



Standard Test Method for Solubility of Fixed Gases in Liquids¹

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ε¹ NOTE—Warnings were moved from notes to section text editorially December 2002.

1. Scope

1.1 This test method covers the determination of the solubility of fixed gases in liquids. It is suitable for gases and liquids that do not react with each other and are compatible with borosilicate glass, mercury, stainless steel, PTFE (polytetrafluoroethylene), and FPM (vinylidene fluoride-hexafluoro propylene copolymer) under the conditions of the test. This test method also covers the determination of the concentration of fixed gases in solutions which are not saturated with the gas.

1.2 *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.* For specific hazard statements see 6.1, 6.2, 8.3, 8.4.2, and 9.3.

1.3 The values stated in SI units are to be regarded as the standard. The values in parentheses are for information only.

2. Referenced Documents

2.1 ASTM Standards:

- D 831 Test Method for Gas Content of Cable and Capacitor Oils²
- D 2883 Test Method for Reaction Threshold Temperature of Liquid and Solid Materials³
- D 4057 Practice for Manual Sampling of Petroleum and Petroleum Products⁴
- E 260 Practice for Packed Column Gas Chromatography⁵

3. Summary of Test Method

3.1 A specimen of the test liquid is saturated with a fixed gas under specified conditions of temperature and pressure. The saturation step may be eliminated if it is desired to determine the concentration of fixed gas in a liquid sample suitably

presented for analysis. A portion of the solution of gas in liquid is transferred to a gas extraction apparatus in which the fixed gas is quantitatively removed from the liquid. The separated gas is transferred to a gas buret in which its volume is determined.

4. Significance and Use

4.1 The solubility of fixed gases in liquids is an important engineering parameter in the design of hydraulic systems. It is a measure of the amount of gas which can be released from solution when a system undergoes changes in pressure and temperature. Theoretical considerations permit approximate values of gas solubility to be computed with reasonable accuracy. In this test method, dissolved gases are separated physically from a liquid and measured volumetrically. The test method permits subsequent analysis of separated gases by any appropriate method.

5. Apparatus

5.1 *Ambient Pressure Saturator*, suitable for the saturation of liquids with fixed gases at various temperatures at ambient pressure is shown in Fig. 1. The system comprises four parts:

- 5.1.1 *Gas Supply and Pressure Regulator*,
- 5.1.2 *Gas Dispersion Element*,
- 5.1.3 *Heating Mantle*, to fit 1000-mL separatory funnel (Fig. 1), and
- 5.1.4 *Temperature Measurement and Control Devices*.

NOTE 1—In the event that it is desired to saturate a liquid with a toxic or flammable gas, the use of this system is not recommended, unless suitable means are provided for the collection and disposal of the escaping gas.

5.2 *Elevated Pressure Saturator*, used to saturate liquids with gases at pressures other than ambient. A suitable vessel, usable at pressures up to 608 kPa (6 atm), is illustrated in Fig. 2. The vessel consists of a 2.5 L stainless steel bomb with a thermostatic control jacket. A valve at one end is connected to a pressure gage and gas supply. A valve at the other end is provided with a fitting that connects directly to the gas extraction apparatus.

- 5.2.1 *Thermostatic Control*, for jacket of saturator.
- 5.2.2 *Shaker*, reciprocating, horizontal.

¹ This test method is under the jurisdiction of ASTM Committee D02 on Petroleum Products and Lubricants and is the direct responsibility of Subcommittee D02.11 on Engineering Sciences of High Performance Fluids and Solids.

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² *Annual Book of ASTM Standards*, Vol 10.03.

³ *Annual Book of ASTM Standards*, Vol 05.01.

⁴ *Annual Book of ASTM Standards*, Vol 05.02.

⁵ *Annual Book of ASTM Standards*, Vol 03.06.