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**Test method for compressive strength of powder**

粉末抗压强度测试方法

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# Test method for compressive strength of powder

## 1 Scope

This document specifies the test method for compressive strength of powder.

This document is applicable to the determination of the compressive strength of crushable spherical, spherical or irregular powders with a particle size of 5  $\mu\text{m}$  ~ 50  $\mu\text{m}$ .

This document does not apply to powders with obviously unequal shapes (such as flakes and strips).

## 2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

GB/T 8170, *Rules of rounding off for numerical values and expression and judgement of limiting values*

GB/T 19077, *Particle size analysis -- Laser diffraction methods*

## 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

### 3.1 crushing force

The test force when powder particles are crushed.

### 3.2 compressive strength of powder

The strength limit of powder particles when subjected to external pressure.

### 3.3 particle diameter

For spherical powders, it is the diameter of the powder particles. For spherical or irregular-shaped powders, it is the "equivalent particle diameter" of the powder particles.

**NOTE:** "Equivalent particle diameter" is measured using the method in Figure 1. The equivalent particle diameter  $d$  is the arithmetic mean of  $d_1$  and  $d_2$ .

- b) Use a soft lint-free cloth or clean paper to clean the test platform and indenter;
- c) Turn on the equipment system and run it for 30 min;
- d) Spread the powder to be tested evenly on the test platform;
- e) Transfer the test platform to the objective lens of the micro-compression testing machine and fix it. Set appropriate loading pressure and loading rate according to sample characteristics;
- f) Adjust the position of the test platform. Observe the particles in the viewing area of the plane indenter. Select particles with a representative target particle diameter (similar to  $D_{50}$ );
- g) Adjust the eyepiece or objective lens magnification so that a single particle is located in the center of the plane indenter viewing area. Fine-tune the height of the test platform to make the edges of the target particles clear. Measure the particle diameter;
- h) Fine-tune the height of the test platform again to move the target particles to the apex and focus. Move the test platform under the flat indenter. Test and obtain the test force and compression displacement curve;
- i) The number of test particles shall be no less than 5. The number of test particles can also be selected according to actual needs.

## 9 Test data processing

9.1 The compressive strength of powder is calculated according to formula (1):

$$p_{cs} = \alpha \times 1\,000 \times \frac{F_{yk}}{\pi \cdot d^2} \dots\dots\dots (1)$$

Where,

$p_{cs}$  - Compressive strength, in MPa;

$\alpha$  - Calculation coefficient, taking 2.48;

$F_{yk}$  - Crushing force, in millinewton (mN);

$d$  - Particle diameter, in micron ( $\mu\text{m}$ ).

9.2 The test results are given as the arithmetic mean of the compressive strength of the test particles. Round to 1 MPa according to the provisions of GB/T 8170.

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