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Fine ceramics (advanced ceramics, advanced technical ceramics) — Test method for antialgal activity of semiconducting photocatalytic materials

Céramiques techniques — Méthode d'essai pour l'activité algicide des matériaux photocatalytiques semi-conducteurs

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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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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information.

The committee responsible for this document is ISO/TC 206, *Fine ceramics*.

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Introduction

Under ultraviolet (UV) light illumination, photocatalysts have diverse functions, such as prevention of fouling, antifogging effects, antibacterial effects, deodorization, and decomposition of air and water contaminants, and their applications have grown in recent years. Since products utilizing these photocatalytic functions are commercialized in large quantities, a method to evaluate and determine photocatalytic effects is required. This International Standard is intended to provide a method for objective evaluation of activity in controlling algae, which are a primary producer of microbial contamination (in the form of environmental biofilms) of outdoor structures, under illumination with ultraviolet light to simulate the outdoor environment and to contribute, via control of algae, to conservation of urban landscapes, prevention of member corrosion, and prevention of fouling of water tank window materials.

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Fine ceramics (advanced ceramics, advanced technical ceramics) — Test method for antialgal activity of semiconducting photocatalytic materials

1 Scope

This International Standard specifies a test method for evaluating anti-algal activities in outdoor structures, specifically flat photocatalytic materials (for example, window panes and water tank glasses, films, guardrails, etc.) under irradiation of ultraviolet light. It does not include powder, granular or porous photocatalytic materials.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 27447, *Fine ceramics (advanced ceramics, advanced technical ceramics) — Test method for antibacterial activity of semiconducting photocatalytic materials*

3 Terms and definitions

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

3.1
photocatalyst
substance with many functions based on oxidization and reduction reactions under *photoirradiation* (3.3), including decomposition and removal of contaminants, deodorization, antibacterial actions, and prevention of fouling

3.2
photocatalytic materials
materials in which or on which the *photocatalyst* (3.1) is added by coating, impregnation, mixing, etc.

Note 1 to entry: Photocatalytic materials are to be used for building and road construction materials to obtain the above-mentioned functions.

3.3
photoirradiation
irradiation of UV light at wavelength 300 nm to 380 nm

3.4
antialgal activity
activity in suppressing growth of algae over a material surface

3.5
photocatalytic antialgal treatment
support of a *photocatalyst* (3.1) by means of various methods, including coating, impregnation, blending, and others, for utilization of the antialgal activity of a photocatalyst

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3.6
photocatalytic antialgal activity based on three-point absorbance spectrum method
photocatalytic *antialgal activity* (3.4) derived from the ratio of the absorbance of material treated with *photocatalyst* (3.1) after *photoirradiation* (3.3) of UV light to that of non-treated material after photoirradiation

4 Algae used in the test

The type of algae to be used in the test with photocatalytic-treated antialgal materials shall be *Chlorella vulgaris* (NIES-227). The strain of algae to be used in the test shall be the same strain stored in agencies affiliated with the World Federation for Culture Collections or the Japan Society for Culture Collection.

5 Preparation for the test

5.1 Conditions for handling of algae

The test shall be performed in a laboratory with equipment needed to prevent mixing with other microorganisms.

5.2 Chemicals, materials, and apparatus

Unless otherwise specified, the chemicals, materials, and apparatus to be used in the test shall be as follows. Test tubes, flasks, pipettes, tweezers, etc. shall be carefully cleaned with alkaline or neutral detergent, rinsed thoroughly with water, dried, and sterilized by hot air or high-pressure steam before use.

5.2.1 Purified water, the water used for the preparation of all solutions and culture media and for all determinations shall be distilled or deionized and shall have a conductivity of <1 µS/cm.

5.2.2 Ethanol for disinfection, solution whose ethanol concentration has been adjusted to 77 % to 82 % in volume fraction by means of purified water.

5.2.3 Autoclave, capable of maintaining the temperature at 121 °C ± 1 °C (equivalent to a pressure of 103 kPa).

5.2.4 Dry sterilizer, capable of maintaining the temperature at 160 °C to 180 °C.

5.2.5 Spectrophotometer, capable of measurement within the wavelength range of 400 nm to 800 nm.

5.2.6 Refrigerator, capable of maintaining the temperature at 4 °C ± 1 °C.

5.2.7 Platinum loop, with an end loop of approximately 4 mm.

5.2.8 Glass plate, made from material not affecting the growth of microorganisms.

5.2.9 Cotton plug, plug of non-degreased cotton, or silicon plug, metal plug, or molten plug.

5.2.10 Test tube mixer, for microorganism test.

5.2.11 Contact film, film of material not affecting the growth of microorganisms, which is free of water-absorbing properties and features satisfactory adherence, and in which transmittance in the range of 340 nm to 380 nm, as measured according to the method specified in ISO 27447, accounts for 85 % or more.

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