

Experiment Name: Determination of Solids in Water as per Indian Standards

Objective:

To measure the various types of solids (total solids, suspended solids, dissolved solids, and volatile solids) in water as per **IS 3025 (Part 15): 1984**.

Apparatus and Materials

1. **Glassware:**
 - Evaporating dishes (porcelain or glass).
 - Gooch crucibles or Whatman filter papers (for suspended solids).
 - Beakers (250 mL).
2. **Drying Oven:** Capable of maintaining a temperature of 103–105°C.
3. **Muffle Furnace:** Capable of reaching 550°C for volatile solids determination.
4. **Analytical Balance:** Sensitivity of 0.1 mg.
5. **Vacuum Pump or Filtration Apparatus:** For filtration of suspended solids.
6. **Desiccator:** To cool samples to room temperature in a moisture-free environment.
7. **Distilled Water:** For rinsing and sample preparation.
8. **Glass Fiber Filter Discs** (or equivalent): For separation of suspended solids.

Types of Solids

1. **Total Solids (TS):** Includes both dissolved and suspended solids.
2. **Suspended Solids (SS):** Solids retained on a filter after sample filtration.
3. **Dissolved Solids (DS):** Solids that pass through the filter.
4. **Volatile Solids (VS):** Portion of solids lost upon ignition at 550°C, indicative of organic content.

Procedure

A. Total Solids (TS)

1. **Preparation:**
 - Clean and dry an evaporating dish in a drying oven at 103–105°C.
 - Cool the dish in a desiccator and weigh it. Record the weight as W1.
2. **Sample Measurement:**
 - Pour a measured volume (50–100 mL) of well-mixed water into the dish.
3. **Evaporation and Drying:**
 - Place the dish in the drying oven at 103–105°C for 24 hours.
 - Remove, cool in a desiccator, and weigh. Record the final weight as W2.
4. **Calculation:** Total Solids (mg/L) = $(W2 - W1) \times 1000 / \text{Volume of sample (mL)}$

B. Suspended Solids (SS)

1. **Preparation:**
 - Dry a filter paper or glass fiber filter disc at 103–105°C. Cool and weigh it (W1).
2. **Filtration:**
 - Filter a measured volume (50–100 mL) of the water sample through the filter.
 - Rinse the filter with distilled water to remove dissolved solids.
3. **Drying and Weighing:**
 - Dry the filter at 103–105°C until a constant weight is obtained.
 - Cool in a desiccator and weigh (W2).
4. **Calculation:** Suspended Solids (mg/L) = $(W_2 - W_1) \times 1000 / \text{Volume of sample (mL)}$

C. Dissolved Solids (DS)

1. **Procedure:**
 - The dissolved solids are calculated as the difference between the total solids and suspended solids:

$$\text{Dissolved Solids (mg/L)} = \text{Total Solids} - \text{Suspended Solids}$$

D. Volatile Solids (VS)

1. **Preparation:**
 - Place the dried residue (from TS or SS determination) in a muffle furnace at 550°C for 15–30 minutes.
 - Allow the sample to cool in a desiccator and weigh it (W3).
2. **Calculation:** Volatile Solids (mg/L) = Total Solids – Ash (residue at 550°C)

Observation Table

Parameter	Sample Volume (mL)	Initial Weight (W ₁) (g)	Final Weight (W ₂ /W ₃) (g)	Weight Difference (g)	Concentration (mg/L)
Total Solids (TS)					
Suspended Solids (SS)					
Dissolved Solids (DS)					
Volatile Solids (VS)					

Precautions

1. Ensure consistent drying and cooling times for accurate results.
2. Avoid contamination of samples during handling and weighing.
3. Use freshly prepared or well-preserved samples.
4. Handle hot dishes and filters with care.

Results

The concentrations of total solids, suspended solids, dissolved solids, and volatile solids in the water sample are expressed in **mg/L**.

References

- **IS 3025 (Part 15): 1984** – Methods of Sampling and Test (Physical and Chemical) for Water and Wastewater: Determination of Solids.
- Relevant guidelines from the **Central Pollution Control Board (CPCB), India**.