NOTICE: This standard has either been superseded and replaced by a new version or withdrawn.
Contact ASTM International (www.astm.org) for the latest information

Designation: E2193 – 08

StandardTest Method for Ultraviolet Transmittance of Monoethylene Glycol (Ultraviolet Spectrophotometric Method)[1]

This standard is issued under the fixed designation E2193; 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 the transmittance of monoethylene glycol (1,2-ethanediol; MEG) at wavelengths in the region 220 to 350 nm. The results provide a measure of the purity of the sample with respect to ultraviolet absorbing compounds.

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

1.3 *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.*

1.4 Review the current Material Safety Data Sheets (MSDS) for detailed information concerning toxicity, first aid procedures, and safety precautions.

2. Referenced Documents

2.1 *ASTM Standards:*[2]

E131 Terminology Relating to Molecular Spectroscopy

E169 Practices for General Techniques of Ultraviolet-Visible Quantitative Analysis

E180 Practice for Determining the Precision of ASTM Methods for Analysis and Testing of Industrial and Specialty Chemicals (Withdrawn 2009)[3]

E275 Practice for Describing and Measuring Performance of Ultraviolet and Visible Spectrophotometers

2.2 *Other Document:*

Manufacturer's Instruction Manual of Spectrophotometer

3. Summary of Test Method

3.1 The product is sampled in such a way as to avoid extraneous contamination and air contact. The absorbance of the sample contained in a 50-mm or 10-mm cell is measured against water at a series of wavelengths and the transmittance over a pathlength of 10 mm is calculated.

3.2 This test method can be performed with two options as to sample preparation prior to UV measurement.

3.2.1 Option A: Nitrogen sparging of the sample (see 4.2).

3.2.2 Option B: No nitrogen sparging.

4. Significance and Use

4.1 Knowledge of the ultraviolet transmittance of monoethylene glycol is required to establish whether the product meets the requirements of its quality specifications.

4.2 Dissolved oxygen in organic solvents, such as MEG, forms complexes that shift the solvent absorption from the vacuum ultraviolet range into the measurable UV range (near 190 to 250 nm). Monoethylene glycol has a UV absorption peak at 180 nm. For MEG-oxygen complexes, this peak is shifted to a longer wavelength, thus increasing the absorbability at 220 nm.

4.2.1 However, this effect is not observed in water. There is no significant measurable effect due to dissolved oxygen in water that would require nitrogen sparging prior to using for collection of the reference spectrum.

4.2.2 Nitrogen sparging and re-measurement of suspect or borderline glycol samples at 220 nm can be used as a tool to rule out or confirm the presence of UV affecting contaminants other than oxygen.

5. Apparatus

5.1 *Ultraviolet Spectrophotometer,* double beam, suitable for measurement at wavelengths in the region 200 to 400 nm, having a spectral bandwidth of 2.0 nm or less at 220 nm, wavelength accuracy ±0.5 nm or less at 220 nm, wavelength repeatability 0.3 nm or less at 220 nm and a photometric accuracy of ±0.5 % *T* or less, in the transmittance region above 50 % *T*. Stray light shall be less than 0.1 % at 220 nm. The instrument shall be provided with matched fused silica cells with pathlengths of 50 ± 0.1 mm or 10 mm ± 0.01 mm. Use of 50-mm cell should provide better precision.

[1] This test method is under the jurisdiction of ASTM Committee E15 on Industrial and Specialty Chemicalsand is the direct responsibility of Subcommittee E15.02 on Product Standards.

Current edition approved April 1, 2008. Published May 2008. Originally approved in 2002. Last previous edition approved in 2004 as E2193 – 04. DOI: 10.1520/E2193-08.

[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.

[3] The last approved version of this historical standard is referenced on www.astm.org.

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

Copyright © ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959. United States

Documents
Document Sharing Hub
Full document details: ASTM E2193-08

5.1.1 *Optional Single Beam Spectrophotomer*—Use the same cell for measurement of the blank and the sample.

5.2 *Nitrogen Stripping Apparatus (Option A, 3.2.1),* consisting of an oil-free pressure reducing valve to fit the nitrogen cylinder, a control valve, vinyl tubing and a disposable glass pipette to be inserted in a 25-mL volumetric flask. Components should be clean and free of ultraviolet contaminants. Avoid contacting the sample with any plastic material containing plasticizers. Plasticizers can leach out of the material and cause erroneous results. Replace the disposable pipette by a clean, new one after each sample handling. (See Section 9.)

5.3 *Bottles,* capacity at least 0.5–L, with lined, well-fitting cap. Use a fresh bottle for each determination.

5.4 *Glassware:*

5.4.1 *Volumetric Flask,* 25-mL.

6. Reagents and Materials

6.1 *Purity of Reagents*—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 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 *Holmium Oxide Wavelength Calibration Filter,* calibrated (if required; see 8.1.1).

NOTE 1—The standard reference material SRM 2034, available from the National Institute of Standards and Technology (NIST),[5] is suitable.

6.3 *Standard Absorbance Filter,* with certified absorbance values (if required; see 8.1.2).

NOTE 2—The standard reference material SRM 2031, available from NIST,[5] is suitable. In addition, SRM 935a may be used (see 6.4).

6.4 *Stray Light Filter,* for measuring stray light at 220 nm (if required; see 8.1.3).

NOTE 3—The (potassium iodide) standard reference material SRM 2032, available from NIST,[5] is suitable (see also 6.8).

6.5 *Naphthalene Solution*—(1 mg/L isooctane) Dissolve 1 mg naphthalene in 1000 mL of spectroscopic grade isooctane. (**Warning**—Isooctane is highly flammable and irritating to the respiratory system. Avoid contact with skin. Naphthalene is irritating to the skin, eyes, and respiratory system. It may cause sensitization by skin contact. Avoid contact with eyes. Wear suitable protective clothing.

6.6 *Nitrogen,* minimum purity 99.99 % (V/V), oil-free.

6.7 *Potassium Dichromate or Potassium Chromate,* for checking photometric accuracy (if required; see 8.1.2).

NOTE 4—The standard reference material, no. SRM 935a, available from NIST,[5] is suitable.

(**Warning**—Potassium dichromate is harmful in contact with skin, toxic if swallowed, and very toxic by inhalation. It is irritating to the respiratory system and skin. Risk of serious damage to eyes. It may cause sensitization by skin contact. It may cause heritable genetic damage. It may cause cancer by inhalation. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). Avoid exposure—obtain special instructions before use. This material or its container, or both, must be disposed of as hazardous waste. Avoid release to the environment. Refer to special instructions/safety data sheets.) (**Warning**—Potassium chromate is irritating to eyes, respiratory system, and skin. It may cause sensitization by skin contact. It may cause heritable genetic damage. It may cause cancer by inhalation. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). Avoid exposure—obtain special instructions before use. This material or its container, or both, must be disposed of as hazardous waste. Avoid release to the environment. Refer to special instructions/safety data sheets.)

6.8 *Potassium or Sodium Iodide Solution,* for measuring stray light at 220 nm (if required; see 8.1.3).

NOTE 5—The "UV-VIS Standard" sodium iodide solution,[6] is suitable. Potassium iodide solutions can be prepared from NIST standard reference material SRM 2032 (see 6.4 and Note 3).

6.9 *Water,* HPLC grade.

6.10 *Monoethylene Glycol Quality Control Sample,* (only required if maintaining a control chart, see 10.5). Store at a temperature between 0 and 5°C. Warm to ambient temperature before use.

7. Sampling

7.1 The following precautions must be observed carefully since the ultraviolet transmittance is very sensitive to small amounts of extraneous material contaminating the sample and to oxygen dissolved in the sample through air contact. The sample connection must be protected against accidental contamination and designed so that it will permit convenient positioning of the sample bottle to the sample outlet in order to minimize air contact, that is, the descending stream of sample should be as short as possible. Purge the sampling line thoroughly with sample. Fill the bottle partly with sample, shake and discard. Repeat the rinsing procedure. Then take the sample in a "gentle stream," thus filling the bottle to within 10 mm of the top. A "gentle stream" is a rate of flow that avoids spattering, splashing, or other aggressive manifestations on the part of the sample flow. Cap and avoid excessive shaking during transport (see also Section 9).

8. Preparation of Apparatus

8.1 *Spectrophotometer*—Check the performance of the spectrophotometer as described below. General information on

[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 Pharmacopeia and National Formulary*, U.S. Pharmacopeial Convention, Inc. (USPC), Rockville, MD.

[5] Available from National Institute of Standards and Technology (NIST), 100 Bureau Dr., Stop 1070, Gaithersburg, MD 20899-1070, http://www.nist.gov.

[6] Available from Merck KGaA, Frankfurterstraße 250, D-64293 Darmstadt, Germany.

AVA Documents
Document Sharing Hub

Full document details: ASTM E2193-08