

ISO/TC 229

Secretariat: BSI

Voting begins on:  
2023-10-26

Voting terminates on:  
2023-12-21

---

---

## Nanotechnologies — Silica nanomaterials — Characteristics and measurement methods for silica with ordered nanopore array (SONA)

iTeh Standards  
(<https://standards.iteh.ai>)  
Document Preview

[ISO/DTS 22298](#)

<https://standards.iteh.ai/catalog/standards/sist/9c547097-31ef-4e6f-96ce-da4befdcd8ea/iso-dts-22298>

RECIPIENTS OF THIS DRAFT ARE INVITED TO SUBMIT, WITH THEIR COMMENTS, NOTIFICATION OF ANY RELEVANT PATENT RIGHTS OF WHICH THEY ARE AWARE AND TO PROVIDE SUPPORTING DOCUMENTATION.

IN ADDITION TO THEIR EVALUATION AS BEING ACCEPTABLE FOR INDUSTRIAL, TECHNOLOGICAL, COMMERCIAL AND USER PURPOSES, DRAFT INTERNATIONAL STANDARDS MAY ON OCCASION HAVE TO BE CONSIDERED IN THE LIGHT OF THEIR POTENTIAL TO BECOME STANDARDS TO WHICH REFERENCE MAY BE MADE IN NATIONAL REGULATIONS.



Reference number  
ISO/DTS 22298:2023(E)

iTeh Standards  
(<https://standards.iteh.ai>)  
Document Preview

[ISO/DTS 22298](https://standards.iteh.ai/catalog/standards/sist/9c547097-31ef-4e6f-96ce-da4befdcd8ea/iso-dts-22298)

<https://standards.iteh.ai/catalog/standards/sist/9c547097-31ef-4e6f-96ce-da4befdcd8ea/iso-dts-22298>



**COPYRIGHT PROTECTED DOCUMENT**

© ISO 2023

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office  
CP 401 • Ch. de Blandonnet 8  
CH-1214 Vernier, Geneva  
Phone: +41 22 749 01 11  
Email: [copyright@iso.org](mailto:copyright@iso.org)  
Website: [www.iso.org](http://www.iso.org)

Published in Switzerland

# Contents

Page

Foreword.....	iv
Introduction.....	v
<b>1 Scope.....</b>	<b>1</b>
<b>2 Normative references.....</b>	<b>1</b>
<b>3 Terms and definitions.....</b>	<b>1</b>
<b>4 Abbreviated terms.....</b>	<b>3</b>
<b>5 Characteristics and measurement methods.....</b>	<b>3</b>
5.1 General.....	3
5.2 Descriptions of characteristics and measurement methods.....	4
5.2.1 General.....	4
5.2.2 Chemical composition content.....	4
5.2.3 Pore size.....	4
5.2.4 Pore size distribution.....	4
5.2.5 Specific pore volume.....	5
5.2.6 Specific surface area.....	5
5.2.7 Type of ordered nanopore array.....	5
5.2.8 Moisture content.....	5
5.2.9 Hydrate content.....	6
5.2.10 Stability.....	6
5.2.11 Morphology.....	6
5.2.12 Particle size.....	6
<b>6 Test report.....</b>	<b>7</b>
<b>Annex A (informative) Type of ordered nanopore array.....</b>	<b>8</b>
<b>Annex B (informative) Evaluation of pore size distribution.....</b>	<b>9</b>
<b>Bibliography.....</b>	<b>10</b>

<https://standards.iteh.ai/catalog/standards/sist/9c547097-31ef-4e6f-96ce-da4befdcd8ea/iso-dts-22298>

## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives)).

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at [www.iso.org/patents](http://www.iso.org/patents). ISO shall not be held responsible for identifying any or all such patent rights.

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

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

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at [www.iso.org/members.html](http://www.iso.org/members.html).

## 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<sup>[1]-[5]</sup> 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<sup>[6]</sup>.

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<sub>2</sub> 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,<sup>[7]-[8]</sup> 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.

## Document Preview

[ISO/DTS 22298](#)

<https://standards.iteh.ai/catalog/standards/sist/9c547097-31ef-4e6f-96ce-da4befdcd8ea/iso-dts-22298>

