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**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 29284-2024

Replacing GB/T 29284-2012

Poly(lactic acid)

聚乳酸

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Foreword

This document is in accordance with the provisions of GB/T 1:1-2020 "Guidelines for standardization work Part 1: Structure and drafting rules for standardization documents" Drafting: This document replaces GB/T 29284-2012 "Polylactic acid": Compared with GB/T 29284-2012, except for structural adjustments and editorial changes, In addition, the main technical changes are as follows:

- Added "Classification" (see Chapter 4);
- Changed the performance requirements of PLA resin in Table 1, deleted "ignition residue, n-hexane extract, volatile matter content, intrinsic viscosity Deviation and weight average molecular weight deviation" inspection items and performance requirements, and added "ash content, lactide content, molecular weight distribution index "Special grade, extrusion grade, injection molding grade, fiber grade" and corresponding performance requirement indicators have been added: The inspection item "water content" was changed to "water content", the inspection item "tensile strength" was changed to "tensile breaking stress", and the inspection item "water content" was changed to "water content": The test item "notched impact strength" was changed to "simple beam notched impact strength", and the test item "biodegradability" was changed to "relative For "Biodegradability", "Color" is optional (see Chapter 5, Chapter 4 of the:2012 edition);
- Changed the sample preparation (see 6:1, 5:1 of the:2012 edition);
- Changed the state adjustment time, changing "should be greater than 4h" to "at least 40h, but not more than 96h" (see 6:2,:2012 edition 5:2);
- Changed the sensory test method (see 6:3, 5:3 of the:2012 edition);
- Change "water content" to "moisture content", delete method 1, add "Karl Fischer method" as method 1 and arbitration method, and Method 2 was modified and the formula was supplemented (see 6:4, 5:4 of the:2012 edition);
- Added "the peak temperature of the melting peak during the first thermal cycle is used as the melting point of the sample" (see 6:7);
- Added "The midpoint temperature of the temperature range where the glass transition

occurs during the second thermal cycle is used as the glass transition temperature of the sample" Temperature" (see 6:8);

--- Change "tensile strength" to "tensile breaking stress", and change the test method to "prepare A1 type specimen according to 6:1: GB/T 1040:2, the test speed is 5 mm/min" (see 6:9, 5:9 of the:2012 edition);

--- Change "notched impact strength" to "simply supported beam notched impact strength", and change the test method to "prepared according to the provisions of 6:1 B1 type test specimen, single notch, notch type is A type: Perform lateral impact test according to GB/T 1043:1" (See 6:10, 5:10 of the:2012 edition);

---Change "biodegradability" to "relative biodegradability", and delete the reference standard "GB/T 19276:1-2003" in the test method: and "GB/T 19276:2-2003" (see 6:11, 5:11 of the:2012 edition);

--- Deleted the test methods for ignition residue, n-hexane extract, volatile matter, intrinsic viscosity deviation and weight average molecular weight and its deviation Law (see 5:12~5:16 of the:2012 edition);

--- Added the test method for ash content (see 6:12);

1 Scope

China's national product standard for poly(lactic acid). It specifies the classification, the requirements, the test methods, the inspection rules and the marking, packaging, transport and storage of PLA resin. Poly(lactic acid) is the biodegradable plastic that is actually made in quantity. It is polymerised from lactic acid produced by fermenting sugar from maize or cassava, so its carbon comes from a crop rather than from oil, and under industrial composting conditions it breaks down to carbon dioxide and water. Those two properties are why it is used for food packaging, disposable tableware, agricultural film, fibres and 3D printing filament, and why the volumes have grown as single-use plastic restrictions have spread. It is also a demanding material to process, and the reason is water. PLA hydrolyses at melt temperature: resin that has picked up moisture from the air loses molecular weight in the extruder, and the product made from it is weak in a way that cannot be seen. That is why the moisture content is one of the requirements a converter checks first. The 2024 revision reorganises the specification around how the material is actually sold. It adds a classification chapter and introduces grades - a general grade, an extrusion grade, an injection moulding grade and a fibre grade - each with its own requirements, since a resin optimised for spinning is not the resin for a thermoformed tray. It revises the property table, deleting the ignition residue, hexane extract, volatile matter and viscosity and molecular weight deviation items, and adding ash content, lactide content and the molecular weight distribution index. And it renames several test items to the current terminology. Issued on 25 April 2024 and in force since 1 November 2024, it replaces GB/T 29284-2012.

1 Plastics - Preparation of injection moulded test specimens for thermoplastic materials - Part 1: General principles and multi-purpose test specimens and long Preparation of strip specimens GB/T 19277:

1 Determination of the ultimate aerobic biodegradability of materials under controlled composting conditions by measuring the carbon dioxide released Methods Part 1: General methods GB/T 19466:

2 Plastics Differential Scanning Calorimetry (DSC) Part 2: Determination of Glass Transition Temperature GB/T 19466:

3 Plastics Differential Scanning Calorimetry (DSC) Part 3: Determination of Melting and Crystallization Temperature and Enthalpy

2 Normative references

The contents of the following documents constitute the essential clauses of this document through normative references in this document: For referenced documents without a date, only the version corresponding to that date applies to this document; for referenced documents without a date, the latest version (including all amendments) applies to This document: GB/T 1033:

1 Plastics - Determination of density of non-cellular plastics - Part 1: Immersion method, liquid pycnometer method and titration method GB/T 1040:

2 Determination of tensile properties of plastics Part 2: Test conditions for moulding and extruded plastics GB/T 1043:

1 Determination of impact properties of simply supported plastic beams Part 1: Non-instrumented impact test

GB/T 2547 Plastics Sampling Method

GB/T 2918 Standard environment for conditioning and testing of plastic specimens GB/T 3682:

1 Plastics Thermoplastics - Determination of melt mass flow rate (MFR) and melt volume flow rate (MVR) Part 1: Standard methods

GB/T 8170 Rules for rounding off values and expression and determination of limit values GB/T 9345:

GB/T 14190-2017 Test method for fiber-grade polyester (PET) chips GB/T 17037:

GB/T 37191 Determination of moisture content of raw rubber - Karl Fischer method

3 Terms and definitions

The following terms and definitions apply to this document: 3:

1 Polylactide A polymer obtained by chemical synthesis using lactic acid or lactide, a dimer of lactic acid, as a monomer and having the chemical structure shown in Figure 1:

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