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

GB/T 45974-2025

**Fine ceramics - Method for determination of grain size and size
distribution**

精细陶瓷 晶粒尺寸和尺寸分布的测定方法

(English Translation)

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Reference

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 is modified to adopt ISO 13383-1:2012 "Fine ceramics (advanced ceramics, advanced technical ceramics) Microstructural characterization Part 1 Part 1: Determination of grain size and size distribution.

The technical differences between this document and ISO 13383-1:2012 and the reasons for them are as follows.

--- Increased the scope of application of this document to adapt to my country's technical conditions (see Chapter 1);

--- Changed the symbols of terms to make them more standardized (see 3.3, 3.4, 3.5);

--- Increased diamond abrasive grit to adapt to my country's technical conditions and facilitate test development (see 5.1);

--- Added the requirement of using a scanning electron microscope to take microstructure photos to make the test process more rigorous (see 7.1);

--- The normative reference GB/T 27025 replaces ISO/IEC 17025 (see Chapter 11).

The following editorial changes have been made to this document.

- To coordinate with the existing standard, the name of the standard is changed to "Determination of grain size and size distribution of fine ceramics";
- Added a note on the definition of average linear intercept grain size (see 3.2);
- Deleted the note to Chapter 4 of ISO 13383-1:2012;
- Deleted the notes to 5.1 and 7.1 in ISO 13383-1:2012;
- Deleted the notes to 7.4.2 and 8.5 in ISO 13383-1:2012;
- Deleted Note 4 to Chapter 11 of ISO 13383-1:2012;
- Deleted Annex G (informative) of ISO 13383-1:2012.

1 Scope

This document describes a manual method for determining the grain size of fine ceramics using microscopic photographs of polished and etched samples to reveal the grain boundaries.

This method does not give the true average grain size, but rather a slightly smaller parameter depending on the the relationship between the results of this method and the true grain size depends on the anisotropy of the grain shape and microstructure.

The file contains two types of methods. Method A and Method B.

Method A is the average linear intercept method, which is divided into Method A1 and Method A2. Method A1 is suitable for single-phase dense ceramics and main crystals.

For ceramics with a volume fraction of less than about 5% of the pore and glass grain boundary phases, intercept counting is sufficient. Method A2 is suitable for pore or second phase volume for ceramics with fractions greater than approximately 5%, or ceramics with multiple major crystalline phases, a single intercept length needs to be measured and can be selected for size Method A2 is based on distinguishing the microstructural differences between pores or phases and calculating their average linear intercepts.

NOTE: ISO 13383-2 gives the method for determining the volume fraction of the second phase.

Method B is the average equivalent circle diameter method, which is applicable to all types of ceramic materials (regardless of whether there is a second phase) and the grain size Determination of grain size, grain aspect ratio and size distribution.

Some users apply automatic or semi-automatic image analysis to micrographs or directly captured images of microstructures, as long as the technology used Simulation of manual methods (see Clauses 4 and 8.4) satisfies this document.

This document applies to the determination of grain size and size distribution of

single-phase ceramic materials and whisker and/or particle reinforced composite ceramic materials.

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 27025 General requirements for the competence of testing and calibration laboratories (GB/T 27025-2019, ISO/IEC 17025:2017, IDT)

3 Terms and Definitions

The following terms and definitions apply to this document.

grain size

The sizes of different crystals or phases in a material.

gmli

The average value of the distances between grain boundaries obtained from randomly drawn lines in a micrograph or micrograph.

Note: Also known as average linear cross-section grain size.