UDC 628·1/3:543·319

Indian Standard (Reaffirmed 1998)

METHODS OF SAMPLING AND TEST (PHYSICAL AND CHEMICAL) FOR WATER AND WASTE WATER

PART 22 ACIDITY

(First Revision)

Water Sectional Committee, CDC 26; Panel for Methods of Test for Water and Effluents, CDC 26:P1 [Ref : Doc : CDC 26 (9087)]

1. Scope — Prescribes the indicator and potentiometric methods for determination of acidity. These methods are applicable to the determination of acidity in water and waste water. The applicable range is 0·5 to 500 mg/l acidity as $CaCO_3$.

2. Principle and Theory — Acidity of water is its quantitative capacity to react with a strong base to a designated *p*H. It may be defined as equivalent concentration of hydrogen ions in mg/l. The equation in its simplest form is as follows:

$$H^+ + NaOH = H_2O + Na^+$$

3. Interferences — A fading and temporary end point characterizes the phenolphthalein acidity titration performed at room temperature on a sample containing iron and aluminium sulphate. Better results are obtained by titrating the sample at boiling temperature. Acid samples from mine drainage are subjected to interferences. Coloured or turbid samples may interfere in end point. Analyse such samples by potentiometric titration.

4. Sampling and Storage — Sampling and storage shall be done as prescribed in IS : 3025 (Part 1)-1986 'Methods of sampling and test (physical and chemical) for water and waste water: Part 1 Sampling (*first revision*)'.

5. Sample Preparation — The test sample used should be free from turbidity or filtered through 0·45 μm membrane filter.

6. Apparatus

6.1 *pH Meter*

6.2 *Burette* — 50-ml capacity.

6.3 *Magnetic Stirring Device*

7. Reagents

7.1 *Distilled Water* — *p*H should not be less than 6·0. If the *p*H is less than 6·0, it shall be freshly boiled for 15 minutes and cooled to room temperature. Deionized water may be used provided that it has a conductance of less than 2 μs/cm and a *p*H more than 6·0.

7.2 *Potassium Acid Phthalate* — 0·02 N. Dissolve 4·084 6 g of potassium acid phthalate salt ($KHC_8H_4O_4$) (dried at 120°C for 2 hours) in carbon dioxide free distilled water and dilute to 1 litre.

7.3 *Sodium Hydroxide Solution* — 15 N.

7.3.1 *Sodium hydroxide solution* — 1 N. Dilute 67 ml of 15 N sodium hydroxide solution (**7.3**) to one litre with distilled water.

7.3.2 *Sodium hydroxide solution* — 0·02 N. Dilute 20 ml of 1 N sodium hydroxide solution (**7.3.1**) to one litre and standardize using standard potassium acid phthalate (**7.2**).

7.4 *Phenolphthalein Indicator* — Dissolve 0·5 g of phenolphthalein in 100 ml, 1:1 (*v*/*v*) alcohol water mixture and add 0·02 N sodium hydroxide solution drop by drop till very faint pink colour is observed.

7.5 *Methyl Orange Indicator* — Dissolve 0·5 g of methyl orange in distilled water and make up to 100 ml in a volumetric flask.

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8. Procedure

8.1 *Indicator Method* — Pipette 20 ml or a suitable aliquot of sample into a 100-ml beaker. The sample size shall be so selected so that not more than 20 ml of titrant is needed for the titration. Determine the *p*H of water. If *p*H is less than 3·7, add two drops of methyl orange indicator into the first sample beaker and titrate with standard 0·02 N sodium hydroxide solution until the colour changes to the faint orange characteristic of *p*H 3·7. Record the volume of sodium hydroxide used. To the second sample beaker, add 2 to 3 drops of phenolphthalein indicator and titrate with 0·02 N sodium hydroxide solution to the appearance of faint pink colour characteristics of *p*H 8·3. Record the volume used.

8.2 *Potentiometric Method* — Pipette 20 ml or a suitable aliquot of sample into a 100-ml beaker. Titrate with standard sodium hydroxide solution to *p*H 3·7 and *p*H 8·3. Record the volume of standard sodium hydroxide used. No indicator is required.

9. Calculation — Calculate acidity in the sample as follows:

$$\text{Acidity at } p\text{H } 3{\cdot}7, \text{ as mg/l } CaCO_3 = \frac{A \times N \times 50\,000}{V}$$

$$\text{Acidity at } p\text{H } 8{\cdot}3, \text{ as mg/l } CaCO_3 = \frac{B \times N \times 50\,000}{V}$$

where

A = volume in ml of standard sodium hydroxide used to titrate to *p*H 3·7,

N = normality of standard sodium hydroxide,

V = volume in ml of sample taken for test, and

B = volume in ml of standard sodium hydroxide used to titrate to *p*H 8·3.

EXPLANATORY NOTE

Acidity of water or waste water is its quantitative capacity to react with a strong base to a designated *p*H. Strong mineral acids, weak acids like acetic and carbonic and hydrolyzable salts like ferrous or aluminium sulphates may contribute to the measured acidity. Acids contribute towards corrosiveness, influence chemical reactions and biological processes. The measurement also reflects a change in the quality of the source water.

This method supersedes **19** of IS:3025-1964 'Methods of sampling and test (physical and chemical) for water used in industry'.

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