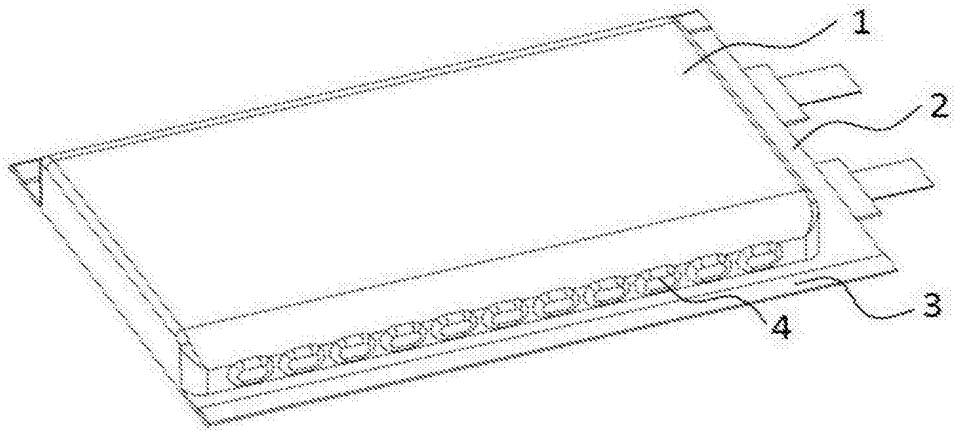


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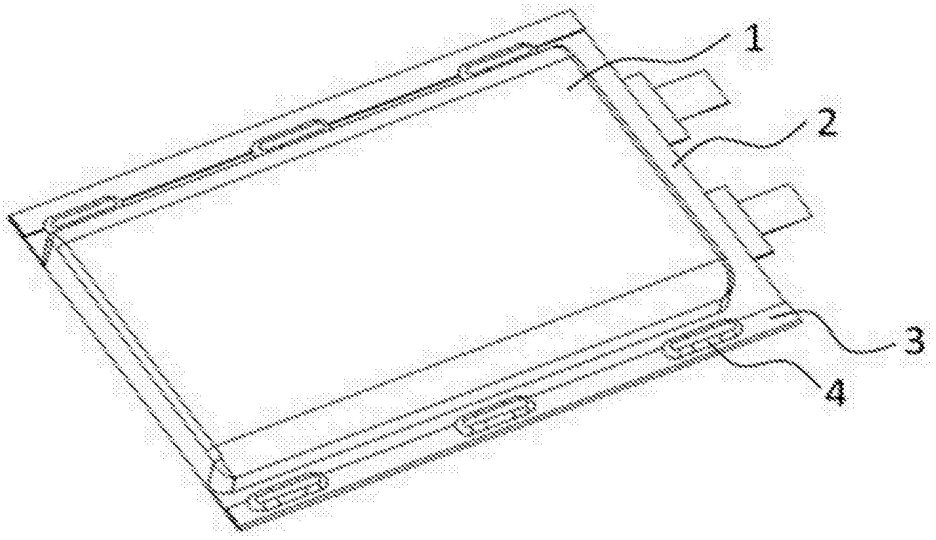


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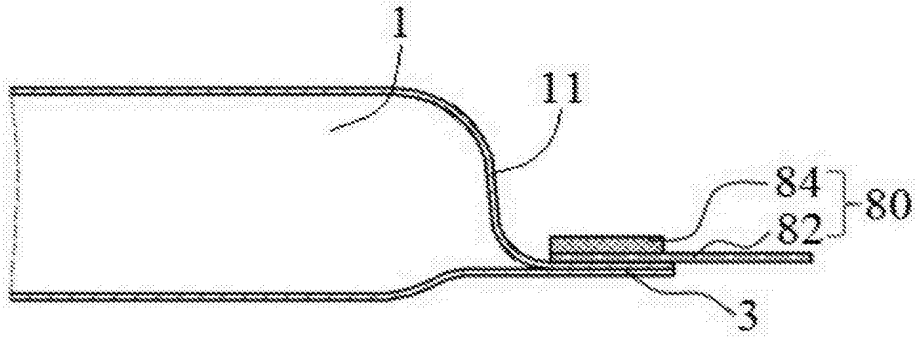


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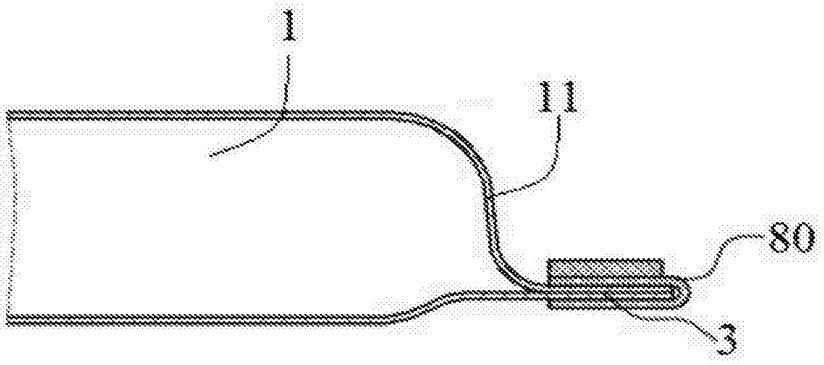


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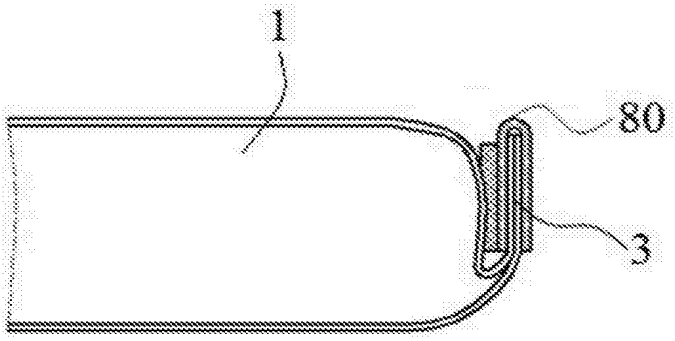



图 14

MORNINGSIDE
A Questel Company

# TRANSLATION CERTIFICATION

Date: May 7, 2026

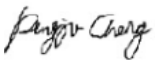
To whom it may concern:

I, Patrick Cheng, a translator fluent in the English and Chinese languages, on behalf of Morningside, do solemnly and sincerely declare that the following is, to the best of my knowledge and belief, a true and correct translation of the document(s) listed below in a form that best reflects the intention and meaning of the original text.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001of Title 18 of the United States Code.

The document is designated as:

- CN205122651U (Duan).pdf



Signature

Patrick Cheng

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