Designation: G 94 – 92 (Reapproved 1998)

Standard Guide for Evaluating Metals for Oxygen Service[1]

This standard is issued under the fixed designation G 94; 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.

1. Scope

1.1 This guide applies to metallic materials under consideration for oxygen or oxygen-enriched fluid service, direct or indirect, as defined in Section 3. It is concerned primarily with the properties of a material associated with its relative susceptibility to ignition and propagation of combustion. It does not involve mechanical properties, potential toxicity, outgassing, reactions between various materials in the system, functional reliability, or performance characteristics such as aging, shredding, or sloughing of particles, except when these might contribute to an ignition.

1.2 This document applies only to metals; nonmetals are covered in Guide G 63.

NOTE 1—The American Society for Testing and Materials takes no position respecting the validity of any evaluation methods asserted in connection with any item mentioned in this guide. Users of this guide are expressly advised that determination of the validity of any such evaluation methods and data and the risk of use of such evaluation methods and data are entirely their own responsibility.

NOTE 2—In evaluating materials, any mixture with oxygen exceeding atmospheric concentration at pressures higher than atmospheric should be evaluated from the hazard point of view for possible significant increase in material combustibility.

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

1.4 *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:*

D 2015 Test Method for Gross Calorific Value of Coal and Coke by the Adiabatic Bomb Calorimeter[2]

D 2382 Test Method for Heat of Combustion of Hydrocarbon Fuels by Bomb Calorimeter (High-Precision Method)[3]

D 2512 Test Method for Compatibility of Materials with Liquid Oxygen (Impact Sensitivity Threshold and Pass-Fail Techniques)[4]

D 2863 Test Method for Measuring the Minimum Oxygen Concentration to Support Candle-Like Combustion of Plastics (Oxygen Index)[5]

D 4809 Test Method for Heat of Combustion of Liquid Hydrocarbon Fuels by Bomb Calorimeter (Intermediate Precision Method)[6]

G 63 Guide for Evaluating Nonmetallic Materials for Oxygen Service[7]

G 72 Test Method for Autogenous Ignition Temperature of Liquids and Solids in a High-Pressure Oxygen-Enriched Environment[7]

G 86 Test Method for Determining Ignition Sensitivity of Materials to Mechanical Impact in Ambient Liquid Oxygen and Pressurized Liquid and Gaseous Oxygen Environments[7]

G 88 Guide for Designing Systems for Oxygen Service[7]

2.2 *Compressed Gas Association Document:*

Pamphlet G-4.4, Industrial Practices for Gaseous Oxygen Transmission and Distribution Piping Systems[8]

2.3 ASTM Adjuncts:

Test Program Report on the Ignition and Combustion of Materials in High-Pressure Oxygen[9]

3. Terminology

3.1 *Definitions:*

3.1.1 *direct oxygen service*—in contact with oxygen during normal operations. Examples: oxygen compressor piston rings, control valve seats (see Guide G 63).

3.1.2 *impact-ignition resistance*—the resistance of a material to ignition when struck by an object in an oxygen atmosphere under a specific test procedure (see Guide G 63).

3.1.3 *indirect oxygen service*—not normally in contact with oxygen, but which might be as a result of a reasonably foreseeable malfunction, operator error, or process disturbance. Examples: liquid oxygen tank insulation, liquid oxygen pump motor bearings (see Guide G 63).

3.1.4 *maximum use pressure*—the maximum pressure to

[1] This guide is under the jurisdiction of ASTM Committee G-4 on Compatibility and Sensitivity of Materials in Oxygen Enriched Atmospheres and is the direct responsibility of Subcommittee G04.02on Recommended Practices.

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[2] *Annual Book of ASTM Standards*, Vol 05.05.

[3] *Annual Book of ASTM Standards*, Vol 05.02.

[4] *Annual Book of ASTM Standards*, Vol 15.03.

[5] *Annual Book of ASTM Standards*, Vol 08.02.

[6] *Annual Book of ASTM Standards*, Vol 05.03.

[7] *Annual Book of ASTM Standards*, Vol 14.02.

[8] Available from Compressed Gas Association, Inc., 1235 Jefferson Davis Highway, Arlington, VA.

[9] Available from ASTM Headquarters, Order ADJG0094.

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