



Designation: D3802 – 23

Standard Test Method for Ball-Pan Hardness of Activated Carbon¹

This standard is issued under the fixed designation D3802; 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 a procedure for determining the ball-pan hardness number of granular activated carbons. For the purpose of this test, granular activated carbons are those having particles 90 % of which are larger than 80 mesh (180 μm) as determined by Test Method [D2862](#).

1.2 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this 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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 ASTM Standards:²

[B19 Specification for Cartridge Brass Sheet, Strip, Plate, Bar, and Disks](#)

[B150/B150M Specification for Aluminum Bronze Rod, Bar, and Shapes](#)

[D2652 Terminology Relating to Activated Carbon](#)

[D2854 Test Method for Apparent Density of Activated Carbon](#)

[D2862 Test Method for Particle Size Distribution of Granular Activated Carbon](#)

[D2867 Test Methods for Moisture in Activated Carbon](#)

[E11 Specification for Woven Wire Test Sieve Cloth and Test Sieves](#)

[E300 Practice for Sampling Industrial Chemicals](#)

3. Terminology

3.1 *General*—Terms applicable to this standard are defined in Terminology [D2652](#).

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *nominal particle size: natural, granular, and irregularly shaped particle carbons, n*—that particle size range, expressed in terms of Specification [E11](#) sieve sizes, whose small end excludes not more than 5 % of the particle size distribution, and whose large end excludes not more than 5 % of the distribution, on a weight basis.

3.2.2 *nominal particle size: pelleted carbons, n*—that particle size range, expressed in terms of Specification [E11](#) sieve sizes, whose small end excludes not more than 10 % of the particle size distribution, and whose large end excludes not more than 5 % of the distribution, on a weight basis.

3.2.3 *small end nominal particle size, n*—that particle size, expressed by its equivalent Specification [E11](#) sieve, which defines the excluded portion of the particle size distribution at its small particle size end in accordance with [3.2.1](#) or [3.2.2](#).

4. Summary of Test Method

4.1 A screened and weighed sample of the carbon is placed in a brass hardness pan with a specified number of stainless steel balls, then subjected to a combined rotating and tapping action for 30 min. At the end of this period, the amount of particle size degradation is determined by measuring the quantity of carbon, by weight, which is retained on a sieve whose openings are closest to one half the openings of the sieve that defines the minimum nominal particle size of the original sample.

5. Significance and Use

5.1 Several methods have been employed in the past for determining the resistance of activated carbons to particle size degradation under service conditions, including the ball-pan method, the stirring bar method, and the dust elutriation method. None of these have proven completely satisfactory for all applications, and all have been questioned by ASTM Committee D28 on Activated Carbon as tests for establishing

¹ This test method is under the jurisdiction of ASTM Committee [D28](#) on Activated Carbon and is the direct responsibility of Subcommittee [D28.04](#) on Gas Phase Evaluation Tests.

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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.