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

This standard is issued under the fixed designation G 126; 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 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.~~ G04.

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:*

~~G63Guide for Evaluating Nonmetallic Materials for Oxygen Service[2]~~

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

G 63 Guide for Evaluating Nonmetallic Materials for Oxygen Service

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

~~G72Test Method for Autogenous Ignition Temperature of Liquids and Solids in a High-Pressure Oxygen-Enriched Environment[2]~~

74 Test Method for Ignition Sensitivity of Materials to Gaseous Fluid Impact

~~G74Test Method for Ignition Sensitivity of Materials to Gaseous Fluid Impact[2]~~ 86 Test Method for Determining Ignition Sensitivity of Materials to Mechanical Impact in Ambient Liquid Oxygen and Pressurized Liquid and Gaseous Oxygen Environments

G 88 Guide for Designing Systems for Oxygen Service

G 93 Practice for Cleaning Methods and Cleanliness Levels for Material and Equipment Used in Oxygen-Enriched Environments

G 94 Guide for Evaluating Metals for Oxygen Service

G 114 Practices for Evaluating the Age Resistance of Polymeric Materials Used in Oxygen Service

G 120 Practice for Determination of Soluble Residual Contamination by Soxhlet Extraction

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

G 122 Test Method for Evaluating the Effectiveness of Cleaning Agents

G 124 Test Method for Determining the Combustion Behavior of Metallic Materials in Oxygen-Enriched Atmospheres

G 125 Test Method for Measuring Liquid and Solid Material Fire Limits in Gaseous Oxidants

~~G86Test Method for Determining the Ignition Sensitivity of Materials to Mechanical Impact in Pressurized Oxygen Environments[2]~~

~~G88Guide for Designing Systems for Oxygen Service[2]~~

~~G93Practice for Cleaning Methods for Material and Equipment Used in Oxygen-Enriched Environments[2]~~

~~G94Guide for Evaluating Metals for Oxygen Service[2]~~

~~G120Test Method for Evaluating the Effectiveness of Cleaning Agents[2]~~

~~G121Practice for Preparation of Contaminated Test Coupons for the Evaluation of Cleaning Agents[2]~~

~~[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.~~

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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* ~~, Vol 14.02.~~volume information, refer to the standard's Document Summary page on the ASTM website.

~~G122Test Method for Evaluating the Effectiveness of Cleaning Agents[2]~~ 127 Guide for the Selection of Cleaning Agents for Oxygen Systems
G 128 Guide for Control of Hazards and Risks in Oxygen Enriched Systems
G 131 Practice for Cleaning of Materials and Components by Ultrasonic Techniques
G 136 Practice for Determination of Soluble Residual Contaminants in Materials by Ultrasonic Extraction
G 144 Test Method for Determination of Residual Contamination of Materials and Components by Total Carbon Analysis Using a High Temperature Combustion Analyzer
G 145 Guide for Studying Fire Incidents in Oxygen Systems

3. Terminology

3.1 *Definitions:*

aging—the exposure of a material to stress, such stress of 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. **G114**

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**

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. **G114**

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**

autoignition temperature—the lowest temperature at which a material will spontaneously ignite in oxygen under specific test conditions. **G63, G95**

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

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

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

DISCUSSION—Sometimes referred to as "background" level. **G121**

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

cleaning effectiveness factor (CEF), *control coupon (also witness coupon) , n*—the fraction of contaminant removed from an initially contaminated test coupon and determined by gravimetric techniques. **G122**

contaminant—(*—(1) a foreign or unwanted substance that can have deleterious effects on system operation, life or reliability. (*) *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) unwanted molecular and particulate matter that could affect or degrade the performance of the components upon which they reside.* **G93, G120, G121** **) 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**).

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

direct oxygen service, *n*—a process of contaminating. **G120, G121** **—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.

control coupon (witness coupon), *impact-ignition resistance, 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. **G120, G121** **—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**

direct oxygen service—component surfaces in contact with oxygen-enriched environments during normal operations. Examples include oxygen compressor piston rings, control valve seats, pipes, regulators, vessels and fittings. **G63, G88, G93, G94**

indirect oxygen service, *n*—service in which oxygen is not normally but may be contacted as a result of an operator error, or