International Standard

ISO 10820

Fine ceramics (advanced ceramics, advanced technical ceramics) — Ultraviolet irradiation equipment using UV-A LEDs and optical radiometry for performance test of semiconducting photocatalytic materials

First edition
2025-09

Reference number
ISO 10820:2025(en)

© ISO 2025



COPYRIGHT PROTECTED DOCUMENT

© ISO 2025

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

Foreword ... **iv**
Introduction ... **v**
1 Scope ... **1**
2 Normative references ... **1**
3 Terms and definitions ... **1**
4 Irradiation equipment ... **3**
4.1 UV-LED Chip properties ... 3
4.2 UV-LED irradiation equipment ... 4
4.3 UV-LED Chip replacement ... 4
5 UV radiometers and spectroradiometers ... **4**
5.1 General ... 4
5.2 UV radiometers ... 4
5.3 Spectroradiometers ... 4
6 Report of irradiation equipment in each application standard ... **5**
Annex A (informative) **Irradiation equipment having multiple UV-LED chips** ... **6**
Bibliography ... **11**

© ISO 2025 – All rights reserved

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 document 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).

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at www.iso.org/patents. ISO shall not be held responsible for identifying any or all such patent rights.

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

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.

© ISO 2025 – All rights reserved

Introduction

Photocatalytic materials are useful in the treatment of harmful environmental pollutants and microorganisms. The market has been expanding significantly over the past 20 years, with the development of test methods for various functions of photocatalyst, including ISO 27447[1]. Light irradiation equipment is indispensable for testing photocatalytic materials, and ISO 10677[2] is widely used as a common UV light source standard in various ISO performance test methods.

In recent years, LEDs that are highly efficient and do not use harmful substances such as mercury have been rapidly developed even in the UV range, and conventional fluorescent lighting will be more difficult to provision in the future. Since the characteristics of LEDs are significantly different from those of conventional UV light sources, this document has been developed so that UV-LEDs can be used for performance testing of various photocatalytic materials. UV-LEDs with a peak wavelength of 365 nm are chosen because they are commonly available and good for photoexcitation of most of semiconductor photocatalysts.

Currently, no other ISO standard exists that uses UV-LED as the test light source for photocatalytic materials. ISO 10677[2] will continue to be maintained for the time being for conventional light source users.

© ISO 2025 – All rights reserved

Fine ceramics (advanced ceramics, advanced technical ceramics) — Ultraviolet irradiation equipment using UV-A LEDs and optical radiometry for performance test of semiconducting photocatalytic materials

1 Scope

This document specifies the irradiation equipment using ultraviolet light emitting diode (UV-LED) and optical radiometry for testing the performance of semiconducting photocatalytic materials. The UV-LED irradiation equipment specified in this document uses UV-LEDs having a peak wavelength of 365 nm in the UV-A range and applies for a semiconductor photocatalyst exhibiting a photocatalytic function at this wavelength.

This document applies only to irradiation equipment using UV-LED. ISO 10677[2] is applicable for equipment using conventional UV light sources such as fluorescent lamps.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

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

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

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

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

3.1
bandwidth
$\Delta\lambda$
measure of the width of a bandpass function defined by:

$$\Delta\lambda = \frac{\int b(\lambda - \lambda_0)\,\mathrm{d}\lambda}{b(\lambda_0)}$$

where

$b(\lambda - \lambda_0)$ is the bandpass function about the central wavelength, λ_0;
$b(\lambda_0)$ is the bandpass function at the central wavelength, λ_0.

Note 1 to entry: In geometric terms, the bandwidth is the width of a rectangle with the same area as the bandpass function and height the same as the bandpass function at the nominal centre wavelength, λ_0.

Note 2 to entry: For a triangular or trapezoid bandpass, the bandwidth is equal to the full width at half maximum (FWHM).

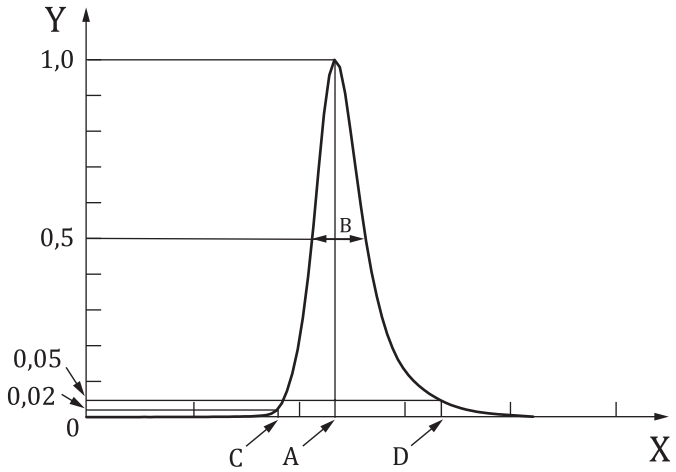
[SOURCE: CIE 233:2019, 3.3[5]]

© ISO 2025 – All rights reserved

3.2
cut-off wavelength
wavelength for which spectral distribution of UV-LED is 5 %

Note 1 to entry: See Figure 1, Key D.

[SOURCE: CEN/TS 16599:2014, 3[8]]



Key

X	wavelength, nm
Y	relative spectral irradiance
A	maximum wavelength, nm
B	full-width at half maximum (FWHM), nm
C	cut-on wavelength, nm
D	cut-off wavelength, nm

Figure 1 — Definitions of spectral characteristics of UV-LEDs

3.3
cut-on wavelength
wavelength for which spectral distribution of UV-LED is 2 %

Note 1 to entry: See Figure 1, Key C.

[SOURCE: CEN TS 16599:2014, 3[8]]

3.4
directional response index (cosine response index) for irradiance
f_2
index describing the responsivity of the photometer to light incident at an angle other than normal (the cosine law for general purpose illuminance meters)

[SOURCE: ISO/CIE 19476:2014, 3.2.5[3]]

3.5
full-width at half maximum
FWHM
wavelength difference between the half-maximum points of the bandpass

Note 1 to entry: See Figure 1, Key B.

[SOURCE: CIE 233:2019, 3.4[5]]

© ISO 2025 – All rights reserved

3.6
irradiation equipment
equipment for irradiation having a light source or multiple light sources

3.7
photocatalyst
substance that performs one or more catalytic functions based on oxidation or reduction reactions under photoirradiation

Note 1 to entry: The functions include decomposition and removal of air and water contaminants, deodorization, antibacterial, self-cleaning, and antifogging actions. A photocatalyst can also be used for light energy conversion.

3.8
spectral responsivity
$s(\lambda)$
quotient of the detector output, $dY(\lambda)$, by the monochromatic detector input, $dX_e(\lambda)=X_{e,\lambda}(\lambda)d\lambda$, in the wavelength interval, $d\lambda$, as a function of wavelength, λ

$$s(\lambda)=\frac{dY(\lambda)}{dX_e(\lambda)}$$

Note 1 to entry: This entry was numbered 845-05-56 in IEC 60050-845:2020[4].

[SOURCE: IEC 60050-845:2020, 845-25-063[4]]

3.9
spectroradiometer
instrument for measuring radiometric quantities in narrow wavelength intervals over a given spectral region

[SOURCE: IEC 60050-845:2020, 845-25-007[4]]

3.10
ultraviolet light emitting diode
UV-LED
solid state device embodying a p-n junction, emitting incoherent ultraviolet radiation when excited by an electric current

3.11
UV radiometer
instrument for measuring the total (spectrally-weighted and integrated) radiation, either irradiance or dose (radiant exposure, time-integrated) over a limited spectral band in the ultraviolet region from an artificial source of optical radiation

Note 1 to entry: A UV radiometer may be used to measure radiation from a broadband UV source, such as a high-pressure mercury (Hg) arc lamp or a xenon (Xe) arc lamp, or from a line source such as a low-pressure Hg arc lamp, whose spectrum is concentrated essentially in a single wavelength at about 365 nm, or from UV light emitting diodes (UV-LEDs).

[SOURCE: CIE 220:2016, 2.2[6]]

4 Irradiation equipment

4.1 UV-LED Chip properties

a) A peak wavelength of optical radiation shall be 365 nm ± 5 nm.

b) A full width at half maximum (FWHM) of UV radiation shall be ≤ 10 nm.

c) A cut-on wavelength should be 345 nm ± 5 nm.

d) A cut-off wavelength should be 385 nm ± 5 nm.

© ISO 2025 – All rights reserved