ICS 07.030
CCS F19

# NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA



# GB/T 41232.3-2023

## Nanomanufacturing - Key control characteristics - Nano-enabled electrical energy storage - Part 3: Contact and coating resistivity measurements for nanomaterials

纳米制造 关键控制特性 纳米储能 第3部分：纳米材料接触电阻率和涂层电阻率的测试

**Issued on: May 23, 2023** **Implemented on: December 1, 2023**

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**Standardization Administration of the PRC**

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## Foreword

This document was issued on 23 May 2023 by the State Administration for Market Regulation; Standardization Administration of the PRC and takes effect on 1 December 2023.

It is a GB/T standard: recommended rather than compulsory, but it is the text a Chinese reviewer applies when assessing a submission.

It is classified under ICS 07.030, Chinese classification F19.

This document is in accordance with the provisions of GB/T 1.1-2020 "Guidelines for Standardization Work Part 1. Structure and Drafting Rules for Standardization Documents"

drafting.

This document is the third part of GB/T 41232 "Nano-manufacturing key control characteristics nano-energy storage". GB/T 41232 has issued

Published the following sections.

--- Part 2. Density test of nano-cathode materials;

--- Part 3. Testing of nanomaterial contact resistivity and coating resistivity.

This document is equivalent to IEC /T S62607-4-3.2015 "Key Control Characteristics of Nanomanufacturing Part 4-3. Nanoscale Energy Storage Devices"

Nanomaterial Contact and Coating Resistivity Test", the file type was adjusted from the IEC technical specification to the national standard of our country.

The following minimal editorial changes have been made to this document.

--- In order to coordinate with existing standards, the name of the standard is changed to

"Nano-manufacturing key control characteristics Nano energy storage Part 3. Nano

Test of Material Contact Resistivity and Coating Resistivity";

---Change "LiNi1/3Co1/3Mn1/3O2" to "LiNixCoyMn1-x-yO2" (see 3.2);

--- Correct "(650+/-5)mm" to "(650+/-5)um" (see 4.2.2);

--- Correct "9mm~40mm" to "9um~40um" (see 4.2.3);

--- Correct "10mm~20mm" to "10um~20um" (see 4.2.3).

Please note that some contents of this document may refer to patents. The issuing agency of this document assumes no responsibility for identifying patents.

This document was proposed by the Chinese Academy of Sciences.

This document is under the jurisdiction of the National Nanotechnology Standardization Technical Committee (SAC/TC279).

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## Introduction

Compared with general materials, nano-energy storage materials have shown superior performance. In order to accelerate the healthy development of nano-energy storage, an emerging industry,

Standardizing the performance testing methods of nano-energy storage materials has become an urgent task in the industry. In this regard, the International Electrotechnical Commission Electrotechnical Products and

The System Nanotechnology Committee (IEC /TC113) has released eight standardized documents on performance testing of nano energy storage materials.

According to the needs of domestic industry development, it is planned to adopt relevant

standards. GB/T 41232 "Nano-manufacturing key control characteristics nano-energy storage" is the guide

The method standard for testing the physical and chemical properties of nano energy storage materials is proposed to be composed of eight parts.

--- Part 1. Electrochemical performance test of nano-cathode materials two-electrode battery method. The purpose is to establish the use of two-electrode batteries

Relevant regulations for testing the electrochemical performance of nanoscale cathode materials.

--- Part 2. Density test of nano cathode materials. The purpose is to establish relevant regulations for testing the density of nanoscale cathode materials.

--- Part 3. Testing of nanomaterial contact resistivity and coating resistivity. The purpose is to establish the measurement of nano-electrode material contact

Relevant regulations on resistivity and coating resistivity.

--- Part 4. Needle punching method for thermal performance testing of nanomaterials. The purpose is to establish a method for testing the thermal properties of nano energy storage devices by acupuncture method.

Regulations on the level of out-of-control.

--- Part 5. Electrochemical performance test of nano-cathode materials three-electrode battery method. The purpose is to establish the use of three-electrode batteries

Relevant regulations for testing the electrochemical performance of nanoscale cathode materials.

--- Part 6. Determination of carbon content in nanometer electrode materials Infrared absorption method. The purpose is to establish the infrared spectroscopic absorption method

Relevant regulations for determining the carbon content of nano-electrode materials.

--- Part 7. Determination of magnetic impurities in nano-cathode materials ICP-OES method. The purpose is to establish the use of inductively coupled plasma

Relevant regulations for the determination of magnetic impurities in nanoscale cathode materials by daughter emission spectrometer (ICP-OES).

--- Part 8. Determination of moisture content in nano-electrode materials Karl Fischer method. The purpose is to establish the adoption of Karl Fischer

Relevant regulations for the determination of moisture content in nano-electrode materials by coulometric titration.

The use of future renewable energy technologies, such as electric vehicles, will mainly rely on efficient energy storage systems. Current lithium-ion batteries, super

Supercapacitors and their derivative concept systems are considered to be the most promising options for innovation.

High energy density and long cycle life are two very important characteristics of electrode materials. Since many electrochemically active materials, such as gold

Metal oxides have low electron transport and insufficient electrical conductivity, so composites containing carbon nanomaterials are used to optimize the current flow in battery electrodes.

The movement of electrons in the composite will affect the electrochemical reaction and energy density of the battery. In addition, the contact between the electrode material and the metal current collector

Electronic contact resistivity is of great significance for achieving low ohmic internal resistance of batteries or capacitors.

This document provides a method for measuring the coating resistivity and contact resistivity of nanometer electrode materials, which is used to evaluate the carbon-containing coating.

Whether the combination of the composite material composition and the preparation process of the nano-layer nano energy storage electrode is optimal. This method can be used between different research groups

Comparison of results.

This document is mainly used for the comparison of contact resistivity and coating resistivity of carbon-containing nanocomposites in the research stage, not for the final product

Evaluation of middle electrodes.

This method is suitable for nano energy storage materials that can only show certain functions and performances by applying nanotechnology.

Addition to active materials can quantify or significantly increase the current flow of electrodes in electrical energy storage devices. Since small amounts of nanomaterials are often sufficient to significantly improve

High material performance, so the percentage of nanomaterials in the device discussed in this document is not directly related to the application of this document.

The nanomaterial content of electrodes, electrode coatings, separators or electrolytes is not relevant for the use of this method.