



Standard Test Method for Interior Porosity of Poly(Vinyl Chloride) (PVC) Resins by Mercury Intrusion Porosimetry¹

This standard is issued under the fixed designation D 2873; 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.

^{ε1} NOTE—Inch-pound units were deleted editorially in April 2000.

1. Scope

1.1 This test method describes a procedure for measuring the interior pore volume and the apparent pore diameter distribution of porous poly(vinyl chloride) resins. The measurements are made by forcing mercury under increasing pressure through a graduated penetrometer into the open pores of the resin samples. The volume of mercury forced into the pores is defined from the change of the mercury volume in the penetrometer; the apparent pore diameter distribution can be defined from incremental volume changes with increasing pressure.

1.2 **Warning**—This standard includes the use of an OSHA-designated hazardous chemical (Mercury). For specific hazard information and guidance relative to use, consult the health and safety documents provided by the supplier, for example, the material safety data sheet.

1.3 The values stated in SI units are to be regarded as the 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 and health practices and determine the applicability of regulatory limitations prior to use.*

NOTE 1—There are no ISO standards covering the primary subject matter of this test method.

2. Referenced Documents

2.1 *ASTM Standards:*

D 883 Terminology Relating to Plastics²

D 1600 Terminology of Abbreviated Terms Relating to Plastics²

D 2396 Test Method for Powder-Mix Time of Poly(Vinyl Chloride) (PVC) Resins Using a Torque Rheometer³

3. Terminology

3.1 *Definitions*—Definitions are in accordance with Terminologies D 883 and D 1600 unless otherwise indicated.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *interior pore volume*—change in the volume of mercury observed above an applied pressure at which a demarcation exists between interior pores and voids between resin particles, and a maximum applied pressure. It is expressed in cubic centimeters per gram. For many resins with a medium size near 100 μm, such a demarcation exists at or near 390 kPa, corresponding to an apparent pore diameter of approximately 3.1 μm. A maximum applied pressure of 35 000 kPa has been found sufficient with most vinyl resins; the use of 21 000 kPa yields slightly lower values with equivalent precision.

4. Significance and Use

4.1 This test method is intended to compare differences in the total interior pore volume of porous vinyl resins. In general, in certain formulations, resins of higher porosity are better dry-blending resins; thus the interior porosity measurement defines one of the criteria useful for the definition of the dry-blend properties of vinyl resins.

5. Limitations

5.1 Only those pores open to the outside surface of the resin sample are filled with the mercury. The apparent pore diameter distribution that may be defined from the data may not be physically significant if there are large openings within the sample which are connected to the surface by narrow pores.

5.2 The pressure applied limits the extent of the open pores filled; thus, at approximately 35 000 kPa the minimum diameter pore penetrated is about 0.035 μm, while at 21 000 kPa the minimum diameter is 0.058 μm.

NOTE 2—The smallest pore diameter entered by the mercury under pressure is stated by:

$$D = 1207 / P_{\text{kPa}} \quad (1)$$

where:

D = diameter of the pore, μm, and

P = absolute pressure.

¹ This test method is under the jurisdiction of ASTM Committee D-20 on Plastics and is the direct responsibility of Subcommittee D20.15 on Thermoplastic Materials.

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² *Annual Book of ASTM Standards*, Vol 08.01.

³ *Annual Book of ASTM Standards*, Vol 08.02.