



BSI Standards Publication

**Plastics — Parameters
comparing the spectral
irradiance of a laboratory
light source for weathering
applications to a reference
solar spectral irradiance**

National foreword

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TECHNICAL
REPORT

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**Plastics — Parameters comparing the
spectral irradiance of a laboratory
light source for weathering
applications to a reference solar
spectral irradiance**

*Plastiques — Paramètres de comparaison de la distribution spectrale
d'une source de lumière de laboratoire pour les applications de
vieillessement et d'une distribution spectrale solaire de référence*



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Foreword

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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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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: [Foreword - Supplementary information](#).

The committee responsible for this document is ISO/TC 61, *Plastics*, Subcommittee SC 6, *Ageing, chemical and environmental resistance*.

Introduction

Laboratory radiation sources generate radiation which is intended to simulate a defined „reference sun“ as perfect as possible, where the fitting to the spectral irradiance in the materials sensitive range is most important. So far, the fitting is described verbally only, e.g. standards concerning artificial weathering, and the user has to decide for himself if the spectral irradiance $E(\lambda)$ indicated by the producer of the laboratory radiation source agrees suitable enough with the „reference sun“ for his specific application or, occasionally, the classification describes the fitting to a wanted „reference sun“ only insufficiently (e.g. for standard weathering tests).

This Technical Report deals with a procedure for the determination of objective factors characterizing the grade of fitting in quantity.

One procedure describes the grade of fitting of a laboratory radiation source to the defined reference sun for specific spectral ranges. A second procedure results in characterizing parameters for the respective wavelength ranges, incorporating known action spectra.

Plastics — Parameters comparing the spectral irradiance of a laboratory light source for weathering applications to a reference solar spectral irradiance

1 Scope

This Technical Report specifies a calculation method which allows calculating a parameter which compares the spectral irradiance of a laboratory radiation source for weathering application to a reference solar spectral irradiance.

2 Terms and definitions

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

2.1

spectral irradiance

E_λ

radiant flux per unit area per wavelength interval

Note 1 to entry: It is measured in watts per square metre per nanometre ($\text{W} \cdot \text{m}^{-2} \cdot \text{nm}^{-1}$).

2.2

action spectrum

description of the spectral efficiency of radiation to produce a particular polymer response (specific property change of a specific polymer) plotted as a function of the wavelength of the radiation

Note 1 to entry: Data of an action spectrum are specific to the polymer but independent from the radiation source, also named spectral sensitivity.

3 Symbols and abbreviated terms

$E(\lambda)_{ref}$ spectral irradiance of reference sun ($\text{W} \cdot \text{m}^{-2} \cdot \text{nm}^{-1}$)

$E(\lambda)_{source}$ spectral irradiance of laboratory radiation source ($\text{W} \cdot \text{m}^{-2} \cdot \text{nm}^{-1}$)

$E(\lambda)_{scaled}$ scaled spectral irradiance of laboratory radiation source ($\text{W} \cdot \text{m}^{-2} \cdot \text{nm}^{-1}$)

$s(\lambda)$ action spectrum

4 Significance

Not for all applications of simulated solar radiation (laboratory radiation source) the total sun spectrum is needed. For economic reasons, therefore, it is advisable to simulate only that spectral range being of importance for the respective process or in cases of application where the object's heating has to be observed in close limits, e.g. with biological objects. In this case, both VIS and IR radiation have to be eliminated to a great extent (see [Table 1](#)).