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An American National Standard

# Standard Test Method for Comparison of Waterborne Petroleum Oils by Infrared Spectroscopy[1]

This standard is issued under the fixed designation D 3414; 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 provides a means for the identification of waterborne oil samples by the comparison of their infrared spectra with those of potential source oils.

1.2 This test method is applicable to weathered or unweathered samples, as well as to samples subjected to simulated weathering.

1.3 This test method is written primarily for petroleum oils.

1.4 This test method is written for linear transmission, but could be readily adapted for linear absorbance outputs.

1.5 *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.* Specific precautionary statements are given in Section 8.

## 2. Referenced Documents

2.1 *ASTM Standards:* [2]

D 1129 Terminology Relating to Water

D 1193 Specification for Reagent Water

D 3325 Practice for Preservation of Waterborne Oil Samples

D 3326 Practice for Preparation of Samples for Identification of Waterborne Oils

D 3415 Practice for Identification of Waterborne Oils

E 131 Terminology Relating to Molecular Spectroscopy

E 168 Practices for General Techniques of Infrared Quantitative Analysis

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

## 3. Terminology

3.1 *Definitions:*

3.1.1 For definitions of terms used in this test method refer to Terminology E 131 and Terminology D 1129.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *weathering of waterborne oil*—the combined effects of evaporation, solution, emulsification, oxidation, biological decomposition, etc.

## 4. Summary of Test Method

4.1 The spill sample and potential source oil(s) are treated identically to put them in an appropriate form for analysis by infrared spectrophotometry. The oils are transferred to suitable infrared cells and the spectra are recorded from 4000 to 600 $cm^{-1}$ for KBr cells, and to 650 cm-1 for HATR cells with ZnSe crystals. All analyses are performed on the same instrument using the same sample cell, which is cleaned between samples. The spectra of the sample and the potential source oil(s) are then compared by superimposing one upon the other, looking at particular portions of the spectra. A high degree of coincidence between the spectra of the sample and a potential source oil indicates a common origin. This test method is recommended for use by spectroscopists experienced in infrared oil identification or under close supervision of such qualified persons.

## 5. Significance and Use

5.1 This test method provides a means for the comparison of waterborne oil samples with potential sources. The waterborne samples may be emulsified in water or obtained from beaches, boats, oil-soaked debris, and so forth.

5.2 The unknown oil is identified by the similarity of its infrared spectrum with that of a potential source oil obtained from a known source, selected because of its possible relationship to the unknown oil.

5.3 The analysis is capable of comparing most oils. Difficulties may be encountered if a spill occurs in an already polluted area, that is, the spilled-oil mixes with another oil.

5.4 In certain cases, there may be interfering substances which require modification of the infrared test method or the use of other test methods (see Practice D 3326, Method D.)

[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] 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.

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