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**Plastics — Recycled plastics — Characterization of polyvinyl butyral
(PVB) recyclates**

**Kunststoffe — Kunststoff-Rezyklate — Charakterisierung von Polyvinylbutyral (PVB)
Rezyklaten**

**Plastiques — Plastiques recyclés — Caractérisation des recyclats de butyral de
polyvinyle (PVB)**

CCMC will prepare and attach the official title page.

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European foreword

CWA XXXXX:2024 has been developed in accordance with the CEN-CENELEC Guide 29 “CEN/CENELEC Workshop Agreements – A rapid way to standardization” and with the relevant provisions of CEN/CENELEC Internal Regulations – Part 2. The proposal was approved and supported by CEN following a public call for participation made on 2024-01-DD. The Kick-off Meeting took place on 2024-03-DD and the final CWA was approved by representatives of interested parties in a Workshop on 2024-10-DD. It does not necessarily reflect the views of all stakeholders who may have an interest in its subject matter.

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- L’Urederra Foundation for Technical and Social Development (SPAIN), Angélica Perez;
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- Politecnico di Torino (ITALY), Professor Claudio Gerbaldi, Dr Alessandro Piovano, Dr Hamideh Darjazi, Dr Matteo Gastaldi;
- xxx.

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Introduction

Recycling plastic waste, by mechanical recycling, is one type of material recovery process intended to save resources (virgin raw materials, water, and energy), while minimizing harmful emissions into air, water and soil as well as any impacts on human health. The environmental impact of recycling has to be assessed over the whole life cycle of the recycling system (from the waste generation point to the disposal of final residues). To ensure that recycling constitutes the best environmental option for treating the available waste, some prerequisites should preferably be met:

- recycling scheme being contemplated should generate lower environmental impacts than alternative recovery options;
- existing or potential market outlets should be identified that will secure a sustainable industrial recycling operation;
- collection and sorting schemes should be properly designed to deliver recyclable plastics waste fractions fitting reasonably well with the available recycling technologies and with the (changing) needs of the identified market outlets, preferably at minimum costs to society.

This document has been produced in accordance with the guidance produced by CEN on Environmental Aspects and in accordance with CEN/TR 15353.

NOTE CEN/TR 15353 considers the general environmental aspects, which are specific to the recycling process.

It is often impossible to trace back each individual product at the end user stage and to check whether the product has been used correctly through its life. Consequently, products are out of industrial control for a period of time. It is possible that during this period contamination with other materials might occur that could affect the product's suitability for recycling into the intended application.

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1 Scope

This document defines a method of specifying delivery conditions for polyvinyl butyral (PVB) recyclates. It gives the most important characteristics and associated test methods for assessing PVB recyclates intended for use in the production of semi-finished/finished products.

It is intended to support parties involved in the use of PVB obtained by mechanical and/or mechano-chemical recycling to agree on specifications for specific and generic applications.

This document is applicable without prejudice to any existing legislation.

This document does not cover the characterization of plastic waste, which is covered by EN 15347, neither traceability topics which are covered by EN 15343.

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.

[NOTE to the drafter: The Normative references clause is compulsory. If there are no normative references, add the following text below the clause title: "There are no normative references in this document."]

EN 15343, *Plastics — Recycled plastics — Plastics recycling traceability and assessment of conformity and recycled content*

ISO 3534-2, *Statistics — Vocabulary and symbols — Part 2: Applied statistics*

[NOTE to the drafter: If a dated reference is impacted by a standalone amendment or corrigendum, list the main standard and include a footnote as follows:

EN XXXX:20YY¹, *General title*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply / the terms and definitions given in EN ISO 472 and CEN/TR 15353 and the following apply.

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

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

[NOTE to the drafter: The Terms and definitions clause is compulsory. If there are no terms and definitions, add the following text: "No terms and definitions are listed in this document."]

3.1
term
text of the definition

¹ As impacted by EN XXXX:20YY/A1:20YY.

3.2

term

admitted term

text of the definition

Note 1 to entry:

[SOURCE: EN XXXX:20YY, definition XX]

[NOTE to the drafter: If applicable, a list of 'Symbols and abbreviated terms' can be included as a subclause under Clause 3 or added as a separate Clause 4.]

4 Symbols and abbreviations

For the purposes of this document, the symbols and abbreviations related to recyclates are given in EN ISO 1043-1.

5 Characterization of PVB recyclates

A single batch is the quantity of recyclate that has homogenous characteristics within the specified tolerances.

The characteristics of PVB recyclates, which shall be met for every batch according to ISO 3534-2 are given in Table 1, and are divided into two types:

- a) mandatory characteristics (M) required to characterize PVB recyclates in general and required for all recyclates;
- b) optional characteristics needed to characterize PVB recyclates according to customer specifications and applications.

NOTE PVB or PVB-containing plastic wastes for recycling may contain different PVB types such as acoustic and non-acoustic PVB. Further variations are seen in the form of the added plasticizer (type and amount). The properties and performance of recyclates derived from such wastes will depend on the relative proportions of the PVB types and the plasticizers.

These characteristics shall be assessed by using the test methods given in Table 1. Where possible, the supplier should provide information on the original applications.

Other tests may be carried out by agreement between the purchaser and the supplier and results shall be reported.

A certificate of analysis giving the test results for each batch of recyclate shall be provided by the supplier to the purchaser upon request.

Where several methods are listed in Table 1, the certificate of analysis shall specify the method used.

The purchaser may require some additional information on recyclate composition from the recycler in order to facilitate the legal use of the recyclate.

In addition to the physical and chemical characteristics specified in Table 1, each batch shall be accompanied by an information stating:

- product name;
- intended (suitable) application(s);
- origin of material that was used for the production of the recycled PVB, where available.

Table 1 — Characterization of PVB recyclates

Characteristic	Unit	Test method	PVB flakes	PVB granulates	Comment
Adhesion to glass	N/cm				Value of reference PVB ("Trosifol Natural UV"): high
Ash content	%	EN ISO 3451-1; 3451-5, Method A?			
Bulk density	kg/m ³	EN ISO 60 or ASTM D1895, Method C (only PET?)			
Colour		Visual inspection			
Colour	L, a, b values	EN ISO/CIE 11664-4			Observer: 10° Illuminant: D65
Impurities Ferrous / non-ferrous metals Other impurities		ISO 12418-2			
Density	kg/m ³	EN ISO 1183-1, Method A			Value of reference PVB ("Trosifol Natural UV"): 1,056
Dry flow rate	s	EN ISO 6168			
Elasticity modulus		EN ISO 178			
Filterability	MPa/(h cm ²)	EN ISO 23900-5			
Filtration level	µm	Mesh size			
Fitness of processing of PVB recyclate - by extrusion					
Flexural modulus	MPa	EN ISO 178			
Glass content	% or mg/kg				
Glass transition point	°C				
Haze					
Impact strength	kJ/m ²	EN ISO 179-1, EN ISO 179-2 or EN ISO 180			
Light transmittance	%				Value of reference PVB ("Trosifol Natural UV"): 89 %

Characteristic	Unit	Test method	PVB flakes	PVB granulates	Comment
Melt mass flow rate	g/10 min	EN ISO 1133 Condition H (EN ISO 1133-2?)			
Original application		Supplier to declare			
Particles: Fine particle content Particle size					Using a method appropriate to the particle type and size range
Particle size distribution	%				
Plastizicer					
Presence of - modifying additives		Supplier to declare			For example, reinforcements, heat and light stabilisers etc.
Refractive index (relevant for PV applications)					Value of reference PVB ("Trosifol Natural UV"): 1,482
Residual Humidity	%	EN 12099			Although the scope of EN 12099 is limited, it is considered relevant
Shape/Size dimension		Visual			
Tensile stress at yield	MPa	EN ISO 527-1 EN ISO 527-2			
Tensile strain at break	%	EN ISO 527-1 EN ISO 527-2			
Thermal conductivity (relevant for PV applications)					Value of reference PVB ("Trosifol Natural UV"): 2,2
Yellowness					

6 Quality assurance

In order that the purchaser of the recyclate can have confidence in the quality of the product, the supplier shall maintain records of the quality control carried out, including incoming materials, processes and finished products.

NOTE A quality management system certified to EN ISO 9001 can be a suitable guarantee of consistent recyclate quality but not the recycled content.

The specification and the standard deviation or range of values within and between batches of material shall be agreed between the supplier and the purchaser.

Where a statement of recycled content, or the previous history of the material, is requested, documentary evidence shall be provided. These records should be available to the purchaser on request.

Where a recyclate has been produced via a melt process, the supplier may choose to state the level of filtration applied during that process. This will determine the maximum size of any non-melting contaminants present in the recyclate. The statement of filtration level shall include details of the filter. Recyclates that have not passed through a melt process cannot be quantified in the same way, and the supplier may state this.

Traceability shall be ensured according to EN 15343, that describes a qualified recycling process and gives details of traceability and the assessment of recycled content.

Bibliography

- [1] CEN/TR 15353, *Plastics — Recycled plastics — Guidelines for the development of standards for recycled plastics*
- [2] EN 15347, *Plastics — Recycled plastics — Characterisation of sorted plastics wastes*
- [3] EN ISO 472, *Plastics — Vocabulary*
- [4] EN ISO 9001, *Quality management systems — Requirements*