



Standard Test Methods for Oxidation Onset Temperature of Hydrocarbons by Differential Scanning Calorimetry¹

This standard is issued under the fixed designation E2009; 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.

^{ε1} NOTE—Warning notes were editorially updated throughout in March 2014.

1. Scope

1.1 These test methods describe the determination of the oxidative properties of hydrocarbons by differential scanning calorimetry or pressure differential scanning calorimetry under linear heating rate conditions and are applicable to hydrocarbons, which oxidize exothermically in their analyzed form.

1.2 *Test Method A*—A differential scanning calorimeter (DSC) is used at ambient pressure, of one atmosphere of oxygen.

1.3 *Test Method B*—A pressure DSC (PDSC) is used at high pressure, for example, 3.5 MPa (500 psig) oxygen.

1.4 *Test Method C*—A differential scanning calorimeter (DSC) is used at ambient pressure of one atmosphere of air.

1.5 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.6 *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*:²

D3350 Specification for Polyethylene Plastics Pipe and Fittings Materials

D3895 Test Method for Oxidative-Induction Time of Polyolefins by Differential Scanning Calorimetry

¹ These test methods are under the jurisdiction of ASTM Committee E37 on Thermal Measurements and are the direct responsibility of Subcommittee E37.01 on Calorimetry and Mass Loss.

Current edition approved March 15, 2014. Published April 2014. Originally approved in 1999. Last previous edition approved in 2008 as E2009 – 08. DOI: 10.1520/E2009-08R14E01.

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.

D4565 Test Methods for Physical and Environmental Performance Properties of Insulations and Jackets for Telecommunications Wire and Cable

D5483 Test Method for Oxidation Induction Time of Lubricating Greases by Pressure Differential Scanning Calorimetry

E473 Terminology Relating to Thermal Analysis and Rheology

E691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method

E967 Test Method for Temperature Calibration of Differential Scanning Calorimeters and Differential Thermal Analyzers

E1858 Test Method for Determining Oxidation Induction Time of Hydrocarbons by Differential Scanning Calorimetry

3. Terminology

3.1 *Definitions*—For definitions of terms used in these test methods, refer to Terminology E473.

3.1.1 *oxidation (extrapolated) onset temperature (OOT)*—a relative measure of oxidative stability at the cited heating rate is determined from data recorded during a DSC scanning temperature test. The temperature at which the onset to the observed oxidation is taken as the OOT.

4. Summary of Methods

4.1 The test specimen in an aluminum container and an empty reference aluminum container or pan are heated at a specified constant heating rate in an oxygen (or air) environment. Heat flow out of the specimen is monitored as a function of temperature until the oxidative reaction is manifested by heat evolution on the thermal curve. The oxidation (extrapolated) onset temperature (OOT), a relative measure of oxidative stability at the cited heating rate, is determined from data recorded during the scanning temperature test. The OOT measurement is initiated upon reaching the exothermic reaction and measuring the extrapolated onset temperature.

4.2 For some particularly stable materials, the OOT may be quite high (>300°C) at the specified heating rate of the experiment. Under these circumstances, the OOT may be