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NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

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Nanomanufacturing - Key control characteristics - Nano-enabled electrical energy storage - Part 2: Density measurement of cathode nanomaterials

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foreword

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

drafted:

This document is part 2 of GB/T 41232 "Nanoscale energy storage for key control characteristics of nanofabrication": GB/T 41232 has been issued

The following parts are distributed:

--- Part 2: Density test of nano cathode materials:

This document is equivalent to IEC /T S62607-4-2:2016 "Key Control Characteristics of Nanomanufacturing - Part 4-2: Nanoscale Energy Storage

Density Test of Nano-Anode Materials in Pieces", the document type has been adjusted from IEC technical specifications to my country's national standards:

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

--- In order to coordinate with the existing standardization documents, the standard name was changed to "Nano-manufacturing Key Control Characteristics Nano Energy Storage Part 2"

Minutes: Density Testing of Nano Cathode Materials":

Please note that some content of this document may be patented: The issuing agency of this document assumes no responsibility for identifying patents:

Introduction

Compared with general materials, nano energy storage materials show superior performance: In order to accelerate the healthy development of nano energy storage, an emerging industry:

Therefore, standardizing the performance testing methods of nanometer energy storage materials has become an urgent work in the industry: In this regard, the International Electrotechnical Commission for Electrotechnical Products and

The System Nanotechnology Committee (IEC /TC113) has issued eight standardized documents on performance testing of nanoscale energy storage materials:

According to the development needs of the domestic industry, it is proposed to adopt the relevant standards: GB/T 41232 "Nano-scale energy storage for key control characteristics of nano-manufacturing" is the guide

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

--- Part 1: Electrochemical performance testing of nano-positive electrode materials by two-electrode battery method: The purpose is to establish the use of two-electrode batteries

The relevant provisions of the method to test the electrochemical performance of nano cathode materials:

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

--- Part 3: Testing of nanomaterials contact resistivity and coating resistivity: The purpose is to establish the measurement of nanoelectrode material contact

Regulations for resistivity and coating resistivity:

--- Part 4: Acupuncture method for thermal properties testing of nanomaterials: The purpose is to establish the use of acupuncture method to test the thermal loss of nanometer energy storage devices:

regulations on the level of control:

--- Part 5: Electrochemical performance testing of nano-positive electrode materials by three-electrode battery method: The purpose is to establish the use of three-electrode batteries

The relevant provisions of the method to test the electrochemical performance of nano cathode materials:

--- Part 6: Determination of carbon content in nano-electrode materials by infrared absorption method: The purpose is to establish the use of infrared spectroscopy

Relevant regulations for the determination of carbon content of nano-electrode materials:

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

Relevant regulations for the determination of magnetic impurities in nano cathode materials

by bulk 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:

Compared with ordinary-sized materials, nanomaterials have many unique properties in mechanics, heat, magnetism, optics, and electrochemistry: just

When the particle size of electrode materials (such as lithium iron phosphate) is reduced to nanometer size, its electrochemical performance will be greatly improved: For example, the smaller the particle size of the material, the smaller the

Diffusion paths in which short lithium ions are intercalated/deintercalated: The larger the specific surface area, the greater the contact area between the electrode and the electrolyte, thereby improving the electrical conductivity:

Current charge/discharge rate: Moreover, the sub-gap band will be generated on the surface of the particles, which makes the discharge curve of the electrode smoother and helps prolong the cycle of the electrode:

Ring life:

Density is one of the key controlling properties of nano-cathode materials, which has an important impact on the performance of electrical energy storage devices: suitable density, electrical

Chemical properties such as high and low temperature charge/discharge performance and charge/discharge rate performance will be significantly enhanced:

Among the many density properties of nano-cathode materials, the appropriate compaction density will increase the charging capacity, reduce the internal resistance, reduce the polarization effect, and improve the

Cycle life and availability of high electrical energy storage devices: Therefore, it is particularly important to choose the optimal compaction density in the design of electrical energy storage devices: if

If the compaction density is too large or too small, the intercalation and deintercalation of ions will be affected: In general, the compaction density and the specific capacity of the energy storage device are

The positive correlation is one of the key parameters to determine the energy density of materials:

The rolling density also affects the electrochemical performance of nano-cathode materials: Roll density is the ratio of the mass of the coating mix to its volume

It can be used not only to evaluate the volumetric energy density, but also to select cathode materials for hybrid electric vehicles or pure electric vehicles

Provide evidence:

Both of these density properties need to be considered when evaluating nanoscale electrical energy storage devices: The comparison results of the two density properties can be used to judge the nanometer

The consistency of the cathode material is closely related to the performance and safety of the energy storage device: Therefore, for the user, formulating a

It is necessary to compare the density test standards of nano cathode materials from different suppliers:

This standardized method is only suitable for comparing the performance of nano-cathode materials in the research stage, not for evaluating electrode materials in end products:

material: This method is suitable for materials that can only exhibit functions or properties through nanotechnology, and intentionally added to active materials can

Quantify or significantly alter the performance of electrical energy storage devices:

Nanofabrication Key Control Features Nanoscale Energy Storage

Part 2: Density testing of nano-cathode materials

1 Scope

This document describes a method for testing the density of powdered nano-cathode materials in electrical energy storage devices: This document contains terms and definitions,

The recommended methods of sample preparation, the main process of performance testing of nano-cathode materials, data analysis and result interpretation, and example analysis, etc:

This document is suitable for judging the availability and applicability of nano-cathode materials:

2 Normative references

The contents of the following documents constitute essential provisions of this document through normative references in the text: Among them, dated citations

documents, only the version corresponding to that date applies to this document; for undated references, the latest edition (including all amendments) applies to

this document: