



Standard Test Method for Determination of pHe of Ethanol, Denatured Fuel Ethanol, and Fuel Ethanol (Ed75-Ed85)¹

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1. Scope

1.1 This test method covers a procedure to determine a measure of the acid strength of high ethanol content fuels. These include ethanol, denatured fuel ethanol, and fuel ethanol (Ed75-Ed85). The test method is applicable to fuels containing nominally 70 volume % ethanol, or higher, as described in Specifications D 4806 and D 5798.

1.2 Acid strength as measured in this test method is defined as pHe. A pHe value for alcohol solutions is not directly comparable to pH values of water solutions.

1.3 The value of pHe will depend somewhat on the fuel blend, the stirring rate, and the time the electrode is in the fuel.

1.4 *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:

D 4806 Specification for Denatured Fuel Ethanol for Blending with Gasolines for Use as Automotive Spark-Ignition Engine Fuel²

D 5798 Specification for Fuel Ethanol (Ed75-Ed85) for Automotive Spark-Ignition Engines³

3. Terminology

3.1 Definitions:

3.1.1 *ethanol, n*—ethyl alcohol, the chemical compound, C₂H₅OH.

3.1.2 *denaturants, n*—natural gasoline, gasoline components, unleaded gasoline, or toxic or noxious materials added to fuel ethanol to make it unsuitable for beverage use but not unsuitable for automotive fuel use.

3.1.3 *denatured fuel ethanol, n*—fuel ethanol made unfit for beverage use by the addition of denaturants.

3.1.4 *fuel ethanol (Ed75-Ed85), n*—a blend of ethanol and hydrocarbons of which the ethanol portion is nominally 75 to 85 volume % denatured ethanol.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *pHe, n*—a measure of the acid strength of alcohol fuels defined by this apparatus and procedure.

4. Summary of Test Method

4.1 The sample is analyzed at room temperature using a specified electrode system and a pH meter with a sufficiently high impedance and recommended for use with ion specific electrodes.

4.2 Readings are taken at exactly 30 s because the meter reading will drift throughout the analysis due to solvent effects on the electrode.

4.3 The electrode is soaked in water-based pH 7 buffer between readings to prepare it for the next sample. This rehydrates the glass electrode, a necessary step to preserve the electrode's response characteristics.

5. Significance and Use

5.1 The acid strength, as measured by pHe, is a good predictor of the corrosion potential of ethanol fuels. It is preferable to total acidity because total acidity does not measure acid strength; overestimates the contribution of weak acids, such as carbonic acid; and may underestimate the corrosion potential of low concentrations of strong acids, such as sulfuric acid.

6. Apparatus

6.1 *pH meter*—All types of commercially available pH meters with a sufficiently high impedance and recommended for use with ion specific electrodes are acceptable for this test method. Temperature compensation and readability to 0.01 pH unit are recommended.

6.2 *Electrode*—ORION Ross Sure-Flow combination electrode⁴ with a glass body shall be used. Because the measurement is (of necessity) not made at equilibrium, it is essential

¹ This test method is under the jurisdiction of ASTM Committee D-2 on Petroleum Products and Lubricants and is the direct responsibility of Subcommittee D02.A on Gasoline and Oxygenated Fuels.

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² *Annual Book of ASTM Standards*, Vol 05.02.

³ *Annual Book of ASTM Standards*, Vol 05.03.

⁴ The specified electrode (ORION Cat. No. 8172BN) is available from many laboratory supply companies or from the manufacturer: Orion Research Incorporated, Laboratory Products Group, The Schrafft Center, 529 Main Street, Boston, MA 02129.