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Nanotechnologies — Nanostructured porous alumina as catalyst support for vehicle exhaust emission control — Specification of characteristics and measurement methods

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National foreword

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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 documents 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).

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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.

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.

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Introduction

Nanostructured porous alumina as catalyst support for vehicle exhaust emission control plays an important role in automotive exhaust treatment[15]. Three-way catalytic converters (TWCs) have been used in vehicle exhaust control systems worldwide, which can convert carbon monoxide (CO), hydrocarbon (HC) and oxynitride (NOx) into carbon dioxide (CO_2), nitrogen (N_2) and oxygen (O_2). Nanostructured porous alumina has the advantages of a high specific surface area (SSA) and excellent thermal stability, which makes TWCs keep high catalytic activity at a temperature of 900 °C to 1 000 °C in gasoline cars. As one of the most important materials in the catalytic converter[16], nanostructured porous alumina with proper performance is in great demand. In the automotive exhaust treatment field, almost 11,000 tons of porous alumina powders are needed per year.

SSA, specific pore volume, impurities and thermal stability are the main characteristics affecting the performance of nanostructured porous alumina as catalyst support[17]. A high SSA can facilitate homogeneous dispersion of noble metal. A suitable specific pore volume ensures efficient noble metal loading and allows reaction gas to pass through and contact with the catalyst. Impurities can deactivate the noble metal catalyst and thus are harmful. An excellent thermal stability guarantees that TWCs maintain at high activity levels after a long distance running and thus have a prolonged service life. The schematic illustration is shown in Annex A.

The world market demand for nanostructured porous alumina is growing year by year. Currently, however, there are no standards for manufacturers in managing quality control and assurance, and for users in selecting suitable materials for TWCs.

This document provides characteristics and measurements of nanostructured porous alumina as catalyst support for vehicle exhaust emission control. It aims to facilitate worldwide transactions between buyers and sellers of nanostructured porous alumina.

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TECHNICAL SPECIFICATION **ISO/TS 23362:2021**

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1 Scope

This document specifies characteristics to be measured of nanostructured porous alumina in powder form as catalyst support for vehicle exhaust emission control and their relevant measurement methods. It includes critical characteristics that are required to be measured and additional characteristics that are recommended to be measured, based upon agreement between the interested parties. Measurement methods for each characteristic are recommended.

This document is applicable to nanostructured porous alumina for gasoline-powered cars. It does not apply to characteristics specific for health, the environment and safety issues.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/TS 80004-1, *Nanotechnologies — Vocabulary — Part 1: Core terms*

ISO/TS 80004-6, *Nanotechnologies — Vocabulary — Part 6: Nano-object characterization*

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/TS 80004-1, ISO/TS 80004-6 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1.1
specific surface area
SSA
absolute surface area of the sample divided by sample mass

[SOURCE: ISO 9277:2010, 3.11]

3.1.2
specific pore volume
volume of open pores per unit mass of a material

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