

STN	Fotokatalýza. Slovník.	STN P CEN/TS 16981 03 9001
------------	-------------------------------	--

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. 04/17

Táto predbežná STN je určená na overenie. Pripomienky zasielajte ÚNMS SR najneskôr do 30. 11. 2018.

Obsahuje: CEN/TS 16981:2016

124616

Úrad pre normalizáciu, metrológiu a skúšobníctvo Slovenskej republiky, 2017
Podľa zákona č. 264/1999 Z. z. o technických požiadavkách na výrobky a o posudzovaní zhody a o zmene a doplnení niektorých zákonov v znení neskorších predpisov sa slovenská technická norma a časti slovenskej technickej normy môžu rozmnožovať alebo rozširovať len so súhlasom slovenského národného normalizačného orgánu.

ICS 01.040.25; 25.220.20

English Version

Photocatalysis - Glossary of terms

Photokatalyse - Glossar der Begriffe

This Technical Specification (CEN/TS) was approved by CEN on 15 August 2016 for provisional application.

The period of validity of this CEN/TS is limited initially to three years. After two years the members of CEN will be requested to submit their comments, particularly on the question whether the CEN/TS can be converted into a European Standard.

CEN members are required to announce the existence of this CEN/TS in the same way as for an EN and to make the CEN/TS available promptly at national level in an appropriate form. It is permissible to keep conflicting national standards in force (in parallel to the CEN/TS) until the final decision about the possible conversion of the CEN/TS into an EN is reached.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.



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

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

Contents		Page
European foreword		3
Introduction		4
1	Scope	5
2	Generalities	5
2.1	Note on units	5
2.2	Note on symbols	5
2.3	Note on the relationship between spectral, radiometric, and photonic quantities	5
3	Terms and definitions	6
Bibliography		53

European foreword

This document (CEN/TS 16981:2016) has been prepared by Technical Committee CEN/TC 386 "Photocatalyse", the secretariat of which is held by AFNOR.

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

According to the CEN/CENELEC Internal Regulations, the national standards organisations of the following countries are bound to announce this Technical Specification: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, 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 ($\cdot\text{OH}$), perhydroxyl radicals ($\cdot\text{OOH}$), 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), 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.

Safety statement

Persons using this document should be familiar with the normal laboratory practice, if applicable. This document cannot address all of the 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 permitted in this Technical Specification may have negative environmental impact. As technological advantages lead to better alternatives for these materials, they will be eliminated from this Technical Specification to the extent possible.

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

1 Scope

A common language for standards, disclosed to a wide audience and referring only to the operational protocols and to their outcomes, is needed both for a consistent set of standards and the connection with the scientific literature. This glossary will take into account existing glossary of terms used in *photocatalysis* and *photochemistry*. Because in *photocatalysis* numerous properties are difficult to be evaluated, it is strongly recommended in standard norms to avoid reporting properties depending on number of active sites, the mechanisms of adsorption or kinetic mechanisms of photocatalytic reactions. For the same reason instead of the *quantum yield* and related quantities it is easier to report the *photonic efficiency*.

Most of the definitions reported in this Technical Specification 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 use and many technical specifications on the physical values suggested for irradiation conditions in the standards are reported in a separate Technical Specification [3].

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.

2 Generalities

2.1 Note on units

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*. Note that “amount concentration” is the preferred term for what has been known as “molar concentration”, and is complementary to the terms “mass concentration” and “number concentration”.

2.2 Note on symbols

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 .

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, i.e., H_o or F_o for *fluence*, E_o for *fluence rate*, $H_{p,o}$ or $F_{p,o}$ for *photon fluence*, and $E_{p,o}$ for *photon fluence rate*, note the letter o as subscript. This has been done primarily to comply with internationally agreed-upon symbols. It is important, however, to avoid confusion with the terms used to designate an amount of energy (or photons) prior to *absorption*. In these cases, the superscript 0 (zero) is used.

2.3 Note on the relationship between spectral, radiometric, and photonic quantities

When a quantity expressed in photonic units (G_p) covers a *wavelength* range (polychromatic irradiation between λ_1 and λ_2), then G_p is the integral between λ_1 and λ_2 of the corresponding spectral photonic quantity, $G_p(\lambda)$:

$$G_p = \int_{\lambda_1}^{\lambda_2} G_p(\lambda) d\lambda \text{ (e.g., spectral photon flux).}$$

Since a spectral radiometric or energetic quantity at a given *wavelength* λ ($G_{e,\lambda}$, e.g., *spectral radiant power*, $P_{\lambda/W}$ nm⁻¹), is related to the corresponding photonic quantity at the same *wavelength* ($G_{p,\lambda}$, e.g., *spectral photon flux* / s⁻¹ nm⁻¹) by the relation:

$$G_{e,\lambda} = E(\lambda) G_{p,\lambda}$$

with

$$E(\lambda) = h c / \lambda, \text{ the energy of a photon of wavelength } \lambda.$$

The relation between photonic (G_p) and corresponding radiometric (or energetic, G_e) quantity is given by:

$$G_e = h c \int_{\lambda_1}^{\lambda_2} G_p(\lambda) 1/\lambda d\lambda$$

or, more useful in practice:

$$G_p = (1/h c) \int_{\lambda_1}^{\lambda_2} G_e(\lambda) \lambda d\lambda$$

Therefore, for example, to calculate a *photon flux* over a *wavelength* interval, the *spectral distribution* of the *radiant power* is necessary. Note that in the Glossary no sub-index e has been used for the radiometric quantities. Radiometric quantities (G_e , as above, *radiant power* and others) are needed because *lamp* providers usually give the *spectral distribution* of the *lamps* in these units, and not in photonic units (G_p , *photon flux* and other photonic quantities) and because of quantification of radiation using, e.g., radiometers.

koniec náhľadu – text ďalej pokračuje v platenej verzii STN