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# Degradability and Identification Requirements of Biodegradable Plastics and Products

生物降解塑料与制品降解性能及标识要求

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# Degradability and Identification Requirements of Biodegradable Plastics and Products

## 1 Scope

This document specifies the degradability and identification requirements of biodegradable plastics and products. The performance of the specific products except the degradability shall comply with the requirements of the product standard.

This document is applicable to the following types of biodegradable plastics and products:

---natural polymer materials;

---synthetic polymers;

---materials containing additives, such as: plasticizers, pigments or other compounds;

---the mixture of the above materials;

---products processed from various biodegradable materials.

## 2 Normative References

The contents of the following documents constitute indispensable clauses of this document through the normative references in the text. In terms of references with a specified date, only versions with a specified date are applicable to this document. In terms of references without a specified date, the latest version (including all the modifications) is applicable to this document.

GB/T 1844.2 Plastic - Symbols and Abbreviated - Part 2: Fillers and Reinforcing Materials

GB/T 9345.1-2008 Plastics - Determination of Ash - Part 1: General Methods

GB/T 15337 General Rules for Atomic Absorption Spectrometric Analysis

GB/T 19276.1 Determination of the Ultimate Aerobic Biodegradability of Plastic Materials in an Aqueous Medium - Method by Measuring the Oxygen Demand in a Closed Respirometer

GB/T 19276.2 Determination of the Ultimate Aerobic Biodegradability of Plastic Materials in an Aqueous Medium - Method by Analysis of Evolved Carbon Dioxide

GB/T 19277.1 Determination of the Ultimate Aerobic Biodegradability of Plastic Materials under Controlled Composting Conditions - Method by Analysis of Evolved Carbon Dioxide - Part 1: General Method

theoretical release of biogas from the material.

### 3.3 absolute degree of biodegradation

During the biodegradation process, the measured degree of biodegradation of the sample of the test material.

### 3.4 relative degree of biodegradation

**relative degree of biodegradation**

During the biodegradation test, use a thin layer of cellulose as a control reference material in the biodegradation to test the activity of the degradation medium. The biodegradation process of the reference material is treated in the same way as the test material. The percentage of the degree of biodegradation of the sample and that of the reference material is the relative degree of biodegradation.

### 3.5 disintegration

During the composting process, the test material and its products will be decomposed by microorganisms together with the fresh biomass waste, and will change from larger shapes to extremely fine fragments due to physical or chemical effects.

[source: GB/T 19811, modified]

### 3.6 disintegration

At the end of the composting process, after the compost is sieved through a 2 mm sieve, the percentage of the mass of the test material fragment residues larger than 2 mm in the oversize and the total dry solids of the material before the test.

### 3.7 soil-degradable

Under soil landfill conditions, a nature of being finally decomposed into simple compounds, such as: carbon dioxide ($CO_2$) and / or methane ($CH_4$), and water ($H_2O$), and mineralized inorganic salts and biological dead bodies of elements contained in them.

### 3.8 composting-degradable

Under composting conditions, a nature of being finally decomposed into simple compounds, such as: carbon dioxide ($CO_2$) and / or methane ($CH_4$), and water ($H_2O$), and mineralized inorganic salts and biological dead bodies of elements contained in them.

### 3.9 industrial composting

Industrial composting is a method of processing that utilizes industrial conditions to generate compost.

**NOTE:** compost is an organic soil conditioning agent obtained by biodegrading the mixture. The

mixture consists mainly of plant residues, sometimes containing some organic materials and some inorganic matters.

### 3.10 home composting

Home composting is a process of composting disposal of products of privately or domestically generated organic wastes, such as: food, garden and paper product wastes, etc.

**NOTE:** generally, the generated compost is used for private purposes without any commercial transactions.

### 3.11 marine-degradable

In the marine environment (such as: sediment interface, sediment, other actual field conditions and its laboratory mesophilic simulation conditions, etc.), a nature of being finally decomposed into simple compounds, such as: carbon dioxide ($CO_2$) and / or methane ($CH_4$), and water ($H_2O$), and mineralized inorganic salts and biological dead bodies of elements contained in them.

### 3.12 freshwater environment-degradable

In the freshwater environment (such as: rivers, lakes and simulated aqueous culture medium, etc.), a nature of being finally decomposed into simple compounds, such as: carbon dioxide ($CO_2$) and / or methane ($CH_4$), and water ($H_2O$), and mineralized inorganic salts and biological dead bodies of elements contained in them.

### 3.13 slurry anaerobic digestion

In the slurry anaerobic digestion device or simulated anaerobic digestion device, a nature of being finally decomposed into simple compounds, such as: carbon dioxide ($CO_2$) and / or methane ($CH_4$), and water ($H_2O$), and mineralized inorganic salts and biological dead bodies of elements contained in them.

### 3.14 high-solids anaerobic digestion

In an actual high-solids anaerobic digestion device or simulated high-solids anaerobic digestion environment, a nature of being finally decomposed into simple compounds, such as: carbon dioxide ($CO_2$) and / or methane ($CH_4$), and water ($H_2O$), and mineralized inorganic salts and biological dead bodies of elements contained in them.

## 4 Degradability Requirements

### 4.1 Organic Composition (volatile solids content)

The organic composition (volatile solids content) of biodegradable plastics and products shall be greater than or equal to 51%.

### 4.2 Chemical Properties

#### 4.2.2 Substances of very high concern

All materials used shall comply with national laws and regulations of products or banned hazardous substances in certain fields, especially those classified as carcinogenic, mutagenic, reproductive toxic substances, and allergenic substances, which shall be highly concerned. The substances of very high concern shall comply with the requirements of GB/T 39498, and the manufacturer shall provide relevant evidences, for example, self-declaration.

### 4.3 Degree of Biodegradation

The degree of biodegradation shall comply with the following requirements:

a) The relative degree of biodegradation shall be greater than or equal to 90%, and the absolute degree of biodegradation of a single organic component with a component greater than or equal to 1% in the material shall be greater than or equal to 60%;

b) If biodegradable plastics and products are composed of a mixture or a combination of multiple materials, then, the organic components with a component less than 1% shall also be biodegradable, but the proof of capacity is not required, and the sum of the components with a component less than 1% shall be less than 5%.

**NOTE:** for organic components whose component is greater than or equal to 1%, a certificate of biodegradability, for example, inspection report, shall be provided; for organic components whose component is less than 1%, corresponding product inspection reports or self-declarations by the enterprise can be provided for the biodegradability.

### 4.4 Disintegration

For biodegradable plastics and products that are claimed to be industrial compostable, high-solids anaerobic digestible and home compostable, the disintegration shall be greater than or equal to 90%.

### 4.5 Eco-toxicity Test of Degradation Products

#### 4.5.1 Phytotoxicity test of degradation products

If required, the emergence rate of degradation products of biodegradable plastics and products in the phytotoxicity test shall be greater than or equal to 90%, and the percentage of the mass of grown plants by the sample degradation product after drying at 105 °C for 3 h and that of the blank group of grown plants after drying shall be greater than or equal to 90%.

#### 4.5.2 Degradation product earthworm test pass rate

If required, the earthworm test survival rate of degradation product of biodegradable plastics and products shall be greater than or equal to 90%, and the ratio of surviving earthworms to the mass of earthworms at the beginning of the test shall be greater than or equal to 90%.

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