



Standard Test Method for Total Nitrogen in Organic Materials by Modified Kjeldahl Method¹

This standard is issued under the fixed designation E 258; 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.

This standard has been approved for use by agencies of the Department of Defense.

1. Scope

1.1 This test method covers the determination of total nitrogen in nitrogen-containing organic compounds. This test method is not applicable for use on materials containing N-O, N-N linkages.

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.*

NOTE 1—Another method of restricted application is given in Test Method D 1013.

2. Referenced Documents

2.1 ASTM Standards:

D 1013 Test Method for Determining Total Nitrogen in Resins and Plastics²

D 1193 Specification for Reagent Water³

E 200 Practice for Preparation, Standardization, and Storage of Standard and Reagent Solutions for Chemical Analysis⁴

3. Summary of Test Method

3.1 The sample is digested in a mixture of concentrated sulfuric acid, potassium sulfate, and mercuric oxide. The amounts of organic matter, potassium sulfate, and sulfuric acid present during the digestion step are critical. The organic material is oxidized and the nitrogen converted to ammonium sulfate. Sodium sulfide is added to the digested mixture to precipitate the mercury after which the solution is made strongly alkaline with sodium hydroxide solution and the

ammonia which is liberated is distilled into a measured volume of standard acid. The amount of acid neutralized by the ammonia is determined by titrating the excess acid with standard sodium hydroxide solution.

4. Significance and Use

4.1 This test method may be used to determine the total nitrogen content of certain unknown organic samples, or to assay known nitrogen containing organic compounds.

4.2 This test method may be used on organic materials in which the complete conversion of nitrogen to ammonium sulfate can be accomplished by digestion in a mixture of sulfuric acid, potassium sulfate, and mercuric oxide. It cannot be used on materials containing N-O, N-N linkages.

4.3 This test method assumes that ammonia can be quantitatively measured by distillation from an alkaline solution into a measured volume of standard acid.

5. Apparatus

5.1 *Kjeldahl Flasks* of moderately thick, well-annealed borosilicate glass for digestion and distillation, 500 or 800-mL capacity.

NOTE 2—The usual flask and connecting bulb commercially available are made to be assembled by means of a rubber stopper. To minimize lacerations from broken flasks while assembling the apparatus, it is recommended that the flask have an outer spherical 35/25 joint and the bulb have an inner spherical 35/25 joint. This type apparatus is held together by a spring clamp.

5.2 *Connecting Bulbs* of the Willits-John type, or a scrubber bulb equally effective in preventing mechanical carry-over of the contents of the distillation flask to the condenser (Note 2).

5.3 *Digestion and Distillation Equipment* consists of an adjustable heater, water-cooled condenser, receiver support, and fume disposal unit. Any of the well-known commercial Kjeldahl digestion and distillation units are suitable. The units may be heated either electrically or by gas burner but must be adjusted after an initial warm-up period to bring 250 mL of water to a rolling boil in 4 to 6 min. Before testing the unit,

¹ This test method is under the jurisdiction of ASTM Committee E15 on Industrial and Specialty Chemicals and is the direct responsibility of Subcommittee E15.01 on General Standards.

This test method has been adopted from Method 2.054 of the Official Methods of Analysis of the Association of Official Agricultural Chemists, 13th Edition, 1980.

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² *Annual Book of ASTM Standards*, Vol 06.03.

³ *Annual Book of ASTM Standards*, Vol 11.01.

⁴ *Annual Book of ASTM Standards*, Vol 15.05.