



Designation: D8393 – 21

Standard Guide for Determination of Pore Volume of Powdered Catalysts and Catalyst Carriers by Water Adsorption¹

This standard is issued under the fixed designation D8393; 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 guide measures pore volume of powdered catalysts and catalyst carriers by titration with water. The water does not react with material. The range of pore volume is 0.25 mL/g to 0.46 mL/g.

1.2 This guide is suitable for fine catalysts such as fluid catalytic cracking (FCC) catalysts (fresh or equilibrium), catalyst additives and spray dried catalyst carriers or finished catalysts, or a combination thereof, and is typically applicable to powders with the majority of particles (above 90 %) in the distribution range between 20 and 150 μm equivalent spherical diameter (determined by Test Method D4464) and with an average particle size between 60 and 100 μm .

NOTE 1—This technique is capable of measuring particles below and above this range (for example, from 1 to 300 μm) but no precision data is available.

1.3 *Units*—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 the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.5 *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

- D1193 Specification for Reagent Water
- D4284 Test Method for Determining Pore Volume Distribution of Catalysts and Catalyst Carriers by Mercury Intrusion Porosimetry
- D4464 Test Method for Particle Size Distribution of Catalytic Materials by Laser Light Scattering
- E105 Guide for Probability Sampling of 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 *capillary action, n*—the ability of a liquid to flow in narrow spaces as induced by the intermolecular forces between the liquid and surrounding solid surfaces.

3.1.2 *macropore, n*—pore with internal width greater than 50 nm.

3.1.3 *mesopore, n*—pore with internal width between 2 nm and 50 nm.

3.1.4 *surface tension, n*—the attractive force exerted upon the surface molecules of a liquid by the molecules beneath that tends to draw the surface molecules into the bulk of the liquid and makes the liquid assume the shape having the least surface area.

4. Summary of Guide

4.1 This guide is intended to provide mesopore and macropore volume information of powdered catalysts and catalyst carriers. It helps users to judge the end point during the titration of catalytic material with water.

4.2 The added water is drawn by capillarity action into the catalytic material's mesopores and macropores. When the end

¹ This guide 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.