

Turbidity, nephelometric

Parameter and Code:

Turbidity, I-3860-85 (nephelometric turbidity unit): 00076

1. Application

This method is generally applicable to any water that does not contain coarse material that settles rapidly. Samples having greater than 100 nephelometric turbidity units (NTU) must be diluted prior to analysis.

2. Summary of method

2.1 The method presented below is based upon a comparison of the intensity of light scattered by the sample under defined conditions with the intensity of light scattered by a standard reference suspension under the same conditions. The greater the intensity of scattered light, the greater the turbidity. Formazin polymer, which has gained acceptance as the turbidity standard reference suspension in the brewing industry, is also used as the turbidity standard reference suspension for water. It is easy to prepare and is more reproducible in its light-scattering properties than is clay or turbid, natural-water standards. The turbidity of a particular concentration of Formazin suspension is defined as 40 NTU. This same suspension of Formazin has a turbidity of approximately 40 units when measured on the Jackson candle turbidimeter; therefore, turbidity units based on the Formazin preparation will closely approximate those derived from the Jackson candle turbidimeter but may not always be identical to them.

2.2 For additional information on the turbidity measurement and its significance, see American Public Health Association and others (1980), California State Water Quality Control Board (1963), and U.S. Public Health Service (1962).

3. Interferences

The presence of colored solutes causes measured turbidity values to be low. Precipitation of dissolved constituents (for example, Fe) causes measured turbidity values to be high.

4. Apparatus

Hach turbidimeter, Model No. 2100 or 2100A.

5. Reagents

5.1 *Hexamethylenetetramine solution*, 10 g/100 mL: Dissolve 10.0 g hexamethylenetetramine in demineralized water and dilute to 100.0 mL.

5.2 *Hydrazine sulfate solution*, 1 g/100 mL: Dissolve 1.000 g $(\text{NH}_2)_2\text{H}_2\text{SO}_4$ in demineralized water and dilute to 100.0 mL.

5.3 *Turbidity standard suspension I* (Formazin): In a 100-mL volumetric flask mix 5.0 mL hydrazine sulfate solution with 5.0 mL hexamethylenetetramine solution. After 24 h standing at $25 \pm 3^\circ\text{C}$, dilute to 100.0 mL with demineralized water and mix well. Prepare fresh monthly (NOTE 1).

NOTE 1. Prepared standards of several ranges are available from the instrument manufacturer. These have a reliable shelf life of 4 to 6 months, thereby making more frequent preparation unnecessary.

5.4 *Turbidity standard suspension II*: Dilute 10.0 mL turbidity standard suspension I to 100.0 mL with demineralized water. The turbidity of this suspension is defined as 40 nephelometric turbidity units (NTU). Prepare fresh weekly. This suspension may be diluted

as required to prepare more dilute turbidity standards.

6. Procedure

6.1 Turbidimeter calibration: The manufacturer's operating instructions should be followed. Measure the standards on the turbidimeter covering the range of 0 to 100 NTU. If the instrument is already calibrated in standard turbidity units, this procedure will check the accuracy of the calibration. At least one standard should be included for each instrument range to be used. Some instruments permit adjustment of sensitivity so that scale values will correspond to turbidities. *Reliance on a manufacturer's solid-scattering standard for setting overall instrument sensitivity for all ranges is not an acceptable practice unless the turbidimeter has been shown to be free of drift on all ranges.* If a pre-calibrated scale is not supplied, then a calibration graph should be prepared for each range of the instrument.

6.2 Turbidity less than 100 NTU: Shake the sample to disperse the solids thoroughly. Wait until air bubbles disappear; then pour the sample into the turbidimeter tube. Read the turbidity directly from the instrument scale or from the appropriate calibration curve.

6.3 Turbidity exceeding 100 NTU: Dilute the sample with one or more volumes of nonturbid water until the turbidity falls below 100 NTU.

7. Calculations

Turbidity (NTU) =

$$\text{observed turbidity} \times \frac{\text{final dilution volume}}{\text{original dilution volume}}$$

8. Report

Report turbidity (00076) as follows: less than 10 NTU, one decimal; 10 NTU and above, two significant figures.

9. Precision

According to data reported by the U.S. Environmental Protection Agency, the precision of data from a single laboratory expressed in terms of the percent relative standard deviation is as follows:

| Mean (NTU) | Relative standard deviation (percent) |
|---------------|---|
| 0.26 | 2 |

References

- American Public Health Association and others, 1980, Standard methods for the examination of water and wastewater 15th ed. : Washington, D.C., p. 132-4.
- California State Water Quality Control Board, 1963, Water quality criteria: Publication 3-A, p. 290.
- U.S. Environmental Protection Agency, 1979, Methods for chemical analysis of water and wastes: Cincinnati, p. 180.1-1.
- U.S. Public Health Service, 1962, Drinking water standards. Public Health Service Publication 956, p. 6.