Designation: G 126 – 00

Standard Terminology Relating to the Compatibility and Sensitivity of Materials in Oxygen Enriched Atmospheres[1]

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1. Scope

1.1 This terminology defines terms related to the compatibility and sensitivity of materials in oxygen enriched atmospheres. 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 Service[2]
G 72 Test Method for Autogenous Ignition Temperature of Liquids and Solids in a High-Pressure Oxygen-Enriched Environment[2]
G 74 Test Method for Ignition Sensitivity of Materials to Gaseous Fluid Impact[2]
G 86 Test Method for Determining Ignition Sensitivity of Materials to Mechanical Impact in Pressurized Oxygen Environments[2]
G 88 Guide for Designing Systems for Oxygen Service[2]
G 93 Practice for Cleaning Methods for Material and Equipment Used in Oxygen-Enriched Environments[2]
G 94 Guide for Evaluating Metals for Oxygen Service[2]
G 114 Practice for Aging Oxygen-Service Materials Prior to Flammability Testing[2]
G 120 Practice for Determination of Soluble Residual Contamination in Materials and Components by Soxhlet Extraction[2]
G 121 Practice for Preparation of Contaminated Test Coupons for the Evaluation of Cleaning Agents[2]
G 122 Test Method for Evaluating the Effectiveness of Cleaning Agents[2]
G 124 Test Method for Determining the Combustion Behavior of Metallic Materials in Oxygen-Enriched Atmospheres[2]
G 125 Test Method for Measuring Liquid and Solid Material Fire Limits in Gaseous Oxidants[2]
G 127 Guide for the Selection of Cleaning Agents for Oxygen Systems[2]
G 128 Guide for Control of Hazards and Risks in Oxygen Enriched Systems[2]
G 131 Practice for Cleaning of Materials and Components by Ultrasonic Techniques[2]
G 136 Practice for Determination of Soluble Residual Contaminants in Materials by Ultrasonic Extraction[2]
G 144 Test Method for Determination of Residual Contamination of Materials and Components by Total Carbon Analysis Using a High Temperature Combustion Analyzer[2]
G 145 Guide for Studying Fire Incidents in Oxygen Systems[2]

3. Terminology

3.1 *Definitions:*

autoignition temperature (AIT), *n*—the lowest temperature at which a material will spontaneously ignite in an oxygen-enriched atmosphere under specific test conditions. **G 63, G 72, G 94, G 128**

contaminant, *n*—unwanted molecular or particulate matter that could adversely affect or degrade the operation, life, or reliability of the systems or components upon which it resides. **G 93, G 120, G 121, G 131, G 136, G 144**

contaminate, *v*—to make unfit for use, either intentionally or unintentionally, by introduction of a contaminant. **G 131, G 136**

contamination, *n*—(*1*) the amount of unwanted molecular or particulate matter in a system; (*2*) the process or condition of being contaminated.

[1] This terminology is under the jurisdiction of ASTM Committee G04 on Compatibility and Sensitivity of Materials in Oxygen Enriched Atmospheres and is the direct responsibility of Subcommittee G04.03 on Terminology.

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[2] *Annual Book of ASTM Standards*, Vol 14.04.

DISCUSSION—Contamination and cleanliness are opposing properties: increasing cleanliness implies decreasing contamination.
G 93, G 120, G 121, G 131, G 136, G 144

control coupon (*also witness coupon*), *n*—(*1*) 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 131); (*2*) a coupon made from the same material as the test coupons but in this test method is not coated with the contaminant (G 121).

DISCUSSION—(*1*) in this practice, the control coupon is contaminated in the same manner as the test coupons and is subjected to the identical extraction procedure (G 120); (*2*) in this practice, the control coupon is contaminated in the same manner as the test coupons and is subjected to the identical cleaning procedure (G 131).

degas, *v*—the process of removing gases from a liquid. G 131, G 136

direct oxygen service, *n*—service in contact with oxygen-enriched atmosphere during normal operations. G 63, G 88, G 94

DISCUSSION—Examples are oxygen compressor piston rings or control valve seats.

impact-ignition resistance, *n*—the resistance of a material to ignition when struck by an object in an oxygen-enriched atmosphere under a specific test procedure. G 63, G 94, G 128

indirect oxygen service, *n*—service in which oxygen is not normally but may be contacted as a result of an operator error, or process disturbance, such as liquid oxygen tank insulation or liquid oxygen pump motor bearings. G 63, G 88, G 94

DISCUSSION—Examples include, liquid oxygen tank insulation or liquid oxgen pump motor bearings.

maximum use pressure, *n*—the greatest pressure to which a material can be subjected as a result of a *reasonably* foreseeable malfunction, operator error or process disturbance. G 63, G 94

maximum use temperature, *n*—the greatest temperature to which a material can be subjected as a result of a *reasonably* foreseeable malfunction, operator error, or process disturbance. G 63, G 94

molecular contaminant, *n*—nonparticulate contaminant that may exist in either a gaseous, liquid, or solid state.

DISCUSSION—Molecular contaminant may be uniformly or nonuniformly distributed as a solution or an emulsion or may be in the form of droplets. Molecular contaminants account for most of what constitutes nonvolatile residue. G 120, G 121, G 136, G 144

nonmetal, *n*—any material other than a metal, nonpolymeric alloy, or any composite in which the metallic component is not the most easily ignited component and for which the individual constituents cannot be evaluated independently, including (ceramics, such as glass, synthetic polymers, such as most rubbers, thermoplastics, and thermosets, and natural polymers, such as naturally occurring rubber, wood, and cloth.) **Nonmetallic is the adjective form of this term.** G 63, G 93, G 94, G 128

nonvolatile residue (NVR), *n*—molecular or particulate matter remaining following the filtration and controlled evaporation of a liquid containing contaminants. G 120, G 121, G 131, G 136, G 144

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

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

oxygen compatibility (also *oxidant compatibility*), *n*—the ability of a substance to coexist with both oxygen and a potential source(s) of ignition at an expected pressure and temperature with a magnitude of risk acceptable to the user. G 93, G 125, G 128, G 145

oxygen-enriched, *adj*—containing more than 25 mole percent oxygen. G 63, G 88, G 94, G 128, G 145

DISCUSSION—Other standards such as those published by NFPA and OSHA differ from the definition in their specification of oxygen concentration.

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 greatest dimension and is specified in micrometers.
G 120, G 121, G 131, G 136, G 144

qualified technical personnel, *n*—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 oxidants and other materials. G 63, G 88, G 94, G 128, G 145

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

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

3.2 *Definitions of Terms Specific to This Standard:*

aging, *n*—the exposure of a material to individual or combined stresses such as time, temperature, pressure, abrasion, ionizing radiation, light, impact with gas or particles, tensile or compressive force (either static or cyclic), contact with other materials or chemicals, or any other feature that may be present during a material's service life. G 114

artificial aging, n—aging in which a stress variable is outside the domain of exposure that a 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.

DISCUSSION—The degree of artificiality may vary on a large scale. An example of mild artificiality is exposure of a material to a greater pressure than it experiences in the use condition. An example of extreme artificiality is the use of sandpaper 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 the resulting effect is preferred. G 114

natural aging, n—aging in which a material is exposed to