



Designation: D3908 – 20

Standard Test Method for Hydrogen Chemisorption on Supported Platinum Catalysts by Volumetric Vacuum Method¹

This standard is issued under the fixed designation D3908; 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 the chemisorption of hydrogen at 298 K (25 °C) on supported platinum catalysts that have been reduced in flowing hydrogen at 723 K (450 °C). It incorporates a static volumetric vacuum technique at constant volume.

1.2 The test method is intended for use on unused supported platinum on alumina catalysts of loadings greater than 0.3 weight %. Data on other supports and lower platinum loadings were not tested.

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.*

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

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 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.

3. Terminology

3.1 *Definitions*—See Terminology D3766.

3.2 *Quality and Statistics*—See Terminology E456.

3.3 *Precision and Bias*—See Practice E177.

3.4 *Symbols*—The following symbols are used:

P_c	= pressure of gas in calibrated bulb, torr
P_{mc}	= pressure of gas in calibrated bulb and manifold, torr
P_m	= pressure in manifold, torr
P_{md}	= pressure in manifold and dead space, torr
P_{m_x}	= pressure in manifold prior to expansion into sample tube for X equilibration point, torr
P_{e_x}	= equilibrium pressure after expansion for generating X equilibrium point, torr
V_c	= volume of calibrated bulb, cm ³
V_m	= volume of manifold between stopcocks 12 and 2 with only 4 and 1 open, cm ³
V_d	= volume of dead space in sample cell containing catalyst (volume between 2 and 3), cm ³
$V_{ads}(STP)_x$	= volume of gas adsorbed at STP, cm ³
$V_{ads}(STP)_{cx}$	= cumulative volume of gas adsorbed through X, cm ³
V_S	= monolayer volume of gas adsorbed at STP, cm ³
$T_{m_{Ax}}$	= temperature representative of the manifold prior to expansion into the sample cell, K
$T_{m_{Bx}}$	= temperature representative of the entire system after equilibrium pressure (P_{e_x}) has been established, K
T_m	= temperature of manifold prior to expansion into sample cell for dead space determination, K
T_{m_d}	= temperature of entire system after equilibrium pressure has been established for dead space determination, K
T	= average manifold temperature for a given dose, K = $(T_{m_{Ax}} + T_{m_{Bx}})/2$
W_{cat}	= mass of catalyst, g
X	= weight percent of platinum