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

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In the event of any doubts arising as to the contents,
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Foreword

This Japanese Industrial Standard has been established by the Minister of Economy, Trade and Industry, through deliberations at the Japanese Industrial Standards Committee in accordance with the Industrial Standardization Act.

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

Introduction

This Japanese Industrial Standard has been prepared based on **ISO 19635** : 2016, Edition 1, with some modifications of the technical contents.

In this Standard, clause and subclause numbers followed by a capital letter of Latin alphabet starting with “A” indicate that the clause or subclause includes items not given in the corresponding International Standard. The vertical lines on both sides and dotted underlines indicate changes from the corresponding International Standard. A list of modifications with the explanations is given in Annex JA.

1 Scope

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

WARNING Persons carrying out tests based on this Standard should acquire microbiological techniques.

NOTE The International Standard corresponding to this Standard and the symbol of degree of correspondence are as follows.

ISO 19635 : 2016 *Fine ceramics (advanced ceramics, advanced technical ceramics) — Test method for antialgal activity of semiconducting photocatalytic materials* (MOD)

In addition, symbols which denote the degree of correspondence in the contents between the relevant International Standard and **JIS** are IDT (identical), MOD (modified), and NEQ (not equivalent) according to **ISO/IEC Guide 21-1**.

2 Normative references

Part or all of the provisions of the following standards, through reference in this text, constitute provisions of this Standard. The most recent editions of the standards (including amendments) indicated below shall be applied.

JIS C 1609-1 *Illuminance meters Part 1 : General measuring instruments*

JIS K 0557 *Water used for industrial water and wastewater analysis*

JIS K 0950 *Sterilized plastic petri dishes*

JIS K 8101	<i>Ethanol (99.5) (Reagent)</i>
JIS K 8180	<i>Hydrochloric acid (Reagent)</i>
JIS K 8263	<i>Agar (Reagent)</i>
JIS K 9009	<i>Sodium dihydrogenphosphate dihydrate (Reagent)</i>
JIS K 9019	<i>Disodium hydrogenphosphate dodecahydrate (Reagent)</i>
JIS P 3801	<i>Filter paper (for chemical analysis)</i>
JIS R 1600	<i>Glossary of terms relating to fine ceramics</i>
JIS R 1702	<i>Fine ceramics (advanced ceramics, advanced technical ceramics) — Test method for antibacterial activity of photocatalytic materials and efficacy</i>
NOTE	Normative reference in the corresponding International Standard : ISO 27447 <i>Fine ceramics (advanced ceramics, advanced technical ceramics) — Test method for antibacterial activity of semiconducting photocatalytic materials</i>
JIS R 1709	<i>Fine ceramics (advanced ceramics, advanced technical ceramics) — Light source for test of photocatalytic materials used under ultraviolet</i>
JIS R 3644	<i>Glass tubes</i>
JIS R 3645	<i>Glass rods</i>
JIS S 3016	<i>Tooth brushes</i>
JIS Z 2801	<i>Antibacterial products — Test for antibacterial activity and efficacy</i>
JIS Z 8802	<i>Methods for determination of pH of aqueous solutions</i>

3 Terms and definitions

For the purpose of this Standard, the following terms and definitions, and those given in **JIS R 1702** and **JIS R 1600** apply.

3.1

photocatalyst

substance with many functions based on oxidization and reduction reactions under photoirradiation, including decomposition and removal of contaminants, air purification, antibacterial actions, antifungal actions, antiviral actions, antialgal activity, selfcleaning and antifogging

3.2

photocatalytic materials

building and road construction materials or other materials on which the photocatalyst is added by coating, impregnation, kneading or various film-forming methods, for utilization of the various functions of the photocatalyst

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 by means of coating, impregnation, kneading or various film-forming methods, for utilization of the antialgal activity of a photocatalyst

3.6

photocatalytic antialgal activity based on three-point absorbance spectrum method

photocatalytic antialgal activity derived from the ratio of the absorbance of material treated with photocatalyst after photoirradiation of UV light to that of non-treated material after photoirradiation

3.6A

photocatalytic antialgal activity with photoirradiation based on three-point absorbance spectrum method

photocatalytic antialgal activity derived from the ratio of the absorbance of material treated with photocatalyst after photoirradiation of UV light to that of material treated with photocatalyst after storage in the dark

3A Symbols and units

For the purpose of this Standard, the following symbols and units apply.

- W_{base692} : absorbance at wavelength 692 nm at the baseline connecting absorbance at wavelengths 660 nm and 750 nm
- W_{660} : absorbance at a wavelength of 660 nm
- W_{750} : absorbance at a wavelength of 750 nm
- W_{692} : absorbance at a wavelength of 692 nm
- W_{peak} : absorbance after baseline correction at a wavelength of 692 nm
- $W_{\text{p,l,mean}}$: mean value of W_{peak} of three photocatalytic-treated antialgal test pieces after photoirradiation for a given time
- $W_{\text{p,d,mean}}$: mean value of W_{peak} of three photocatalytic-treated antialgal test pieces after storage in the dark for a given time
- $W_{\text{n,l,mean}}$: mean value of W_{peak} of three non-treated test pieces after photoirradiation for a given time
- $W_{\text{g,0h,peak}}$: W_{peak} of glass plate test piece immediately after inoculation with test solu-

tion

- $W_{g,l,peak}$: W_{peak} of glass plate test piece after photoirradiation for a given time
- $W_{g,0h,max}$: maximum value of W_{peak} of three glass plate test pieces immediately after inoculation with test solution
- $W_{g,0h,min}$: minimum value of W_{peak} of three glass plate test pieces immediately after inoculation with test solution
- $W_{g,0h,mean}$: mean value of W_{peak} of three glass plate test pieces immediately after inoculation with test solution
- R_s : photocatalytic antialgal activity based on three-point absorbance spectrum method (%)
- ΔR : photocatalytic antialgal activity with photoirradiation based on three-point absorbance spectrum method (%)

3B Measuring principle

This is a method for obtaining antialgal activities of photocatalytic materials due to the contact between algae and test piece under irradiation of UV light. This test method is suitable for the development, performance comparison, quality control, characterisation, reliability and design data acquisition of photocatalytic materials.

By inoculating the surface of photocatalytic materials with cultured algae and irradiating them with UV light for a certain period of time, the algae are damaged by the oxidative decomposition of the photocatalyst, which causes the Chlorophyll in the algae to decompose, thus discolouring the algae. Discoloured algae inoculum is collected from the surface of photocatalytic materials, and the absorbance at wavelengths derived from Chlorophyll is determined and compared with the absorbance in the absence of oxidative decomposition of the photocatalyst.

4 Algae used in the test

(Clause 4 of the corresponding International Standard is moved to 5.1.)

5 Preparation for the test

5.1 Algae used in the test

The type of algae to be used in the test shall be *Chlorella vulgaris*. 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 Microbial Resources and Systematics (see Table 1).

The test shall be performed in a laboratory with equipment necessary to prevent mixing with other microorganisms and to attain the level of biosafety of algae handled. For hazard levels and the equipment required to comply with them, for example, the National Institute of Infectious Diseases, Safety Management Regulations for Pathogens and Toxins should be referred to.