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Plastics — Methods for marine exposure

Plastiques — Méthodes d'exposition aux intempéries marines

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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 15314 was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 6, *Ageing, chemical and environmental resistance*.

Introduction

Plastics are often used in outdoor applications where they are immersed or partially immersed in water. In some cases, materials made from plastic are designed to float on water. In others, plastic articles that are discarded end up as floating debris. In addition to the effects of sunlight and heat, plastic polymers or products exposed in marine environments may be subjected to hydrolysis, water absorption, extraction of stabilizers, erosion by wave action, corrosion by salts and/or attack by seaborne microorganisms. These stresses are not simulated in typical weathering exposures conducted in accordance with ISO 877. Therefore a separate standard is necessary to define procedures that realistically and consistently stress plastic materials in the same way that they would be in products used or discarded in marine environments. This International Standard describes three procedures for the exposure of plastic materials in the same way as they could be when used in marine environments.

There are four primary reasons why the rate of degradation of plastics exposed at sea can be different from that for the same plastic exposed on land[1]:

a) exposure in moist conditions is known to accelerate degradation of some polymers — small amounts of absorbed water may act as a plasticizer, increasing accessibility of the matrix to oxygen, or may leach out stabilizing additives;

b) differences in heat build-up between plastics exposed in water or on the surface compared to plastics exposed on land;

c) the action of microorganisms that may shield the plastic from UV radiation or may enhance biodegradation processes;

d) the action of macroorganism settlements that can produce disfigurement of surfaces.

It is essential to establish appropriate exposure procedures in order to properly assess the performance of plastics used in marine environments, and to evaluate how long plastics discarded as litter will persist in marine environments.

Plastics — Methods for marine exposure

1 Scope

This International Standard describes three methods for the exposure of plastics in a marine environment. Method A covers exposures where specimens float on the surface, method B covers exposures where specimens are partially immersed and method C covers exposures where specimens are completely immersed. Although intended for marine (salt water) exposure, the methodology might be used with outdoor brackish water and fresh-water exposures as well. Direct weathering of plastics on land is described in ISO 877.

Method A is particularly applicable to enhanced-degradability plastics where the environmental degradation under marine floating exposure is expected to be accelerated relative to that of regular plastic materials.

This International Standard specifies the general requirements for the apparatus, and procedures for using the test methods described.

It lists properties that may be used to evaluate changes in plastics subjected to marine exposure. More specific information about methods for determining the changes in properties of plastics on exposure and reporting these results is given in ISO 4582.

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 293, *Plastics — Compression moulding of test specimens of thermoplastic materials*

ISO 294-1, *Plastics — Injection moulding of test specimens of thermoplastic materials — Part 1: General principles, and moulding of multipurpose and bar test specimens*

ISO 294-2, *Plastics — Injection moulding of test specimens of thermoplastic materials — Part 2: Small tensile bars*

ISO 294-3, *Plastics — Injection moulding of test specimens of thermoplastic materials — Part 3: Small plates*

ISO 295, *Plastics — Compression moulding of test specimens of thermosetting materials*

ISO 877, *Plastics — Methods of exposure to direct weathering, to weathering using glass-filtered daylight, and to intensified weathering by daylight using Fresnel mirrors*

ISO 2818, *Plastics — Preparation of test specimens by machining*

ISO 3167, *Plastics — Multipurpose test specimens*

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