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AMERICAN SOCIETY FOR TESTING AND MATERIALS
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Standard Test Method for Real Density of Calcined Petroleum Coke by Helium Pycnometer¹

This standard is issued under the fixed designation D 2638; 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 is intended for the determination of the real density (RD) of calcined petroleum coke. Real density, by definition is obtained when the particle size of the specimen is smaller than 75 microns (No. 200 Sieve).

1.2 The values stated in acceptable metric units are to be regarded as the 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:

D 346 Practice for Collection and Preparation of Coke Samples for Laboratory Analysis²

D 2013 Method of Preparing Coal Samples for Analysis²

D 2234 Test Methods for Collection of a Gross Sample of Coal²

D 4057 Practice for Manual Sampling of Petroleum and Petroleum Products³

D 4292 Test Method for Vibrated Bulk Density of Calcined Petroleum Coke³

D 4930 Test Method for Dust Control Material on Calcined Petroleum Coke⁴

E 11 Specification for Wire-Cloth Sieve for Testing Purposes⁵

3. Terminology

3.1 Definitions:

3.1.1 *calcined petroleum coke*—green petroleum coke which has been thermally treated to drive off the volatile matter and to develop crystalline structure.

3.1.2 *petroleum coke*—a solid, carbonaceous residue produced by thermal decomposition of heavy petroleum fractions and/or cracked stocks.

¹ This test method is under the jurisdiction of ASTM Committee D-2 on Petroleum Products and Lubricants and is the direct responsibility of Subcommittee D02.05.OD on Petroleum Coke Sampling and Procedures.

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² *Annual Book of ASTM Standards*, Vol 05.05.

³ *Annual Book of ASTM Standards*, Vol 05.02.

⁴ *Annual Book of ASTM Standards*, Vol 05.03.

⁵ *Annual Book of ASTM Standards*, Vol 14.02.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *bulk density*—the mass of the particles divided by the volume they occupy which includes the space between the particles. Refer to Test Method D 4292 for bulk density procedures.

3.2.2 *dedusting material*—See Test Method D 4930.

3.2.3 *real density* (RD) (also be referred to as true specific gravity). The mass divided by the volume occupied by the material excluding pores and voids. It is required, therefore, that voids in the coke be eliminated and that pores in the material be filled by the fluid being displaced. This requirement is met for the purposes of this test method by reducing the coke particles to a size smaller than 75 microns.

3.2.3.1 *Discussion*—The density of particles larger than 75 microns up to the largest that can be put into the helium pycnometer can also be determined, but must be designated as particle density (PD). The precision data obtained for RD may not be applicable to PD.

4. Summary of Test Method

4.1 A representative sample of calcined petroleum coke is dried and ground to pass a 75-micron (200-mesh) screen. The mass of the sample is determined directly and the volume derived by the volume of helium displaced when the sample is introduced into a helium pycnometer. The ratio of the mass of the sample to the volume is reported as the real density.

5. Significance and Use

5.1 The real density of calcined petroleum coke directly influences the physical and chemical properties of the manufactured carbon and graphite artifacts for which it is used. Density, therefore, is a major quality specification of calcined petroleum coke and is used as a control in coke calcination.

6. Interferences

6.1 Oil or other dedust material sprayed on calcined petroleum coke to control dust will interfere with the determination of real density so the oil must be removed before reducing the sample to 75 microns. Refer to Test Method D 4930 for dedust oil removal.

7. Apparatus

7.1 *Analytical Balance*, accurate to ± 0.1 mg.

7.2 *Desiccator*.

7.3 *Drying Oven*, preferably a vacuum oven, for temperature to 120°C.