

ICS 77.160
CCS H22



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

GB/T 43091-2023

Test method for compressive strength of powder

粉末抗压强度测试方法

Issued on: September 7, 2023

Implemented on: April 1, 2024

**Issued by: State Administration for Market Regulation;
Standardization Administration of the PRC**

Table of Contents

Foreword	3
1 Scope	4
2 Normative references	4
3 Terms and definitions	4
4 Method principle	5
5 Test conditions	6
6 Instruments and equipment	6
7 Sample	6
8 Test steps	6
9 Test data processing	7
10 Test report	8

Foreword

This document was issued on 7 September 2023 by the State Administration for Market Regulation; Standardization Administration of the PRC and takes effect on 1 April 2024.

It is a GB/T standard: recommended rather than compulsory, but it is the text a Chinese reviewer applies when assessing a submission.

1 Scope

GB/T 43091-2023 measures the strength of individual powder particles. It is a property that matters wherever a powder is handled rather than merely possessed: particles that fracture under load generate fines, and fines change everything downstream - flowability in a hopper or a printer's recoater, packing density in a die, permeability in a filter bed, and the dust that becomes both a loss and a hazard. Catalyst supports, proppants, additive manufacturing powders and pharmaceutical granules are all specified partly on this basis, and it cannot be inferred from the bulk material's properties, because the strength of a single particle depends on its internal porosity and the flaws within it. This document specifies the test method for the compressive strength of powder, in which individual particles are compressed and the load at failure recorded. It applies to determining the compressive strength of crushable spherical, near-spherical or irregular powders in the particle size range from about 5 μm upward. Under CCS H22, it is written for powder producers, for the additive manufacturing, catalysis and oilfield industries that specify particle integrity, and for the laboratories that test it.

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 μm ~ 50 μm .

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 D50);

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):

Where,

pcs - Compressive strength, in MPa;

alpha - Calculation coefficient, taking 2.48;

Fyk - Crushing force, in millinewton (mN);

d - Particle diameter, in micron (um).

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.

.....