INTERNATIONAL STANDARD

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Specifications for compostable plastics

Spécifications pour les plastiques compostables

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ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

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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 17088 was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 5, *Physical-chemical properties*.

This second edition cancels and replaces the first edition (ISO 17088:2008), of which it constitutes a minor revision to clarify the wording of the second paragraph in Subclause 6.3.1.

Introduction

Management of solid wastes is a problem of growing interest around the world. Cities, towns and countries are attempting to divert more materials from disposal (landfills and incineration without energy recovery) by performing different recovery options in order to transform waste into usable products. Plastics recovery technologies include material recovery (mechanical recycling, chemical or feedstock recycling, and biological or organic recycling) and the recovery of energy in the form of usable heat under controlled combustion conditions.

As interest in composting (biological or organic recycling) grows, it will be necessary to identify correctly plastics, and products made from plastics, which will disintegrate and biodegrade satisfactorily under composting conditions and will not leave any persistent or toxic residues.

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WARNING — Sewage, activated sludge, soil and compost might contain potentially pathogenic organisms. Therefore appropriate precautions should be taken when handling them. Toxic test, compounds and those whose properties are unknown should be handled with care. The handling of these materials in the context of the application of this International Standard might be further controlled by national and/or regional legislation.

1 Scope

This International Standard specifies procedures and requirements for the identification and labelling of plastics, and products made from plastics, that are suitable for recovery through aerobic composting. The four following aspects are addressed:

a) biodegradation;

b) disintegration during composting;

c) negative effects on the composting process and facility;

d) negative effects on the quality of the resulting compost, including the presence of high levels of regulated metals and other harmful components.

This specification is intended to establish the requirements for the labelling of plastic products and materials, including packaging made from plastics, as "compostable" or "compostable in municipal and industrial composting facilities" or "biodegradable during composting" (for the purposes of this International Standard, these three expressions are considered to be equivalent). The labelling will, in addition, have to conform to all international, regional, national or local regulations (e.g. European Directive 94/62/EC).

NOTE The recovery of compostable plastics through composting can be carried out under the conditions found in well-managed composting plants, where the temperature, water content, aerobic conditions, carbon/nitrogen ratio and processing conditions are optimized. Such conditions are generally obtained in industrial and municipal composting plants. Under these conditions, compostable plastics will disintegrate and biodegrade at rates comparable to yard trimmings, kraft paper bags and food scraps.

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 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 16929, *Plastics — Determination of the degree of disintegration of plastic materials under defined composting conditions in a pilot-scale test*

ISO 20200, *Plastics — Determination of the degree of disintegration of plastic materials under simulated composting conditions in a laboratory-scale test*

EN 13432:2000, *Packaging — Requirements for packaging recoverable through composting and biodegradation — Test scheme and evaluation criteria for the final acceptance of packaging*

ASTM D5338, *Standard Test Method for Determining Aerobic Biodegradation of Plastic Materials Under Controlled Composting Conditions, Including Thermophilic Temperatures*

ASTM D6400, *Standard Specification for Compostable Plastics*

OECD Guidelines for the Testing of Chemicals — Guideline 208: *Terrestrial Plants, Growth Test*

3 Terms and definitions

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

3.1
biodegradable during composting
synonymous with “compostable” (see definition of “compostable plastic”)

3.2
catalyst
substance, used in small proportion, that augments the rate of a chemical reaction and, in theory, remains unchanged chemically at the end of the reaction

3.3
compost
organic soil conditioner obtained by biodegradation of a mixture consisting principally of vegetable residues, occasionally with other organic material and having a limited mineral content

3.4
compostable plastic
plastic that undergoes degradation by biological processes during composting to yield CO_2, water, inorganic compounds and biomass at a rate consistent with other known compostable materials and leave no visible, distinguishable or toxic residue

3.5
composting
aerobic process designed to produce compost

3.6
disintegration
physical breakdown of a material into very small fragments

3.7
filler
relatively inert solid material added to a plastic to modify its strength, permanence, working properties or other qualities, or to lower costs

3.8
theoretical amount of evolved carbon dioxide
$ThCO_2$
maximum theoretical amount of carbon dioxide evolved after completely oxidizing a chemical compound, calculated from the molecular formula and expressed as milligrams of carbon dioxide evolved per milligram or gram of test compound

3.9
total dry solids
amount of solids obtained by taking a known volume of test material or compost and drying at about 105 °C to constant mass

3.10
ultimate aerobic biodegradation
breakdown of an organic compound by microorganisms in the presence of oxygen into carbon dioxide, water and mineral salts of any other elements present (mineralization) plus new biomass

3.11
volatile solids
amount of solids obtained by subtracting the residue of a known volume of test material or compost after incineration at about 550 °C from the total dry solids of the same sample

NOTE The volatile-solids content is an indication of the amount of organic matter present.

4 Principle

4.1 The purpose of this specification is to establish standards for identifying and labelling plastic products and materials that will compost satisfactorily in well-managed composting facilities where the typical conditions of composting can be consistently obtained (i.e. a long thermophilic phase, aerobic conditions, sufficient water content, a suitable carbon/nitrogen ratio, etc.). Products meeting the requirements outlined below are appropriate for labelling as “compostable”, “compostable in municipal and commercial facilities” or “biodegradable during composting”.

4.2 The test used simulates an intensive aerobic composting process. It measures

a) the ultimate level of aerobic biodegradation of the test material;

b) the degree of disintegration obtained;

c) any negative effects on the finished compost;

d) the maximum concentration of regulated metals in the compost.

The test is terminated when the plateau phase of the biodegradation has been attained; the standard time for termination is 45 days, but the test could continue for up to six months.

5 Basic requirements

5.1 In order to compost satisfactorily, a plastic product or material shall demonstrate each of the characteristics found in 5.1.1 to 5.1.4 and quantified in Clause 6.

5.1.1 Disintegration during composting

The plastic product or material shall disintegrate during composting such that any remaining plastic is not readily distinguishable from the other organic materials in the finished compost. Additionally, the plastic product or material shall not be found in significant quantities during screening prior to final distribution of the compost.

5.1.2 Ultimate aerobic biodegradation

The ultimate level of aerobic biodegradation shall be established by testing under controlled conditions.

5.1.3 No adverse effect on ability of compost to support plant growth

The plastic product or material tested shall have no adverse effect on the ability of the compost to support plant growth, when compared to blank composts to which no test or reference substance has been added at the start of testing.