

2.0 EXPERIMENT ON DETERMINATION OF TURBIDITY

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2.0 EXPERIMENT ON DETERMINATION OF TURBIDITY

PREAMBLE:

“How to determine turbidity in Water and Wastewater”.

Test procedure is in accordance to IS: 3025 (Part 10) - Reaffirmed 2002.

In addition to our Indian Standard, we also discuss in brief regarding the procedure stated in

- (1) APHA Standard Methods for the Examination of Water and Wastewater - 20th Edition. Method 2130 B.
- (2) Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020, USEPA, Method 180.1.

2.1 AIM

To determine the turbidity of the given water sample with the stipulations as per **IS: 3025 (Part 10) - Reaffirmed 2002.**

2.2 INTRODUCTION

Turbidity is the technical term referring to the cloudiness of a solution and it is a qualitative characteristic which is imparted by solid particles obstructing the transmittance of light through a water sample. Turbidity often indicates the presence of dispersed and suspended solids like clay, organic matter, silt, algae and other microorganisms.

2.2.1 ENVIRONMENTAL SIGNIFICANCE

When the turbid water in a small, transparent container such as drinking glass is held up to the light, an aesthetically displeasing opaqueness or milky coloration is apparent. The colloidal material which exerts turbidity provides adsorption sites for chemicals and for biological organism that may not be harmful. They may be harmful or cause undesirable tastes and odours. Disinfection of turbid water is difficult because of the adsorptive characteristics of some colloids and because the solids may partially shield organisms from disinfectant. In natural water bodies, turbidity may impart a brown or other color to water and may interfere with light penetration and photosynthetic reaction in streams and lakes. Turbidity increases the load on slow sand filters.

The filter may go out of operation, if excess turbidity exists. Knowledge of the turbidity variation in raw water supplies is useful to determine whether a supply requires special treatment by chemical coagulation and filtration before it may be used for a public water supply. Turbidity measurements are used to determine the effectiveness of treatment produced with different chemicals and the dosages needed. Turbidity

measurements help to gauge the amount of chemicals needed from day-to-day operation of water treatment works.

Measurement of turbidity in settled water prior to filtration is useful in controlling chemical dosages so as to prevent excessive loading of rapid sand filters. Turbidity measurements of the filtered water are needed to check on faulty filter operation. Turbidity measurements are useful to determine the optimum dosage of coagulants to treat domestic and industrial wastewaters. Turbidity determination is used to evaluate the performance of water treatment plants.

2.3 PRINCIPLE

Turbidity is based on the comparison of the intensity of light scattered by the sample under defined conditions with the intensity of the light scattered by a standard reference suspension under the same conditions. The turbidity of the sample is thus measured from the amount of light scattered by the sample taking a reference with standard turbidity suspension. The higher the intensity of scattered light the higher is the turbidity. Formazin polymer is used as the primary standard reference suspension.

2.4 MATERIALS REQUIRED

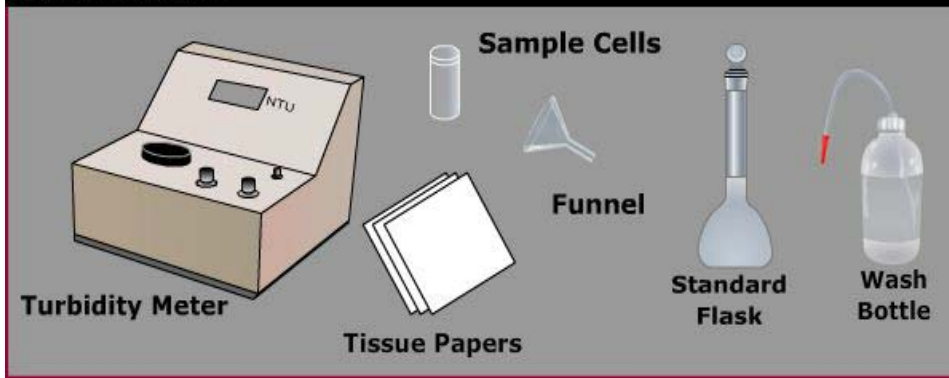
2.4.1 APPARATUS REQUIRED

1. Turbidity Meter
2. Sample Cells
3. Standard flasks
4. Funnel
5. Wash Bottle
6. Tissue Papers

2.4.2 CHEMICALS REQUIRED

1. Hexamethylenetetramine
2. Hydrazine sulphate
3. Distilled water

Apparatus Required

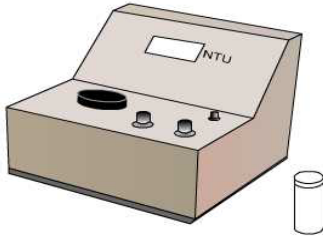


Chemicals Required



PROCEDURE CHART

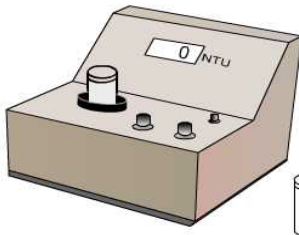
Switch on the Turbidity meter
(Atleast 30 min before the test)



Prepare 400 NTU
solution



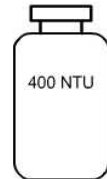
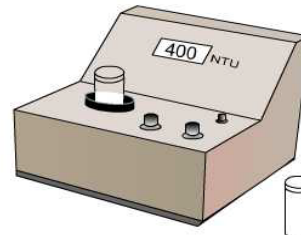
Calibrate the turbidity meter
to 0 NTU using disstilled water
and by adjusting the
calibration knob



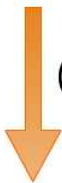
3



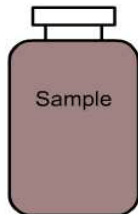
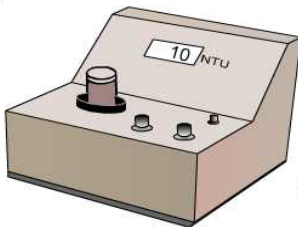
Calibrate the turbidity meter
to 400 NTU using
the standard solution
by adjusting the
calibration knob



4



Read the Turbidity meter
by inserting the sample



2.5 SAMPLE HANDLING AND PRESERVATION

Water samples should be collected in plastic cans or glass bottles. All bottles must be cleaned thoroughly and should be rinsed with turbidity free water.

Volume collected should be sufficient to insure a representative sample, allow for replicate analysis (if required), and minimize waste disposal.

No chemical preservation is required. Keep the samples at 4°C. Do not allow samples to freeze.

Analysis should begin as soon as possible after the collection. If storage is required, samples maintained at 4°C may be held for up to 48 hours.

2.5.1 PRECAUTIONS

The following precautions should be observed while performing the experiment:

- The presence of coloured solutes causes measured turbidity values to be low. Precipitation of dissolved constituents (for example, Fe) causes measured turbidity values to be high.
- Light absorbing materials such as activated carbon in significant concentrations can cause low readings.
- The presence of floating debris and coarse sediments which settle out rapidly will give low readings. Finely divided air bubbles can cause high readings.

2.6 PROCEDURE

For testing the given water sample first the reagents are to be prepared. Then the turbidity meter is required to be calibrated.

2.6.1 PREPARATION OF REAGENTS

1. Hydrazine Sulphate

- Weigh accurately 1 g of hydrazine sulphate and dissolve it in turbidity free distilled water.
- Take 100 mL standard measuring flask and place a funnel over it.
- Transfer it to a 100 mL standard flask and make up to 100 ml using turbidity free distilled water.

2. Hexamethylene Tetramine

- Weigh accurately 10 g of Hexamethylene tetramine and dissolve it in turbidity free distilled water.
- Take 100 mL standard measuring flask and place a funnel over it.
- Transfer it to a 100 mL standard flask and make up to 100 ml using turbidity free distilled water.

3. Standard 4000 NTU Solution

- Mix 5 mL of hydrazine sulphate solution and 5 mL of Hexamethylenetetramine solution in a 100 mL standard measuring flask.
- Allow the mixture to stand for 24 hours.
- After 24 hours, make up the volume to 100 mL using turbidity free distilled water.
- The standard 4000 NTU solution is ready.

2.6.2 CALIBRATION OF TURBIDITY METER

Using the standard solution calibrate the instrument.

The instrument is having four knobs, out of which the two knobs in the bottom is the set zero knob, this is for setting the instrument to zero.

The one which is there in the top left hand side is the calibration knob, used for the calibration.

The other one in the top is the knob for setting the detection range. It is adjusted to 1000 NTU range.

Step 1

To the sample cells, add turbidity free distilled water up to the horizontal mark, wipe gently with soft tissue. Place it in the turbidity meter such that the vertical mark in the sample cell should coincide with the mark in the turbidity meter and cover the sample cell. Now using the set zero knob, adjust the reading to zero.

Step 2

According to our need, prepare a standard solution. In this case, a 200 NTU solution is prepared by diluting the standard 4000 NTU solution and added to the sample cells, up to the horizontal mark, wipe gently with soft tissue. Place it in the turbidity meter such that the vertical mark in the sample cell should coincide with the mark in the turbidity meter and cover the sample cell.

If the instrument is not showing 200 NTU, using the calibration knob adjust the reading to 200 NTU.

Repeat the procedure for two / three times.

Now the instrument is calibrated.

2.6.3 TESTING OF WATER SAMPLE

- To the sample cells, add sample water up to the horizontal mark, wipe gently with soft tissue and place it in the turbidity meter such that the vertical mark in the sample cell should coincide with the mark in the turbidity meter and cover the sample cell.
- Check for the reading in the turbidity meter. Wait until you get a stable reading.
- The turbidity of the given water sample is 8.4 NTU.

2.7 CALCULATION

For determining the Turbidity of the given water sample the readings are required to be tabulated.

2.7.1 TABLE

Sample No.	Temperature of Sample (°C)	Turbidity (NTU)
1.		
2.		
3.		

For sample 1 the temperature of the sample is 27°C and turbidity value 8.0 NTU

For sample 2 the temperature of the sample is 27°C and the turbidity value 2.3 NTU

For sample 3 the temperature of the sample is 27°C and obtained turbidity value is 44 NTU

2.7.2 DATA SHEET

DETERMINATION OF TURBIDITY DATA SHEET

Date Tested : August 30, 2010

Tested By : CEM Class, Group A

Project Name : CEM, NITTTR Lab

Sample Number : BH1, BH2, BH3

Sample Location BH1 : Perungudi (Lat 12' 57" 31.74 S Long 80'14" 8.82)

Sample Description : Surface water

Sample Location BH2 : Pallikarnai (Lat 12' 56" 31.02 S Long 80'12" 47.99)

Sample Description : Ground water

Sample Location BH2 : Thiruvannmiyur (Lat 12' 59" 0.84 S Long 80' 16" 8.21)

Sample Description : Sea water

TABULATION

Sample No	Temperature of Sample (°C)	Turbidity (NTU)
1	27	8.0
2	27	2.3
3	27	44

Result:-

The turbidity of the given sample 1 = 8.0 NTU

The turbidity of the given sample 2 = 2.3 NTU

The turbidity of the given sample 3 = 44 NTU

2.8 INTERPRETATION OF RESULTS

The turbidity of the given water sample is **8 NTU**.

2.9 INFERENCE

Turbidity is a measure of light transmission and indicates the presence of suspended material such as clay, silt, finely divided organic material, plankton and other inorganic material. If turbidity is high, be aware of possible bacterial contamination. Normally the ground water is clear in nature and it will satisfy the code's need. The ground water may get contaminated by intrusion of domestic or industrial wastewater causing turbidity of the sample. Turbidity in excess of 5 NTU is usually objectionable for aesthetic reasons. In case of freshwater lakes and ponds, due to contamination and algal growth the turbidity of these water increases to very high levels. The clarity of sea water is very low because of huge amount of suspended particles, thereby increasing the turbidity.

2.10 EVALUATION

1. Turbidity is caused by Clay, Silt, Organic matter and Microbes.

- a) True
- b) False

2. The turbidity is measured based on the

- a) Light absorbing properties
- b) Light Scattering properties
- c) Particle Size
- d) Particle mass

3. The colour of the water sample affects the turbidity.

- a) True
- b) False

4. In a nephelo turbidity meter the light detectors are at

- a) 180°
- b) 360°
- c) 90°
- d) 270°

5. What is the unit of turbidity.

- a) TU
- b) MTU
- c) NTU
- d) IU

6. What is the light source for the nephelo turbidity meter?

- a) Tungsten filament lamp
- b) Deuterium lamp
- c) Hollow Cathode lamp
- d) Sodium vapour lamp

7. The turbidity affects the aquatic life in the water.

- a) True
- b) False

8. The standard unit of turbidity is considered as that produced by

- a) 2ppm of silica in distilled water
- b) 1ppm of silica in distilled water
- c) 4ppm of silica in distilled water
- d) 9ppm of silica in distilled water

9. The material used in the standard solution for nephelometer is ____.

- a) Silica
- b) Clay
- c) Formazin
- d) Barium Chloride

10. Mixture of hydrazine sulphate and hexamethylenetetramine solution is allowed to stand for ____.

- a) 24 hours
- b) 12 hours
- c) Minimum 6 hours
- d) No specific time

KEY TO ITEMS:

- 1) True
- 2) b
- 3) True
- 4) c
- 5) c
- 6) a
- 7) True
- 8) b
- 9) c
- 10) a