

CN110429328B Method for improving internal temperature rise of battery

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A method to improve the temperature rise inside the battery

technical field

The invention belongs to the technical field of lithium batteries, and in particular relates to a method for improving the internal temperature rise of the battery.

Background technique

Fast charging is one of the main development directions of lithium-ion batteries. In the case of high-rate charging, the internal heat generation of the battery increases, resulting in a sharp rise in battery temperature. If the internal temperature of the battery is too high, it will affect the stability of the positive/negative electrode material and electrolyte. If the temperature is too high, it will even cause the diaphragm to shrink, resulting in a short circuit between the positive and negative electrodes, which poses a huge safety hazard.

The Chinese invention patent application with application number 201510060477.3 discloses a cell structure, in which the positive and negative tabs are located in the blank area in the middle of the pole piece, and the head of the anode pole piece is inserted into the end of the cell during the winding process, In order to make better use of the internal space of the battery, the head of the anode plate will be designed as a single-sided coating area, and there will be a risk of discounting due to the existence of tension after rolling.

SUMMARY OF THE INVENTION

The purpose of the present invention is to solve the problem of the existing battery core structure, in the process of high rate charging, due to the large internal resistance of the battery and more internal heat generation, the battery temperature rises greatly, and the temperature rise will increase the safety risk of the battery. A method for improving the internal temperature rise of a battery, the winding core structure obtained by the method can reduce the internal resistance of the battery, thereby reducing the temperature rise of the battery.

To achieve the above object, the technical scheme adopted by the present invention is as follows:

A method for improving the internal temperature rise of a battery, the specific steps of the method are:

Step 1: Spray cleaning solvent on the tab welding areas of the positive and negative pole pieces respectively, remove the coating on the positive and negative pole pieces sprayed with the cleaning solvent area, clean out a blank area, and weld the tabs on the positive and negative pole pieces. The blank area of the positive and negative pole pieces, and an insulating adhesive layer 1 is attached to the two opposite surfaces of the blank area of the positive and negative pole pieces, and the insulating adhesive layer 1 completely covers the blank area;

Step 2: The two opposite surfaces of the negative pole piece and the positive pole piece are affixed with an insulating adhesive layer 1, and a layer of insulating adhesive layer 2 is attached to the corresponding position, and the two opposite surfaces of the positive pole piece and the negative pole piece are affixed with an insulating adhesive layer. A corresponding position is also pasted with a layer of insulating adhesive layer 2. The positive and negative electrode pieces and the separator are wound to form a battery core; during the winding process, the insulating adhesive layer 1 of the positive electrode and the negative electrode must be insulated. The second glue layer overlaps, and the first insulating glue layer of the negative pole piece overlaps with the second insulating glue layer of the positive pole piece.

The beneficial effects of the present invention relative to the prior art are:

1.The tabs are welded in the middle of the pole pieces, which is equivalent to dividing the battery into two parts, which can effectively reduce the internal resistance of the battery and reduce the polarization of the battery during the charging and discharging process, and the internal resistance can be reduced by 40-50%;

2.The battery resistance is reduced, and the Joule heat Q_j and polarization heat Q_p are reduced during high-rate charging, which effectively reduces the battery temperature rise, and the temperature rise can be reduced by about 25% to 35%;

3.The invention can effectively utilize the internal space of the battery, reduce the thickness of the battery, improve the energy density of the battery, and the energy density is increased by about 0.5-1.5%;

4.Compared with the existing cell structure design, the structure has higher safety performance.

Description of drawings

Fig. 1 is the schematic diagram of conventional structure winding core;

Fig. 2 is the core structure schematic diagram of the present invention;

Figure 3 is a schematic diagram of the positive electrode sticking glue;

Figure 4 is a schematic diagram of the negative pole piece glue sticking;

Figure 5 is a schematic diagram of welding and sticking glue in the blank area of the pole piece;

Figure 6 is a comparison diagram of the internal resistance of the new structure and the conventional structure;

Figure 7 is a schematic diagram of the internal temperature rise of the battery when charging at 1.5C;

Among them, 1-positive pole piece, 2-negative pole piece, 3-diaphragm, Z-positive ear, F-negative ear, Z1-positive ear tape, F2/F3-negative insulating tape, F1-negative ear tape, Z2/Z3-positive insulating tape, d- width of welding tab, l- length of welding end of tab, C- insulating glue layer beyond one side of blank area, D- width of blank area.

Detailed ways

The technical solutions of the present invention will be further described below in conjunction with the accompanying drawings and examples, but are not limited thereto. Any modification or equivalent replacement of the technical solutions of the present invention without departing from the spirit and scope of the technical solutions of the present invention should be included in the within the protection scope of the present invention.

The internal heat generation of lithium batteries during use mainly comes from four aspects: reaction heat Q_r , Joule heat Q_j , polarization heat Q_p and decomposition heat Q_s . Q_r is the heat generated by the internal chemical reaction of the lithium battery, which is an endothermic reaction during charging and an exothermic reaction during discharging; Q_j is the heat lost by the lithium battery due to internal resistance; Q_p is the lithium battery during the charging and discharging process due to polarization. There is heat generated; Q_s is the heat generated by the lithium battery during self-discharge or during side reactions. In the process of high-rate charging, the polarization of the battery becomes larger, the proportion of Joule heat Q_j and polarization heat Q_p increases, and the heat generation increases significantly. It can be seen from the above analysis that the temperature rise of the battery during high-rate charging is mainly caused by the heat generated by the battery internal resistance and polarization internal resistance. Reducing the battery internal resistance is the main solution to improve the battery temperature rise and increase the high-rate charging.

Embodiment 1: This embodiment describes a method for improving the internal temperature rise of a battery. The specific steps of the method are:

Step 1: Spray the cleaning solvent on the welding areas of the electrodes of the positive and negative pole pieces respectively. The presence of the solvent can dissolve the binder in the pole piece coating, reducing the adhesion between the pole piece coating and the pole piece base material. After the junction force is reduced, a scraper is used to remove the coating on the positive and negative pole pieces by spraying the cleaning solvent area, and a

blank area is cleaned, and the tabs are welded to the blank area of the positive and negative pole pieces by welding, and A layer of insulating adhesive layer 1 is attached to each of the two opposite surfaces of the blank area of the positive and negative pole pieces, and the insulating adhesive layer 1 completely covers the blank area; specifically, the cleaning solvent can be deionized water, NMP, DMAC, DMF , TEP, DMSO and absolute ethanol;

Step 2: The two opposite surfaces of the negative pole piece and the positive pole piece are affixed with an insulating adhesive layer 1, and a layer of insulating adhesive layer 2 is attached to the corresponding position, and the two opposite surfaces of the positive pole piece and the negative pole piece are affixed with an insulating adhesive layer. One corresponding position is also affixed with a layer of insulating adhesive layer two, the positive and negative pole pieces and the separator are wound to form a battery cell (refer to Figure 3 and Figure 4 for the specific schematic diagram); during the winding process, the positive pole piece should be The insulating adhesive layer 1 of the negative pole piece overlaps with the insulating adhesive layer 2 of the negative pole piece, and the insulating adhesive layer 1 of the negative pole piece overlaps the insulating adhesive layer 2 of the positive pole piece.

Embodiment 2: In the method for improving the internal temperature rise of the battery described in Embodiment 1, the relationship between the width D of the blank area and the width d of the tab is: $D > d$, and the width of the blank area is 0.5 ~2.0mm.

Embodiment 3: In the method for improving the internal temperature rise of the battery described in Embodiment 1, the length of the insulating adhesive layer 1 of the positive pole piece should exceed the length of the blank area of the positive pole piece by 4.0 to 5.0 mm, and the length of the positive pole piece The width of the insulating adhesive layer 1 should exceed the width of the blank area of the positive pole piece by 4.0 to 5.0 mm.

Embodiment 4: In the method for improving the internal temperature rise of the battery described in Embodiment 1, the length of the insulating adhesive layer 1 of the negative pole piece should exceed the length of the negative pole piece by 0.5-2.0 mm, and the insulating adhesive of the negative pole piece The width of layer 1 should exceed the width of the negative pole piece by 0.5 to 2.0 mm.

Embodiment 5: A method for improving the internal temperature rise of the battery described in Embodiment 1, adding a 5-15mm empty foil to the head of the positive pole piece. The existence of the empty foil can relieve the tension in the single-sided area to improve the The problem of discounting the pole pieces.

Embodiment 6: In the method for improving the internal temperature rise of the battery described in Embodiment 1, the insulating adhesive layer 1 and the insulating adhesive layer 2 are both (1) adhesive tapes composed of a base material and a viscous substance, Such as tape; or (2) a coating (without substrate) that can play an insulating effect.

Example 1:

1.Select 515974 (experimental battery model) as the experimental model, and the blank group is designed according to the conventional structure, that is, the tabs are located on the empty foils of the positive and negative pole pieces, as shown in Figure 1;

2.The experimental group was designed with a new structure. First, the positive electrode piece 1 and the negative electrode piece 2 were sprayed with cleaning solvent on the corresponding positive electrode lug Z and negative electrode lug F welding area, and then the coating in the welding area was removed by a scraper device. , the base material of the pole piece is exposed to form a blank area where the tab can be welded. The size of the blank area can be adjusted according to the width d of the tab and the length l of the welding end of the tab. As shown in Figure 5, the width D of the blank area is slightly larger , in the width direction, ensure that the distance between the edge of the blank area and the tab is 0.5 to 2.0mm, so as to ensure that the tab can be welded to the blank area, and the tab will not be welded on the coating due to the existence of tolerances. Welding and other safety risks.

3.After the welding of the positive terminal Z and the negative terminal F is completed, stick an insulating adhesive layer on the upper and lower surfaces of the positive terminal Z and the negative terminal F respectively to form adhesive tape. The length and width of the positive terminal adhesive tape Z1 must exceed the blank area. About 4.0-5.0mm; the length and width of the negative electrode tape F1 should exceed the

blank area by about 1.0-2.0mm; the position of the negative electrode piece 2 corresponding to the positive electrode Z should also be pasted with positive insulating tape Z2, Z3, After winding, the two adhesive tapes Z2 and Z3 will just overlap with the positive terminal Z to play a protective role. The length and width of the insulating rubber layer should exceed one side of the blank area by about 1.0 to 2.0 mm; The position of the positive pole piece 1 also needs to be pasted with insulating adhesives F2 and F3. After winding, the two adhesive tapes of F2 and F3 will just overlap with the negative ear F to play a protective role. The length and width of the insulating adhesive layer should exceed the blank area. One side is about 4.0-5.0mm; this type of glue can ensure that the negative electrode coating extends into the protective tape of the positive electrode by 2.0-4.0mm, so as to ensure that during the charging and discharging process, the lithium ions can be completely embedded in the negative electrode, otherwise, Lithium ions may be precipitated on the surface of the negative electrode tape to form lithium dendrites, which will affect the battery performance and cause serious safety hazards. Please refer to Figure 3 and Figure 4 for the specific paste method.

4. Arrange the positive pole piece 1, the diaphragm 3, the negative pole piece 2, and the diaphragm 3 in order, and roll them in a counterclockwise direction. Because the negative pole ear F is welded in the middle of the pole piece, the single-sided area of the negative electrode head is prone to rolling stress. It is curled, so 5-15mm of empty foil is reserved at the head to relieve stress. When winding, the innermost pole piece of the negative electrode is folded by 1-2mm. At the same time, the head of the positive electrode is cut with two knives, and the head of the conventional structure is removed Empty foil, at this time, the positive pole piece 1 can be inserted into the inner folded end of the winding core, which improves the utilization rate of battery space. For details, please refer to FIG. 2 .

5. After the winding is completed, follow-up production is carried out according to the normal process, and the process data in the subsequent process is collected and the battery performance is reported for inspection to compare the effects.

It can be seen from the test data in Figure 6 that the internal resistance of the battery is reduced from 35.7mΩ to 19.7mΩ, and the internal resistance is reduced by about 45%; When C is charged and discharged, the new structure can significantly improve the temperature rise performance of the battery. The average temperature rise of charging is reduced by 3.9 °C, and the average temperature rise of discharge is reduced by 4.8 °C, the percentages are 26% and 31.2%, respectively, and the effect is very obvious.

1. A method for improving the internal temperature rise of a battery, characterized in that: the specific steps of the method are:

Step 1: Spray cleaning solvent on the tab welding areas of the positive and negative pole pieces respectively, remove the coating on the positive and negative pole pieces sprayed with the cleaning solvent area, clean out a blank area, and weld the tabs on the positive and negative pole pieces. The blank area of the positive and negative pole pieces, and a layer of insulating adhesive layer 1 is attached to the two opposite surfaces of the blank area of the positive and negative pole pieces, and the insulating adhesive layer 1 completely covers the blank area; the width of the blank area The relationship between D and the tab width d is, $D > d$, and the width of the blank area ranges from 0.5 to 2.0 mm;

Step 2: The two opposite surfaces of the negative pole piece and the positive pole piece are affixed with an insulating adhesive layer 1, and a layer of insulating adhesive layer 2 is attached to the corresponding position, and the two opposite surfaces of the positive pole piece and the negative pole piece are affixed with an insulating adhesive layer. A corresponding position is also pasted with a layer of insulating adhesive layer 2. The positive and negative electrode pieces and the separator are wound to form a battery core; during the winding process, the insulating adhesive layer 1 of the positive electrode and the negative electrode must be insulated. The two layers of glue overlap, and the insulating glue layer 1 of the negative pole piece overlaps with the insulating glue layer 2 of the positive pole piece; 5-15mm empty foil is reserved at the head of the negative pole piece, and the innermost pole piece is folded with paste 1 when the negative pole is wound. ~2mm; add 5~15mm of empty foil at the head of the positive pole piece.

2. The method for improving the internal temperature rise of a battery according to claim 1, characterized in that: the length of the insulating adhesive layer 1 of the positive pole piece should exceed the length of the blank area of the positive pole piece by 4.0 to 5.0 mm, and the insulation of the positive pole piece The width of the first adhesive layer should exceed the width of the blank area of the positive pole piece by 4.0 to 5.0 mm.

3. The method for improving the internal temperature rise of a battery according to claim 1, wherein the length of the insulating adhesive layer 1 of the negative pole piece should exceed the length of the negative pole piece by 0.5-2.0 mm, and the insulating adhesive layer of the negative pole piece The width of one should exceed the width of the negative pole piece by 0.5 to 2.0 mm.
4. The method for improving the internal temperature rise of a battery according to claim 1, wherein the insulating adhesive layer 1 and the insulating adhesive layer 2 are both (1) adhesive tapes composed of a base material and a viscous substance; or (2) A coating that can play an insulating effect.



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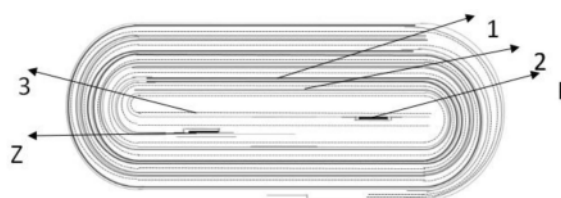
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(54) 发明名称

一种改善电池内部温升的方法

(57) 摘要

一种改善电池内部温升的方法,属于锂电池技术领域。所述方法为:在极耳焊接区域喷涂清洗溶剂,将涂层移除,清洗出空白区域,通过焊接方式,将极耳焊接在空白区域,且在空白区域的两个相对表面各贴一层绝缘胶层一,且绝缘胶层一将空白区域完全覆盖;负极极片的两个相对表面与正极极片贴有绝缘胶层一相对应的位置贴有一层绝缘胶层二,正极极片的两个相对表面与负极极片贴有绝缘胶层一相对应的位置也贴有一层绝缘胶层二,要使正极极片的绝缘胶层一与负极极片的绝缘胶层二重叠,负极极片的绝缘胶层一与正极极片的绝缘胶层二重叠。相对比现有的电芯结构设计,本结构安全性能更高。



1. 一种改善电池内部温升的方法,其特征在于:所述方法具体步骤为:

步骤一:在正、负极极片的极耳焊接区域分别喷涂清洗溶剂,将正、负极极片上喷涂清洗溶剂区域的涂层移除,清洗出一块空白区域,通过焊接方式,将极耳焊接在正、负极极片的空白区域,且在正、负极极片的空白区域的两个相对表面各贴一层绝缘胶层一,且绝缘胶层一将空白区域完全覆盖;所述空白区域的宽度D与极耳宽度d的关系式是, $D>d$,空白区域的宽度范围为0.5~2.0mm;

步骤二:负极极片的两个相对表面与正极极片贴有绝缘胶层一相对应的位置贴有一层绝缘胶层二,正极极片的两个相对表面与负极极片贴有绝缘胶层一相对应的位置也贴有一层绝缘胶层二,正、负极极片与隔膜卷绕制成电芯;在卷绕过程中,要使正极极片的绝缘胶层一与负极极片的绝缘胶层二重叠,负极极片的绝缘胶层一与正极极片的绝缘胶层二重叠;在负极极片头部预留5~15mm空箔,卷绕时负极最内折极片折膏1~2mm;在正极极片头部增加5~15mm的空箔。

2. 根据权利要求1所述的一种改善电池内部温升的方法,其特征在于:正极极片的绝缘胶层一的长度要超出正极极片空白区域长度的4.0~5.0mm,正极极片的绝缘胶层一的宽度要超出正极极片空白区域宽度的4.0~5.0mm。

3. 根据权利要求1所述的一种改善电池内部温升的方法,其特征在于:负极极片的绝缘胶层一的长度要超出负极极片长度的0.5~2.0mm,负极极片的绝缘胶层一的宽度要超出负极极片宽度的0.5~2.0mm。

4. 根据权利要求1所述的一种改善电池内部温升的方法,其特征在于:所述绝缘胶层一和绝缘胶层二均为(1)由基材和黏性物质组成的胶纸;或(2)能够起到绝缘效果的涂层。

一种改善电池内部温升的方法

技术领域

[0001] 本发明属于锂电池技术领域,具体涉及一种改善电池内部温升的方法。

背景技术

[0002] 快充是现在锂离子电池主要发展方向之一,在大倍率充电情况下,电池内部产热增加,导致电池温升急剧上升。电池内部温度过高会对正/负极材料和电解液的稳定性产生影响,温度过高甚至会引起隔膜收缩,造成正、负极接触短路,有巨大的安全隐患。

[0003] 申请号为201510060477.3的中国发明专利申请公开了一种电芯结构,其结构中正、负极耳位于极片中间的空白区,且阳极极片在卷绕过程中头部插至电芯的端部,为了更好的利用电池内部空间,阳极极片头部会设计成单面涂层区,辊压后由于张力的存在,会有打折风险。

发明内容

[0004] 本发明的目的是为了解决现有电池卷芯结构,大倍率充电过程中,由于电池内阻较大,内部产热较多导致电池温升大,温升大会增加电池的安全风险的问题,提供一种改善电池内部温升的方法,利用该方法得到的卷芯结构,可降低电池内阻,进而降低电池温升。

[0005] 为实现上述目的,本发明采取的技术方案如下:

[0006] 一种改善电池内部温升的方法,所述方法具体步骤为:

[0007] 步骤一:在正、负极极片的极耳焊接区域分别喷涂清洗溶剂,将正、负极极片上喷涂清洗溶剂区域的涂层移除,清洗出一块空白区域,通过焊接方式,将极耳焊接在正、负极极片的空白区域,且在正、负极极片的空白区域的两个相对表面各贴一层绝缘胶层一,且绝缘胶层一将空白区域完全覆盖;

[0008] 步骤二:负极极片的两个相对表面与正极极片贴有绝缘胶层一相对应的位置贴有一层绝缘胶层二,正极极片的两个相对表面与负极极片贴有绝缘胶层一相对应的位置也贴有一层绝缘胶层二,正、负极极片与隔膜卷绕制成电芯;在卷绕过程中,要使正极极片的绝缘胶层一与负极极片的绝缘胶层二重叠,负极极片的绝缘胶层一与正极极片的绝缘胶层二重叠。

[0009] 本发明相对于现有技术的有益效果为:

[0010] 1. 极耳焊接在极片中间位置,相当于将电池一分为二,可有效降低电池内阻,减少充放电过程中的电池极化,内阻降低可达40~50%;

[0011] 2. 电池阻值降低,大倍率充电时焦耳热 Q_j 和极化热 Q_p 降低,有效降低电池温升,温升可降低约25%~35%;

[0012] 3. 本发明能有效利用电池内部空间,降低电池厚度,提升电池能量密度,能量密度提升约0.5~1.5%;

[0013] 4. 相对比现有的电芯结构设计,本结构安全性能更高。

附图说明

- [0014] 图1为常规结构卷芯示意图；
[0015] 图2为本发明的卷芯结构示意图；
[0016] 图3为正极极片贴胶示意图；
[0017] 图4为负极极片贴胶示意图；
[0018] 图5为极片空白区焊接贴胶示意图；
[0019] 图6为新结构与常规结构电芯内阻对比图；
[0020] 图7为1.5C充电时电池内部温升示意图；
[0021] 其中，1-正极极片、2-负极极片、3-隔膜、Z-正极耳、F-负极耳、Z1-正极耳胶纸、F2/F3-负极绝缘胶纸、F1-负极耳胶纸、Z2/Z3-正极绝缘胶纸、d-焊接极耳宽度、l-极耳焊接端长度、C-绝缘胶层超出空白区单侧区、D-空白区域的宽度。

具体实施方式

[0022] 下面结合附图和实施例对本发明的技术方案作进一步的说明，但并不局限于此，凡是对本发明技术方案进行修正或等同替换，而不脱离本发明技术方案的精神范围，均应涵盖在本发明的保护范围之内。

[0023] 锂电池在使用过程中内部产热主要来源于四个方面：反应热 Q_r 、焦耳热 Q_j 、极化热 Q_p 和分解热 Q_s 。 Q_r 是锂电池内部化学反应产生的热量，充电时表现为吸热反应，放电时表现为放热反应； Q_j 是锂电池因内阻损失的热量； Q_p 是锂电池在充放电过程中由于极化存在产生的热量； Q_s 是锂电池在自放电过程中或副反应过程中产生的热量。在大倍率充电过程中，电池极化变大，焦耳热 Q_j 和极化热 Q_p 占比增大，产热明显增加。通过以上分析可以看出，大倍率充电时，电池温升主要是由于电池内阻和极化内阻产热引起的，降低电池内阻是改善电池温升，提升大倍率充电的主要解决方式。

[0024] 具体实施方式一：本实施方式记载的是一种改善电池内部温升的方法，所述方法具体步骤为：

[0025] 步骤一：在正、负极极片的极耳焊接区域分别喷涂清洗溶剂，溶剂的存在能溶解极片涂层中Binder，使极片涂层与极片基材之间的粘结力降低，粘结力降低之后，采用刮片设备将正、负极极片上喷涂清洗溶剂区域的涂层移除，清洗出一块空白区域，通过焊接方式，将极耳焊接在正、负极极片的空白区域，且在正、负极极片的空白区域的两个相对表面各贴一层绝缘胶层一，且绝缘胶层一将空白区域完全覆盖；具体地，清洗溶剂可以为去离子水、NMP、DMAC、DMF、TEP、DMSO和无水乙醇等；

[0026] 步骤二：负极极片的两个相对表面与正极极片贴有绝缘胶层一相对应的位置贴有一层绝缘胶层二，正极极片的两个相对表面与负极极片贴有绝缘胶层一相对应的位置也贴有一层绝缘胶层二，正、负极极片与隔膜卷绕制成电芯（具体示意图可参考图3、图4）；在卷绕过程中，要使正极极片的绝缘胶层一与负极极片的绝缘胶层二重叠，负极极片的绝缘胶层一与正极极片的绝缘胶层二重叠。

[0027] 具体实施方式二：具体实施方式一所述的一种改善电池内部温升的方法，所述空白区域的宽度D与极耳宽度d的关系式是， $D > d$ ，空白区域的宽度范围为0.5~2.0mm。

[0028] 具体实施方式三：具体实施方式一所述的一种改善电池内部温升的方法，正极极

片的绝缘胶层一的长度要超出正极极片空白区域长度的4.0~5.0mm,正极极片的绝缘胶层一的宽度要超出正极极片空白区域宽度的4.0~5.0mm。

[0029] 具体实施方式四:具体实施方式一所述的一种改善电池内部温升的方法,负极极片的绝缘胶层一的长度要超出负极极片长度的0.5~2.0mm,负极极片的绝缘胶层一的宽度要超出负极极片宽度的0.5~2.0mm。

[0030] 具体实施方式五:具体实施方式一所述的一种改善电池内部温升的方法,在正极极片头部增加5~15mm的空箔,空箔的存在可以缓解单面区张力,来改善头部极片打折问题。

[0031] 具体实施方式六:具体实施方式一所述的一种改善电池内部温升的方法,所述绝缘胶层一和绝缘胶层二均为(1)由基材和黏性物质组成的胶纸,如胶带;或(2)能够起到绝缘效果的涂层(不含基材)。

[0032] 实施例1:

[0033] 1.选用515974(实验电池型号)作为实验型号,空白组按照常规结构进行设计,即极耳位于正、负极极片头部的空箔上,如图1所示;

[0034] 2.实验组采用新结构进行设计,首先分别对正极极片1和负极极片2在相应的正极耳Z和负极耳F焊接区域喷涂清洗溶剂,然后采用刮片设备将焊接区域内的涂层移除,裸露出极片基材,形成可焊接极耳的空白区域,空白区域的大小可根据极耳宽度d和极耳焊接端的长度l进行调整,如图5所示,空白区域的宽度D略大,在宽度方向上,保证空白区域的边缘与极耳的距离为0.5~2.0mm,以保证极耳可以焊接在空白区域,而不会因为公差的存在导致极耳焊在涂层上而产生虚焊等安全风险。

[0035] 3.正极耳Z和负极耳F焊接完成后,在正极耳Z和负极耳F上、下表面分别贴一绝缘胶层,形成胶纸,正极耳胶纸Z1长度和宽度方向单侧均需超出空白区域约4.0~5.0mm;负极耳胶纸F1长度和宽度方向单侧均需超出空白区域约1.0~2.0mm;与正极耳Z对应的负极极片2位置亦需贴正极绝缘胶纸Z2、Z3,卷绕后Z2和Z3这两道胶纸将正好与正极耳Z重叠,起到保护作用,该绝缘胶层长度和宽度方向需超出空白区域单侧约1.0~2.0mm;与负极耳F对应的正极极片1位置亦需贴绝缘胶F2、F3,卷绕后F2各F3这两道胶纸将正好与负极耳F重叠,起到保护作用,该绝缘胶层长度和宽度方向需超出空白区域单侧约4.0~5.0mm;此种贴胶方式可保证负极涂层延伸到正极的保护胶纸内2.0~4.0mm,以保证在充放电过程中,锂离子可完全嵌入到负极中,否则,锂离子可能在负极胶纸表面析出,形成锂枝晶,影响电池性能及产生严重的安全隐患,具体贴胶方式可参考图3和图4。

[0036] 4.将正极极片1、隔膜3、负极极片2、隔膜3,依次排列,按逆时针方向进行卷绕,因负极耳F焊接在极片中间,负极头部单面区因辊压应力存在易卷曲,故在其头部预留5~15mm空箔缓解应力,卷绕时负极最内折极片折膏1~2mm,与此同时,正极头部采用切两刀方式,去掉常规结构头部空箔,此时正极极片1可以插至卷芯内折端部,提升了电池空间利用率,具体可参考图2。

[0037] 5.卷绕完成后,后续按照正常工艺生产,后续收集过程中制程数据和对电池性能进行报检,对比效果。

[0038] 从图6的测试数据可以看出,采用新结构的电芯,电池内阻由35.7mΩ降低到19.7mΩ,内阻降低约为45%;从图7温升测试数据可以看出,电池在1.5C充放电时,新结构能明显

改善电池温升性能,充电温升均值降低3.9℃,放电温升均值降低4.8℃,百分比分别为26%和31.2%,效果非常明显。

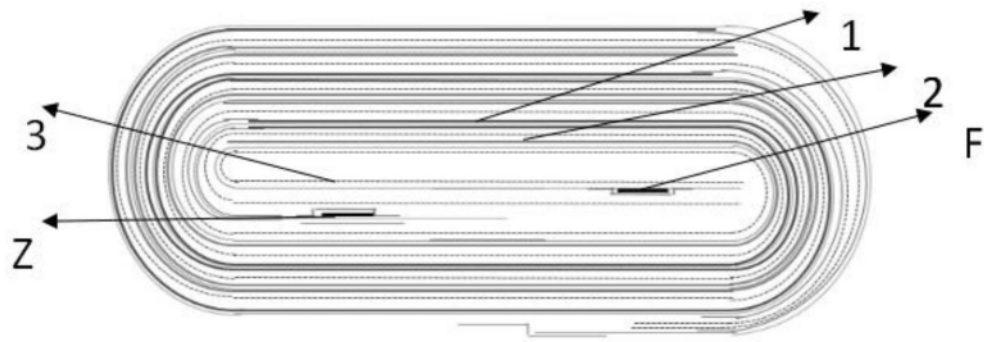


图1

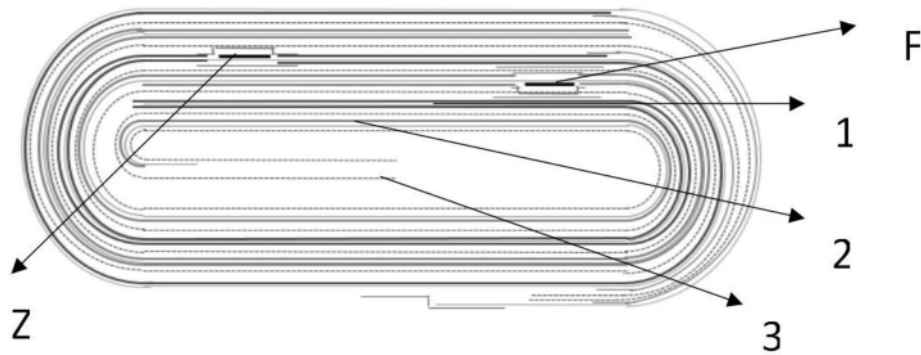


图2

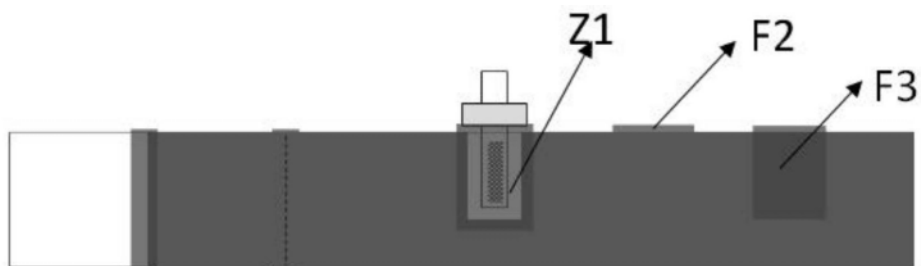


图3

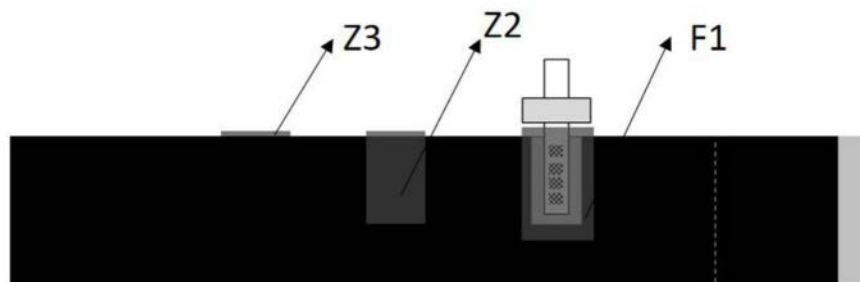


图4

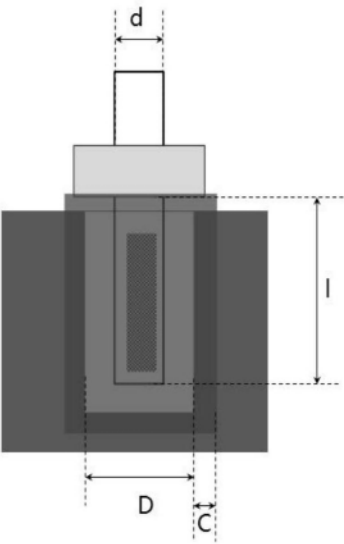


图5

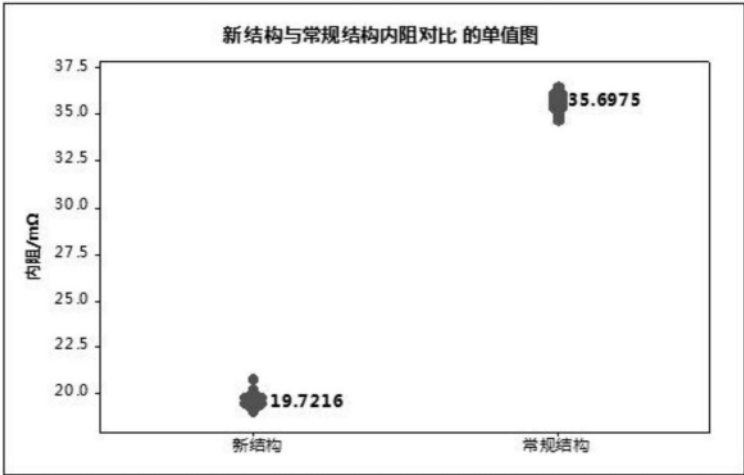


图6

序号		新结构			常规结构		
充电	初始温度/℃	27.3	27.8	28.1	29.5	28.9	28.8
	表面最高温度/℃	38.6	38.8	38.9	44.1	43.5	44.3
	温升/℃	11.3	11	10.8	14.6	14.6	15.7
放电	初始温度/℃	29.2	30	29.2	28.2	28.1	30.9
	表面最高温度/℃	39.5	40.3	40.5	44.7	43.8	44.9
	温升/℃	10.3	10.3	11.3	16.5	15.7	14

图7