

First edition
2016-02-01

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 vieillissement et d'une distribution spectrale solaire de référence



Reference number
ISO/TR 18486:2016(E)

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Contents

	Page
Foreword	iv
Introduction	v
1 Scope	1
2 Terms and definitions	1
3 Symbols and abbreviated terms	1
4 Significance	1
5 Requirements	2
6 Calculation methods	2
6.1 Characterizing parameter for a wavelength range	2
6.1.1 Choice of the wavelength range	2
6.1.2 Scaling condition	2
6.1.3 Characterizing parameter $f_{\lambda_1-\lambda_2}$ for a wavelength range	3
6.2 Characterizing parameter for a known action spectrum	3
6.2.1 Choice of the wavelength range with action spectrum	3
6.2.2 Scaling condition with action spectrum	4
6.2.3 Characterizing parameter $f_{s(\lambda)_1-s(\lambda)_2}$ with action spectrum	4
Annex A (informative) Examples for parameters of some commercially available solar simulators	5
Bibliography	7

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.

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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](#)).