1.10 Turbidimetry and nephelometry

Turbidimetry is the measurement of the degree of attenuation of a radiant beam incident on particles suspended in a medium, the measurement being made in the directly transmitted beam. It may be measured with a standard photoelectric filter photometer or spectrophotometer with illumination at an appropriate wavelength.

Nephelometry is the measurement of the light scattered by suspended particles, the measurement usually being made perpendicularly to the incident beam.

Turbidimetry or nephelometry may be useful for the measurement of precipitates formed by the interaction of very dilute solutions of reagents, or other particulate matter, such as suspensions of bacterial cells. In order that consistent results may be achieved, all variables must be carefully controlled. Problems due to birefringence may be encountered, particularly with bacterial cells. Where proper control is possible, extremely dilute suspensions may be measured.

Terms

Transmittance (*T*) - The ratio of the radiant flux transmitted by the test substance to that of the incident radiant flux. Terms formerly used include transmittancy and transmission.

Turbidance (*S*) - A measure of the light-scattering effect of suspended particles.

Turbidity (τ) - In light-scattering measurements, the turbidity is the measure of the decrease in incident beam intensity per unit length of a given suspension.

Apparatus

Turbidity may be measured with a standard photoelectric filter photometer or spectrophotometer, preferably with illumination in the red-orange region of the spectrum (for example, by using a blue filter).

Nephelometric measurements require an instrument with a photocell placed so as to receive scattered rather than transmitted light; as this geometry applies also to fluorimeters in general, the latter can be used as nephelometers by proper selection of filters.

Instrumental measurement

For instrumental measurement it is advisable to ensure that settling of the particles being measured will be negligible. This is usually accomplished by including a protective colloid in the liquid suspending medium. It is important that results be interpreted by comparison of readings with those representing known concentrations of suspended matter, produced under exactly the same conditions.

Visual comparison

Carry out turbidity comparison in tubes that are matched as closely as possible in internal diameter and in all other respects. Flat-bottomed comparison tubes of transparent glass of about 70 mL capacity and about 23 mm internal diameter are suitable. For turbidity comparison the tubes should be viewed horizontally, against a dark background, with the aid of a light source directed from the sides of the tubes.