



Designation: D2010/D2010M – 98 (Reapproved 2024)

Standard Test Methods for Evaluation of Total Sulfation Activity in the Atmosphere by the Lead Dioxide Technique¹

This standard is issued under the fixed designation D2010/D2010M; 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.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope

1.1 These test methods describe the evaluation of the total sulfation activity in the atmosphere. Because of its oxidizing power, lead dioxide (PbO_2) converts not only sulfur dioxide (SO_2), but other compounds, such as mercaptans and hydrogen sulfide, into sulfate. It fixes sulfur trioxide and sulfuric acid mist present in the atmosphere (see **Note 1**).

1.2 Test Method A describes the use of a PbO_2 candle, and Test Method B describes that of a PbO_2 sulfation plate.²

1.3 These test methods provide a weighted average effective SO_2 level for a 30-day interval.

1.4 The results of these test methods correlate approximately with volumetric SO_2 concentrations, although the presence of dew or condensed moisture tends to enhance the capture of SO_2 onto the candle or plate.

1.5 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system are not necessarily exact equivalents; therefore, to ensure conformance with the standard, each system shall be used independently of the other, and values from the two systems shall not be combined.

NOTE 1—It has been shown that the rate constant of the chemical reaction between SO_2 and PbO_2 is independent of the concentration of SO_2 up to levels of 1000 ppm(v), if 15 % or less of the PbO_2 has been reduced (**1**).³ 15 % of the PbO_2 is equivalent to 11 mg to 12 mg of SO_2/cm^2 per day.

1.6 *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 appro-*

priate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use. For specific precautionary statements, see Section 8.

1.7 *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:*⁴

D516 Test Method for Sulfate Ion in Water

D1193 Specification for Reagent Water

D1356 Terminology Relating to Sampling and Analysis of Atmospheres

D1357 Practice for Planning the Sampling of the Ambient Atmosphere

G91 Practice for Monitoring Atmospheric SO_2 Deposition Rate for Atmospheric Corrosivity Evaluation

3. Terminology

3.1 *Definitions*—For definitions of terms used in these test methods, refer to Terminology **D1356**.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *sulfation, n*—the process by which sulfur-containing compounds are oxidized by the action of PbO_2 .

3.2.2 *sulfation activity, n*—the capture rate of sulfur-containing compounds as they are oxidized by PbO_2 under the conditions of these test methods.

4. Summary of Test Methods

4.1 *Test Method A*—Inert cylinders are coated with PbO_2 paste and exposed to the atmosphere for an extended period of time, usually one month. Sulfur oxides react chemically with the paste, forming lead sulfate (PbSO_4) (**1-5**).

¹ These test methods are under the jurisdiction of ASTM Committee **D22** on Air Quality and are the direct responsibility of Subcommittee **D22.03** on Ambient Atmospheres and Source Emissions.

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² Test Method B has been adapted from Practice **G91**, which is under the jurisdiction of ASTM Committee **G01** on Corrosion of Metals and is the direct responsibility of Subcommittee **G01.04** on Corrosion of Metals in Natural Atmospheric and Aqueous Environments.

³ The boldface numbers in parentheses refer to the list of references at the end of this standard.

⁴ For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at www.astm.org/contact. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.