



Standard Practice for Infrared (IR) Procedure for Determination of Aromatic/ Aliphatic Ratio of Bituminous Emulsions¹

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1. Scope

1.1 This practice uses infrared analytical techniques to qualitatively determine in the laboratory a ratio of aromatic absorbance to aliphatic absorbance. This practice may be used to determine if the bitumen in the emulsion is predominantly aromatic or aliphatic in nature.

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.*

2. Referenced Documents

2.1 *ASTM Standards:*²

D2939 Test Methods for Emulsified Bitumens Used as Protective Coatings (Withdrawn 2012)³

3. Terminology

3.1 *Definitions:*

3.1.1 *aliphatic*—a group of organic compounds characterized by straight- or branched-chain arrangements of the constituent carbon atoms. Examples of aliphatic compounds include paraffins (alkanes), olefins (alkenes), and acetylenes (alkynes). These compounds are primarily found in petroleum sources.

Hawley's Condensed Chemical Dictionary⁴

3.1.2 *aromatic*—a group of organic compounds made up of unsaturated cyclic hydrocarbons containing one or more rings, an example of which is benzene. Large numbers of these compounds are derived from petroleum and coal tar, and are classified as “aromatics” because of their strong and not unpleasant odor characteristics.

Hawley's Condensed Chemical Dictionary⁴

3.1.3 *infrared absorbance*—the range of wavelengths in the infrared that are absorbed by a specimen and identify its molecular components and compound structures. The infrared region of the electromagnetic spectrum includes wavelengths from 0.70 μm to approximately 300 μm , that is, longer than visible light and shorter than microwave.

Hawley's Condensed Chemical Dictionary⁴

4. Summary of Practice

4.1 A sample of bituminous emulsion from which the water has been removed using Na_2SO_4 is dissolved in carbon disulfide (CS_2), and the infrared (IR) absorbance from 2.5 to 4.2 μm is determined. The absorbance at 3.27 μm (aromatic) is divided by the absorbance at 3.40 μm (aliphatic) to obtain the IR ratio.

5. Significance and Use

5.1 The results of this practice may be used to distinguish tar-based emulsion from an asphalt-based emulsion for specification compliance purposes.

6. Apparatus

6.1 *Infrared Spectrophotometer.*

6.2 *Sealed Sodium Chloride (NaCl) IR Cell*, with 0.1 to 1 mm path length.

6.3 *IR Cell Cleaner.*

6.4 *Vacuum Pump and Dry-Ice Trap*, to protect pump.

6.5 *Syringe*, glass, 10 mL.

6.6 *Mechanical Shaker.*

6.7 *Sieves*, No. 40 (425 μm opening) and No. 100 (150 μm).

6.8 *Balance*, capable of weighing to 0.001 g.

6.9 *Pipet*, 10 mL and rubber bulb.

¹ This practice is under the jurisdiction of ASTM Committee D08 on Roofing and Waterproofing and is the direct responsibility of Subcommittee D08.09 on Bituminous Emulsions.

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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.

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

⁴ Lewis, R. J., Sr., *Hawley's Condensed Chemical Dictionary*, Thirteenth Edition, New York, Van Nostrand Reinhold, 1997.