



Designation: G 126 – 94

Standard Terminology Relating to the Compatibility and Sensitivity of Materials in Oxygen Enriched Atmospheres¹

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1. Scope

1.1 This terminology defines terms related to the compatibility and sensitivity of materials in oxygen enriched atmosphere. It includes those standards under the jurisdiction of ASTM Committee G-4.

1.2 The terminology concentrates on terms commonly encountered in and specific to practices and methods used to evaluate the compatibility and sensitivity of materials in oxygen. This evaluation is usually performed in a laboratory environment, and this terminology does not attempt to include laboratory terms.

2. Referenced Documents

2.1 ASTM Standards:

G 63 Guide for Evaluating Nonmetallic Materials for Oxygen Service²

G 72 Test Method for Autogenous Ignition Temperature of Liquids and Solids in a High-Pressure Oxygen-Enriched Environment²

G 74 Test Method for Ignition Sensitivity of Materials to Gaseous Fluid Impact²

G 86 Test Method for Determining the Ignition Sensitivity of Materials to Mechanical Impact in Pressurized Oxygen Environments²

G 88 Guide for Designing Systems for Oxygen Service²

G 93 Practice for Cleaning Methods for Material and Equipment Used in Oxygen-Enriched Environments²

G 94 Guide for Evaluating Metals for Oxygen Service²

G 120 Test Method for Evaluating the Effectiveness of Cleaning Agents²

G 121 Practice for Preparation of Contaminated Test Coupons for the Evaluation of Cleaning Agents²

G 122 Test Method for Evaluating the Effectiveness of Cleaning Agents²

3. Terminology

3.1 Definitions:

aging—the exposure of a material to stress, such stress of

¹ This terminology 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 G04.03 on Nomenclature and Definitions. Current edition approved August 15, 1994. Published March 1995.

² *Annual Book of ASTM Standards*, Vol 14.02.

which may include time, pressure, contact with materials or chemicals, temperature, abrasion, ionizing radiation, light, impact with gas or particles, tensile or compressive force (either static or cyclic), or any other feature that may be present during a material's service life. These stressors may be present individually or in combination. **G 114**

artificial aging—aging in which a stress variable is outside the domain of exposure that the material might see in a component for oxygen service or in which an alternative mechanism is used to produce an effect that simulates the results of natural aging. The degree of artificiality may vary on a large scale. An example of mild artificiality might be exposure of a material to a greater pressure than it experiences in the use conditions. An example of extreme artificiality would be the use of sand paper to increase a material's surface roughness to simulate particle-impact abrasion that occurs in the use condition. A high degree of artificiality affects the strength of conclusion that can be drawn, because it may be difficult to relate the results to the use condition. Artificial aging that accelerates natural aging but does not alter it is preferred. **G 114**

autoignition temperature—the lowest temperature at which a material will spontaneously ignite in oxygen under specific test conditions. **G 63, G 95**

blank, n—the contamination level of the fluid when the test coupon is omitted.

DISCUSSION—Sometimes referred to as “background” level. **G 121**

cleaning effectiveness factor (CEF), n—the fraction of contaminant removed from an initially contaminated test coupon and determined by gravimetric techniques. **G 122**

contaminant—(1) a foreign or unwanted substance that can have deleterious effects on system operation, life or reliability. (2) unwanted molecular and particulate matter that could affect or degrade the performance of the components upon which they reside. **G 93, G 120, G 121**

contamination, n—a process of contaminating. **G 120, G 121**

control coupon (witness coupon), n—a coupon made from the same material and prepared in exactly the same way as the test coupons, which is used to verify the validity of the method or part thereof. **G 120, G 121**

direct oxygen service—component surfaces in contact with oxygen-enriched environments during normal operations.

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Examples include oxygen compressor piston rings, control valve seats, pipes, regulators, vessels and fittings. **G 63, G 88, G 93, G 94**

fibers—particulate matter with a length of 100 µm or greater, and a length-to-width ratio of 10 to 1 or greater. **G 93**

impact ignition resistance—the resistance of a material to ignition when struck by an object in an oxygen atmosphere under a specific test procedure. **G 63, G 94**

indirect oxygen service—service in which oxygen is not normally contacted but in which it 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. **G 63, G 88, G 93, G 94**

inorganics—being or composed of matter other than hydrocarbons and their derivatives, or matter that is not of plant or animal origin. **G 93**

maximum use pressure—the maximum pressure to which a material can be subjected due to a reasonably foreseeable malfunction, operator error, or process upset. **G 63, G 94**

maximum use temperature—the maximum temperature to which a material can be subjected due to a reasonably foreseeable malfunction, operator error, or process upset. **G 63, G 94**

molecular contaminant (non-particulate contamination), *n*—the molecular contaminant may be in a gaseous, liquid, or solid state.

DISCUSSION—It may be uniformly or non-uniformly distributed, or be in the form of droplets. Molecular contaminants account for most of the NVR. **G 120, G 121**

natural aging—aging in which the material is exposed to conditions replicating those that are present in actual service in a component for oxygen service. **G 14**

nonmetallic—any material, other than a metal, or any composite in which the metal is not the most easily ignited component and for which the individual constituents cannot be evaluated independently. **G 63, G 94**

nonmetallics—organic and inorganic materials such as ceramics, glasses, polymers, rubber, cloth, wood, and paper

products.

G 93

nonvolatile residue (NVR), *n*—residual molecular and particulate matter remaining following the filtration of a solvent containing contaminants and complete evaporation of the solvent at a specified temperature. **G 120, G 121**

operating pressure—the pressure expected under normal operating conditions. **G 63, G 94**

operating temperature—the temperature expected under normal operating conditions. **G 63, G 94**

organics—being or composed of hydrocarbons or their derivatives, or matter of plant or animal origin.

oxygen-enriched—a fluid mixture (gas or liquid) that contains more than 25 mol % oxygen. **G 63, G 88, G 93, G 94**

oxygen-enriched atmosphere—a fluid mixture (gas or liquid) that contains more than 25 mol % oxygen. **G 88**

particle (particulate contaminant), *n*—a piece of matter in a solid state with observable length, width, and thickness.

DISCUSSION—The size of a particle is usually defined by its great dimension and is specified in micrometers.

particulate—a general term used to describe a finely divided solid of organic or inorganic matter, including metals. These solids are usually reported as the amount of contaminant by the population of a specific micrometer size.

qualified technical personnel—persons such as engineers and chemists who, by virtue of education, training, or experience, know how to apply physical and chemical principles involved in the reactions between oxygen and other materials. **G 63, G 88, G 93, G 94**

reaction effect—the personnel injury, facility damage, product loss, downtime, or mission loss that could occur as the result of an ignition. **G 63, G 94**

residual contamination R_e , *n*—the absolute mass of contaminant remaining after the cleaning process and expressed in milligrams per square centimetre of area or optionally as milligrams per square foot. **G 122**

surface roughness, R_a , *n*—the arithmetic average deviation profile from the centerline, normally reported in micrometres. **G 121, G 122**

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