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Standard Test Method for Cloud Point of Nonionic Surfactants[1]

This standard is issued under the fixed designation D2024; 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.

This standard has been approved for use by agencies of the Department of Defense.

1. Scope

1.1 This test method covers the determination of the solubility inversion temperature or "cloud point" of nonionic surfactants or detergent systems which are characteristically less soluble in water at higher temperatures than at lower temperatures. It is limited to those surfactants and detergent systems for which the visible solubility change occurs over a range of 1°C or less at concentrations of 0.5 to 1.0 % in water between 30 and 95°C.

1.2 *Chemical Limitations*—Nonionic surfactants that exhibit a characteristic cloud point in general terms consist of a water-in-soluble moiety condensed with 50 to 75 % by weight of ethylene oxide.

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]

E1 Specification for ASTM Liquid-in-Glass Thermometers

3. Significance and Use

3.1 The cloud point temperature is a reproducible characteristic of certain *pure* nonionic surfactants. It is also characteristic of certain nonionic surfactant formulated systems. This test method is appropriate for both systems.

NOTE 1—If the transition from a distinctly cloudy to a clear solution is not sharp, that is, if it does not take place within a range of 1°C, this test method is not appropriate.

4. Interferences

4.1 Ionic surfactants or detergents in concentrations down to 1 % or less of the nonionic surfactant drastically raise the characteristic cloud point of the latter. The presence of salts and bases (that is, non-surface active materials) will lower the characteristic cloud point. Acids tend to raise the cloud point.

5. Apparatus

5.1 *Thermometer*—An ASTM Partial Immersion Thermometer having a range from −20 to +150°C or 0 to 302°F and conforming to the requirements for Thermometer 1C or 1F in accordance with Specification E1.

6. Procedure

6.1 Prepare a 1.0 % test solution by weighing a 1 ± 0.1-g sample into a 150-mL beaker and add 100 mL of distilled or demineralized water which is at a temperature of less than 30°C. Agitate until the sample is dissolved. Pour 50 ± 5 mL of test solution into a 25 by 200-mm test tube of borosilicate glass. While agitating the test solution slowly with the thermometer, heat the test tube with a bunsen burner until the test solution becomes definitely cloudy. Remove from heat. While stirring slowly with the thermometer, allow the test solution to cool slowly until it becomes clear. Record the temperature (Note 1).

7. Precision

7.1 The following precision data provide a reasonable basis for judging the significance of the results:

7.1.1 *Repeatability*—Duplicate results by the same operator should not be considered suspect unless they differ by more than 0.5°C.

7.1.2 *Reproducibility*—The average result reported by one laboratory should not be considered suspect unless it differs from that of another laboratory by more than 1.0°C.

[1] This test method is under the jurisdiction of ASTM Committee D12 on Soaps and Other Detergents and is the direct responsibility of Subcommittee D 12.15 on Physical Testing.

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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.