TECHNICAL REPORT

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Plastics — Standard table for reference global solar spectral irradiance at sea level — Horizontal, relative air mass 1

Plastiques — Table de référence pour l'irradiance solaire spectrale totale au niveau de la mer — Horizontale, masse d'air relative 1

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Foreword

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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*.

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Introduction

The effect of solar radiation on surface of the earth (global radiation) is the most important primary weathering factor. The photons absorbed by the molecules during radiation exposure are often sufficient to split chemical bonds, start photochemical reactions and cause an electron transfer[1]. The spectral irradiance of the solar radiation is variable locally and in time. A reference spectrum is therefore required as a basis for the simulation of the spectral irradiance of solar radiation with artificial radiation sources/radiation systems. Data of the CIE (Commission Internationale de L'Éclairage) Publication (No. 85, 1989) have been used as a basis for years. Table 4 specifies the spectral irradiance of global radiation (direct and diffuse radiation) for a cloudless sky, zenith position of the sun by day and night comparisons at the equator at sea level. But in CIE 85, the data of the global solar irradiance only begins at 305 nm, the step width is very rough and the calculation code got unexplainably lost. Therefore, there have been efforts to revise CIE No. 85 for many years. The new Table 1 gives modelled data (using the SMARTS model version 2.9.2) generated using an air mass zero (AM0) spectrum based on extraterrestrial spectrum of Gueymard[2][3].

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1 Scope

This Technical Report provides a reference spectrum to the field of weathering degradation (see Table 1) in order to classify solar simulators in the UV, visible and infrared wavelength range.

The photochemical ageing which occurs in practice is simulated with time compression in laboratory weathering instruments by sequencing maximum stress climate episodes. To give a spectral irradiance target, the table specifies the spectral irradiance of global radiation (direct and diffuse radiation) with a cloudless sky, zenith position of the sun by day and night comparisons at the equator at sea level as defined in Table 4 of CIE No. 85 .This is a realistic maximum exposure under representative clear sky conditions.

The data contained in Table 1, Figure 2, and Figure 3 were generated using the SMARTS2 Version 2.9.2[2] [3] to recalculate the CIE No. 85, Table 4.

Table 2 contains the original data from CIE No. 85, Table 4. The numbers are shown in Figure 2 and Figure 3 as well.

2 References

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

CIE No. 85, Technical Report; *Solar Spectral Irradiance*; 1989

3 Terms and definitions

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

3.1
global solar irradiance
solar radiant flux, both direct and diffuse, received on a horizontal plane unit area from a solid angle of 2π steradians

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

3.2
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 ($W \cdot m^{-2} \cdot nm^{-1}$).

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