polyetherimide, the second polymer resin was polyamide-imide, and a ratio of the first polymer resin to the second polymer resin was 60:40; the solvent was acetone; the coating pore-expanding agent was water; and the ceramic particles were alumina;

S3: coating: the above-prepared coating slurry was coated on the ceramic film by a double-sides simultaneous micro-gravure plate, a porous gel-ceramic hybrid coating was prepared utilizing solidification-induced gelation and phase separation pore formation, combined with water washing and drying process; and a corresponding coated separator was obtained.

On the basis of Example 1, Examples 2-17 and Comparative Examples 1-3 were formed respectively by changing the first polymer resin and the second polymer resin, the ratio of the first polymer resin to the second polymer resin, the ratio of polymer in the slurry, the substrate, the thickness of the coating and the thickness of the separator, and the proportion of ceramic particles in the slurry; and the differences in each example and comparative example are detailed in Table 1. The coating thickness in Table 1 refers to the coating thickness on both sides, that is, the thickness of the coating on both sides obtained by coating the coating slurry on the ceramic film by double-sides simultaneous or step-by-step micro-gravure plate.

Referring to Table 1, Table 1 shows the properties of the corresponding separators obtained from the above Examples 1-17 and Comparative Examples 1-3.

Test method of adhesion: a to-be-test coated film sample was made into a standard sample strip (coated film (25 mm × 180 mm), electrode sheet (20 mm × 150 mm)), a coated surface of the separator was bond to the electrode sheet by using a hot press shaping machine under a certain pressure at a temperature of 60°C, and then the other end of the electrode sheet and the sample were clamped by a clamp, and pulling force was applied until the stroke of the tension machine ended. Tension machine parameter settings: positioning shift: 150 mm, test speed: 300 mm/min.

Test method of thermal shrinkage rate at 130°C for 60 min: first, a separator was cut into 50 mm × 50 mm test sample strips along the transverse and machine directions of the separator, and perform initial marking on the separator; second, the cut sample was sandwiched between A4 papers, 5 sheets on top and 5 sheets on the bottom; next, the oven temperature was set to 130°C, and the oven was allowed to heat up to the set temperature and was fully preheated to ensure the internal temperature stabilized at the set point; then, the prepared samples sandwiched between A4 papers, together with the papers, were placed quickly into the oven, and the sample was placed in the exact center position of the upper layer of the oven, and the lower layer was not used, and the oven door was closed immediately; after closing the oven door, the test was forest to 60 min according to the test requirements,

What is claimed is:

1. A coating slurry, which has a main component comprising a solvent and an adhesive polymer resin, and a weight proportion of the adhesive polymer resin in the slurry is 5-20wt%; wherein the adhesive polymer resin comprises a combination of a PVDF-based adhesive resin polymer and a polyimide type adhesive resin, and a mass ratio of the polyimide type adhesive resin to the PVDF-based adhesive resin polymer is 50–85:15–50;

or the adhesive polymer resin comprises a combination of at least two polyimide type adhesive resins; wherein the at least two polyimide type adhesive resins comprise a first polyimide type adhesive resin and a second polyimide type adhesive resin, and a mass ratio of the first polyimide type adhesive resin to the second polyimide type adhesive resin is 50–85:15–50.

2. The coating slurry according to claim 1, wherein a glass transition temperature of the first polyimide type adhesive resin is greater than 200°C, and a glass transition temperature of the second polyimide type adhesive resin is greater than 140°C.

3. The coating slurry according to claim 1, wherein the solvent is an organic solvent, the polyimide type adhesive resin is a modified polyimide, and the modified polyimide is soluble in the organic solvent.

4. The coating slurry according to claim 3, wherein in a case where the adhesive polymer resin comprises a combination of a PVDF-based adhesive resin polymer and a polyimide type adhesive resin, the polyimide type adhesive resin is selected from at least one of the following polymer resins: ether-anhydride-type polyimide, fluorinated-anhydride-type polyimide, ketone-anhydride-type polyimide, bismaleimide, olefin-terminated polyimide, polyesterimide, polyamide-imide, and polyetherimide;

in a case where the adhesive polymer resin comprises a combination of at least two polyimide type adhesive resins, the at least two polyimide type adhesive resins are selected from at least two of the following polymer resins: ether-anhydride-type polyimide, fluorinated-anhydride-type polyimide, ketone-anhydride-type polyimide, bismaleimide, olefin-terminated polyimide, polyesterimide, polyamide-imide, and polyetherimide.

5. The coating slurry according to any one of claims 1-4, wherein the coating slurry further comprises a coating pore-expanding agent, and a weight proportion of the coating pore-expanding agent in the slurry is 0.05-5wt%.

6. The coating slurry according to claim 5, wherein the coating pore-expanding agent is one or a combination of water, ethanol, polyethylene glycol, and methanol.

7. The coating slurry according to claim 6, wherein the coating slurry further comprises ceramic particles, and a weight proportion of the ceramic particles in the slurry is greater than 0wt% and less than or equal to 5wt%; preferably, the ceramic particles are any one or a combination of alumina, boehmite, silicon oxide, magnesium oxide, titanium oxide, and zirconium oxide.

8. The coating slurry according to claim 7, wherein a weight proportion of the solvent in the slurry is 70-95wt%; preferably, the solvent is one or a combination of acetone, N-methylpyrrolidone, and DMAc.

9. A coated separator, comprising a substrate and a polymer layer, and the polymer layer is coated on one side or both sides of the substrate; wherein the polymer layer comprises at least two functional groups selected from an imide group, heteroaromatic ring, and aromatic ring, and at least one functional group selected from an ester group, ether bond, thioether bond, a ketone group, an amide group, phenolic hydroxyl ether, a methyl group, a methylene group, a trifluoromethyl group, and C-F bond.

10. A coated separator, comprising a substrate and a polymer layer, and the polymer layer is coated on one side or both sides of the substrate; wherein the polymer layer is formed by coating the coating slurry according to any one of claims 1-8.

11. A coated separator, comprising a substrate and a polymer layer, and the polymer layer is coated on one side or both sides of the substrate; wherein the coated separator has a dielectric breakdown voltage of 2.1-5.0 kV, and a dielectric strength is greater than 4.5 kV/mil.

12. The coated separator according to any one of claims 9-11, wherein a surface layer of the polymer layer has a porous structure; preferably, the porous structure is a honeycomb-like and dense porous structure.

13. The coated separator according to claim 12, wherein the coated separator further comprises ceramic particles, and the ceramic particles are embedded in the polymer layer, with an island-shaped structure; preferably, a diameter of the island-shaped structure is 0.5-2 μm.

14. A method for preparing the coated separator according to any one of claims 11-13, comprising the following steps:

providing a substrate;

preparing a slurry: adding 5-20wt% of an adhesive polymer resin to a solvent, and fully dissolving to obtain a coating slurry; wherein, the adhesive polymer resin comprises a combination of a PVDF-based adhesive resin polymer and a polyimide type adhesive resin, and a mass ratio of the

polyimide type adhesive resin to the PVDF-based adhesive resin polymer is 50–85:15–50; or the adhesive polymer resin comprises a combination of at least two polyimide type adhesive resins, and the at least two polyimide type adhesive resins comprise a first polyimide type adhesive resin and a second polyimide type adhesive resin, and a mass ratio of the first polyimide type adhesive resin to the second polyimide type adhesive resin is 50–85:15–50; and

coating: coating the prepared coating slurry onto at least one surface of the substrate to form a polymer layer on the substrate.

15. A battery, comprising a coated separator, a positive electrode, a negative electrode, and an electrolyte, and the coated separator is the coated separator according to any one of claims 9-13.