



Standard Test Methods for Limiting Oxygen (Oxidant) Concentration in Gases and Vapors¹

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1. Scope

1.1 These test methods cover the determination of the limiting oxygen (oxidant) concentration of mixtures of oxygen (oxidant) and inert gases with flammable gases and vapors at a specified initial pressure and initial temperature.

1.2 These test methods may also be used to determine the limiting concentration of oxidizers other than oxygen.

1.3 Differentiation among the different combustion regimes (such as the hot flames, cool flames and exothermic reactions) is beyond the scope of these test methods.

1.4 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.5 *These test methods should be used to measure and describe the properties of materials, products, or assemblies in response to heat and flame under controlled laboratory conditions and should not be used to describe or appraise the fire hazard or fire risk of materials, products, or assemblies under actual fire conditions. However, results of this test may be used as elements of a fire risk assessment which takes into account all of the factors which are pertinent to an assessment of the fire hazard of a particular end use.*

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

2. Referenced Documents

2.1 ASTM Standards:²

E1445 Terminology Relating to Hazard Potential of Chemicals

¹ These test methods are under the jurisdiction of ASTM Committee E27 on Hazard Potential of Chemicals and are the direct responsibility of Subcommittee E27.04 on Flammability and Ignitability of Chemicals.

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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.

2.2 NFPA Publication:³

NFPA 69 Standard on Explosion Prevention Systems

2.3 NTIS Publications:⁴

Bulletin 503 Coward, H.F., and Jones, G.W., Bureau of Mines, "Limits of Flammability of Gases and Vapors," NTIS AD701575, 1952

Bulletin 627 Zabetakis, M.G., Bureau of Mines, "Flammability Characteristics of Combustible Gases and Vapors," NTIS AD701576, 1965

Bulletin 680 Kuchta, J.M., Bureau of Mines, "Investigation of Fire and Explosion Accidents in the Chemical, Mining, and Fuel-Related Industries — A Manual," NTIS PB87113940, 1985

3. Terminology

3.1 *Definitions*—See also Terminology **E1445**.

3.1.1 *flammable*—capable of propagating a flame.

3.1.2 *ignition*—the initiation of combustion.

3.1.3 *limit of flammability*—the boundary in composition space dividing flammable and nonflammable regions.

3.1.4 *limiting oxygen (oxidant) concentration (LOC) of a fuel-oxidant-inert system*—the oxygen (oxidant) concentration at the limit of flammability for the worst case (most flammable) fuel concentration.

3.1.4.1 *Discussion*—Limiting oxygen (oxidant) concentration is also known as *minimum oxygen (oxidant) concentration* or as *critical oxygen (oxidant) concentration*.

4. Summary of Test Method

4.1 A mixture containing one or more flammable components (fuel), oxygen (oxidant) and inert gas(es) (such as nitrogen, carbon dioxide, argon, etc.) is prepared in a suitable test vessel at a controlled initial temperature and made to the specified initial pressure. Proportions of the components are determined by a suitable means. Ignition of the mixture is attempted and flammability is determined from the pressure rise produced. The criterion for flammability is a pressure rise

³ Available from National Fire Protection Association (NFPA), 1 Batterymarch Park, Quincy, MA 02169-7471, <http://www.nfpa.org>.

⁴ Available from National Technical Information Service (NTIS), 5285 Port Royal Rd., Springfield, VA 22161, <http://www.ntis.gov>.