



Designation: D4952 – 23

Standard Test Method for Qualitative Analysis for Active Sulfur Species in Fuels and Solvents (Doctor Test)¹

This standard is issued under the fixed designation D4952; 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 This test method covers and is intended primarily for the detection of mercaptans in motor fuel, kerosine, and similar petroleum products. This method may also provide information on hydrogen sulfide and elemental sulfur that may be present in these sample types.

1.2 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this 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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.* For specific warning statements, see 7.3.

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

D1193 Specification for Reagent Water

D3227 Test Method for (Thiol Mercaptan) Sulfur in Gasoline, Kerosine, Aviation Turbine, and Distillate Fuels (Potentiometric Method)

D4175 Terminology Relating to Petroleum Products, Liquid Fuels, and Lubricants

2.2 Energy Institute Standards:³

IP 30 Detection of Mercaptans, Hydrogen Sulfide, Elemental Sulfur, and Peroxides – Doctor Test Method

3. Terminology

3.1 Definitions:

3.1.1 For definitions of terms used in this test method, refer to Terminology D4175.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *flowers of sulfur, n*—a purified form of sulfur that is prepared by sublimation, as opposed to precipitation.

3.2.2 *sour, adj*—describing material having a detectable quantity of hydrogen sulfide or mercaptan.

3.2.3 *sweet, adj*—describing material having a nondetectable quantity of hydrogen sulfide or mercaptan.

3.3 Acronyms:

3.3.1 *UV, adj*—ultraviolet, the spectrum of electromagnetic radiation commonly defined as having a wavelength between 100 and 400 nanometers.

3.3.1.1 *Discussion*—In the context of this test method, the term of UV is expanded to include wavelengths up to 550 nm for the reason discussed in 8.1.

4. Summary of Test Method

4.1 The sample is shaken with sodium plumbite solution, a small quantity of powdered sulfur added, and the mixture shaken again. The presence of mercaptans or hydrogen sulfide or both is indicated by discoloration of the sulfur floating at the oil-water interface or by discoloration of either of the phases.

5. Significance and Use

5.1 Sulfur present as mercaptans or as hydrogen sulfide in distillate fuels and solvents can attack many metallic and non-metallic materials in fuel and other distribution systems. A negative result in the doctor test ensures that the concentration of these compounds is insufficient to cause such problems in normal use.

¹ This test method is under the jurisdiction of ASTM Committee D02 on Petroleum Products, Liquid Fuels, and Lubricants and is the direct responsibility of Subcommittee D02.03 on Elemental Analysis.

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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 Available from Energy Institute, 61 New Cavendish St., London, WIG 7AR, U.K., <http://www.energyinst.org>.

*A Summary of Changes section appears at the end of this standard