



Standard Test Method for Single-Point Determination of Specific Surface Area of Catalysts and Catalyst Carriers Using Nitrogen Adsorption by Continuous Flow Method¹

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1. Scope

1.1 This test method covers the single-point determination of the surface area of catalysts and catalyst carriers that exhibit Type II or Type IV nitrogen adsorption isotherms using a nitrogen-helium flowing gas mixture. This test method is applicable for the determination of total surface areas from 0.1 to 300 m², where rapid surface area determinations are desired.

1.2 Because the single-point method uses an approximation of the BET equation, the multipoint BET method (Test Method D3663) is preferred to the single-point method.

NOTE 1—This is particularly true when testing microporous materials.

1.3 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of whoever uses this standard to consult and establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:²

D3663 Test Method for Surface Area of Catalysts and Catalyst Carriers

D3766 Terminology Relating to Catalysts and Catalysis

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

¹ This test method is under the jurisdiction of Committee D32 on Catalysts and is the direct responsibility of Subcommittee D32.01 on Physical-Chemical 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.

3. Terminology

3.1 *Definitions*—See Terminology D3766.

3.2 *Symbols*:

A_{cs}	= cross-sectional area of nitrogen, 16.2×10^{-20} m ² .
C_I	= integrator counts.
C_I^{Ta}	= integrator counts corrected for ambient temperature.
C_I^{Pa}	= integrator counts corrected for ambient pressure.
N	= Avogadro's number, 6.02×10^{23} , molecules/mole.
P	= partial pressure of nitrogen, torr.
P_a	= ambient pressure, torr.
P_o	= saturated equilibrium vapor pressure of liquid nitrogen, torr.
R	= gas constant, 82.1 cm ³ atm/K mole.
T_a	= ambient temperature, K.
V	= volume of nitrogen adsorbed at ambient temperature and pressure, cm ³ .
W_1	= tare of sample cell, g.
W_2	= sample mass + tare of sample cell after analysis, g.
W_s	= mass of sample, g.

4. Summary of Test Method

4.1 The sample is degassed by heating in a flow of inert gas to remove adsorbed vapors from the surface. The sample is then immersed in a liquid nitrogen bath causing adsorption of nitrogen from a flowing mixture of a fixed concentration of nitrogen in helium. When adsorption is complete, the sample is allowed to warm to room temperature causing desorption, which results in an increase in the nitrogen concentration in the flowing mixture. The quantity of nitrogen gas desorbed is determined by sensing the change in thermal conductivity.

4.2 Calculation of the surface area is based on a modified form of the BET equation.

5. Significance and Use

5.1 This test method is useful for determining the specific surface area of catalysts and catalyst carriers for material specifications, manufacturing control, and research and development in the evaluation of catalysts.