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BSI Standards Publication

Photocatalysis — Irradiation conditions for testing photocatalytic properties of semiconducting materials and the measurement of these conditions

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English Version

Photocatalysis - Irradiation conditions for testing photocatalytic properties of semiconducting materials and the measurement of these conditions

Photocatalyse - Détermination des conditions d'irradiation pour tester les propriétés photocatalytiques de matériaux semi-conducteurs

Photokatalyse - Bestrahlungsbedingungen zum Prüfen photokatalytischer Eigenschaften von halbleitenden Werkstoffen und die Messung dieser Bedingungen

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Contents

Page

Foreword

This document (CEN/TS 16599:2014) has been prepared by Technical Committee CEN/TC 386 “Photocatalysis”, the secretariat of which is held by AFNOR.

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Introduction

Photocatalysis is a very efficient advanced oxidation technique which enables the production of hydroxyl radicals (·OH) or perhydroxyl radicals (·OOH), capable of partly or completely mineralising/oxidising the majority of organic compounds. Its principle is based on the simultaneous actions of photons and of a catalytic layer which allows degradation of molecules. The most commonly used photocatalyst is titanium dioxide (TiO_2), the latter being thermodynamically stable, non-toxic and economical. It can be used in powder form or deposited on a substrate (glass fibre, fabrics, plates/sheets, etc.). The objective is to introduce performance standards for photo-induced effects (including photocatalysis). These standards will mainly concern test and analysis methods.

1 Scope

This Technical Specification prescribes the conditions for irradiating photocatalytic surfaces in order to perform photocatalytic efficiency tests. In addition, the measurement and documentation of these irradiation conditions with respect to the spectral distribution, irradiance and homogeneity are given.

2 Symbols and abbreviations

APD	avalanche photodiode
A (λ)	decadic absorbance
CA	chemical actinometry
E	irradiance
FWHM	full width at half maximum
h_{d}	height difference
h_{max}	maximum height difference
h_{s}	measurement plane
LED	light emitting diode
PC-A	photocatalytic amber
PC-B	photocatalytic blue
PC-C	photocatalytic cyan
PC-G	photocatalytic green
PC-R	photocatalytic red
PC-U	photocatalytic ultraviolet
PC-UC	photocatalytic ultraviolet C
PC-V	photocatalytic violet
QP_{abs} (λ)	total amount of absorbed photons
$q_{\mathrm{p}}{}^{\circ}$ (λ)	incident photon flux
λ	wavelength
φ (λ)	quantum yield

In Annex A, further examples concerning literature, terms and definitions, quantities and figures are listed for information.

3 Specification of spectral areas and irradiance values

As shown in Table 1, different spectral areas in combination with the specified irradiance should be used for irradiation during photocatalytical analysis. The test procedures themselves are described in their according standards, e.g. ISO 22197-1 [6] for the abatement of nitrogen monoxide.