
Polimerni materiali - Ogljični in okoljski odtis polimernih materialov na biološki osnovi - 2. del: Ogljični odtis materialov, količina (masa) CO₂, odstranjena iz zraka in vključena v molekulo polimera (ISO 22526-2:2020)

Plastics - Carbon and environmental footprint of biobased plastics - Part 2: Material carbon footprint, amount (mass) of CO₂ removed from the air and incorporated into polymer molecule (ISO 22526-2:2020)

Kunststoffe - CO₂- und ökologischer Fußabdruck von biobasierten Kunststoffen - Teil 2: Werkstoff-CO₂-Fußabdruck, Menge (Masse) des aus der Luft entfernten und in das Polymermolekül integrierten CO₂ (ISO 22526-2:2020)

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Plastiques - Empreinte carbone et environnementale des plastiques biosourcés - Partie 2: Empreinte carbone des matériaux, quantité (masse) de CO₂ captée dans l'air et incorporée dans les molécules de polymères (ISO 22526-2:2020)

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2020-03

**Plastics — Carbon and environmental
footprint of biobased plastics —**

Part 2:

**Material carbon footprint, amount
(mass) of CO₂ removed from the
air and incorporated into polymer
molecule**

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*Plastiques — Empreinte carbone et environnementale des plastiques
biosourcés*

ISO 22526-2:2021

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*Partie 2: Empreinte carbone des matériaux, quantité (masse) de CO₂
captée dans l'air et incorporée dans les molécules de polymères*



Reference number
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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.

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).

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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*.

A list of all parts in the ISO 22526 series can be found on the ISO website.

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

Increased use of biomass resources for manufacturing plastic products can be effective in reducing global warming and the depletion of fossil resources.

Current plastic products are composed of biobased synthetic polymers, fossil-based synthetic polymers, natural polymers and additives that can include biobased materials.

Biobased plastics refer to plastics that contain materials wholly or partly of biogenic origin.

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Plastics — Carbon and environmental footprint of biobased plastics —

Part 2:

Material carbon footprint, amount (mass) of CO₂ removed from the air and incorporated into polymer molecule

1 Scope

This document defines the material carbon footprint as the amount (mass) of CO₂ removed from the air and incorporated into plastic, and specifies a determination method to quantify it.

This document is applicable to plastic products, plastic materials and polymer resins that are partly or wholly based on biobased constituents.

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 16620-1, *Plastics — Biobased content — Part 1: General principles*

ISO 16620-2:2019, *Plastics — Biobased content — Part 2: Determination of biobased carbon content*

ISO 16620-3:2015, *Plastics — Biobased content — Part 3: Determination of biobased synthetic polymer content*

ISO 16620-4, *Plastics — Biobased content — Part 4: Determination of biobased mass content*

ISO 16620-5, *Plastics — Biobased content — Part 5: Declaration of biobased carbon content, biobased synthetic polymer content and biobased mass content*

3 Terms, definitions, symbols and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 472, ISO 16620-1, ISO 16620-2, ISO 16620-3, ISO 16620-4 and ISO 16620-5 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/>

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3.2 Symbols

m_{BSP}	biobased synthetic polymer content, expressed as a percentage of the total mass
m_c	fraction of carbon present in a product, in %
M_{B}	biobased carbon content on a mass base (kg) per 1 kg of polymer
M_{CO_2}	amount (mass) of CO ₂ removed from the air and incorporated into 1 kg of the polymer
$M_{\text{CO}_2, x}$	amount (mass) of CO ₂ removed from the air per 1 kg of each polymer
x_{B}^{TC}	biobased carbon content by total carbon content, expressed as a percentage of the total carbon content
$x_{\text{B}}^{\text{TOC}}$	biobased carbon content by total organic carbon content, expressed as a percentage of the total organic carbon content

3.3 Abbreviated terms

TC	total carbon
TOC	total organic carbon

4 Application

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Material carbon footprint shall not be used for a communication on overall environmental superiority because the material carbon footprint covers only a single impact category.

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5 Material carbon footprint

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5.1 Principle

Material carbon footprint is based on the biobased carbon content of the biobased polymers, plastics or products. Therefore, material carbon footprint according to this document is applicable to plastic products, including semi-finished and finished plastic products, plastic materials, polymers, polymer resins, monomers or additives that are partly or wholly based on biobased constituents.

5.2 Determination of the biobased carbon content

Biobased carbon content of the product as % of the total organic carbon $x_{\text{B}}^{\text{TOC}}$ or as % of the total carbon x_{B}^{TC} is experimentally determined using radiocarbon analysis as described in ISO 16620-2:2019, 8.3.1, 8.3.2 and 8.3.3.

5.3 Determination or calculation of biobased carbon content on a mass base

Biobased carbon content on a mass base (kg) per 1 kg of polymer (M_{B}) is determined or calculated using [Formula \(1\)](#):

$$M_{\text{B}} = \left(\frac{m_c}{100} \right) \times \left(\frac{x_{\text{B}}^{\text{TOC}} \text{ or } x_{\text{B}}^{\text{TC}}}{100} \right) \quad (1)$$

where m_c is the fraction of carbon present in a product, in %, and is

— experimentally determined with the elemental analysis, or