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GB/T 5161-2025

Replacing GB/T 5161-2014

Metallic powder - Determination of effective density - Liquid immersion method

金属粉末 有效密度的测定 液体浸透法

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Foreword

This document complies with the provisions of GB/T 1.1-2020 "Standardization Work Guidelines Part 1: Structure and Drafting Rules of Standardization Documents". Drafting.

This document replaces GB/T 5161-2014 "Determination of Effective Density of Metal Powders by Liquid Immersion Method", and is consistent with GB/T 5161-2014.

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In comparison, aside from structural adjustments and editorial changes, the main technical changes are as follows.

a) The scope of application has been changed (see Chapter 1, Chapter 1 of the 2014 edition);

b) Change "in a vacuum environment" to "using vacuum degassing or ultrasonic bath" (see Chapter 4, Chapter 2 of the 2014 edition);

c) The section on "Test Preparation" (see Chapter 5 in the 2014 edition) has been removed;

d) Requirements for the "impregnation solution" have been added (see Chapter 5);

e) Added "vacuum pump" and "ultrasonic cleaner" (see 6.3, 6.7), and changed "vacuum degree measuring instrument" to "vacuum gauge" (see 6.4). (2014 version 4.3);

f) Added "samples" (see Chapter 7);

g) Added "Test Conditions" (see Chapter 8);

h) Added "sample" and "parallel test" (see 9.1, 9.2), and added ultrasonic bath degassing method (see 9.3.2 Method 2);

i) Change "Calculation" to "Experimental Data Processing" and add "The calculation result is displayed to two decimal places, and the numerical value is rounded according to..." The description of "conducting in accordance with the provisions of GB/T 8170" (see Chapter 10, Chapter 7 of the 2014 edition);

j) Added "relative error" (see Chapter 11);

k) The density values for some deaerated distilled water in Appendix B have been changed (see Appendix B, Appendix B of the 2014 edition).

Please note that some content in this document may involve patents. The issuing organization of this document assumes no responsibility for identifying patents.

This document was proposed by the China Nonferrous Metals Industry Association.

This document is under the jurisdiction of the National Technical Committee on Standardization of Nonferrous Metals (SAC/TC243).

This document was drafted by: Guangdong Academy of Sciences Institute of New Materials, China Iron & Steel Research Institute Co., Ltd., and Xi'an Ouzhong Materials Technology Co., Ltd.

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This document was first published in 1985, revised for the first time in 2014, and this is the second revision.

Determination of effective density of metal powder Liquid impregnation method

1 Scope

This document describes a method for determining the effective density of metal powders using the specific gravity bottle method.

This document applies to the determination of the effective density of metal powders. Other sintered metal materials (limited to particles or components without closed pores) are also included.

For reference in the determination of true density.

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2 Normative references

GB/T 8170

3 Terms and Definitions

The following terms and definitions apply to this document.

3.1

The volume occupied by powder particles after removing the volume of all open pores.

3.2

The mass of the powder is divided by the effective volume of the powder.

Note. When closed pores exist in the particles, the closed pores are considered as part of the volume of a single particle.

3.3 pycnometry (specific gravity bottle method)

A method of determining the effective density of powders or granules using a specific gravity bottle.

Note. This is a type of liquid impregnation method.

4 Principles

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The metal powder sample is placed in a specific gravity bottle with known mass and volume, a liquid medium is added, and the liquid is degassed using a vacuum degassing method or an ultrasonic bath.

The medium fully penetrates the open pores of the powder particles. Based on Archimedes' principle, the effective volume of the powder is measured, and thus the unit volume is calculated.

The mass of the powder is its effective density.

5 Reagents or materials

A liquid with good wettability and low volatility under vacuum should be selected. The impregnation solution should not chemically react with the sample or dissolve it.

Products. Xylene, degassed distilled water, ethanol, etc. can be selected as impregnation solutions.

6.1 Specific Gravity Bottle

A glass specific gravity bottle is recommended, such as the Gay-Lussac glass specific gravity bottle with a volume of 25 mL as specified in GB/T 21785.

Or 50mL, see Figure 1 for a schematic diagram of a glass specific gravity bottle.

Figure 1 Schematic diagram of a glass specific gravity bottle

6.2 Vacuum Degassing Device

The vacuum degassing device should be large enough to accommodate a specific gravity bottle, allowing for clear observation of the sample inside. This device should be compatible with a vacuum pump.

Connect the components to create a vacuum environment for the specific gravity bottle, as shown in Figure A.1 of Appendix A.

6.3 Vacuum Pump

The vacuum level can reach 666.5 Pa (5 mmHg).

6.4 Vacuum Gauge

The measurement range is 0 kPa to 26.66 kPa (0 mmHg to.200 mmHg).

6.5 Balance

The graduation value is 0.0001g.

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