



Designation: D4046 – 14

Standard Test Method for Alkyl Nitrate in Diesel Fuels by Spectrophotometry¹

This standard is issued under the fixed designation D4046; 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 test method covers a procedure for the determination of 0.03 to 0.30 volume % of alkyl nitrate in diesel fuels.

1.2 This test method can be used for the determination of any alkyl nitrate in diesel fuel provided that standards used for calibration contain the same alkyl nitrate ester as the test specimens to be analyzed.

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

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.* For specific hazard statements, see Section 7.

2. Referenced Documents

- 2.1 *ASTM Standards*:²
[D1193 Specification for Reagent Water](#)

3. Summary of Test Method

3.1 The determination is based on the simultaneous hydrolysis of the ester in 65 % sulfuric acid solution and nitration of *m*-xylenol by the nitric acid liberated. The nitroxylenol is extracted from the reaction mixture and reacted with sodium hydroxide to form the yellow salt. The color is measured spectrophotometrically at 452 nm, and the concentration of alkyl nitrate is determined by reference to the slope of the calibration curve.

4. Significance and Use

4.1 In diesel fuel, the presence of alkyl nitrates such as amyl nitrate, hexyl nitrate, or octyl nitrate causes a higher residue

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 D02.03 on Elemental Analysis.

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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.

value than observed in untreated fuel, which can lead to erroneous conclusions as to the coke forming propensity of the fuel. The presence of such alkyl nitrate in the fuel can be determined using this test method. This test method can be used to determine the amount of alkyl nitrate that has been added to diesel fuel to improve Cetane Number. The test method is applicable as a basis for judging compliance with specifications covering any alkyl nitrate.

5. Interferences

5.1 Other nitrate esters, inorganic nitrate ions, and nitrogen oxides will interfere.

6. Apparatus

6.1 *Absorption Cells*, matched, having a 1.000 ± 0.002 -cm path length.

6.2 *Separatory Funnel*, Squibb-type glass stoppered with TFE-fluorocarbon stopcock, 125-mL capacity.

6.3 *Shaking Machine*, automatic, capable of multiple samples and 250 oscillations/min.

6.4 *Spectrophotometer*, capable of measuring absorption in the region of 452 ± 5 nm.

6.5 *Volumetric Flask*, 10- and 100-mL capacity.

6.6 *Measuring Pipet*, 1-mL, 3-mL, 4-mL, and 10-mL.

6.7 *Buret*, 10-mL capacity.

7. Reagents

7.1 *Purity of Reagents*—Reagent grade chemicals shall be used in all tests. Unless otherwise indicated, it is intended that all reagents conform to the specifications of the committee on Analytical Reagents of the American Chemical Society, where such specifications are available.³ Other grades may be used, provided it is first ascertained that the reagent is of sufficiently high purity to permit its use without lessening the accuracy of the determination.

³ *Reagent Chemicals, American Chemical Society Specifications*, American Chemical Society, Washington, DC. For suggestions on the testing of reagents not listed by the American Chemical Society, see *Analar Standards for Laboratory Chemicals*, BDH Ltd., Poole, Dorset, U.K., and the *United States Pharmacopeia and National Formulary*, U.S. Pharmacopeial Convention, Inc. (USPC), Rockville, MD.

*A Summary of Changes section appears at the end of this standard