
**Plastics — Organic recycling —
Specifications for compostable
plastics**

*Plastiques — Recyclage organique — Spécifications pour les
plastiques compostables*



This document is a preview generated by EKO



COPYRIGHT PROTECTED DOCUMENT

© ISO 2021

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

Foreword	iv
Introduction	vi
1 Scope	1
2 Normative references	1
3 Terms and definitions	2
4 General	4
5 Basic requirements	4
5.1 General	4
5.2 Disintegration during composting	4
5.3 Ultimate aerobic biodegradability	4
5.4 No adverse effect of compost on terrestrial organisms	4
5.5 Control of constituents	5
6 Detailed requirements	5
6.1 General	5
6.2 Disintegration during composting	5
6.2.1 General	5
6.2.2 Variation in permitted thickness	6
6.3 Ultimate biodegradation	6
6.3.1 Aerobic biodegradation	6
6.3.2 Potential for biogas production	7
6.4 No adverse effects of compost on terrestrial organisms	8
6.4.1 General	8
6.4.2 Ecotoxicity test scheme	8
6.4.3 Plant growth test (mandatory)	8
6.4.4 Acute earthworm toxicity test (mandatory)	9
6.4.5 Chronic earthworm toxicity test (mandatory)	9
6.4.6 Nitrification inhibition test with soil microorganisms (optional)	9
6.5 Control of constituents	9
6.5.1 General	9
6.5.2 Regulated metals and other elements	9
6.5.3 Per- and poly-fluorinated compounds (PFCs)	10
6.5.4 Other hazardous substances	10
6.5.5 Volatile solids	10
7 Declaration of results	10
8 Test report	10
Annex A (informative) Examples of maximum concentrations of regulated metals and other elements	12
Annex B (normative) Detection of per- and poly-fluorinated compounds and maximum concentrations of other hazardous substances	13
Annex C (normative) Determination of ecotoxic effects on higher plants	14
Annex D (normative) Determination of acute ecotoxic effects to earthworm	16
Annex E (normative) Determination of chronic ecotoxic effects to earthworm	18
Annex F (informative) Determination of nitrification activity of soil microorganisms	20
Bibliography	22

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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 14, *Environmental aspects*.

This third edition cancels and replaces the second edition (ISO 17088:2012), which has been technically revised.

The main changes compared to the previous edition are as follows:

- in [Clause 3](#):
 - the following terms have been added: organic recycling, anaerobic digestion, per- and poly-fluorinated compound, well-managed industrial composting process, industrial composting, organic constituents, home composting;
 - the term catalyst has been deleted;
- 6.1.4 has been deleted;
- a new subclause, [6.2.2](#), on variation in permitted thickness has been added;
- in [6.3](#), requirements regarding biodegradability of constituents have been revised;
- in [6.3.1.1](#), the following references have been added as additional laboratory test methods for biodegradation testing: ISO 14851, ISO 14852, ISO 17556;
- a new subclause, [6.3.2](#), on potential for biogas production has been added;
- [6.4](#) has been extended covering ecotoxicity tests with representative species from three trophic levels;
- in [6.5](#), new requirements regarding control of constituents with respect to per- and poly-fluorinated compounds (PFCs) and hazardous substances (as specified in [Annex B](#)) have been included;
- the list of regulated metals in EU + EFTA countries has been revised;

— new annexes, [Annex B](#), [Annex C](#), [Annex E](#) and [Annex F](#), have been added.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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.

This document intends to correctly identify compostable plastics, and compostable products made from plastics, which can be recovered by organic recycling, i.e. will disintegrate and biodegrade satisfactorily together with biowaste producing compost as an outcome, in composting or in anaerobic digestion followed by composting, and will not leave any persistent or hazardous residues.

Plastics — Organic recycling — Specifications for compostable plastics

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.

1 Scope

This document specifies procedures and requirements for plastics, and products made from plastics, that are suitable for recovery through organic recycling. The four following aspects are addressed:

- a) disintegration during composting;
- b) ultimate aerobic biodegradation;
- c) no adverse effects of compost on terrestrial organisms;
- d) control of constituents.

These four aspects are suitable to assess the effects on the industrial composting process.

This document is intended to be used as the basis for systems of labelling and claims for compostable plastics materials and products.

This document does not provide information on requirements for the biodegradability of plastics which end up in the environment as litter. It is also not applicable to biological treatment undertaken in small installations by householders.

NOTE 1 The recovery of compostable plastics through composting can be carried out under the conditions found in well-managed industrial composting processes, 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 disintegrate and biodegrade at rates comparable to yard trimmings, kraft paper bags and food scraps.

NOTE 2 “Compostable” or “compostable in municipal and industrial composting facilities” are expressions considered to be equivalent to organically recyclable for the purposes of this document.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 11268-1, *Soil quality — Effects of pollutants on earthworms — Part 1: Determination of acute toxicity to Eisenia fetida/Eisenia andrei*

ISO 11268-2, *Soil quality — Effects of pollutants on earthworms — Part 2: Determination of effects on reproduction of Eisenia fetida/Eisenia andrei*

ISO 11269-2, *Soil quality — Determination of the effects of pollutants on soil flora — Part 2: Effects of contaminated soil on the emergence and early growth of higher plants*

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 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 15685, *Soil quality — Determination of potential nitrification and inhibition of nitrification — Rapid test by ammonium oxidation*

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

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

EN 14582, *Characterization of waste — Halogen and sulfur content — Oxygen combustion in closed systems and determination methods*

OECD (2006), Test No. 208: *Terrestrial Plant Test: Seedling Emergence and Seedling Growth Test*, OECD Guidelines for the Testing of Chemicals, Section 2, OECD Publishing, Paris,

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

3.1 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

[SOURCE: ISO 472:2013, 2.1735]

3.2 compostable plastic

plastic that undergoes degradation by biological processes during composting to yield CO₂, water, inorganic compounds and biomass at a rate consistent with other known compostable materials and leave no visible, distinguishable or toxic residue

Note 1 to entry: "Hazardous" is used synonymously to "toxic".

3.3 composting

aerobic process designed to produce compost starting from biodegradable waste

Note 1 to entry: Composting is classified into industrial composting, home composting and worm composting.

3.4 disintegration

physical breakdown of a material into very small fragments