



Standard Test Method for Lithium and Sodium in Lubricating Greases by Flame Photometer¹

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1. Scope

1.1 This test method covers determination of the lithium and sodium content of lubricating greases by means of a flame photometer.

1.2 *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.*

1.3 The preferred units are mass % and accepted SI units. The values given in parentheses are for information only.

2. Referenced Documents

2.1 *ASTM Standards:*

D 1193 Specification for Reagent Water²

3. Summary of Test Method

3.1 The sulfated ash of the grease is extracted with water and the lithium and sodium content of the resulting solution is determined by means of a suitable flame photometer.

4. Significance and Use

4.1 Lubricating greases can contain the lithium soap of hydroxy stearic acid or the sodium soap of various fatty acids as thickeners. The determination of total lithium or total sodium is a measure of the amount of thickener in the grease.

5. Apparatus

5.1 *Flame Photometer*, suitably equipped to determine lithium and sodium over a range from 0 to 15 mg/L lithium and from 0 to 5 mg/L sodium.

6. Reagents

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.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.

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

6.3 *Lithium Sulfate, Stock Solution*—1.188 g of lithium sulfate dried to constant weight at 180°C (356°F), is dissolved in water and made up to 1 L. This will contain 150 mg/L lithium.

6.4 *Sodium Sulfate, Stock Solution*—0.1544 g of sodium sulfate, dried to constant weight at 105°C (221°F), is dissolved in water and made up to 1 L. This will contain 50 mg/L sodium.

6.5 *Sulfuric Acid* (rel. den. 1.84)—Concentrated sulfuric acid (H₂SO₄).

7. Sampling

7.1 A homogeneous sample shall be obtained to ensure quantitative analytical results.

8. Procedure

8.1 Weigh to the nearest 1 mg approximately 1 g of the grease into a platinum dish or crucible. Heat the dish until the sample can be ignited with a flame. Maintain at such a temperature that the sample burns at a uniform and moderate rate, leaving only ash and carbon when the burning ceases.

8.2 Cool the dish and completely moisten the residue by the dropwise addition of concentrated sulfuric acid. Heat the dish at a low temperature, taking care to avoid spattering of the contents, and continue heating until fumes are no longer evolved. Place the dish in a furnace at 550 ± 25°C (1022 ± 45°F) and continue heating until the oxidation of the carbon is practically complete.

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 D02.03.0B on Spectrometric Methods.

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

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.