VOLUMETRIC ANALYSIS: CHLORIDE

1. OBJECTIVE AND IMPORTANCE OF EXPERIMENT

Volumetric analysis is a phase of quantitative analysis that depends upon the measurement of liquid reagent volumes of standard solutions needed to complete particular reactions in samples submitted to test. A standard solution is defined as follows: a solution whose strength or reacting value per unit volume is known. The facilities needed for conducting a simple volumetric analysis are equipment to measure the sample accurately either an analytical balance or volumetric glassware such a pipette; a standard solution of suitable strength; an indicator to show when the stoichiometric end point has been reached; and a carefully calibrated burette for measuring the volume of standard solution needed to reach the stoichiometric end point as shown by the indicator.

Analysis by volumetric methods is very popular, as compared with gravimetric methods, because of the time that usually can be saved by such procedures. Volumetric methods are used for many determinations such as dissolved oxygen, chlorides… etc.

Chloride, in the form of chloride (Cl^-) ion, is one of the major inorganic anions in water and wastewater. Chloride occurs in all natural waters in widely varying concentration.

1.1. Significance of Chloride

Chloride in reasonable concentrations is not harmful to humans. At concentrations above 250 mg / L it gives a salty taste to water, which is objectionable to many people. In many areas the level of chloride in natural waters is an important consideration in the selection of supplies for human, industrial, and agricultural uses. The chloride determination is used to control pumping of groundwater from locations where intrusion of seawater is a problem.

1.2. Measurement Principals

There are several “Standards Methods” procedures for measurement of chloride. The argentometric method is suitable for use in relatively clear waters.

Argentometric Method:

In a neutral or slightly alkaline solution, potassium chromate can indicate the end point of the silver nitrate titration of chloride. Silver chloride is precipitated quantitatively before red silver chromate is formed.

The Argenometric method employs a solution of silver nitrate for titration. In the titration the chloride ion is precipitated as white silver chloride.

$$Ag^+ + Cl^- \leftrightarrow AgCl_{(s)}$$

The end point cannot be detected visually unless an indicator capable of demonstrating the presence of excess Ag^+ is presents. The indicator normally used is potassium chromate, which supplies chromate ions. As the concentration of chloride ions approaches extinction, the silver-ion concentration increases to a level at which the solubility product of silver chromate is exceeded and it begins to form a reddish-brown precipitate.

$$2Ag^+ + Cr_4^{2-} \leftrightarrow Ag_2\, CrO_{4(s)}$$

2. EXPERİMENTAL PROCEDURE

2.1. Materials and Equipment

- pH Meter
- Erlenmayer Flask
- Pipette
- Potassium chromate indicator solution
- Standard 0,0141 N Silver Nitrate ($AgNO_3$) Titrant
- 1 N NaOH
- 1 N H_2SO_4

2.2 Steps of Experiment

1) Use a 100 mL sample or a suitable portion diluted to 100 mL
2) Adjust sample pH to 7 to 10 with H_2SO_4 or NaOH
3) Add 1,0 mL (5-10 drop) K_2CrO_4 indicator solution
4) Titrate with standard $AgNO_3$ titrant to a pinkish yellow end point.

2.3 Calculations

$$mgCl^-/_L = \frac{(A-B) \times N \times 35450}{mL\ Sample}$$

where;

A: mL titration for sample

B: mL titration for blank

N: Normality of $AgNO_3$

3 REPORTS and OBSERVATIONS

Your comments and research homework.