



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

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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 and health practices and determine the applicability of regulatory limitations prior to use.*

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

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
$V_{\text{ads}}(\text{STP})_x$	= volume of gas adsorbed at STP, cm^3
$V_{\text{ads}}(\text{STP})_{c,x}$	= 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
%D	= percent platinum atoms on the surface

4. Significance and Use

4.1 This test method sets forth a procedure by which duplicate catalyst samples can be compared either on an interlaboratory or intralaboratory basis. It is anticipated that catalyst producers and users will find this test method of value.

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.