



## Standard Test Method for Mercaptan Content of the Atmosphere<sup>1</sup>

This standard is issued under the fixed designation D 2913; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

### 1. Scope

1.1 This test method covers measurement of the concentration of mercaptans (organic thiols) in the atmosphere at concentrations below 100 parts per billion (ppb(v) = 195  $\mu\text{g}/\text{m}^3$ ). For concentrations above 100 ppb(v) level, the sampling period can be reduced or the liquid volume increased either before or after aspirating. The minimum detectable amount of methyl mercaptan is 0.04  $\mu\text{g}/\text{mL}$  (**1**)<sup>2</sup> in a final liquid volume of 25 mL. When sampling air at the maximum recommended rate of 2 L/min for 2 h, the minimum detectable mercaptan concentration is 1.0 ppb(v) (1.95  $\mu\text{g}$  methyl mercaptan/ $\text{m}^3$  at 101.3 kPa (760 mm Hg) and 25°C). This test method determines total mercaptans and does not differentiate among individual mercaptans, although it is most sensitive to the lower molecular weight alkanethiols.

1.2 The values stated in SI units are to be regarded as the standard.

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.* Specific precautionary statements are given in 8.7, 8.8, and Section 9.

### 2. Referenced Documents

#### 2.1 ASTM Standards:

- D 1193 Specification for Reagent Water<sup>3</sup>
- D 1357 Practice for Planning the Sampling of the Ambient Atmosphere<sup>4</sup>
- D 1914 Practice for Conversion Units and Factors Relating to Sampling and Analysis of Atmospheres<sup>4</sup>
- D 2914 Test Methods for Sulfur Dioxide Content of the Atmosphere (West-Gaeke Method)<sup>4</sup>
- D 3195 Practice for Rotameter Calibration<sup>4</sup>
- D 3249 Practice for General Ambient Air Analyzer Procedures<sup>4</sup>

<sup>1</sup> This test method is under the jurisdiction of ASTM Committee D-22 on Sampling and Analysis of Atmospheres and is the direct responsibility of Subcommittee D22.03 on Ambient Atmospheres and Source Emissions.

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<sup>2</sup> The boldface numbers in parentheses refer to the list of references at the end of this test method.

<sup>3</sup> *Annual Book of ASTM Standards*, Vol 11.01.

<sup>4</sup> *Annual Book of ASTM Standards*, Vol 11.03.

D 3609 Practice for Calibration Techniques Using Permeation Tubes<sup>4</sup>

D 3631 Test Methods for Measuring Surface Atmospheric Pressure<sup>4</sup>

E 1 Specification for ASTM Thermometers<sup>5</sup>

### 3. Terminology

3.1 *Definitions*—For definitions of terms used in this test method, refer to Terminology D 1356.

### 4. Summary of Test Method

4.1 This test method is intended for obtaining an integrated sample over a selected time span (such as 2 h) either manually or in an automatic sequential sampler using 10 mL of absorption liquid in a bubbler.

4.2 The absorption liquid is delivered to the laboratory for colorimetric analysis by reaction between the collected mercaptan and *N,N*-dimethyl-*p*-phenylenediamine.

### 5. Significance and Use

5.1 Mercaptans are odorous substances offensive at low concentrations and toxic at higher levels. They are emitted from geothermal sources, industrial processes, and food processing facilities.

### 6. Interferences

6.1 The *N,N*-dimethyl-*p*-phenylenediamine reaction is also suitable for the determination of other sulfur-containing compounds including hydrogen sulfide and dimethyl disulfide (**2**). The potential for interference from these latter compounds is especially important, since all of these compounds commonly coexist in certain industrial emissions. Appropriate selection of the color formation conditions and measurements of absorbance at the specified wavelength will eliminate the potential interference from hydrogen sulfide.

6.2 Hydrogen sulfide, if present in the sampled air, may cause a turbidity in the sample absorbing solution. This precipitate must be filtered before proceeding with the analysis. One study showed that 100  $\mu\text{g}$  of  $\text{H}_2\text{S}$  gave a mercaptan color equivalent to 1.5 to 2.0  $\mu\text{g}$  of mercaptan (**3**). Another study reported no absorption at 500 nm in the presence of 150  $\mu\text{g}$  of hydrogen sulfide (**4, 5**).

6.3 Approximately equimolar response is obtained from the hydrolysis products of dimethyl disulfide, the molar extinction

<sup>5</sup> *Annual Book of ASTM Standards*, Vol 14.03.