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Plastics — Methods for the preparation of samples for biodegradation testing of plastic materials

Plastiques — Méthodes de préparation des échantillons pour les essais de biodégradation des matériaux plastiques

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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 10210 was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 5, *Physical-chemical properties*.

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Introduction

Plastics recovery technology includes material recycling, organic recycling and energy recovery. The use of biodegradable plastics is one of the valuable recovery options in the field of organic recycling.

ISO standards for determining the ultimate aerobic and anaerobic biodegradability of plastic materials in an aqueous medium, activated sludge, compost, digesting sludge and soil have been published. These standards include ISO 14851, ISO 14852, ISO 14853, ISO 14855-1, ISO 14855-2, ISO 15985 and ISO 17556. For the user of these standards, it might be difficult to compare biodegradation changes during a test, even when using the same samples, due to differences in the test conditions. These differences might arise from the compost preparation, the test preparation methodology, the shape and/or size of the test sample, etc. Accurate comparison of biodegradability data for the same plastic material can be difficult to achieve unless the conditions specified in the standards are accurately followed.

A unified approach to test sample preparation is important in achieving consistency within the standards mentioned above. The methods described in this document help to provide a consistent approach to sample preparation techniques for biodegradation testing of plastic materials.

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Plastics — Methods for the preparation of samples for biodegradation testing of plastic materials

WARNING — The use of this International Standard might involve hazardous materials, operations and equipment. This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and to determine the applicability of regulatory limitations prior to use.

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1 Scope

This International Standard describes methods for the preparation of test samples used in the determination of the ultimate aerobic and anaerobic biodegradability of plastic materials in an aqueous medium, soil, controlled compost or anaerobic digesting sludge. The methods described are designed to provide dimensional consistency of test samples, resulting in improved reproducibility of test results during the determination of the ultimate biodegradability of the product.

These methods apply to the following materials:

— natural and/or synthetic polymers, copolymers or mixtures of these;

— plastic materials that contain additives, such as plasticizers or colorants;

— plastic composite materials that contain organic or inorganic fillers;

— products made from the above materials.

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 472, *Plastics — Vocabulary*

ISO 3310-1, *Test sieves — Technical requirements and testing — Part 1: Test sieves of metal wire cloth*

ISO 14851, *Determination of the ultimate aerobic biodegradability of plastic materials in an aqueous medium — Method by measuring the oxygen demand in a closed respirometer*

ISO 14852, *Determination of the ultimate aerobic biodegradability of plastic materials in an aqueous medium — Method by analysis of evolved carbon dioxide*

ISO 14853, *Plastics — Determination of the ultimate anaerobic biodegradation of plastic materials in an aqueous system — Method by measurement of biogas production*

ISO 14855-1, *Determination of the ultimate aerobic biodegradability of plastic materials under controlled composting conditions — Method by analysis of evolved carbon dioxide — Part 1: General method*

ISO 14855-2, *Determination of the ultimate aerobic biodegradability of plastic materials under controlled composting conditions — Method by analysis of evolved carbon dioxide — Part 2: Gravimetric measurement of carbon dioxide evolved in a laboratory-scale test*

ISO 15985, *Plastics — Determination of the ultimate anaerobic biodegradation and disintegration under high-solids anaerobic-digestion conditions — Method by analysis of released biogas*

ISO 17088, *Specifications for compostable plastics*

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ISO 17556, *Determination of the ultimate aerobic biodegradability of plastics materials in soil by measuring the oxygen demand in a respirometer or the amount of carbon dioxide evolved*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 472 and the following apply.

3.1
sieve
wire mesh of specified aperture size

3.2
bulk material
test material taken from a polymer product or part of a product

NOTE The size of the bulk polymeric test sample is approximately 1 cm × 1 cm × 1 cm.

3.3
sheet
planar product of arbitrarily limited maximum thickness in which the thickness is small compared to the length and width

NOTE The thickness of sheets is typically 0,5 mm to 3 mm.

3.4
film
thin planar product of arbitrarily limited maximum thickness in which the thickness is very small compared to the length and width and which is generally supplied in roll form

NOTE 1 The arbitrary thickness limit can differ between countries and often between materials.

NOTE 2 The thickness of films is typically 0,01 mm to 0.3 mm.

3.5
pellet
small mass of preformed moulding material, having relatively uniform dimensions in any given batch and used as feedstock in moulding and extrusion operations

NOTE The average diameter of pellets can range from 1 mm to 5 mm.

3.6
granule
relatively small particle produced in various sizes and shapes in operations such as cutting, grinding, crushing, precipitation and polymerization

NOTE 1 These operations can also yield material in the form of powder and, in some precipitation and polymerization processes, material in the form of beads can be produced

NOTE 2 The average diameter of granules can range from 0,1 mm to 3 mm.

3.7
powder
very fine particulate material smaller in size than granules

NOTE The average diameter of polymeric powder particles can range from 0,01 mm to 0,1 mm.

3.8
test material
product from which a test sample is taken and used to assess the biodegradability of a polymeric item by means of standardized biodegradation tests

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