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Photocatalysis - Glossary of terms

Táto norma obsahuje anglickú verziu európskej normy.
This standard includes the English version of the European Standard.

Táto norma bola oznámená vo Vestníku ÚNMS SR č. 12/21

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Supersedes CEN/TS 16981:2016

English Version

Photocatalysis - Glossary of terms

Photocatalyse - Glossaire de termes

Photokatalyse - Glossar der Begriffe

This European Standard was approved by CEN on 18 July 2021.

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This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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European foreword

This document (EN 16981:2021) has been prepared by Technical Committee CEN/TC 386 “Photocatalysis”, under WG 1 “Terminology”, the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by April 2022, and conflicting national standards shall be withdrawn at the latest by April 2022.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes CEN/TS 16981:2016.

In comparison with the previous edition, the following technical modifications have been made:

— Change of the Scope: “The glossary lists a consistent set of definitions to be used in standards on photocatalysis for their consistency and connection with the scientific literature”.

— Change to Clause 2: Paragraphs were updated:

“Normative references and notes

There are no normative references in this document.

Most of the definitions reported in this document are a sub-set of the IUPAC definitions in *photocatalysis* and *radiocatalysis* [1]. Some other definitions, in particular for the *photocatalytic rate* and reactors, are taken from a dedicated work [2].

The technical specifications for the apparatus and physical values for irradiation conditions to be used in the standards are reported in a separate Technical Specification [3].

For the magnitudes implying energy or photons incident on a surface from all directions, the set of symbols recommended by the International Organization for Standardization (ISO) [4] and included in the IUPAC “Green Book”, and by the International Commission on Illumination [5] are adopted. This has been done primarily to comply with internationally agreed-upon symbols.”

— Clause 3: introductory wording and definitions were updated:

“ISO and IEC maintain a generic terminological databases for use in standardization, which could complement this dedicated Glossary, at the following addresses:

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

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

The arrangement of entries is alphabetical, and the criterion adopted by the IUPAC has been followed for the typeface used: italicized words in a definition or following it indicate a cross-reference in the Glossary.

SI units are adopted, with some exceptions, prominently in the use of the molar decadic absorption coefficient, ϵ , with common units $\text{dm}^3 \text{mol}^{-1} \text{cm}^{-1}$ and a mole of photons denoted as an einstein. As recently the definition of the SI units was established in terms of a set of seven defining constants, including the Avogadro number, the mole (symbol: mol) is the base unit of amount (number) of substance.

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Functional dependence of a physical quantity f on a variable x is indicated by placing the variable in parentheses following the symbol for the function; e.g. $\varepsilon(\lambda)$. Differentiation of a physical quantity f with respect to a variable x is indicated by a subscript x ; e.g. the typical spectral radiant power quantity $P_\lambda = dP/d\lambda$. The natural logarithm is indicated with \ln , and the logarithm to base 10 with \log ."

The following definitions were deleted:

- amalgam lamp (before 3.17),
- back electron-transfer (before 3.20)
- bioluminescence (before 3.25),
- charge-transfer (CT) absorption (before 3.35),
- charge-transfer (CT) complex (before 3.36),
- charge-transfer (CT) state (before 3.37),
- circular dichroism (CD) (before 3.43)
- charge hopping (before 3.31),
- circular dichroism (CD) (before 3.43),
- current yield see photocurrent yield (before 3.49),
- dielectric (before 3.59),
- differential quantum (before 3.60),
- diode light emitting (LED) (before 3.61),
- driving force (before 3.63),
- driving force (for electron transfer) (before 3.64),
- electron-transfer photosensitization (before 3.69),
- emissivity see emittance (before 3.73),
- excitation transfer see energy transfer (before 3.77),
- flash photolysis (before 3.85),
- FWHM (before 3.95),
- germicidal lamp (before 3.97),
- hypsochromic shift (before 3.103),
- inner-filter effect (before 3.106),
- inner-sphere electron transfer (before 3.107),
- interferometer (before 3.113),
- Lambert–Beer law (before 3.116),
- Lambert law (before 3.117),
- LED (before 3.119),
- light-emitting diode (LED) (before 3.121),
- low-pressure mercury lamp (arc) (before 3.123),
- medium-pressure mercury lamp (arc) (before 3.127),
- mercury–xenon lamp (arc) (before 3.129),

- multiphoton process(before 3.132),
- OLED (before 3.135),
- OPA (before 3.137),
- OPO (before 3.138),
- optical multichannel analyzer (OMA) (before 3.140),
- optical parametric amplification process (before 3.141),
- optical parametric oscillator (OPO) (before 3.142),
- optoacoustic spectroscopy(before 3.143),
- photo-assisted catalysis(before 3.148),
- photohydration(before 3.166),
- photon emittance(before 3.174),
- photopolymerization(before 3.185),
- quartz-iodine lamp(before 3.194),
- radiant energy fluence rate(before 3.201),
- reactor CSTR(before 3.210),
- reflection factor (before 3.214),
- reflectivity(before 3.215),
- self-absorption (before 3.219),
- self-quenching (before 3.220),
- sensitizer (before 3.221),
- sensitization (before 3.222),
- singlet oxygen (before 3.223),
- singlet state(before 3.224),
- solvent shift(before 3.226),
- spectral radiant energy, Q_λ (before 3.238),
- spectral sensitization(before 3.244),
- tungsten-halogen lamp(before 3.248),
- wolfram lamp(before 3.259),

The following definitions were updated:

- 3.11 actinic.
- 3.12 actinism.
- 3.18 attenuance filter
- 3.28 Brewster angle
- 3.64 extinction coefficient
- 3.65 Fermi level
- 3.71 fluorescence spectrum

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- 3.92 Fourier-transform spectrometer
- 3.93 Fourier-transform spectroscopy
- 3.95 mercury lamp
- 3.100 organic light-emitting device
- 3.102 phosphorescence
- 3.103 photoacoustic spectroscopy
- 3.113 photocuring
- 3.116 photodynamic effect
- 3.140 photoreaction
- 3.142 photosensitization
- 3.143 photosensitizer
- 3.145 quantum efficiency
- 3.152 radiant energy fluence
- 3.158 rate of photon absorption
- 3.159 reaction rate
- 3.160 reactor batch
- 3.163 red shift
- 3.165 RGB color model
- 3.191 UV dose

The following definitions were added:

- 3.137 photonic unit conversion
- 3.161 reactor continuous Stirred-Tank
- 3.162 reactor plug flow

Any feedback and questions on this document should be directed to the users' national standards body. A complete listing of these bodies can be found on the CEN website.

According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

Photocatalysis is a very efficient advanced oxidation technique which enables the production of active species following light absorption by the photocatalyst, such as bound/free hydroxyl radicals ($\cdot\text{OH}$), hydroperoxyl radicals ($\cdot\text{OOH}$) and other ROS, conduction band electrons and valence band holes, capable of partly or completely mineralising/oxidising the majority of organic compounds. The most commonly used photocatalyst is titanium dioxide (TiO_2). Photocatalysts can be used in powder form or deposited as thin films on different substrates (glass fibre, fabrics, plates/sheets, etc.). The objective of standardization is to introduce test standards for evaluation of the performance of photocatalysts (including photocatalysis and photo-induced effects). These standards mainly concern tests and analysis methods, and require a common language.

A common language for standards, disclosed to a wide audience and referring only to the operational protocols and to their outcomes, is needed for a consistent set of standards and the connection with the scientific literature. This glossary will take into account existing glossary of terms and literature definitions used in *photocatalysis* and *photochemistry*. Because in *photocatalysis* numerous properties are difficult to be evaluated, in this Glossary and in related standard norms the report of properties depending on some physical-chemical properties and model parameters, like the number of active sites, the mechanisms of adsorption or kinetic mechanisms of photocatalytic reactions is avoided.

Safety statement

Persons using this document should be familiar with the normal laboratory practice, if applicable. This document does not address safety problems, if any, associated with its use. It is the responsibility of the user to establish appropriate safety and health practices and to ensure compliance with any regulatory conditions.

Environmental statement

It is understood that some of the material described in this document may have negative environmental impact. As technological advantages lead to better alternatives for these materials, they will be eliminated from this document to the possible extent.

At the end of the test, the user of this document will take care to carry out an appropriate disposal of the wastes, according to local regulation.

EN 16981:2021 (E)**1 Scope**

The glossary lists a consistent set of definitions to be used in standards on photocatalysis for their consistency and connection with the scientific literature.

2 Normative references and notes

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