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Space systems — Measurements of thermo-optical properties of thermal control materials

Systèmes spatiaux — Mesures des propriétés thermo-optiques des matériaux de thermorégulation

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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 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 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 20, *Aircraft and space vehicles*, Subcommittee SC 14, *Space systems and operations*.

This second edition cancels and replaces the first edition (ISO 16378:2013), which has been technically revised.

The main changes are as follows:

— updated terms and definitions according to the referenced document revision;

— revised description of sample thickness precision requirements;

— deleted solar absorptance measurement with central sample mounting sphere.

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

Solar absorptance and infrared emittance are the key parameters of materials for both active and passive thermal design of space systems.

This document describes the methodology, instruments, equipment, and samples used to calculate the key parameters of thermal-control materials, i.e. solar absorptance (α_s or α_p) and the infrared emittance (ε_h or ε_n). The measurements defined in this document are performed at ground test facilities with the purpose of obtaining material properties. The measured properties are used for material selection, thermal design of spacecraft, process control, quality control, etc. Also, on-orbit temperature data in the beginning of life can be assessed using the data obtained by ground measurement.

Space systems — Measurements of thermo-optical properties of thermal control materials

1 Scope

This document specifies the multiple measurement methods, instruments, equipment, and samples used to calculate the thermo-optical properties of thermal control materials. This document compares their features, indicates their limitations and biases, and guides the applications. This document also defines requirements for calibration and reference materials to ensure data quality.

This document specifies the following test methods, including the configuration of samples and calculations.

a) Solar absorptance using a spectrophotometer (α_s) — Annex A.

b) Solar absorptance using the comparative test method (α_p) — Annex B.

c) Hemispherical infrared emittance using the thermal test method ($\varepsilon_{h\text{-}t}$) — Annex C.

d) Normal infrared emittance using an IR spectrometer ($\varepsilon_{n\text{-}s}$) — Annex D.

e) Normal infrared emittance using ellipsoid collector optics ($\varepsilon_{n\text{-}e}$) — Annex E.

f) Normal infrared emittance using two rotating cavities ($\varepsilon_{n\text{-}c}$) — Annex F.

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
absorptance
α
quotient of absorbed *radiant flux* (3.8) and incident radiant flux, expressed by

$$\alpha = \Phi_a/\Phi_m$$

where Φ_a is absorbed radiant flux and Φ_m is incident radiant flux

[SOURCE: ISO 80000-7:2019, 7-31.1]