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Fine ceramics (advanced ceramics, advanced technical ceramics) — Test method for air-purification performance of semiconducting photocatalytic materials under indoor lighting environment —

Part 1:
Removal of nitric oxide

Reference number
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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.

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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 206, *Fine ceramics*.

This second edition cancels and replaces the first edition (ISO 17168-1:2018), which has been technically revised.

The main changes are as follows:

— normative reference to ISO 24448 added to Clause 2 and 6.4.

A list of all parts in the ISO 17168 series can be found on the ISO website.

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

A photocatalyst is a substance that performs decomposition and removal of contaminants, self-cleaning, antifogging, deodorization and antibacterial actions under photoirradiation. Its application has expanded considerably in recent years. The application of photocatalysts for indoor spaces has increasingly been sought as a solution to indoor environmental problems. Since conventional photocatalysts are responsive only to ultraviolet light, studies have been made to develop an indoor-light-active photocatalyst that makes effective use of indoor light, which room lights mainly emit, and thus demonstrates high photocatalytic performance indoors. The development has recently led to the commercialization of various indoor-light-active photocatalytic products, and there has been demand for the establishment of test methods to evaluate the performance of this type of photocatalyst.

This document is based on ISO 22197-1, a test method for air purification performance of photocatalytic materials under UV light, and is intended to provide a testing method to determine the performance of indoor-light-active photocatalytic materials with regards to the removal of nitric oxide, enabling swift distribution of photocatalytic products and thus contributing to a safe and clean environment.

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Part 1:
Removal of nitric oxide

WARNING — The use of this document can involve hazardous materials, operations and equipment. It is necessary to check that there are no leaks from the gas flow paths, and to properly dispose of exhaust gas and wastewater. This document does not purport to address all of the safety or environmental problems associated with its use.

1 Scope

This document specifies a test method for the determination of the air purification performance, with regards to removal of nitric oxide, of materials that contain a photocatalyst or have photocatalytic films on the surface, usually made from semiconducting metal oxides such as titanium dioxide or other ceramic materials, by continuous exposure of a test piece to the model air pollutant under illumination from indoor light.

This document is applicable for use with different kinds of materials, such as construction materials in flat sheet, board or plate shape, which are the basic forms of materials for various applications. This document also applies to materials in honeycomb form, and to plastic or paper materials containing ceramic microcrystals and composites. This document does not apply to certain test pieces that contain a large amount of adsorbent, due to unattained adsorption equilibrium. This document does not apply to powder or granular photocatalytic materials.

This test method is usually applicable to photocatalytic materials produced for air purification. This method is not suitable for the determination of other performance attributes of photocatalytic materials, i.e. decomposition of water contaminants, self-cleaning, antifogging and antibacterial actions.

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 7996, *Ambient air — Determination of the mass concentration of nitrogen oxides — Chemiluminescence method*

ISO 10304-1, *Water quality — Determination of dissolved anions by liquid chromatography of ions — Part 1: Determination of bromide, chloride, fluoride, nitrate, nitrite, phosphate and sulfate*

ISO 10523, *Water quality — Determination of pH*

ISO 14605, *Fine ceramics (advanced ceramics, advanced technical ceramics) — Light source for testing semiconducting photocatalytic materials used under indoor lighting environment*

ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories*

ISO 24448, *Fine ceramics (advanced ceramics, advanced technical ceramics) — LED light source for testing semiconducting photocatalytic materials used under indoor lighting environment*

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3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

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

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

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

3.1
photocatalyst
substance that performs one or more functions based on oxidation and reduction reactions under photoirradiation, including decomposition and removal of air and water contaminants, deodorization, and antibacterial, self-cleaning and antifogging actions; a type of functional fine ceramics

3.2
indoor light
light from an artificial light source for general lighting service that does not include sunlight

3.3
indoor-light-active photocatalyst
photocatalyst (3.1) that performs under *indoor light* (3.2) irradiation

3.4
photocatalytic material
material in which or on which the photocatalyst is added by, for example, coating, impregnation or mixing

Note 1 to entry: Photocatalytic materials are intended primarily for use as building and road construction materials to obtain the above-mentioned functions.

3.5
zero-calibration gas
air in which common pollutants are below 0,01 µl/l

Note 1 to entry: Zero-calibration gas is prepared from indoor air using a laboratory air purification system or supplied as synthetic air in a gas cylinder.

3.6
standard gas
diluted gas of known concentration supplied in cylinders and certified by an accredited laboratory

3.7
test gas
mixture of air and pollutant(s) of known concentration prepared from the *standard gas* (3.6) or the *zero-calibration gas* (3.5), or from the *standard gas* (3.6) only, to be used for the performance test of a *photocatalytic material* (3.4)

3.8
purified water
water with a specific conductivity lower than 1 µS/cm, prepared by the ion exchange method or distillation

3.9
dark conditions
test conditions of no light illumination by the light source for testing and room lighting

Note 1 to entry: Usually, the *test gas* (3.7) is supplied for comparison with the illuminated reaction.

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