



Standard Test Method for Radial Crush Strength of Extruded Catalyst Particles¹

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1. Scope

1.1 This test method is suitable for determining the resistance of extruded catalysts to compressive force from the side.

1.2 This test method was developed using extruded catalyst from $\frac{1}{16}$ to $\frac{1}{8}$ in. in diameter (0.159 to 0.318 cm) and limited to pieces with a length to diameter ratio greater than or equal to 1:1. This test method may be applicable to other diameters.

1.3 This test method is suitable for the determination of mean crush strength per millimetre in the range of 0 to 15 lbf/mm (0 to 65 N/mm).

1.4 The values stated in pounds lbf/mm units are to be regarded as the standard. The values given in parentheses are provided for information only.

1.5 This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and to determine the applicability of regulatory limitations before use.

2. Referenced Documents

2.1 ASTM Standards:

E 177 Practice for Use of the Terms Precision and Bias in ASTM Test Methods²

E 456 Terminology Relating to Quality and Statistics²

E 691 Practice for Conducting and Interlaboratory Study to Determine the Precision of a Test Method²

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 *extruded catalyst particles*, as used in this test method, cylindrical particles with uniform cross sections, either solid, hollow core, or multilobed, formed by extrusion.

4. Summary of Test Method

4.1 Individual extrudates taken from a representative sample are calcined, measured in length, placed between two flat surfaces, and subjected to a compressive force. The force required to crush the extrudate is measured. The procedure is replicated, the force per millimetre calculated, and the average of all quotients determined.

5. Significance and Use

5.1 This test method is intended to provide information on the ability of an extruded catalyst to retain physical integrity during use.

6. Apparatus

6.1 A suitable compression testing device is required, composed of the following:

6.1.1 *Calibrated Pressure or Force Gage*, marked for direct reading of the force in pounds force (Newtons) with a range about two times the expected average force reading. A suitable system (mechanical, hydraulic, or pneumatic) must be provided so that the rate of force applied is both uniform and controllable within specified limits (see 9.4).

6.1.2 *Tool Steel Anvils*, between which the sample will be crushed. The faces of the tool steel anvils shall be smooth and free from hollows or ridges that would interfere with uniform contact along the length of the extrudate. The faces shall be parallel to each along their entire length of travel. The faces of both anvils must be longer in one dimension than the length of the sample pieces to be crushed.

6.2 A device for determining length, reading in millimetres, and of suitable accuracy to measure to the nearest tenth.

7. Sampling

7.1 A test sample of 50 to 200 individual particles shall be obtained from larger composites by riffling or splitting according to STP 447A (Section 5.12), with the aim of obtaining a representative sample that represents both the shape and size of the larger composite. The amount of the sample shall depend on the precision required and the homogeneity of the material being tested. All of the individual particles sampled that have a length to diameter ratio greater than or equal to one shall be tested.

7.2 Heat the test sample(s) at $400 \pm 15^\circ\text{C}$ for not less than 3 h.

NOTE 1—Moisture pick-up by extrudates is often rapid and the measured crush strength may be affected.

7.3 After heating, cool the test sample(s) in a desiccator or other suitable container to prevent the adsorption of moisture before testing.

NOTE 2—If the catalyst may be damaged at 400°C , a lower temperature can be used so long as it is specified with the result. Normally, this treatment can take place in air. However, for materials that might react with air at elevated temperatures (such as prerduced catalysts), the heat

¹ This test method is under the jurisdiction of ASTM Committee D-32 on Catalysts, and is the direct responsibility of Subcommittee D32.02 on Physical-Mechanical Properties.

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² *Annual Book of ASTM Standards*, Vol 14.02.