
**Packaging material recycling —
Report on substances and materials
which may impede recycling**

*Recyclage des matériaux d'emballage — Rapport sur les substances et
les matériaux pouvant empêcher le recyclage*

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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. 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. www.iso.org/patents.

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The committee responsible for this document is ISO/TC 122, *Packaging*, Subcommittee SC 4, *Packaging and environment*.

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Introduction

Saving resources and increasing resource efficiency, together with minimizing the negative environmental impacts, are acknowledged as important objectives in the search for sustainability. The recycling of used packaging is one of the principal strategies that contribute significantly to the fulfilment of these objectives.

To ensure the efficacy of this strategy, recycled materials need to meet the requirements of the identified applications. The supply of used packaging has to be sufficiently continuous and stable in order to sustain an industrial recycling operation. Furthermore, the collection and sorting schemes have to be designed and managed for delivering the required fractions of used packaging fit for recycling.

It is essential that consistent information and communication about recycling be provided to users. This includes raising awareness of the value of recycling, as well as providing specific instructions as to how users can actively participate in the collection and sorting of used packaging for subsequent material recycling.

The composition of the used packaging streams, the sorting and recycling practices and technologies, as well as the market demand for recycled materials will continue to change due to innovation, regulations, and other developments. In such a context, it is important to always keep in mind the importance of the yield and efficiency of the whole recycling system, in addition to the quality and the intrinsic properties of materials to be recycled. Sometimes, innovations can themselves act as impediments to recycling, at least at the moment of their introduction. Precautions must be taken so that innovations do not jeopardize the functionality of existing schemes.

The recovery of used packaging by material recycling is largely influenced by the materials and substances used for packaging and the condition in which they arrive at the recycling operations, notably the presence of impurities such as product residues and extraneously introduced materials. Collection of several packaging materials together (co-mingling) can often result in lower quality materials with high content of impurities. In turn, this may lead to lower yields and increased costs. The proper design of collection and sorting schemes is of critical importance. This Technical Report provides examples covering the main packaging materials and can be used as a guide for taking into account substances and materials that may be incorporated in packaging and which may inhibit subsequent operations related to recycling.

This Technical Report covers the following aspects:

- materials, combinations of materials, or designs of packaging that may create problems in collecting and sorting before material recycling;
- substances or materials that have the potential to create problems in the recycling process;
- the presence of substances or materials that may negatively influence the quality of the recycled material.

ISO 18604 sets out the basis for classifying packaging as recoverable by material recycling. This is one of the routes for the recovery of used packaging, with the inter-relationship between the various routes being covered in ISO 18601.

ISO 18604 requires that the design, choice of materials, and the manufacturing operations of packaging take into account the activities to which the used packaging will be exposed when processed through the expected recovery operations. In particular, that International Standard deals with the need to take into account the collection, sorting, and recycling of the materials.

This Technical Report, therefore, provides a non-exhaustive overview of substances, materials, and components that need to be considered in the design and control of packaging as defined in ISO 18604.

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Packaging material recycling — Report on substances and materials which may impede recycling

1 Scope

This Technical Report provides a non-exhaustive overview of substances and materials that may cause a sustained impediment to recycling activities and is intended to assist in the assessment requirements set out in ISO 18604.

It describes substances or materials which cause problems or inhibit the recycling process, or which have a negative influence on the quality of recycled material, where technical solutions are not expected to be developed in the near future.

These examples are, however, qualified by the fact that the recycling operations can vary regionally, that technology is constantly changing, and that the use to which the recycled material is put will also determine whether the presence of such substances and materials is a problem.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 18601, *Packaging and the environment — General requirements for the use of ISO standards in the field of packaging and the environment* <https://standards.iteh.ai/catalog/standards/sist/1bd1a3d3-ccf3-453a-a110-017279c57007>

ISO 18604, *Packaging and the environment — Material recycling*

ISO 21067, *Packaging — Vocabulary*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 21067 apply.

4 Recycling

A viable recycling system requires, in the first place, a well-functioning market for the recycled materials. The recycled materials need to meet the requirements of the identified applications, and the supply of used packaging has to be sufficiently continuous and stable in order to sustain an industrial recycling operation. Furthermore, the collection and sorting schemes have to be designed and managed for delivering the required fractions of used packaging fit for recycling.

The performance of a recycling system typically depends on a number of elements. These are the design, production, distribution, and use of packaging placed on the market, as well as the collection and sorting of used packaging and subsequent recycling operations for the identified applications of the recycled materials. Not all recycling technologies are widely available or used in all regions and countries.

The recovery of used packaging by material recycling is largely influenced by the materials used for packaging and the condition in which they arrive at the recycling operations, notably the presence of impurities such as product residues and extraneously introduced materials. This Technical Report provides examples covering the main packaging materials and can be used as a guide for taking into account substances and materials that may be incorporated in packaging and which may or do inhibit subsequent operations related to recycling.

In providing examples of substances and materials that may impede recycling, a number of key issues need to be considered. These include:

- the specific composition of the packaging (or packaging components), including base materials used;
- the physical characteristics of the packaging, such as shape, colour, volume, weight, dimensions, and (non) detachable pieces;
- the mix of packaging materials in the collection stream;
- the collection/sorting and recycling operations available in the location where the packaging completes its functional life;
- the residues of the packaging contents and extraneous contamination resulting from the use of the packaging, or from the collection and sorting processes. The contamination may be very small in quantity but can result in a disproportionate problem;
- the ease with which constituents or contaminants which may impede recycling can be separated from the materials to be recycled;
- the specifications for a new product made from the used packaging, including quality and functionality.

The examples in [Clause 5](#) include data from current and typical specifications associated with used packaging supplied for recycling on a commercial and practical basis. It should be noted that these specifications may vary from location to location.

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5 Material examples

Packaging is produced from a wide range of materials and combinations of materials, selected according to the functional requirements of the packaging application.

The following tables provide a non-exhaustive list of examples, guidelines, and common industrial practices for materials and substances which cause problems in the recycling operations of each of the main packaging materials:

- [Table 1](#) Aluminium;
- [Table 2](#) Glass;
- [Table 3](#) Paper and paperboard;
- [Table 4](#) Plastic;
- [Table 5](#) Steel;
- [Table 6](#) Wood.

Depending on the guidelines and conditions for the individual systems in place, non-packaging products, with the same or very similar material composition as the packaging items concerned, may be accepted within these packaging collection and sorting systems.

Table 1 — Aluminium

| Packaging recoverable by material recycling | | |
|--|---|---|
| Reference to ISO 18604 | | |
| B.2 Design criteria NOTE c) | Materials and substances integral with the packaging | Comments |
| i) Separability of components | <ul style="list-style-type: none"> — Beverage and food cans require no separation as the lids, tabs, and body are in similar alloying elements. — Composite containers should easily be separated to allow source separation by the user or separation during the collection and sorting stage. — Semi-rigid and flexible aluminium foil packaging can be separated at source by the user. — Foil laminates require specifically adapted separation and recovery processes which allow for material recycling and/or incineration with energy recovery. | <p>The majority of aluminium rigid and semi-rigid packaging is single material of similar alloying elements, which ensures that closed-loop (can-to-can recycling) or open-loop recycling (into other aluminium products) is feasible.</p> <p>Non-aluminium components or substances are effectively removed during the collection and sorting processes, at the input side to the recycling process, or during processing.</p> <p>Separation normally involves the recovery of the aluminium fraction using a thermal process which results in the destruction of the laminating ply, with an associated energy or by-product recovery.</p> <p>Small aluminium packaging items are increasingly collected and recycled from the bottom ashes in incinerators. New sorting techniques including optimized eddy current separation allow for the collection of even the smallest fraction.</p> |
| ii) Compatibility of material compositions or material combinations with the recycling process | <ul style="list-style-type: none"> — Material compositions are uniform in respect of the major aluminium components of the packaging/packaging system, i.e. similar alloying elements. — Non-aluminium components, printing inks, lacquers, and any sealants are accepted as easily removable during the recycling process. | |
| iii) Acceptable tolerances for non-compatible elements or substances in the recycling process | <ul style="list-style-type: none"> — Acceptable tolerances are determined by the individual recycling process plant and its design. | |

Table 1 — Aluminium (continued)

| Packaging recoverable by material recycling | | |
|---|--|---|
| Reference to ISO 18604 | | |
| B.5 Criteria for collection/sorting | Materials and substances external to the packaging | Comments |
| Compatibility with the collection and sorting systems | <p>Materials which require separation in the collection and sorting system and are not acceptable in the recycling process.</p> <ul style="list-style-type: none"> — steel — lead — iron — plastics — paper — sand — glass — dirt — food residues — grease — any other foreign substances — excessive moisture | <p>No aluminium packaging is made of alloying elements, including lead. However, occasionally, lumps of lead can be found inside beverage cans to make these heavier and therefore more attractive for cash-for-cans weight-based collection schemes. Sorting centres either do not accept unspecified bales of used beverage cans or carry out extra controls to detect the lead with x-ray machines and subsequently remove it.</p> |
| | <p>These guideline tolerances are indicative and subject to on-going review. Contractual specifications are negotiated directly between aluminium packaging scrap suppliers and users in the various countries. These specifications may show variances from the guideline tolerances due to the differences in local conditions and technologies.</p> | |

Table 2 — Glass

| Packaging recoverable by material recycling | | |
|--|---|---|
| Reference to ISO 18604 | | |
| B.2 Design criteria NOTE c) | Materials and substances integral with the packaging | Comments |
| i) Separability of components | <p>Closures and capsules should be easily separable from the glass packaging to allow source separation by the user.</p> <p>Labels and sleeves of paper, plastics, or aluminium foil are generally accepted in the recycling process.</p> <p>Care should be taken to ensure that any inorganic electronic parts or devices used with glass packaging are readily separable from the glass container prior to its recycling.</p> | <p>The glass container industry lays great stress on a maximum separation at source as a key to cullet quality management.</p> <p>A ban on lead-containing overcaps was introduced in the EU in 1993.</p> |
| ii) Compatibility of material compositions or material combinations with the recycling process | <p>The printing and glueing medium associated with labels, etc. or polymer coatings are generally accepted in the recycling process.</p> | <p>Non-glass packaging components or substances are effectively removed in the processing of cullet (with the exception of ceramics, porcelain, and certain plastic adhesive labels).</p> |

