



Designation: D5228 – 16 (Reapproved 2023)

Standard Test Method for Determination of Butane Working Capacity of Activated Carbon¹

This standard is issued under the fixed designation D5228; 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 butane working capacity (BWC) of new granular activated carbon. The BWC is defined as the difference between the butane adsorbed at saturation and the butane retained per unit volume of carbon after a specified purge. The test method also produces a butane activity value that is defined as the total amount of butane adsorbed on the carbon sample and is expressed as a mass of butane per unit weight or volume of carbon.

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.* For a specific hazard statement, see 7.1.

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

D2652 Terminology Relating to Activated Carbon

D2854 Test Method for Apparent Density of Activated Carbon

D2867 Test Methods for Moisture in Activated Carbon

D3195 Practice for Rotameter Calibration

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

E300 Practice for Sampling Industrial Chemicals

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

3. Terminology

3.1 *Definitions*—For definitions of terms used in this test method, refer to Terminology D2652.

4. Summary of Test Method

4.1 An activated carbon bed of known volume and mass is saturated with butane vapor. The mass adsorbed at saturation is noted. The carbon bed is then purged under prescribed conditions with dry hydrocarbon free air. The loss of mass is the BWC and is expressed as mass of butane per unit volume of carbon.

5. Significance and Use

5.1 The BWC, as determined by this test method, is a measure of the ability of an activated carbon to adsorb and desorb butane from dry air under specified conditions. It is useful for quality control and evaluation of granular activated carbons that are used in applications where the adsorption of butane and desorption with dry air are of interest. The BWC can also provide a relative measure of the effectiveness of the tested activated carbons on other adsorbates.

5.2 The butane activity and retentivity can also be determined under the conditions of the test. The butane activity is an indication of the micropore volume of the activated carbon sample. The butane retentivity is an indication of the pore structure of the activated carbon sample.

6. Apparatus

6.1 *Water Bath*, capable of maintaining a temperature of $25^{\circ}\text{C} \pm 0.2^{\circ}\text{C}$ and of sufficient depth so the entire carbon bed in the sample tube is immersed in the water. A 6 mm OD copper tube with an immersed length of 1.9 m (Fig. 1) provides adequate heat transfer for gas temperature control.

6.2 *Sample Tube*, as shown in Fig. 2. The glass plate with holes is preferred to a fritted disk to support the carbon, since fritted disks can vary widely in pressure drop.

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.