INSULATION FILM, PIN STRUCTURE AND BATTERY

CROSS REFERENCE TO RELATED APPLICATION

[0001] The present application claims priority to Chinese patent application No. 202420792501.7 filed with the Chinese Patent Office on April 16, 2024, the entire disclosure of which is incorporated by reference into the present application.

TECHNICAL FIELD

[0002] The present application relates to the field of battery technology, and in particular to an insulation film, a pin structure and a battery.

BACKGROUND

[0003] A pin film is pasted on a side where a pin is in contact with a core package within a battery cell so as to prevent the pin from contacting with the core package to cause a short circuit inside the battery. Since the pin is set in an L shape, the pin has two contacting surfaces that contact the core package and intersect with each other.

[0004] In the related art, a glue is applied to the full surface of the pin film that is in contact with the pin, so as to fix the pin film on the pin. The pasting process is to sequentially paste the pin film on the two contacting surfaces of the pin.

SUMMARY

[0005] However, such arrangement will readily cause the pasted portion of the pin film to be pulled when the pin film is pasted to one contacting surface of the pin and then bonded to the other contacting surface of the pin, resulting in the poor attachment effect or the attachment failure of the pin film on the pin.

[0006] In a first aspect, the present application provides an insulation film, including:

[0007] an insulation film body, the insulation film body includes a first insulation portion and a second insulation portion, the first insulation portion extends along a first direction, the second insulation portion extends along a second direction and is connected to the first insulation portion, the first direction and the second direction are located on different planes and are intersected with each other; and

[0008] a colloid, disposed on the first insulation portion; a projection of the colloid on the insulation film body falls on the first insulation portion and falls outside the second insulation portion, and the colloid is configured to connect the first insulation portion with the pin.

[0009] In a second aspect, the present application provides a pin structure, including:

[0010] an insulation film; and

[0011] a pin, the pin includes a terminal connecting portion and a tab connecting portion connected to each other, one of the terminal connecting portion and the tab connecting portion extends along a first direction, and the other extends along a second direction;

[0012] where, the first insulation portion is connected to the terminal connecting portion through the colloid, or the first insulation portion is connected to the tab connecting portion through the colloid.

[0013] In a third aspect, the present application provides a battery, including a pin structure.

[0014] In the technical solution of the present application, a colloid is provided on the first insulation portion to achieve relative fixation of the first insulation portion and the pin in the insulation film body. Moreover, since the colloid is not provided on the second insulation portion of the insulation film body, when the first insulation portion is pasted to the pin through the colloid, the second insulation portion will naturally attach to the pin along the surface of the pin since the insulation film body may undergo elastic deformation. Compared with the manner in which the contact parts between the pin and the pin film (i.e., the insulation film body) adopt the glue attachment, since no glue is provided on the second insulation portion in the present application, the second insulation portion in the present application will not pull the first insulation portion when in contact with the pin, which can in turn avoid the poor attachment effect or the attachment failure between the insulation film body and the pin caused by pulling during attachment.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015] FIG.1 is a perspective schematic diagram of an insulation film provided by an embodiment of the present application;

[0016] FIG.2 is a perspective schematic diagram of an insulation film provided by another embodiment of the present application;

[0017] FIG.3 is a partial exploded schematic diagram of a battery provided by an embodiment of the present application;

[0018] FIG.4 is an enlarged schematic diagram at point A in FIG.1;

[0019] FIG.5 is a schematic structure diagram of an insulation film provided by an embodiment of the present application;

[0020] FIG.6 is a schematic diagram of the assembly between the insulation film and the pin provided by an embodiment of the present application;

[0021] FIG. 7 is an enlarged schematic diagram at point B in FIG. 1.

[0022] Description of reference numbers:

[0023] 100. Insulation film; 1. Insulation film body; 11. First insulation portion; 111. First sub-portion; 112. Second sub-portion; 12. Second insulation portion; 13. Bending portion; 2. Colloid; 3. Bending line; 4. Notch; 5. Pin; 51. Terminal connecting portion; 52. Tab connecting portion; 6. Core package; 7. Top cover assembly; 8. Terminal; 9. Leading-out side; 10. Tab.

DETAILED DESCRIPTION

[0024] In the description of the present application, unless otherwise clearly specified and limited, the terms “interconnected”, “connected”, and “fixed” should be understood in a broad sense. For example, it may be a fixed connection, a detachable connection, or an integral connection; it may also be a mechanical connection or an electrical connection; it may be a direct connection or an indirect connection through an intermediate medium, it may be the communication inside two elements or the interaction relationship between two elements. For one of ordinary skill in the present art, the specific meanings of the above terms in the present application may be understood according to the specific circumstances.

[0025] In the present application, unless otherwise clearly specified and limited, a first feature being “above” or “below” a second feature may include the first feature being direct contact with the second feature, or may include the first feature being not in contact with the second feature but contact with each other through another feature between them. Moreover, a first feature being “above”, “on” and “top” a second feature includes the first feature being directly above and obliquely above the second feature, and the first feature having a higher horizontal height than the second feature. The first feature being “below”, “under” and “underneath” a second feature includes the first feature being directly below and obliquely below the second feature, and the first feature having a lower horizontal height than the second feature.

[0026] In the description of the present embodiment, the directional or positional relationships such as the terms “upper”, “lower”, “left”, “right”, “front” and “rear” are based on the directional or positional relationships shown in the drawings, and are for the convenience of description and simplification of operation, rather than indicating or implying that the device or element referred to must have a specific direction, be constructed and operated in a specific direction, and therefore cannot be understood as limiting the present application. In addition, the terms “first” and “second” are used to distinguish in the description and have no special meaning.

[0027] The present application provides an insulation film, and FIGS. 1 to 7 are some embodiments of the present application. As shown by the direction markings in the drawings, the X direction is the first direction, the Y direction is the third direction, and the Z direction is the second direction.

[0028] Please refer to FIGS. 1 to 3. In some embodiments, the insulation film 100 includes an insulation film body 1, the insulation film body 1 includes a first insulation portion 11 and a second insulation portion 12, the first insulation portion 11 extends along a first direction X, the second insulation portion 12 extends along a second direction Z, and is connected to the first insulation portion 11, and the first insulation portion 11 and the second insulation portion 12 are located in different planes; where the first insulation portion 11 and the second insulation portion 12 are both in contact

with the pin 5, so that the insulation film body 1 may insulate the pin 5 from the core package 6.

[0029] The terminal connecting portion 51 on the pin 5 is connected to the terminal 8 on the top cover assembly 7, and the tab connecting portion 52 is connected to the tab 10 on the core package 6.

[0030] In some embodiments, the insulation film 100 further includes a colloid 2, the colloid 2 is disposed on the first insulation portion 11 and is configured to connect the first insulation portion 11 with the pin 5. The colloid 2 may achieve relative fixation between the insulation film body 1 and the pin 5.

[0031] In the technical solution of the present application, the relative fixation between the first insulation portion 11 and the pin 5 in the insulation film body 1 may be achieved by providing the colloid 2 on the first insulation portion 11. Since the colloid 2 is not provided on the second insulation portion 12 of the insulation film body 1, when the first insulation portion 11 is bonded to the pin 5 through the colloid 2, the second insulation portion 12 will naturally attach to the pin 5 along the surface of the pin 5 since the insulation film body 1 may undergo elastic deformation. Compared with the manner in which the contact parts between the pin 5 and the pin film (i.e., the insulation film body 1) adopt all the glue attachment in the prior art, since no glue is provided on the second insulation portion 12 in the present application, the second insulation portion 12 in the present application will not pull the first insulation portion 11 when in contact with the pin, which can in turn avoid the poor attachment effect or the attachment failure between the insulation film body 1 and the pin 5 caused by pulling during attachment of the insulation film 100.

[0032] It should be noted that since the pin 5 is arranged in an L-shape, including a terminal connecting portion 51 and a tab connecting portion 52 which are vertically connected to each other, each of the portions is described by the annotated names of the parts in the embodiment of the present application. In the related art, when the first insulation portion 11 is pasted to the terminal connecting portion 51 or the tab connecting portion 52 and then the second insulation portion 12 is pasted to the tab

connecting portion 52 or the terminal connecting portion 51, the insulation film body 1 needs to be deformed to be pasted with the tab connecting portion 52 or the terminal connecting portion 51, and this process easily results in pulling of the first insulation portion 11; similarly, if the second insulation portion 12 is provided with a colloid 2, the first insulation portion 11 needs to avoid contact between the second insulation portion 12 and the pin 5 during the pasting process, so as to affect the attachment effect of the first insulation portion 11. The technical solution in the embodiment of the present application can effectively remedy such defect.

[0033] The first insulation portion 11 and the second insulation portion 12 may be respectively in contact with one of the terminal connecting portion 51 and the tab connecting portion 52. In one embodiment of the present application, the first insulation portion 11 is connected to the terminal connecting portion 51, and the second insulation portion 12 is in contact with the tab connecting portion 52; in another embodiment of the present application, the first insulation portion 11 is connected to the tab connecting portion 52, and the second insulation portion 12 is in contact with the terminal connecting portion 51.

[0034] Please refer to FIG. 3. In one embodiment of the present application, the first insulation portion 11 is connected to the terminal connecting portion 51, and the second insulation portion 12 is in contact with the tab connecting portion 52.

[0035] In addition, since the tab connecting portion 52 is in contact with the separator of the core package 6, that is, in contact with the leading-out side 9 of the core package 6 on which the tab 10 is provided, the risk of short circuit in this part is relatively small. Therefore, the length of the second insulation portion 12 in the second direction Z may be as shown in FIG. 1, and the second insulation portion 12 may shield a part of the contact area between the tab connecting portion 52 and the core package 6; the length of the second insulation portion 12 in the second direction Z may be as shown in FIG.2, and the second insulation portion 12 may also completely shield the contact area between the tab connecting portion 52 and the core package 6.

[0036] In addition, there is a corner at the connection part between the terminal connecting portion 51 and the tab connecting portion 52 on the pin 5. Thus, in order to avoid pulling the pasting position between the first insulation portion 11 and the terminal connecting portion 51 when the insulation film body 1 is bent in such corner position, please refer to FIG. 4. In some embodiments of the present application, the first insulation portion 11 includes a first sub-portion 111 and a second sub-portion 112 connected to each other; where the colloid 2 is disposed on the first sub-portion 111, and the second insulation portion 12 is connected to the second sub-portion 112. That is, there is a certain distance between the coating position of the colloid 2 on the first insulation portion 11 and the bending position of the insulation film body 1 at the corner, so as to avoid pulling when the insulation film body 1 is bent to result in the poor attachment effect of the insulation film body 1 and the pin 5.

[0037] Please refer to FIG. 5. In some embodiments of the present application, the length of the second sub-portion 112 in the first direction X is L; where L satisfies: 0.5 mm $\leq$ L $\leq$ 2 mm. That is, setting L to satisfy the interval range of 0.5 mm $\leq$ L $\leq$ 2 mm may avoid the insulation film body 1 from being pulled during pasting, while ensuring the attachment effect between the insulation film body 1 and the pin 5; if the L is less than 0.5 mm, the first insulation portion 11 will be affected by the bending of the insulation film body 1 and thus pulled during the film pasting process, in turn affecting the film pasting efficiency of the insulation film body 1 and the attachment effect of the insulation film body 1; if the L is greater than 2 mm, it will result in a poor attachment effect of the insulation film body 1 at the corner of the pin 5.

[0038] Please refer to FIG. 5 and FIG. 6, the insulation film body 1 further includes a bending portion 13 extending along the third direction Y, one end of the bending portion 13 is connected to the first insulation portion 11 in the first direction X, and the other end of the bending portion 13 is connected to the second insulation portion 12 in the second direction Z, and the cross section of the bending portion 13 perpendicular to the third direction Y is in an arc-shape in; where, since the pin 5 is in an arc-shape at the corner, the cross section of the bending portion 13 of the insulation film body 1

corresponding to the corner of the pin 5 is also in the arc-shape in order to make the insulation film body 1 better fit the pin 5. One end of the bending portion 13 is connected to the second sub-portion 112 in the first direction X.

[0039] It may be understood that, since the insulation film body 1 is bent at the corner of the pin 5 following the shape of the corner, the formed bending portion 13 is also arranged in the arc shape.

[0040] In some embodiments of the present application, the projection of the colloid 2 on the insulation film body 1 also falls outside the bending portion 13. That is, in the present embodiment, the bending portion 13 is also not provided with the colloid 2, so as to prevent the case in which the colloid 2 located at the bending portion 13 is pasted to the pin 5 when the bending portion 13 is bent, thereby pulling the first insulation portion 11 that has been pasted to the pin 5.

[0041] In addition, since the insulation film body 1 is bent at the corner of the pin 5, the smaller the length of the second insulation portion 12 in the second direction Z is, the better the attachment effect between the bending portion 13 and the pin 5 at the corner is.

[0042] Since the second insulation portion 12 is not provided with the colloid 2, when the core package 6 is connected to the lead 5, the bending portion 13 may still fit the corner of the pin 5 due to the abutment function of the core package 6.

[0043] Please refer to FIG. 5 again. In some embodiments of the present application, the thickness of the first insulation portion 11 in the second direction Z is D1, and the thickness of the colloid 2 in the second direction Z is D2; where D1 and D2 satisfy: $0.5D1 \leq D2 \leq 0.75D1$.

[0044] In this embodiment, the thickness D2 of the colloid 2 is set to satisfy the interval range of $0.5D1 \leq D2 \leq 0.75D1$ to ensure the pasting performance of the colloid 2 and facilitate the operator to remove the insulation film body 1 on the pin 5. If the D2 value is less than 0.5D1, the pasting performance of the colloid 2 is poor, and it is not easy to ensure the attachment effect between the insulation film body 1 and the pin 5; if the D2

value is greater than 0.75D1, the colloid 2 is likely to remain on the pin 5 when the insulation film body 1 is removed from the pin 5.

[0045] In some embodiments of the present application, D1 also satisfies: 0.1 mm≤D1≤0.3 mm. That is, in the present embodiment, the value of D1 is set to satisfy the interval range of 0.1 mm≤D1≤0.3 mm to ensure the insulation effect of the first insulation portion 11. If the value of D1 is less than 0.1 mm, the insulation effect of the first insulation portion 11 is poor; if D1 is greater than 0.3 mm, it will result in the increased usage cost of the insulation film body 1, while the size of the first insulation portion 11 in the second direction Z will be too large, and it will also occupy the space requirement of the core package 6 in the second direction Z. Among them, the value of D1 may be 0.1 mm, 0.11 mm, 0.12 mm, 0.13 mm, 0.14 mm, 0.15 mm, 0.16 mm, 0.17 mm, 0.18 mm, 0.19 mm, 0.2 mm, 0.21 mm, 0.22 mm, 0.23 mm, 0.24 mm, 0.25 mm, 0.26 mm, 0.27 mm, 0.28 mm, 0.29 mm, and 0.3 mm.

[0046] It may be understood that, on the basis of satisfying both 0.5D1≤D2≤0.75D1 and 0.1 mm≤D1≤0.3 mm, D2 also satisfies: 0.05 mm≤D2≤0.225 mm. Among them, the value of D2 may be 0.05 mm, 0.06 mm, 0.07 mm, 0.08 mm, 0.09 mm, 0.1 mm, 0.11 mm, 0.12 mm, 0.13 mm, 0.14 mm, 0.15 mm, 0.16 mm, 0.17 mm, 0.18 mm, 0.19 mm, 0.2 mm, 0.21 mm, 0.22 mm, 0.225 mm.

[0047] In some embodiments of the present application, a bending line 3 extending along the third direction Y is provided on the bending portion 13. That is, in the present embodiment, the setting of the bending line 3 may facilitate the bending of the insulation film body 1 at the part corresponding to the corner of the pin 5. The bending line 3 may be either formed by providing with an indentation on the bending portion 13, or by providing with a thinning area on the bending portion 13 when producing the insulation film body 1 to form the bending line 3.

[0048] Referring to FIG. 7, the bending portion 13 is provided with a notch 4 on at least one side in the third direction Y; the notch 4 is provided on the bending line 3. The notch 4 is provided to facilitate an operator or an operating device to locate the position

of the bending line 3, so that the position of the bending line 3 corresponds to the corner position of the pin 5.

[0049] In one embodiment of the present application, a notch 4 is provided at one end of the bending line 3; in another embodiment of the present application, the notch 4 is provided at both ends of the bending line 3. The shape of the notch 4 may be an arc, a triangle, or the like.

[0050] The present application also proposes a pin structure, the pin structure includes an insulation film 100 and a pin 5. The insulation film 100 is described as in the above embodiment. The pin 5 includes a terminal connecting portion 51 and a tab connecting portion 52 that are connected to each other. One of the terminal connecting portion 51 and the tab connecting portion 52 extends along a first direction X, and the other extends along a second direction Z.

[0051] In some embodiments of the present application, the first insulation portion 11 is connected to the terminal connecting portion 51 through the colloid 2, or the first insulation portion 11 is connected to the tab connecting portion 52 through the colloid 2. That is, the first insulation portion 11 can be connected to the terminal connecting portion 51 or the tab connecting portion 52, and correspondingly, the second insulation portion 12 is in contact with the tab connecting portion 52 or the terminal connecting portion 51.

[0052] Please refer to FIG. 3. In one embodiment of the present application, the first insulation portion 11 is connected to the terminal connecting portion 51, and the second insulation portion 12 is in contact with the tab connecting portion 52. That is, in the present embodiment, by providing the colloid 2 on the first insulation portion 11, the relative fixation of the first insulation portion 11 and the terminal connecting portion 51 in the insulation film body 1 is achieved. Since the second insulation portion 12 on the insulation film body 1 is not provided with the colloid 2, when the first insulation portion 11 is pasted to the terminal connecting portion 51 through the colloid 2, the second insulation portion 12 will naturally attach to the tab connecting portion 52 along the surface of the pin 5 since the insulation film body 1 may undergo elastic

deformation. Compared with the manner in which the contact portion between the pin 5 and the pin film (i.e., the insulation film body 1) is pasted with glue, when the second insulation portion 12 in the present embodiment contacts the tab connecting portion 52 on the pin 5, since no glue is provided on the second insulation portion 12, it will not result in the pulling to the first insulation portion 11, which in turn can avoid the poor attachment effect or the attachment failure between the insulation film body 1 and the pin 5 caused by pulling during attachment of the insulation film 100.

[0053] It may be understood that in another embodiment of the present application, the technical solution in which the first insulation portion 11 is connected to the tab connecting portion 52 and the second insulation portion 12 is in contact with the terminal connecting portion 51 also has the above technical effects, which will not be elaborated here one by one.

[0054] In one embodiment of the present application, the projection of the terminal connecting portion 51 in the second direction Z falls completely on the first insulation portion 11; that is, the first insulation portion 11 completely separates the terminal connecting portion 51 from the core package 6, thereby avoiding the pin 5 from contacting the core package 6 to cause a short circuit.

[0055] In another embodiment of the present application, the projection of the tab connecting portion 52 in the first direction X completely falls on the second insulation portion 12. That is, the second insulation portion 12 completely separates the tab connecting portion 52 from the core package 6, thereby avoiding the pin 5 from contacting the core package 6 to cause a short circuit.

[0056] In order to ensure the insulation effect of the pin 5 from the core package 6, the present application has at least one of the above two embodiments. Please refer to FIG. 6. In one embodiment of the present application, the sizes of the first insulation portion 11 and the second insulation portion 12 are both larger than the sizes of the terminal connecting portion 51 and the tab connecting portion 52, that is, the projection of the pin 5 on the insulation film body 1 completely falls on the insulation film body 1, thereby avoiding the pin 5 from contacting the core package 6 to cause short-circuit.

[0057] The present application also proposes a battery, which includes a pin structure, and the structure of the pin is described above. Since the battery adopts all the technical solutions of all the above embodiments, it at least has the beneficial effects brought by the technical solutions of the above embodiments, which will not be elaborated one by one here.

WHAT IS CLAIMED IS

1. An insulation film, comprising:

an insulation film body, wherein the insulation film body comprises a first insulation portion and a second insulation portion, the first insulation portion extends along a first direction, the second insulation portion extends along a second direction and is connected to the first insulation portion, the first direction and the second direction are located on different planes and intersected with each other; and

a colloid, disposed on the first insulation portion; wherein a projection of the colloid on the insulation film body falls on the first insulation portion and outside the second insulation portion; and the colloid is configured to connect the first insulation portion with a pin.

2. The insulation film according to claim 1, wherein the first insulation portion comprises a first sub-portion and a second sub-portion connected to each other;

wherein the colloid is disposed on the first sub-portion, and the second insulation portion is connected to the second sub-portion.

3. The insulation film according to claim 2, wherein a length of the second sub-portion in the first direction is defined as L; wherein L satisfies: $0.5\ \text{mm} \leq L \leq 2\ \text{mm}$.

4. The insulation film according to claim 1, wherein the insulation film body further comprises a bending portion extending along a third direction, one end of the bending portion is connected to the first insulation portion in the first direction, another end of the bending portion is connected to the second insulation portion in the second direction, and a cross section of the bending portion perpendicular to the third direction is in an arc-shape; and

the third direction is perpendicular to the first direction and the second direction.

5. The insulation film according to claim 4, wherein the bending portion is provided with a bending line extending along the third direction.

6. The insulation film according to claim 5, wherein the bending portion is provided with a notch on at least one side in the third direction;

the notch is disposed on the bending line.

7. The insulation film according to claim 6, wherein a shape of the notch is an arc or a triangle.

8. The insulation film according to claim 4, wherein a projection of the colloid on the insulation film body further falls outside the bending portion.

9. The insulation film according to claim 5, wherein the bending line is formed by providing an indentation on the bending portion.

10. The insulation film according to claim 5, wherein the bending line is formed by providing a thinning area on the bending portion when producing the insulation film body.

11. The insulation film according to claim 6, wherein the notch is provided at one end of the bending line or provided at both ends of the bending line.

12. The insulation film according to any one of claims 1 to 11, wherein a thickness of the first insulation portion in a second direction is defined as D1, and a thickness of the colloid in the second direction is defined as D2; wherein the D1 and the D2 satisfy: $0.5D1 \leq D2 \leq 0.75D1$.

13. The insulation film according to claim 12, wherein the D1 further satisfies: 0.1 mm $\leq$ D1 $\leq$ 0.3 mm.

14. The insulation film according to claim 12, wherein the D2 further satisfies: 0.05 mm $\leq$ D2 $\leq$ 0.225 mm.

15. A pin structure, comprising:

an insulation film, the insulation film comprises the insulation film according to any one of claims 1 to 14; and

a pin, the pin comprises a terminal connecting portion and a tab connecting portion connected to each other, one of the terminal connecting portion and the tab connecting portion extends along a first direction, and another of the terminal connecting portion and the tab connecting portion extends along a second direction;

wherein, the first insulation portion is connected to the terminal connecting portion through the colloid, or the first insulation portion is connected to the tab connecting portion through the colloid.

16. The pin structure according to claim 15, wherein a projection of the pin on the insulation film body completely falls on the insulation film body.

17. The pin structure according to claim 15, wherein a projection of the terminal connecting portion in the second direction completely falls on the first insulation portion.

18. The pin structure according to claim 15, wherein a projection of the tab connecting portion in the first direction completely falls on the second insulation portion.

19. A battery comprising the pin structure according to claim 15.

20. The battery according to claim 19, wherein both the first insulation portion and the second insulation portion are in contact with the pin to enable the insulation film body to insulate the pin from a core package of the battery.