Technical Report

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2026-06

Plastics — Use of polyethylene reference film (PERF) for monitoring laboratory and outdoor weathering conditions

Plastiques — Utilisation d'un film de référence en polyéthylène (PERF) pour le contrôle des conditions de vieillissement climatique en laboratoire et en extérieur

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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.

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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 61, *Plastics*, Subcommittee SC 6, *Ageing, chemical and environmental resistance*.

This third edition cancels and replaces the second edition (ISO/TR 19032:2019), which has been technically revised.

The main changes compared to the previous edition are as follows:

— the reference material has been replaced;

— the physicochemical properties and the use of new PERF are described;

— results of interlaboratory tests with new PERF are detailed and commented.

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.

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Introduction

This document describes the physicochemical properties of polyethylene reference film (PERF) as well as a method for using PERF as a weathering reference material to monitor the performance of natural or artificial exposures. Under the action of UV radiation and heat, polyethylene materials undergo photo-oxidation reactions leading to the formation and accumulation of various oxidation products. Among the compounds formed during these photochemical processes, carboxylic acids end-groups are easily detected by their specific infrared absorption in the carbonyl domain. Measuring the relative concentration of carboxylic acids groups allows calculating a carbonyl index that reflects the polymer oxidation level. The photo-oxidation rates being directly dependent on the environmental factors and especially UV radiation and heat, determining the change in the carbonyl index of PERF during natural or artificial exposures allows monitoring polymer ageing conditions.

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Plastics — Use of polyethylene reference film (PERF) for monitoring laboratory and outdoor weathering conditions

1 Scope

This document describes a method that demonstrates the use of polyethylene reference film (PERF) for monitoring laboratory and outdoor conditions as a weathering reference material in weathering tests used for plastics.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 472:2013, *Plastics — Vocabulary*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 472 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
weathering reference material
material of known performance when exposed to solar radiation, heat, and moisture

Note 1 to entry: Weathering reference materials are used for weathering and irradiation testing.

Note 2 to entry: A weathering reference material is typically commercially available.

[SOURCE: ISO 4892-1:2024[1], 3.5, modified – Note 2 to entry added]

4 Abbreviated terms

PERF Polyethylene reference film

PERS Polyethylene reference specimens

FTIR Fourier transform infrared

5 Background information

When subjected to natural or artificial environmental stresses (such as heat, light or humidity), polymer materials are likely to degrade by photo-oxidative pathways.[2] The rate of polymer photo-oxidation mainly depends on two factors: spectral irradiance and temperature. However, the temperature dependence being linked to an exponential law involving an activation energy (similar to an Arrhenius law), the influence of the temperature on the global oxidation rate is the most important. Photo-initiated processes lead to thermally

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