



Standard Test Method for Acid Number of Crude Oils and Petroleum Products by Catalytic Thermometric Titration¹

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^{ε1} NOTE—Footnote 4 was added editorially in December 2016.

1. Scope

1.1 This test method covers the determination of acidic components in crude oil and petroleum products including waxes, bitumen, base stocks, and asphalts that are soluble in mixtures of xylenes and propan-2-ol. It is applicable for the determination of acids whose dissociation constants in water are larger than 10^{-9} ; extremely weak acids whose dissociation constants are smaller than 10^{-9} do not interfere. The values obtained by this test method may not be numerically equivalent to other acid value measurements. The range of KOH acid numbers included in the precision statement is 0.1 mg/g to 16 mg/g.

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

1.3 *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. Some specific hazards statements are given in Section 7 on Safety Precautions.*

2. Referenced Documents

2.1 ASTM Standards:²

- D664 Test Method for Acid Number of Petroleum Products by Potentiometric Titration
- D974 Test Method for Acid and Base Number by Color-Indicator Titration
- D1193 Specification for Reagent Water
- D4057 Practice for Manual Sampling of Petroleum and Petroleum Products

¹ This test method is under the jurisdiction of ASTM Committee D02 on Petroleum Products, Liquid Fuels, and Lubricants and is the direct responsibility of Subcommittee D02.06 on Analysis of Liquid Fuels and Lubricants.

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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.

- D4175 Terminology Relating to Petroleum Products, Liquid Fuels, and Lubricants
- D4177 Practice for Automatic Sampling of Petroleum and Petroleum Products
- D5854 Practice for Mixing and Handling of Liquid Samples of Petroleum and Petroleum Products
- D6299 Practice for Applying Statistical Quality Assurance and Control Charting Techniques to Evaluate Analytical Measurement System Performance

3. Terminology

3.1 For general terminology, refer to Terminology D4175.

3.2 Definitions:

3.2.1 *acid number, n*—the quantity of a specified base, expressed in milligrams of potassium hydroxide per gram of sample, required to titrate a sample in a specified solvent to a specified endpoint using a specified detection system.

3.2.2 *catalytic thermometric titration, n*—a method to determine the end point of a chemical reaction through the use of a temperature measuring device and the addition of a chemical to enhance the detection of the endpoint.

3.2.3 *crude oil, n*—a naturally occurring hydrocarbon mixture, generally in a liquid state, which may also include compounds of sulfur, nitrogen, oxygen, metals, and other elements.

4. Summary of Test Method

4.1 The sample and a fixed mass of paraformaldehyde are dissolved in a mixture of xylenes and propan-2-ol. The mixture is then titrated with potassium hydroxide using a constant rate of titrant addition. A plot of the temperature of the reaction mixture versus the volume of titrant is generated. An exothermic reaction between the titrant and sample occurs simultaneously with the endothermic depolymerization of paraformaldehyde. After all of the acidic material in the sample has reacted, the slope of the plot changes due to the absence of the competitive exothermic acid-base reaction. The change in slope is the inflection point. The depolymerization of paraformaldehyde is catalytically initiated and does not consume a significant quantity of potassium hydroxide. The net change