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Paints and varnishes — Coating systems for wind-turbine rotor blades —

Part 5: Measurement of transmittance properties of UV protective coatings

Matériaux de revêtement pour pales de turbines éoliennes —

Partie 5: Mesurage des propriétés du facteur de transmission des revêtements de protection anti UV

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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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This document was prepared by Technical Committee ISO/TC 35, *Paints and varnishes,* Subcommittee SC 9, *General test methods for paints and varnishes*.

A list of all parts in the ISO/TS 19392 series can be found on the ISO website.

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.

Introduction

In the wind energy industry, coatings are applied to rotor blades surface to protect the glass fibre reinforced polymer composite substrate from environmental stresses. Rain drops and hailstones can damage these coatings in such a way that individual layers come off or the whole coating delaminates from the substrate. This applies mostly to the leading edge. Glass fibre reinforced polymer composites and other blade materials can be also sensitive to UV degradation and thus can be damaged during outdoor operation, if not protected accurately against irradiation by solar radiation. Failure of protection can lead to delamination and a subsequent failure of the full blade.

An important function of the rotor blade coating is therefore to protect the blade material from UV radiation. This applies to the leading edge, but also to the other surface areas of the blade.

The damage by solar radiation is mainly induced by the most energetic ultraviolet (UV) radiation, but also visible (VIS) radiation (e.g. violet or blue radiation) is still energetic enough to have a negative input on the appearance and durability of the blade.

Pigments and organic or inorganic UV absorbers can be used to reduce the coating film transmittance against UV (and visible) radiation and cause a positive effect on lifetime and functional aspects of the blade material. Pigments and UV absorbers can affect the transmittance in the visible range. This may lead to colour change of the coated blade.

This document, as part of the ISO/TS 19392 series on rotor blade coatings, describes a method to measure the spectral transmittance or the transmittance in a specific wavelength range. This allows evaluating the UV and VIS radiation protection quality of a coatings film on the sensitive blade substrate below. The focus is to avoid damage of the blade by natural solar radiation especially caused by the most energetic part, the ultraviolet and short wavelength visible radiation.

Paints and varnishes — Coating systems for wind-turbine rotor blades —

Part 5: Measurement of transmittance properties of UV protective coatings

1 Scope

This document specifies a test method to measure the ultraviolet (UV) and visible (VIS) spectral transmittance in the wavelength range from 280 nm to 700 nm of coatings for wind turbine rotor blades. Single and multilayer coatings or coating systems can be tested.

From the spectral transmittance the transmittance of UV, VIS and the combined UV and VIS wavelength range can be calculated.

It is applicable to free coatings films or coatings applied on a UV-transparent quartz substrate.

2 Normative 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.

ISO 2808, *Paints and varnishes — Determination of film thickness*

ISO 3270, *Paints and varnishes and their raw materials — Temperatures and humidities for conditioning and testing*

ISO 4618, *Paints and varnishes — Vocabulary*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 4618 and the following 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
transmittance
τ

quotient of transmitted radiant flux, Φ_t, and incident radiant flux, Φ_m, $\tau = \frac{\Phi_t}{\Phi_m}$

Note 1 to entry: Transmittance is also defined spectrally in terms of wavelength, in which case, “spectral” is added before the quantity name.

Note 2 to entry: Due to energy conservation, $\alpha + \rho + \tau = 1$ except when polarized radiation is observed, where α is absorptance and ρ is reflectance.

Note 3 to entry: Transmittance, τ, is the sum of regular transmittance, τ_r, and diffuse transmittance, τ_d: $\tau = \tau_r + \tau_d$.

