



Standard Test Method for Quantification of Complex Polycyclic Aromatic Hydrocarbon Mixtures or Petroleum Oils in Water¹

This standard is issued under the fixed designation D 5412; 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 means for quantifying or characterizing total polycyclic aromatic hydrocarbons (PAHs) by fluorescence spectroscopy (FI) for waterborne samples. The characterization step is for the purpose of finding an appropriate calibration standard with similar emission and synchronous fluorescence spectra.

1.2 This test method is applicable to PAHs resulting from petroleum oils, fuel oils, creosotes, or industrial organic mixtures. Samples can be weathered or unweathered, but either the same material or appropriately characterized site-specific PAH or petroleum oil calibration standards with similar fluorescence spectra should be chosen. The degree of spectral similarity needed will depend on the desired level of quantification and on the required data quality objectives.

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.*

2. Referenced Documents

2.1 ASTM Standards:

- D 1129 Terminology Relating to Water²
- D 1193 Specification for Reagent Water²
- D 2777 Practice for Determination of Precision and Bias of Applicable Methods of Committee D-19 on Water²
- D 3325 Practice for Preservation of Waterborne Oil Samples³
- D 3326 Practices for Preparation of Samples for Identification of Waterborne Oils³
- D 3415 Practice for Identification of Waterborne Oils³
- D 3650 Test Method for Comparison of Waterborne Petroleum Oils by Fluorescence Analysis³
- D 4489 Practices for Sampling of Waterborne Oils³
- D 4657 Test Method for Polynuclear Aromatic Hydrocarbons in Water³

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

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² Annual Book of ASTM Standards, Vol 11.01.

³ Annual Book of ASTM Standards, Vol 11.02.

E 131 Terminology Relating to Molecular Spectroscopy⁴

E 169 Practices for General Techniques of Ultraviolet-Visible Quantitative Analysis⁴

E 275 Practice for Describing and Measuring Performance of Ultraviolet, Visible, and Near Infrared Spectrophotometers⁴

E 388 Test Method for Spectral Bandwidth and Wavelength Accuracy of Fluorescence Spectrometers⁴

E 578 Test Method for Linearity of Fluorescence Measuring System⁴

E 579 Test Method for Limit of Detection of Fluorescence of Quinine Sulfate⁴

3. Terminology

3.1 Definitions—For definitions of terms used in this test method, refer to Terminology D 1129, Terminology E 131, and Practice D 3415.

4. Summary of Test Method

4.1 This test method consists of fluorescence analysis of dilute solutions of PAHs or petroleum oils in appropriate solvents (spectroquality solvents such as cyclohexane or other appropriate solvents, for example, ethanol, depending on polarity considerations of the sample). The test method requires an initial qualitative characterization step involving both fluorescence emission and synchronous spectroscopy in order to select appropriate calibration standards with similar fluorescence spectra as compared to the samples (see Annex A1 for the definition of spectral similarity). Intensities of peak maxima of suitable emission spectra are then used to develop calibration curves for quantification.

NOTE 1—Although some sections of the characterization part of this test method are similar to Test Method D 3650, there are also significant differences (See Annex A1). Since the purpose and intent of the two test methods are different, one should not be substituted for the other.

5. Significance and Use

5.1 This test method is useful for characterization and rapid quantification of PAH mixtures including petroleum oils, fuels, creosotes, and industrial organic mixtures, either waterborne or obtained from tanks.

⁴ Annual Book of ASTM Standards, Vol 14.01.