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

GB/T 1033.2-2010

**Plastics -- Methods for determining the density of non-cellular
plastics -- Part 2: Density gradient column method
(English Translation)**

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Table of Contents

Foreword...	3
1 Scope...	5
2 Normative references...	5
3 Terms and definitions...	6
4 Conditioning...	6
5 Methods...	7
6 Precision...	10
7 Test report...	12
Appendix A (Informative) Preparation of density gradient columns...	13
Appendix B (Informative) Liquid systems for density determination...	18

Foreword

GB/T 1033 Plastics - Methods for determining the density of non-cellular plastics is divided into the following three parts:

- Part 1: Immersion method, liquid pycnometer method and titration method;
- Part 2: Density gradient column method;
- Part 3: Gas pycnometer method.

This part is Part 2 of GB/T 1033.

This part was redrafted and modified in relation to ISO 1183-2:2004 Plastics - Methods for determining the density of non-cellular plastics - Part 2: Density gradient column method (English version).

The technical differences between this part and ISO 1183-2:2004 and their reasons are as follows:

- The International Standards listed in the chapter "Normative references" are respectively replaced by the Chinese national standards that correspond to these documents. GB/T 6379.2-2004 Accuracy (trueness and precision) of measurement methods and results - Part 2: Basic method for the determination of repeatability and reproducibility of a standard measurement method (ISO

5725-2:1994, IDT) is added to the reference documents;

- The definition of "density gradient column" is added;
- The float size requirement in ISO 1183-2:2004 is changed from "diameter not more than 5 mm" to "diameter not more than 8 mm";
- The requirements for accuracy of the calculation of density are clarified;
- The content related to precision is added;
- "Appendix C (Informative) Differences between this part of GB/T 1033 and Method D in GB/T 1033-1986" is added.

For ease of use, this part makes the following editorial changes to ISO 1183-2:2004.

- The foreword of ISO 1183-2:2004 is deleted;
- According to the writing rules of Chinese standards, the Appendix B of the original English text is changed into Appendix A of this standard, and the
Plastics - Methods for determining the density of non-cellular plastics - Part 2: Density gradient column method

WARNING: The application of this part may involve some dangerous materials, operations or equipment. This part does not address all possible safety issues related to the application. The user of this part is responsible for establishing the safety and health terms applicable to this part and determining the use specifications of this part before use.

1 Scope

This part of GB/T 1033 specifies the method for determining the density of non-cellular plastics using a density gradient column.

This standard applies to molded or extruded non-porous non-cellular plastic solid particles.

NOTE: Density is usually used to examine the changes in the physical structure or composition of plastic

materials, and is also used to evaluate the homogeneity of samples or specimens. The density of plastic

materials is usually also closely related to the preparation method of the specimen. In this

case, the

detailed method of specimen preparation shall be included in the relevant specifications of the material.

2 Normative references

The clauses in the following documents become clauses of this part through reference in this part of GB/T 1033. For all dated referenced documents, all subsequent amendments (excluding errata) or revisions are not applicable to this part. However, parties to agreements based on this part are encouraged to study whether the latest versions of these documents can be used. For all undated referenced documents, the latest versions are applicable to this part.

GB/T 1033.1-2008 Plastics - Methods for determining the density of non-cellular plastics - Part 1: Immersion method, liquid pycnometer method and titration method (ISO 1183-1:2004, IDT)

GB/T 2035-2008 Terms and definitions for plastics (ISO 472:1999, IDT)

GB/T 2918-1998 Plastics - Standard atmospheres for conditioning and testing (idt ISO 291:1997)

GB/T 6379.2-2004 Accuracy (trueness and precision) of measurement methods

NOTE: The diameter of the specimen is usually less than 5 mm.

5.4.1.1 The glass floats (5.1.3) shall be nearly spherical objects made by any convenient

method, not more than 8 mm in diameter and fully annealed.

5.4.1.2 To prepare glass floats of a certain density range, prepare a series of about 500

mL of mixed solutions prepared in different proportions from the two immersion solutions (5.2). The density range of the mixed solutions shall cover the entire range of density measured by the density gradient column (5.1.1). Gently place the floats in these mixed solutions at room temperature.

Select an appropriate glass float and adjust it according to the following steps to

approximately match the density of the corresponding mixed liquid:

- a) Polish the glass float on a glass plate with a dilute slurry of silicon carbide with a particle size of less than 38 μm (400 mesh) or another suitable abrasive.
- b) Etch the glass float with hydrofluoric acid.

5.4.1.3 Determine the exact density of each glass float obtained above. Gently place a

float in the mixed solution (5.2) placed in the liquid thermostatic bath (5.1.2). The temperature of the liquid thermostatic bath ($t \pm 0.1 \text{ }^{\circ}\text{C}$) is the operating temperature of the density gradient column (23 $^{\circ}\text{C}$ or 27 $^{\circ}\text{C}$). If the float sinks, add the heavier one of the two liquids (conversely, if the float ascends, add the lighter liquid) and then gently stir the mixture to make it uniform. After stirring evenly, observe whether the float is stable and motionless in the mixed solution. If the float moves up or down, adjust the density of the mixed solution again according to the above steps until the float can remain stationary for at least 30 minutes.

5.4.1.4 When the float reaches equilibrium, the density of the mixed liquid is recorded

as the density of the float. The density of the mixed liquid is determined by the liquid pycnometer method (method B) in GB/T 1033.1-2008 or other appropriate methods. The density of each float shall be accurate to 0.0001 g/cm³. If necessary, buoyancy shall be calibrated according to Chapter 6 of GB/T 1033.1-2008.

NOTE: Calibrated glass floats may also be available from approved suppliers.

5.4.2 Preparation of density gradient columns

This part does not describe in detail the preparation method of density gradient columns. Appendix B provides two reference methods.

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