
**Plastics — Artificial weathering including
acidic deposition**

Plastiques — Vieillissement artificiel y compris les dépôts acides



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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 29664 was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 6, *Ageing, chemical and environmental resistance*.

Introduction

This International Standard specifies methods to reproduce the weathering effects that occur when plastics are exposed to heavily polluted outdoor environments. Acidic precipitation can have a significant effect on the photochemical ageing of many polymers. In some cases, this is due to attack on the stabilizers^{[5][6]} or fillers like CaCO_3 ^{[7][8]} applied in technical polymers. The mechanisms differ from those of harmful gases, which essentially constitute the initial products of acidic precipitation.

Arising from changing industrial air pollution and additionally diffused by the stochastic wind and cloud distribution, acidic precipitation occurs sporadically. Thus, especially regarding acidic precipitation, outdoor weathering effects vary enormously within different years. Therefore, it is practically impossible to obtain reliable outdoor exposure results from just one season. These fluctuations can be avoided through the use of a laboratory test, where all weathering parameters, including the acidic deposition, can be controlled.

In artificial weathering tests for plastics, the action of acidic atmospheric precipitation, which is part of the real world, has generally not been considered.

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Plastics — Artificial weathering including acidic deposition

1 Scope

This International Standard describes artificial weathering tests intended to evaluate plastics for use in heavily polluted outdoor environments. Results from this International Standard cannot be used to predict the service life of these plastics.

This International Standard describes two different exposure methods. Use of the methods depends on the form of the plastic product being evaluated.

Method A is intended for products where surface degradation is very important and uses a strong acid spray (pH 1,5) that is applied for a short time.

Method B uses a weaker acid spray (pH 3,5) that is applied over a long period of time so that it can penetrate deeply into the product and is intended for products such as geotextiles and related products.

This International Standard does not cover the influence of special chemicals like agrochemicals.

2 Normative references

The following referenced documents are indispensable for the application 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 291, *Plastics — Standard atmospheres for conditioning and testing*

ISO 4582, *Plastics — Determination of changes in colour and variations in properties after exposure to daylight under glass, natural weathering or laboratory light sources*

ISO 4892-1, *Plastics — Methods of exposure to laboratory light sources — Part 1: General guidance*

ISO 4892-2, *Plastics — Methods of exposure to laboratory light sources — Part 2: Xenon-arc lamps*

ISO 4892-3, *Plastics — Methods of exposure to laboratory light sources — Part 3: Fluorescent UV lamps*

3 Principle

The combined action of UV radiation, heat, humidity, wetting, and acidic deposition is evaluated in weathering devices conforming to ISO 4892-1, ISO 4892-2 and ISO 4892-3.

The acidic deposition, in some cases, may accelerate the degradation of the polymer itself. In other cases, the degradation is accelerated when the acid deposition attacks the stabilizers in the polymer.

Two different methods combine acidic deposition with artificial weathering. In method A, a strong acid solution is applied once per day. In method B, a weaker acid exposure is integrated in the rain phase.

Both test methods aim for the same physical-chemical degradation mechanism as known to occur from exposure in heavily polluted outdoor environment. To consider different climatic conditions, method A includes