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Electrochemical performance test of lithium cobalt oxide - Test method for discharge plateau capacity ratio and cycle life

钴酸锂电化学性能测试 放电平台容量比率及循环寿命测试方法

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1 Scope

This standard specifies the test methods for the discharge plateau capacity ratio and cycle life of lithium cobalt oxide cathode material for lithium ion batteries.

This standard applies to lithium cobalt oxide, for the cathode material of lithium ion batteries.

2 Normative references

The provisions in following documents become the provisions of this Standard through reference in this Standard. For the dated references, the subsequent amendments (excluding corrections) or revisions do not apply to this Standard; however, parties who reach an agreement based on this Standard are encouraged to study if the latest versions of these documents are applicable. For undated references, the latest edition of the referenced document applies.

GB/T 18287-2000 General specification of lithium-ion battery for cellular phone

3 Reagents and raw materials

3.1 Lithium cobalt oxide $LiCoO_2$.

3.2 Lithium hexafluorophosphate $LiPF_6$ (battery grade).

3.3 Ethylene carbonate EC (battery grade).

3.4 Diethyl carbonate DEC (battery grade).

3.5 N-methyl pyrrolidone NMP (battery grade).

3.6 Polyvinylidene fluoride PVdF (battery grade).

3.7 Acetylene black.

3.8 Meso-carbon Microspheres (MCMB).

95%, AND the acetylene black which has a mass fraction of 3% ~ 5%, as a conductive agent. Use the polyvinylidene vinyl fluoride, which has a mass fraction of 5% ~ 7%, as the binder. Mix the mesophase carbon microspheres, acetylene black, polyvinylidene fluoride and N-methylpyrrolidone, to adjust the slurry. Coat the slurry evenly on the copper foil (3.10). Dry it in an oven, at 120 °C, for not less than 12 h. Cut it into electrode sheet, which has a length of 400 mm, a width of 41 mm, a thickness of 0.14 mm ~ 0.15 mm. Strictly control the process of mixing and coating. The area and thickness of the electrode sheet shall be kept consistent.

5.3 Assembly of battery

The battery cell is rolled by the winding method. The square rolling needle is 23 mm ~ 24 mm wide and 1.5 mm thick. The polypropylene microporous film (3.11) is used as the separator. The positive electrode is wrapped in the separator; the negative electrode is placed on the separator, which is aligned and wound. After packaging, perform laser welding. Then place it in an oven, at 100 °C, for vacuum drying, for not less than 12 h. In a drying chamber, which has a dew point temperature lower than -25 °C, use the 1 mol/L $LiPF_6$ (3.2)/EC (3.3) + DEC (3.4) (mass ratio 1:1), as the electrolyte. Inject the electrolyte into the battery. Seal it.

5.4 Formation of batteries

Make the 063048 type test battery. According to the mass and specific capacity of lithium cobalt oxide, which is contained in the battery, under the condition of 25 °C ± 1 °C, use a lithium-ion battery electrochemical performance tester, to carry out 3 charge-discharge cycles. The charging-discharging system is as follows:

a) Charge-discharge current: (0.2 C) A (C is a measure of the discharge speed of the battery; the current used for 1 h discharge is called 1 C discharge current; the current used for 5 h discharge is called 0.2 C discharge current);

b) Charging limit voltage: 4.20 V;

c) Discharge termination voltage: 2.75 V.

5.5 Test of battery

The chemically formed 063048 type test battery is tested, by a lithium-ion battery electrochemical performance tester. The charge-discharge system is as follows:

a) Charging limit voltage: 4.20 V;

b) Discharge termination voltage: 2.75 V;

c) Charge-discharge system: The charge-discharge cycle shall be carried out, in accordance with the provisions of 5.3.6.2 in GB/T 18287-2000.

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