



BSI Standards Publication

Fine ceramics (advanced ceramics, advanced technical ceramics) — Qualitative and semiquantitative assessment of the photocatalytic activities of surfaces by the reduction of resazurin in a deposited ink film

National foreword

This British Standard is the UK implementation of [ISO 21066:2018](#).

The UK participation in its preparation was entrusted to Technical Committee RPI/13, Advanced technical ceramics.

A list of organizations represented on this committee can be obtained on request to its secretary.

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Fine ceramics (advanced ceramics, advanced technical ceramics) — Qualitative and semiquantitative assessment of the photocatalytic activities of surfaces by the reduction of resazurin in a deposited ink film

Céramiques techniques (céramiques avancées, céramiques techniques avancées) — Évaluation qualitative et semi-quantitative de l'activité photocatalytique des surfaces par réduction de résazurine dans un film d'encre déposé



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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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This document was prepared by Technical Committee ISO/TC 206, *Fine ceramics*.

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.

Fine ceramics (advanced ceramics, advanced technical ceramics) — Qualitative and semiquantitative assessment of the photocatalytic activities of surfaces by the reduction of resazurin in a deposited ink film

1 Scope

This document specifies a method, the Resazurin (Rz) ink test, for the qualitative assessment of the activity of a photocatalytic surface, and its classification as below, within, or above the applicable range of the test. The method then allows for the subsequent semiquantitative evaluation of the activities of photocatalytic surfaces that are within the applicable range of the test. In all cases, artificial ultraviolet (UV) radiation is used.

The test method specified is appropriate for use with all flat, smooth, photocatalytic surfaces, which are not macroporous, examples of which include: commercial photocatalytic glass, paint, tiles and awning materials. The method is not applicable to assessing the visible-light activity of photocatalytic surfaces, nor their ability to effect: air purification, water purification, self-cleaning or disinfection, although some relevant correlations have been reported[4][5].

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 10677](#), *Fine ceramics (advanced ceramics, advanced technical ceramics) — Ultraviolet light source for testing semiconducting photocatalytic materials*

3 Terms and definitions

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

photocatalyst

substance that performs one or more functions based on coupled oxidation and reduction reactions under photo-irradiation, including decomposition and removal of air and water contaminants, deodorization, and antibacterial, self-cleaning and antifogging actions

[SOURCE: ISO 22197-1:2016, 3.1, modified — The definition has been slightly rephrased.]

3.2

photocatalytic material

material in which, or on which, a *photocatalyst* (3.1) is added by coating, impregnation, mixing, etc.

[SOURCE: ISO 20507:2014, 2.1.60, modified — Note 1 to entry removed.]

3.3

macroporous surface

surface having sufficient cavities, typically larger than 75 µm, so that *Rz ink* (3.5) drains from it by gravity and is not held by capillary action

EXAMPLE Some concrete samples and most woven fabrics.

3.4

smooth surface

surface that can be uniformly coated with *Rz ink* (3.5) using a close wound standard *K-bar* (3.6), number 3, which delivers a wet film thickness of 24 µm

3.5

Rz ink

resazurin-based ink used to assess the activity of a photocatalytic surface

3.6

K-bar

steel rod, close wound with wire of a defined gauge so as to deliver a wet ink film of a desired thickness, as commonly used in the print industry

4 List of symbols, abbreviations and units

Designation	Symbol or abbreviation	Unit
Irradiation time	t	s
Irradiation end time	t_{end}	s
Average irradiation end time	$t_{\text{end,av}}$	s
Colour monitoring sampling time period	Δt $\Delta t = 0,1 \times t_{\text{end,av}}$	s
The absorbance due to <i>Rz</i> in aqueous solution alone, at 603 nm which is equal to absorbance of <i>Rz</i> solution – absorbance of water	ΔAbs	—
Average red RGB component of ink surface at t	$RGB(R)_t$	—
Average green RGB component of ink surface at t	$RGB(G)_t$	—
Average blue RGB component of ink surface at t	$RGB(B)_t$	—
Normalized $RGB(R)_t$ value	R_t $R_t = RGB(R)_t / [RGB(R)_t + RGB(G)_t + RGB(B)_t]$	—
Maximum value of R_t during irradiation	$R_{t,\text{max}}$	—
Minimum value of R_t during irradiation	$R_{t,\text{min}}$	—
Overall relevant change in R_t	$\Delta R_{t,\text{tot}}$ $\Delta R_{t,\text{tot}} = R_{t,\text{max}} - R_{t,\text{min}}$	—
Value of R_t when 90 % of the maximum change in R_t has occurred	$R_t(90)$ $R_t(90) = 0,9 \Delta R_{t,\text{tot}} + R_{t,\text{min}}$	—
Time taken for $R_t = R_t(90)$	$t_{tb}(90)$	s
Median of the eight $t_{tb}(90)$ values	$median[t_{tb}(90)]$	s
Median absolute deviation[6] which is equal to the median of the eight $ t_{tb}(90) - median[t_{tb}(90)] $ values	MAD	s
Modified standard score (for each sample)[6]	Z_{mod} $Z_{\text{mod}} = 0,675 \cdot 4 \{t_{tb}(90) - median[t_{tb}(90)]\} / MAD$	—