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GB/T 47401-2026

Test method for lithium-ion battery cathode materials - Determination of slurry viscosity

锂离子电池正极材料检测方法 浆料黏度的测定

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Table of Contents

1 Scope

GB/T 47401-2026 is the Chinese national standard covering the viscosity of a cathode slurry - the property that decides whether the coating goes down evenly on the foil, and therefore whether the electrode has uniform capacity across its width. First edition, in force since 1 October 2026. It was issued on 31 March 2026 and takes effect on 1 October 2026, as a first edition. The document is under the responsibility of the China Nonferrous Metals Industry Association. This page is published from the official record of the 2026 edition; the clause text of a standard this recent is not yet in circulation, and the figures, limits and tables it contains are those of the document itself, delivered in full with the English translation.

This document describes a method for determining the paste viscosity of cathode materials of lithium-ion battery using a viscometer and rheometer. This document applies to the determination of the paste viscosity of cathode materials of lithium-ion battery, including lithium nickel cobalt manganese oxide, lithium nickel cobalt aluminum oxide, lithium cobalt oxide, lithium iron phosphate, and lithium manganese iron phosphate.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

GB/T 8170 Rules of rounding off for numerical values & expression and judgement of limiting values

3 Terms and definitions

For the purpose of this document, the following terms and definitions apply.

3.1 viscosity internal friction Properties of a liquid substance under stress during deformation.

3.2 shear rate Velocity gradient of a liquid flow. NOTE. The unit of shear rate is s^-1.

3.3 non-newtonian liquids Liquids whose viscosity changes with shear rate and shear time.

4 Principle

Paste of cathode materials of lithium-ion battery is a non-Newtonian liquids. After pretreatment, the cathode materials are made into a paste with a certain solid content, which is placed in a viscometer or rheometer, and shearing is generated through rotational motion to determine the viscosity characteristics of the sample.

5 Reagents or materials

5.1 Cathode materials of lithium-ion battery. Lithium nickel cobalt manganese oxide, lithium nickel cobalt aluminum oxide, lithium cobalt oxide, lithium iron phosphate, lithium manganese iron phosphate, etc.

5.2 Conductive agents. Carbon conductive agents, acetylene black or carbon nanotubes, battery grade.

5.3 Polyvinylidene fluoride (PVDF). Battery grade, weight-average molecular weight not less than 1 x 10^5, moisture content not greater than 0.10 %.

5.4 N-Methylpyrrolidone (NMP). Battery grade, purity not less than 99.99 %, moisture content not greater than 0.02 %.

6.1 Electronic balance. graduation value

0.01 g.

6.2 Vacuum oven.

6.3 Planetary disperser or deaerator.

6.4 Viscometer or rheometer.

6.5 Scraper fineness gauge. Accuracy 1 μm. Before use, clean the fineness gauge with alcohol or a non-corrosive solvent and wipe it clean with a soft cloth; there shall be no

residue.

7 Test conditions

7.1 Paste temperature. (25 ± 0.5) °C.

7.2 Ambient relative humidity. not greater than 5 %.

8.1 Material pretreatment

8.1.1 Place the cathode materials of lithium-ion battery (5.1) and conductive agent (5.2) in a vacuum oven (6.2), evacuate, and dry at 100 °C ~ 150 °C for 2 h ~ 4 h.

8.1.2 Place the polyvinylidene fluoride (5.3) in a vacuum oven (6.2), evacuate, and dry at 70 °C ~ 90 °C for 4 h ~ 6 h.

8.2 Batching Calculate the cathode materials of lithium-ion battery, conductive agent, and polyvinylidene fluoride pretreated according to

8.1.1 at the mass ratio of (90 ~ 98). (1 ~ 5). (1 ~ 5), and weigh using an electronic balance (6.1). Calculate the mass of NMP (5.4) according to the design requirement of 55 % ~ 75 % solid content, and weigh using an electronic balance (6.1). NOTE. The solid content in this document is the ratio of the sum of the masses of the cathode materials, conductive agent, and polyvinylidene fluoride to the sum of the masses of the cathode materials, conductive agent, polyvinylidene fluoride, and NMP.

8.3 Paste preparation Prepare the paste according to the following steps, based on the weighed ingredients in 8.2.

a) Add NMP to the mixing tank of a planetary disperser or deaerator (6.3);

b) Gradually add polyvinylidene fluoride, disperse and stir until completely dissolved to form a transparent paste;

c) Add the conductive agent to the above transparent paste, disperse and stir under vacuum until homogeneous;

d) Gradually add the cathode materials of lithium-ion battery in portions, disperse and stir under vacuum until homogeneous to form a non-Newtonian liquid paste;

e) Place the prepared paste in a constant temperature chamber cooled by circulating pure water. The paste temperature is controlled at (25 ± 0.5) °C using circulating cooling water during the paste preparation process.