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**Chemically-induced ultra-  
weak photon emission (UPE) —  
Measurement as an analysis method of  
degradation of polymeric material**



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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](http://www.iso.org/directives)).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

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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](http://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*.

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](http://www.iso.org/members.html).

# Chemically-induced ultra-weak photon emission (UPE) — Measurement as an analysis method of degradation of polymeric material

## 1 Scope

This document provides a method for assessing the very early oxidative degradation state of polymers during outdoor weathering and indoor accelerated weathering tests and the influence of various additives can also be evaluated.

This method is based on an analytical method in which the degree of progress of the oxidative degradation reaction of a polymer is sensitively detected by measurement of chemically induced ultra-weak photon emission (UPE).

## 2 Normative references

There are no normative references in this document.

## 3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org>

### 3.1

#### ultra-weak photon emission

#### UPE

phenomenon of light emission observed when electrons are excited to at least one-level higher energy level due to the energy produced by chemical reaction and then are deactivated from the higher energy levels to the ground state

Note 1 to entry: UPE is often used synonymously with “chemiluminescence”. “Chemiluminescence” means luminescence accompanied with a chemical reaction.

### 3.2

#### dark current value

numeric data measured in a state where the detection element is not irradiated with light

### 3.3

#### background

numeric data measured in a state where samples are not placed in a sample container

### 3.4

#### oxidation induction time

#### OIT

time when the emission intensity rapidly increases due to the disturbance of the equilibrium between the generation rate and the disappearance rate of the peroxide produced in plastics

Note 1 to entry: The oxidation induction time varies according to the type of antioxidant, additive concentration, measurement temperature, ageing status, etc.