Technical Specification

ISO/TS 22298

Nanotechnologies — Silica nanomaterials — Specification of characteristics and measurement methods for silica with ordered nanopore array (SONA)

Spécification des caractéristiques et méthodes de mesure de la silice à réseau de nanopores ordonnés (SONA)

First edition
2024-03

Reference number
ISO/TS 22298:2024(en)

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Published in Switzerland

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Foreword

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This document was prepared by Technical Committee ISO/TC 229, *Nanotechnologies.*

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Introduction

Silica with ordered nanopore array (SONA) is expected to act as novel catalysts and adsorbents because of the presence of their uniform nanopores. In addition to SONA, recently developed synthetic strategies have created a huge number of compositional and morphological variations. Therefore, SONA is expected to be applied in various fields such as electronics, optics and materials. They also have potential uses as electrodes for fuel cells and hydrogen-storage materials, all of which are owing to the presence of periodic nanopore and the physical properties of inorganic frameworks.

SONA, as described in the previous reports[1]-[5], has an amorphous structure like silica-gel and exhibits a honeycomb (hexagonal), 3D (cubic) and wormhole (gyroid) pore structure (see Annex A) with ordered cylindrical channels from 2 nm to 50 nm in diameter. The pores are constructed with thin silica walls which are connected to form the regular pore arrangements. The delicate structures of silica walls and their connected structures are influenced by their preparation, aging and storage conditions. The global SONA market is anticipated to witness significant growth on account of a wide range of existing and potential applications of the product in electronics, biomedical, drug delivery and optical fields. A market survey shows extensive use of SONA in the chemical industry as a catalyst support for synthesis of various chemicals[6].

SONA have a variety of industrial applications as catalysts, adsorbents, molecular sieve, where their properties and use cases highly depend on their production processes that affect their nanopore arrangements. They do not have long-range SiO_2 ordering confirmed by powdered X-ray diffraction, showing XRD peaks in low angle region (see Annex A). Having the ability to characterize these materials helps developers adapt to new research frontiers, such as bulky organometallic or inorganic complexes, biosensors from embedded enzymes on nanostructured silica,[7]-[8] to application in energy-efficient desiccation. Standardization of SONA can unify different types of SONA test reports in industry. This allows users to compare or select most suitable and qualified SONA for their applications.