



Standard Practices for Evaluating the Age Resistance of Polymeric Materials Used in Oxygen Service¹

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1. Scope

1.1 These practices describe procedures that are used to determine the age resistance of plastic, thermosetting, elastomeric, and polymer matrix composite materials exposed to oxygen-containing media.

1.2 While these practices focus on evaluating the age resistance of polymeric materials in oxygen-containing media prior to ignition and combustion testing, they also have relevance for evaluating the age resistance of metals, and nonmetallic oils and greases.

1.3 These practices address both established procedures that have a foundation of experience and new procedures that have yet to be validated. The latter are included to promote research and later elaboration in this practice as methods of the former type.

1.4 The results of these practices may not give exact correlation with service performance since service conditions vary widely and may involve multiple factors such as those listed in subsection 5.8.

1.5 Three procedures are described for evaluating the age resistance of polymeric materials depending on application and information sought.

1.5.1 *Procedure A: Natural Aging*—This procedure is used to simulate the effect(s) of one or more service stressors on a material's oxygen resistance, and is suitable for evaluating materials that experience continuous or intermittent exposure to elevated temperature during service.

1.5.2 *Procedure B: Accelerated Aging Comparative Oxygen Resistance*—This procedure is suitable for evaluating materials that are used in ambient temperature service, or at a temperature that is otherwise lower than the aging temperature, and is useful for developing oxygen compatibility rankings on a laboratory comparison basis.

1.5.3 *Procedure C: Accelerated Aging Lifetime Prediction*—This procedure is used to determine the relationship between

aging temperature and a fixed level of property change, thereby allowing predictions to be made about the effect of prolonged service on oxidative degradation.

1.6 The values stated in SI units are to be regarded as the standard, however, all numerical values shall also be cited in the systems in which they were actually measured.

1.7 *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.* Specific precautionary statements are given in Section 10.

2. Referenced Documents

2.1 ASTM Standards:²

- D395 Test Methods for Rubber Property—Compression Set
- D412 Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension
- D638 Test Method for Tensile Properties of Plastics
- D1349 Practice for Rubber—Standard Conditions for Testing
- D1708 Test Method for Tensile Properties of Plastics by Use of Microtensile Specimens
- D2240 Test Method for Rubber Property—Durometer Hardness
- D2512 Test Method for Compatibility of Materials with Liquid Oxygen (Impact Sensitivity Threshold and Pass-Fail Techniques)
- D2863 Test Method for Measuring the Minimum Oxygen Concentration to Support Candle-Like Combustion of Plastics (Oxygen Index)
- D3039 Test Method for Tensile Properties of Polymer Matrix Composite Materials
- D3045 Practice for Heat Aging of Plastics Without Load
- D4809 Test Method for Heat of Combustion of Liquid Hydrocarbon Fuels by Bomb Calorimeter (Precision Method)

¹ These practices are under the jurisdiction of ASTM Committee G04 on Compatibility and Sensitivity of Materials in Oxygen Enriched Atmospheres and is the direct responsibility of Subcommittee G04.02 on Recommended Practices.

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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.