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Plastics — Evaluation of the action of microorganisms

Plastiques — Évaluation de l'action des micro-organismes



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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.

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.

International Standard ISO 846 was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 6, *Ageing, chemical and environmental resistance*.

This second edition cancels and replaces the first edition (ISO 846:1978), which has been technically revised.

The Plastics Project Group of the IBRG (International Biodeterioration Research Group) carried out several interlaboratory tests between 1984 and 1990, using the 1978 edition of this standard, with the aim of checking the reproducibility of the test results. The experience gained from these tests has been incorporated in the present edition. In addition, a soil-burial test method has been included in subclause 8.5, based on a specification the Eidgenössische Materialprüfungsanstalt in St. Gallen, Switzerland.

Annex A forms an integral part of this International Standard. Annexes B and C are for information only.

Introduction

Under certain climatic and environmental conditions, microorganisms may settle on and colonize the surface of plastics or plastics products. Their presence and/or their metabolic products may not only damage the plastic itself, but may also affect the serviceability of building materials and systems containing plastic parts.

The tests and test conditions specified in this International Standard are empirical and cover most- but not all- potential applications.

For specific applications and for long-term tests, procedures should be agreed upon which reflect performance under actual conditions.

The actions of microorganisms on plastics are influenced by two different processes:

- a) direct action: the deterioration of plastics which serve as a nutritive substance for the growth of the microorganisms;
- b) indirect action: the influence of metabolic products of the microorganisms, e.g. discolouration or further deterioration.

This International Standard deals with both of these two processes, as well as their combined action.

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WARNING — Handling and manipulation of microorganisms which are potentially hazardous requires a high degree of technical competence and may be subject to current national legislation and regulations. Only personnel trained in microbiological techniques should carry out such tests. Codes of practice for disinfection, sterilization and personal hygiene must be strictly observed.

It is recommended that workers consult IEC 68-2-10:1988, appendix A “Danger to personnel”, and ISO 7218:1996, *Microbiology of food and animal feeding stuffs — General rules for microbiological examinations*.

1 Scope

This International Standard specifies methods for determining the deterioration of plastics due to the action of fungi and bacteria and soil microorganisms. The aim is not to determine the biodegradability of plastics.

The type and extent of deterioration may be determined by

a) visual examination

and/or

b) changes in mass

and/or

c) changes in other physical properties.

The tests are applicable to all articles made of plastic that have an even surface and that can thus be easily cleaned. The exceptions are porous materials, such as plastic foams.

This International Standard uses the same test fungi as IEC 68-2-10. The IEC method, which uses so-called “assembled specimens”, calls for inoculation of the specimens with a spore suspension, incubation of the inoculated specimens and assessment of the fungal growth as well as any physical attack on the specimens.

The volume of testing and the test strains used will depend on the application envisaged for the plastic. These parameters should therefore be agreed upon before the tests and should be stated in the test report.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 291:—1), *Plastics — Standard atmospheres for conditioning and testing*.

IEC 68-2-10:1988, *Basic environmental testing procedures — Part 2: Tests — Test J and guidance: Mould growth*.

3 Definitions

For the purposes of this International Standard, the following definitions apply:

3.1 biodeterioration: A change in the chemical or physical properties of a material due to the action of a microorganism.

3.2 fungistatic effect: The antimycotic effect of an antimicrobial treatment which prevents a given material from being overgrown by fungi under moist conditions.

3.3 biodegradation: The term “*biodegradation*” is being discussed by TC 61/SC 5/WG 22, *Biodegradability*, and the official definition will be included here when it is available.

4 Principle

4.1 The test involves exposing test specimens of plastic to the action of selected test strains of fungi and bacteria (or, in the case of the soil-burial test, to microbially active soil) for specified or agreed periods of time under specified conditions of temperature and humidity.

At the end of the exposure, the test specimens are assessed before and/or after cleaning by visual examination and/or any change in mass or other physical properties is determined.

The results obtained with the specimens exposed to biological attack (batch V) are compared with those obtained from untreated specimens (batch O) or sterile specimens (batch S) kept under the same conditions.

4.2 Short descriptions of the test methods used to determine the resistance of plastics to fungi (method A) or the fungistatic effects (methods B and B'), resistance to bacteria (method C), and resistance to soil microorganisms (method D) are given below.

4.2.1 Resistance to fungi

4.2.1.1 Method A: Fungal-growth test

Test specimens are exposed to a mixed suspension of fungus spores in the presence of an incomplete nutritive medium (without a carbon source). The fungi can only grow at the expense of the material. If the specimens contain no nutritive component, the fungi cannot develop mycelia and there is no deterioration of the plastic.

1) To be published. (Revision of ISO 291:1977)