

Designation: D 1942 - 80^{ε1}AMERICAN SOCIETY FOR TESTING AND MATERIALS
1916 Race St., Philadelphia, Pa. 19103Reprinted from the Annual Book of ASTM Standards, Copyright ASTM
If not listed in the current combined index, will appear in the next edition.

Standard Test Method for Morpholine in Water¹

This standard is issued under the fixed designation D 1942; 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 NOTE—Editorial corrections, including the renumbering of Sections 3 and 4, were made in March 1989.

1. Scope

1.1 This test method covers a colorimetric procedure for the determination of morpholine in boiler feedwater and steam condensate.

1.2 The test method, as described, may be applied to waters containing morpholine in concentrations from 1 to 5 mg/L. Higher concentrations may be determined by dilution.

1.3 *This standard may involve hazardous materials, operations, and equipment. 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.*

2. Referenced Documents

2.1 ASTM Standards:

D 1066 Practice for Sampling Steam²

D 1129 Definitions of Terms Relating to Water²

D 1192 Specification for Equipment for Sampling Water and Steam²

D 1193 Specification for Reagent Water²

D 3370 Practices for Sampling Water²

E 60 Practice for Photometric and Spectrophotometric Methods for Chemical Analysis of Metals³

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

E 275 Practice for Describing and Measuring Performance of Ultraviolet, Visible, and Near Infrared Spectrophotometers⁵

3. Definitions

3.1 For definitions of terms used in this test method, refer to Definitions D 1129.

4. Summary of Test Method

4.1 Carbon disulfide and morpholine react to form a thiocarbamate which reacts with an excess of copper to form an amber to brown complex. The intensity of the color is

proportional to the amount of morpholine in the water. In order to obtain the reaction with carbon disulfide, the solution must have a pH of approximately 9.5 ± 0.1 at 25°C.

5. Significance and Use

5.1 Morpholine is added to reduce corrosion in steam generating and distribution systems by neutralizing acidic gaseous constituents.

5.2 This test method is used to monitor the concentration of morpholine in steam and condensate so that optimum concentration can be maintained.

6. Interferences

6.1 Except for hydrazine, substances normally present in boiler feedwater and steam do not interfere with this test. Hydrazine causes positive interference. Addition of formaldehyde to the sample aliquot eliminates this effect.⁶

6.2 The basic reactions of the test are common to octadecylamine and other long chain aliphatic amines, as well as to short chain primary, secondary, and tertiary amines.

7. Apparatus

7.1 *Filter Photometer or Spectrophotometer*, suitable for measurements at a wavelength of 430 nm. Filter photometers and photometric practices prescribed in this method shall conform to Practice E 60. Spectrophotometers shall conform to the Practice E 275.

7.2 *Shaker*, reciprocating, adjusted for shaking at the rate of 280 (= 5) oscillations per minute with a horizontal stroke of 1 in.

8. Reagents

8.1 *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.⁷ Other grades may be used, provided it is first ascertained that the reagent is of sufficiently high purity to permit its use without

¹ This test method is under the jurisdiction of ASTM Committee D-19 on Water and is the direct responsibility of Subcommittee D19.06 on Methods for Analysis for Organic Substances in Water.

Current edition approved July 3, 1980. Published September 1980. Originally published as D 1942 - 62. Last previous edition D 1942 - 74.

² Annual Book of ASTM Standards, Vol 11.01.

³ Annual Book of ASTM Standards, Vol 03.05.

⁴ Annual Book of ASTM Standards, Vol 15.05.

⁵ Annual Book of ASTM Standards, Vol 14.01.

⁶ McCluskey, J. K., and Martucci, J. A., "Colorimetric Determination of Morpholine in the Presence of Hydrazine," *ASTM Materials Research and Standards*, Vol 7, No. 2, February 1967, pp. 57-58.

⁷ "Reagent Chemicals, American Chemical Society Specifications," Am. Chemical Soc., Washington, D. C. For suggestions on the testing of reagents not listed by the American Chemical Society, see "Reagent Chemicals and Standards," by Joseph Rosin, D. Van Nostrand Co., Inc., New York, N. Y., and the "United States Pharmacopeia."