



Test Method

Acidity (Titrimetric)— Method 305.2

1. Scope and Application

1.1 This method is applicable to rain, surface and other waters of pH less than 8.3.

1.2 This method is a measure of the concentration of strong and weak acids that react with hydroxyl ions. This includes the dissolved gases that are present.

1.3 The range of this method depends on the volume of sample titrated and upon the precision that the increments of titrant can be measured. If only 10 mL of sample is available for analysis, it is necessary to use a 50 μ L syringe for dispensing the titrant in order to achieve a precision of less than 10 μ eq/L.

2. Summary of Method

2.1 Samples are titrated with 0.02 N carbonate free NaOH solution. The end point is determined with a pH meter. Results are reported as microequivalents (μ eq) per liter.

3. Sampling Handling and Storage

3.1 The sample container must be filled completely, sealed and stored at 4°C. Care must be taken to minimize exposure of the sample to the atmosphere. Open the sample container immediately before analysis.

3.2 Analysis should be performed as soon as possible after collection.

4. Comments

4.1 Samples with an initial pH between 4.3 and 8.3 are subject to

error due to the loss or gain of dissolved gases during sampling, storage and analyses.

5. Apparatus

5.1 pH meter and electrode(s), see Method 150.1 or 150.2.

5.2 Micro buret or micro syringes.

5.3 Teflon or glass magnetic stirring bar.

5.4 Magnetic stirrer.

5.5 Beakers or flasks.

6. Reagents

6.1 Standard sodium hydroxide solution, 1 N: Dissolve 40g NaOH in 250 mL distilled water. Cool and dilute to 1 liter with CO₂ free distilled water. Store in a polyolefin bottle and fitted with a soda lime tube or tight cap to protect from atmospheric CO₂.

6.2 Standard sodium hydroxide titrant, 0.02 N: Dilute 20.0 mL of 1 N NaOH with CO₂-free distilled water to 1 liter. Store in rubber stoppered bottle. Protect from atmospheric CO₂ by using a soda lime tube. Standardize against an 0.02 N potassium acid phthalate solution prepared by dissolving 4.085 g of anhydrous KHC₈H₄O₄ in CO₂ free distilled water and diluted to 1:1.

7. Procedure

7.1 Pipet an appropriate aliquot of sample into beaker or flask containing a small teflon or glass stirring bar. Use extreme care to minimize the sample surface disturbance.

7.2 Immerse pH electrode(s) into sample and stir at a rate that does not cause sample surface disturbance.

7.3 Titrate with 0.02 N NaOH (6.2) to pH 8.3. Titration should be made as quickly as possible to prevent absorption of atmospheric CO₂. Record volume of titrant.

8. Calculation

$$8.1 \text{ Acidity, } \mu\text{eq/L} = \frac{\text{mL}_B \times N_B \times 10^5}{\text{mL}_S}$$

$\mu\text{eq/L}$ = microequivalents per liter

mL_B = mL of NaOH titrant

mL_S = mL of sample

N_B = normality of titrant

9. Precision and Accuracy

9.1 Precision and accuracy data are not available.

References

1. Seymour, M.D., Schubert, S.A., Clayton, J.W. and Fernando, Q., Variation in the Acid Content of Rain Water in the Course of a Single Precipitation, *Water, Air and Soil Pollution* 10(2): 147-161, Aug. 1978.
2. Peden, M.E. and Skowron, Ionic Stability of Precipitation Samples; *Atmospheric Environment*, Vol. 12, pp. 2343-2349. 1978.
3. USGS, Methods for Collection and Analysis of Water Samples for Dissolved Minerals and Gases, p. 39, (1970).
4. Annual Book of ASTM Standards, part 31, "Water," p. 107, D1067, (1978).
5. Standard Methods for the Examination of Water and Wastewater, 14th Edition, p. 273, Method 402 (1975).