Experiment Name : Measuring Acidity in Wastewater

Objective

To determine the acidity of wastewater samples by titration, in accordance with Indian Standard **IS 3025 (Part 22): 1986**, reaffirmed in 2003.

Scope

This method is applicable to all types of wastewater to determine acidity, which reflects the presence of mineral acids, carbon dioxide, and other acidic substances.

Principle

The acidity of wastewater is measured by titration with standard sodium hydroxide (NaOH) using indicators such as methyl orange and phenolphthalein to determine different forms of acidity.

Apparatus

1. **Conical flask** (250 mL)
2. **Burette** (50 mL capacity)
3. **Pipette** (10 or 20 mL)
4. **Measuring cylinder** (100 mL)
5. **Beaker** (100 mL)
6. **Glass rod**
7. **Wash bottle**

Reagents

1. **Standard Sodium Hydroxide (NaOH), 0.02 N**
    - Standardize the sodium hydroxide solution using potassium hydrogen phthalate.
2. **Methyl Orange Indicator**
    - Dissolve 0.5 g of methyl orange in 100 mL distilled water.
3. **Phenolphthalein Indicator**
    - Dissolve 0.5 g of phenolphthalein in 50 mL of ethyl alcohol and dilute to 100 mL with distilled water.
4. **Distilled Water** (free from carbon dioxide)

Procedure

Preparation of the Sample

- Collect a representative wastewater sample in a clean bottle.
- Filter the sample (if turbid) to remove suspended solids.

Titration Process

1. **Take the sample**: Pipette **25 mL** of wastewater into a conical flask.
2. **Strong Acidity (using Methyl Orange)**:
    - Add **2-3 drops** of methyl orange indicator.
    - Titrate with **0.02 N NaOH** until the color changes from **red to orange** (neutralization endpoint).
    - Record the volume of NaOH used as **V1**.
3. **Total Acidity (using Phenolphthalein)**:
    - Add **2-3 drops** of phenolphthalein indicator to the same sample (after methyl orange titration).
    - Titrate with **0.02 N NaOH** until the solution turns **pink** (neutralization endpoint).
    - Record the total volume of NaOH used as **V2**.
4. **Final Observations**:
    - Strong Acidity = V1 mL
    - Total Acidity = V2 mL

Observation Table

S.No.	Vol. of Sample	Burette Reading		Vol. of NaOH used (V)
		initial	final	

Calculations

The acidity is expressed as **mg/L of $CaCO_3$** using the following formulae:

1. **Strong Acidity (as $CaCO_3$):**

$A1 = V1 \times N \times 50{,}000 / Vs$

2. **Total Acidity (as $CaCO_3$):**

   $A2 = V2 \times N \times 50{,}000 Vs$

Where:

- **V1** = Volume of NaOH used for strong acidity (mL)
- **V2** = Total volume of NaOH used for total acidity (mL)
- **N** = Normality of NaOH (0.02 N)
- **V_s** = Volume of sample taken (mL, typically 25 mL)

Reporting Acidity:

- Report the results as **Strong Acidity** and **Total Acidity** in mg/L as $CaCO_3$.

Results

Record the following:

Sample ID	Strong Acidity (mg/L)	Total Acidity (mg/L)

Conclusion

This procedure allows for the accurate determination of acidity in wastewater samples, which is essential for assessing water quality and treatment processes.

Precautions

1. Use freshly prepared indicators and standardized NaOH.
2. Ensure the glassware is clean and rinsed with distilled water.
3. Avoid contamination of the sample during collection and testing.
4. Perform titration slowly near the endpoints for accuracy.
5. Use distilled water free from CO_2.

References

1. **IS 3025 (Part 22): 1986** - Methods of Sampling and Test (Physical and Chemical) for Water and Wastewater.
2. Standard Methods for the Examination of Water and Wastewater, APHA.