



Designation: D 5757 – 00

Standard Test Method for Determination of Attrition and Abrasion of Powdered Catalysts by Air Jets¹

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1. Scope

1.1 This test method covers the determination of the relative attrition characteristics of powdered catalysts by means of air jet attrition. It is applicable to spherically or irregularly shaped particles which range in size between 10 and 180 μm , have skeletal densities between 2.4 and 3.0 g/cm^3 (2400 and 3000 kg/m^3) (see IEEE/ASTM SI-10) and are insoluble in water. Particles less than 20 μm are considered fines.

1.2 *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 determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*

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

E 456 Terminology Relating to Quality and Statistics²

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

IEEE/ASTM SI-10 Standard for Use of the International System of Units (SI): The Modern Metric System²

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *Air Jet Index (AJI)*—a unitless value numerically equal to the percent attrition loss at 5 h.

4. Summary of Test Method

4.1 A sample of dried powder is humidified and attrited by means of three high velocity jets of humidified air. The fines

are continuously removed from the attrition zone by elutriation into a fines collection assembly.

4.2 The AJI is calculated from the elutriated fines to give a relative estimate of the attrition resistance of the powdered catalyst as may be observed in commercial use.

5. Significance and Use

5.1 This test method is intended to provide information concerning the ability of a powdered catalyst to resist particle size reduction during use in a fluidized environment.

5.2 This test method is suitable for specification acceptance, manufacturing control, and research and development purposes.

6. Apparatus

6.1 The air jet attrition system consists of the following:

6.1.1 *Attriting Tube*, a stainless steel tube 710 mm long with a 35 mm inside diameter.

NOTE 1—NPS 1¼-in. pipe, Schedule 40 has the appropriate inside diameter.

6.1.2 *Three 2-mm Long Drilled Sapphire Square Edged Nozzles*, precision drilled 0.381 ± 0.005 mm in diameter. They are mounted equidistant from each other, 10 mm from center and flush with the top surface in a circular orifice plate 6.4 mm thick. The plate is designed to be attached to the bottom of the vertical attriting tube within an air delivery manifold.

6.1.3 *Settling Chamber*, a 300 mm long cylinder with a 110 mm inside diameter and with conical ends reducing to 30 mm inside diameter. The upper cone is approximately 100 mm long and the lower cone is approximately 230 mm long. The chamber is mounted to the top of the attriting tube.

6.1.4 *Fines Collection Assembly*, made up of a 250 mL filtering flask, an extraction thimble connected to the side arms of the flask, and a 200 by 13 mm diameter metal tubing bent to an angle of 125° connecting the top of the flask to the top of the settling chamber.

NOTE 2—The flask may be eliminated and the thimble connected directly to the tubing if the attrition is expected to be low enough to avoid clogging the thimble and creating a backpressure in the settling chamber.

¹ This test method is under the jurisdiction of ASTM Committee D32 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.