



Standard Test Method for Sodium in Residual Fuel Oil (Flame Photometric Method)¹

This standard is issued under the fixed designation D 1318; 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 the determination of sodium in residual fuel oil by means of a flame photometer. Its precision in low ranges limits its application to samples containing more than 15 mg/kg sodium. Other elements commonly found in residual fuel oil do not interfere.

1.2 The values stated in SI units are to be regarded as the standard.

1.3 *This standard does not purport to address all of the safety problems 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 6.3, 6.5, 6.7, 8.2, and Note 3.

2. Referenced Documents

2.1 ASTM Standards:

- D 1193 Specification for Reagent Water²
- D 4057 Practice for Manual Sampling of Petroleum and Petroleum Products³
- D 4177 Practice for Automatic Sampling of Petroleum and Petroleum Products³

3. Summary of Test Method

3.1 A weighed sample is reduced to a carbonaceous ash under controlled conditions. The residual carbon is removed by heating in a muffle furnace at 550°C. The ash is dissolved, diluted to volume, and the sodium determined by means of a flame photometer.

4. Significance and Use

4.1 Excessive amounts of sodium can indicate the presence of materials that cause high wear of burner pumps and valves, and contribute to deposits of boiler heating surfaces.

5. Apparatus

5.1 *Flame Photometer*, capable of isolating the sodium doublet at 589 nm and stable enough to give repeatable measurements that do not vary more than 5 % of their mean in the 2 to 20 mg/kg range of sodium.

5.2 *Platinum Dish*, 100-mL capacity, approximately 35 mm in depth.

5.3 *Electric Muffle Furnace*, capable of operating over a variable range from 200 to 600°C and of maintaining a temperature of 550 \pm 50°C.

6. Reagents and Materials

6.1 *Purity of Reagents*—Reagent grade chemicals shall be used in all tests. Unless otherwise indicated, it is intended that all reagents shall conform to the specifications of the Committee on Analytical Reagents of the American Chemical Society, where such specifications are available.⁴ Other grades can 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.

6.2 *Purity of Water*—Unless otherwise indicated, references to water shall be understood to mean reagent water as defined by Type II or III of Specification D 1193.

6.3 *Hydrochloric Acid* (sp gr 1.19)—Concentrated hydrochloric acid (HCl). (**Warning**—Poison. Causes severe burns. Harmful or fatal if swallowed or inhaled.)

6.4 *Hydrochloric Acid* (1+9)—Mix 1 volume of HCl (sp gr 1.19) with 9 volumes of water.

6.5 *Hydrofluoric Acid* (48 %)—Concentrated hydrofluoric acid (HF). (**Warning**—Poison. Causes severe burns. Harmful or fatal if swallowed or inhaled.)

6.6 *Sodium Solution, Standard* (1000 mg Na/L)—Dissolve 3.088 \pm 0.005 g of dried sodium sulfate (Na₂SO₄) in water and dilute to 1 L in a volumetric flask. Store in a polyethylene bottle.

¹ This test method is under the jurisdiction of ASTM Committee D02 on Petroleum Products and Lubricants and is the direct responsibility of Subcommittee D02.03 on Elemental Analysis.

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² *Annual Book of ASTM Standards*, Vol 11.01.

³ *Annual Book of ASTM Standards*, Vol 05.02.

⁴ *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 Pharmacopoeia and National Formulary*, U.S. Pharmacopoeial Convention, Inc. (USPC), Rockville, MD.