



Designation: D4365 – 19

Standard Test Method for Determining Micropore Volume and Zeolite Area of a Catalyst¹

This standard is issued under the fixed designation D4365; 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 total surface area and mesopore area. From these results are calculated the zeolite area and micropore volume of a zeolite containing catalyst. The micropore volume is related to the percent zeolite in the catalyst. The zeolite area, a number related to the surface area within the zeolite pores, may also be calculated. Zeolite area, however, is difficult to interpret in physical terms because of the manner in which nitrogen molecules pack within the zeolite.

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 precautionary statement, see [Note 3](#).

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

[D3663](#) Test Method for Surface Area of Catalysts and Catalyst Carriers

[D3906](#) Test Method for Determination of Relative X-ray Diffraction Intensities of Faujasite-Type Zeolite-

Containing Materials

[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

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *micropore volume of the catalyst, n* —the pore volume in pores having radii less than 1 nm, usually associated with the zeolite portion of the catalyst, and determined from the intercept of the t-plot.

3.1.2 *surface area of a catalyst, n* —the total surface of the catalyst obtained from the BET method.

3.1.2.1 *Discussion*—Surface area may be used interchangeably with BET area. It is expressed in square meters per gram.

3.1.3 *t-area of the catalyst, n* —the area determined from the slope of the t-plot.

3.1.3.1 *Discussion*—t-area may be used interchangeably with matrix area or external surface area. It is expressed in square meters per gram.

3.1.4 *zeolite area of a catalyst, n* —the difference between total surface area and mesopore area.

3.1.4.1 *Discussion*—The zeolite area may be used interchangeably with micropore area. It is expressed in square meters per gram.

3.2 *Symbols:*

P_{H_1}	= initial helium pressure, torr
P_{H_2}	= helium pressure after equilibration, torr
S_B	= slope of BET plot, 11.7
I_B	= intercept of BET plot, 11.7
A_B	= BET area, 11.9
N	= Avogadro's number
A_{CS}	= Cross-sectional area of adsorbed nitrogen molecule
S_t	= slope of t-plot, 11.13
I_t	= intercept of t-plot, 11.13
A_t	= t-area

¹ This test method is under the jurisdiction of ASTM 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.