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Nanotechnology - Measurement of pore size and pore size distribution of nanoporous materials - Fluorescence probe method

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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 for standardization documents" Drafting.

Please note that some of the contents of this document may involve patents. The issuing organization of this document does not assume the responsibility for identifying patents.

This document was proposed by the Chinese Academy of Sciences.

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Introduction

Nanoporous materials are a type of solid materials with nanopores, which are widely used in adsorption, separation, catalysis and other fields.

Among porous materials, there is a type of material with filtration and separation characteristics. Due to its high filtration accuracy and low filtration energy consumption, it is used as a green and low-carbon separation product.

It is widely used in various material separation and water treatment processes. In nanoporous materials, the pore structure includes through holes, semi-through holes, closed holes and Non-standard cylindrical pores. The separation and filtration performance of the material mainly depends on the pore size and pore size distribution at the narrow part of the through hole.

Therefore, testing the pore size and pore size distribution of the narrow through-pores of nanoporous materials is a key indicator to characterize their filtration performance.

This test method uses fluorescent probes as test substances and is based on the interception test principle.

The interception rate of the optical probe can be used to estimate its pore size and pore size distribution. Fluorescent probes have the advantages of high sensitivity and simultaneous detection of multi-channel signals.

The pore size and pore size distribution test can be carried out by dead-end filtration using a low-concentration mixed test solution, which is fast and low-cost.

The test process in the test method is similar to the actual filtration application process of nanoporous materials, and the test results are consistent with their performance in actual applications.

In addition, the low-concentration test solution can effectively overcome the influence of filtration retentate on pore size test and ensure the accuracy of the results.

This test method is highly practical and provides users in related industries with an accurate, fast and low-cost method for measuring the pore size of nanoporous materials.

The implementation of this method will help supplement the relevant standards in the field of nanomaterials in China. nano technology Nanoporous material pore size and pore size distribution test Fluorescence probe method

1 Scope

This document describes a test method for measuring the through-pore size and pore size distribution of nanoporous materials using a fluorescent probe method.

This document is applicable to the measurement of through-pore size and pore size distribution of nanometer-scale filter materials. For porous materials of other scales, please refer to This document.

2 Normative references

GB/T 4774-2013

GB/T 6682

GB/T 14799-2024

GB/T 20103-2006

GB/T 30544.4-2019

GB/T 30544.6-2016

GB/T 38949-2020

3 Terms and definitions

GB/T 4774-2013, GB/T 14799-2024, GB/T 20103-2006, GB/T 30544.4-2019, GB/T 30544.6- 2016, GB/T 38949-2020 and JY/T 0571-2020 and the following terms and definitions apply to this document.

3.1 Nanopore

At least one dimension is at the nanoscale (1nm~100nm), which may contain pores for gas or liquid.

[Source. GB/T 30544.4-2019, 2.13]

3.2 Nanoporous materials

A solid material having nanopores.

[Source. GB/T 30544.4-2019, 3.4]

3.3 effective opening size

The approximate maximum particle diameter that can effectively pass through the sample.

Note. For example, d90 means that 90% of the standard granular materials with a diameter of this value cannot pass through the test sample after filtration, and the pass rate is 10%.