



Designation: ~~D4699-99~~ Designation: D 4699 – 03 (Reapproved 2008)

Standard Test Method for Vibratory Packing Density of Large Formed Catalyst and Catalyst Carrier Particles¹

This standard is issued under the fixed designation D 4699; 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 vibratory packing density of formed catalyst and catalyst carrier particles that will not break up significantly under test conditions. For the purpose of this test, catalyst particles are defined as extrudates, spheres or formed pellets greater than 4.8 mm ($\frac{3}{16}$ in.).

~~1.2~~

1.2 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.

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

D 3766 Terminology Relating to Catalysts and Catalysis

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

E 456 Terminology Relating to Quality and Statistics

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

3. Summary of Test Method

~~3.1A known sample of environmentally equilibrated formed catalyst or catalyst carrier particles is vibrated in a graduated cylinder. The vibratory packing density is determined for a specified drying condition. Terminology~~

3.1 Definitions—See Terminology D 3766.

4. Significance and Use

~~4.1 This test method is used for measuring the vibratory packing density of formed particles used in fixed bed reactors, driers, etc. Summary of Test Method~~

4.1 A known sample of environmentally equilibrated formed catalyst or catalyst carrier particles is vibrated in a graduated cylinder. The vibratory packing density is determined for a specified drying condition.

5. Significance and Use

5.1 This test method is used for measuring the vibratory packing density of formed particles used in fixed bed reactors, driers, and so forth.

6. Apparatus

~~5.1~~

6.1 Graduated Cylinder, capacity 2000-mL.

~~5.2, capacity 2000-mL.~~

6.2 Vibratory Plate.³

¹This 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.

Current edition approved Oct. 10, 1999. Published December 1999. Originally published as D4699-87. Last previous edition D4699-94.

¹This 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.

Current edition approved April 1, 2008. Published April 2008. Originally approved in 1987. Last previous edition approved in 2003 as D 4699-03.

²For 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*, Vol 14.02, volume information, refer to the standard's Document Summary page on the ASTM website.

5.3.³

6.3 *Desiccator*, with a desiccant grade molecular sieve such as 4A.

5.4

6.4 *Balance* having a sensitivity of 1.0 g.

5.5

6.5 *Balance* having a sensitivity of 0.1 g.

5.6

6.6 *Drying Oven*.

6.

7. Procedure

6.1 Equilibrate test sample to laboratory environment for 4 h.

6.2 ~~Pour~~ 7.2 *Pour* between 1000 to 2000 mL of the test specimen carefully into a tared beaker and weigh to the nearest 1 g. Record as W .

6.3 Separately weigh to the nearest tenth of a gram about 100 g of additional test sample, W_1 , that will be used for moisture loss. Heat this sample at $673\text{ K } (400^\circ\text{C}) \pm 15\text{ K } (15^\circ\text{C})$ for not less than 3 h. Normally, this treatment can take place in air; however, in the case of materials that might react with air at elevated temperature (such as prerduced catalysts) the heat treatment should take place in an inert atmosphere. After heating, cool the test sample in a desiccator or other suitable container to eliminate the possibility of moisture adsorption prior to weighing. Weigh the sample to the nearest tenth of a gram, W_H .

NOTE 1—The conditions may not be appropriate for all materials.

NOTE 2—Since many catalyst formulations are strong adsorbents, the use of a 4A indicating (cobalt-treated) molecular sieve as a desiccating medium is recommended. The desiccant should be regenerated at $493\text{ K } (220^\circ\text{C}) \pm 20$ to $533\text{ K } (260^\circ\text{C}) \pm 20^\circ\text{C}$, as required.

NOTE 3—Multiple samples can be pretreated but must be desiccated prior to analysis.

6.4 ~~Clamp~~ 7.4 *Clamp* the cylinder to the vibratory plate (see example Fig. 1).

6.5 ~~Start~~ 7.5 *Start* vibrator at a setting at the midpoint of the rheostat range and pour the 1000 to 2000-mL test specimen carefully into the graduated cylinder using a funnel. The entire transfer time should be between 90 and 120 s. Those vibrating plate machines that operate at a frequency other than 60 Hz will require appropriate adjustment of the vibrating time.

6.6 Continue vibrating for 5 min.

³ If you are aware of alternative suppliers, please provide this information to ASTM Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend.

³ The sole source of supply of the Syntron Vibrating Machine, Model V-2-B with Power Pulse Controller, known to the committee at this time is FMC Technologies, 57 Cooper Ave., Homer City, PA 15748-9234. If you are aware of alternative suppliers, please provide this information to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend.

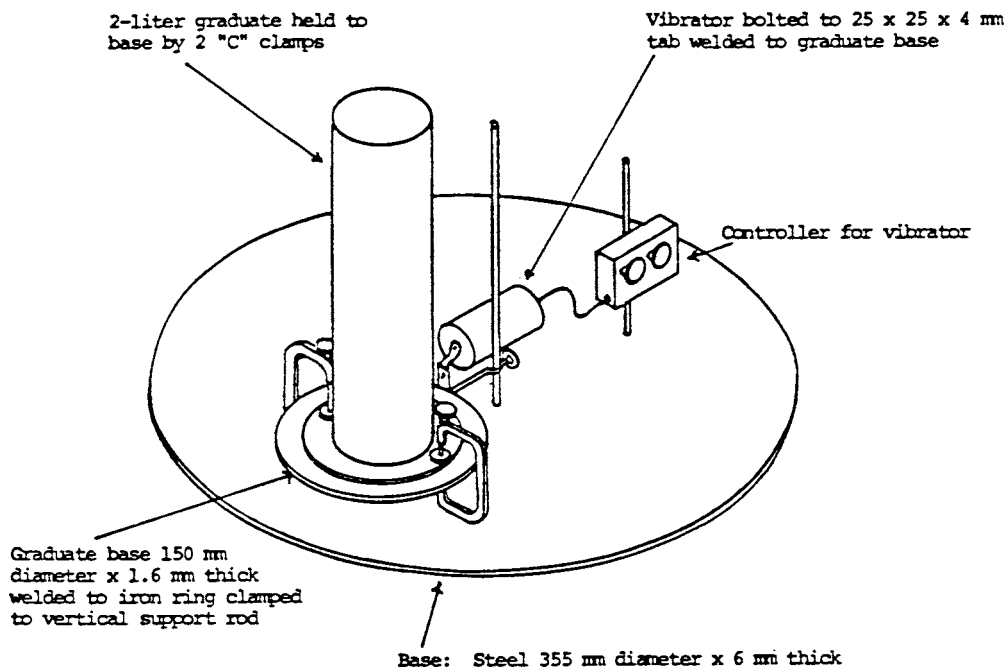


FIG. 1 An Example of Components of Vibratory Stand for Large Diameter Pellets