Designation: D4058 – 96 (Reapproved 2006)

Standard Test Method for Attrition and Abrasion of Catalysts and Catalyst Carriers[1]

This standard is issued under the fixed designation D4058; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This test method covers the determination of the attrition and abrasion resistance of catalysts and catalyst carriers. It is applicable to tablets, extrudate, spheres, and irregularly shaped particles larger than about 1⁄16 in. (1.6 mm) and smaller than about ¾ in. (19 mm). The materials used in developing the method exhibited losses on attrition less than 7 %; however, the method should be applicable to materials giving much higher attritions.

1.2 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.3 *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:*[2]

E177 Practice for Use of the Terms Precision and Bias in ASTM Test Methods

E456 Terminology Relating to Quality and Statistics

E691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method

3. Summary of Test Method

3.1 A sample of catalyst or catalyst carrier is rotated for a set period of time in a cylindrical drum having a single baffle. Fines produced by attrition and abrasion in the test are determined by sieving through a standard sieve.

4. Significance and Use

4.1 This test method is considered to be a measure of the propensity of a catalyst to produce fines in the course of transportation, handling, and use. However, there is no absolute level of acceptability. The values obtained are significant principally in relation to values for other materials (or other samples of the same material) of comparable size.

5. Apparatus

5.1 A cylindrical drum with inside dimensions of 10 in. (254 mm) diameter and 6 in. (152 mm) long with a single radial baffle 2 in. (51 mm) high extending the full length of the cylinder. A lid shall be provided and secured to the container with Allen-head screws, wing nuts or other suitable means as to ensure that no fines escape during the test. The inside of the drum should have a surface roughness no greater than about 250 µin. (6.4 µm). (The roughness of cold-rolled steel or a smooth grind on a lathe is satisfactory.) A suitable design is shown in Fig. 1.

5.2 Any convenient means of rotation, such as a ball mill roller, geared to give the desired rate of rotation of the drum.

6. Sampling

6.1 Obtain a representative sample of about 110 g of the material to be tested by gently splitting or quartering. Any sampling technique requiring extensive agitation or handling will cause some attrition and, therefore, compromise the results of the test.

6.2 Gently sieve the sample on a No. 20 (850-µm) ASTM sieve.

6.3 Transfer the presieved sample to a widemouthed container tared to the nearest 0.01 g.

6.4 Dry the presieved sample in air for 3 h at 400°C. It may be necessary to modify or eliminate this step when testing materials that might be decomposed or drastically altered by the drying conditions.

NOTE 1—For example, an activated carbon catalyst may be treated for 4 h at 190°C in a vacuum oven.

6.5 Cool the dried sample for at least 30 min in a desiccator using freshly regenerated 4A molecular sieves as the desiccant. The molecular sieves shall be regenerated at 220 to 260°C.

[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] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.