

The Determination of Sulphate in Water by ISE

Sulphate is determined using a Barium ISE and measurements are made using the sample subtraction technique. The Barium ISE can also be used as an endpoint sensor in a Sulphate titration and replaces the poor endpoint associated with this method.

The sample solution should be in the range 0.0001 to 0.003 molar Sulphate. For concentrations outside this range the concentration of the Barium Chloride Titrand should be adjusted accordingly.

Equipment/Reagents:

1. EDT direction DR359TX Ion analyser or pH meter with mV mode
2. Barium combination ISE cat no 3081.
3. Balance weighing to 0.0005g
4. Glassware
5. Methanol
6. Barium Chloride (Analar)
7. Magnetic stirrer

Standard Preparation:

Dissolve 0.028g of BaCl₂ in 500ml of deionised water in a 1 litre volumetric flask. Add 250mls of methanol. Dilute to the mark with deionised water. This is 0.0001 Molar Barium Chloride. Methanol is added to aid the precipitation of Barium Sulphate.

Method:

1. Pipette 100ml of the BaCl₂ standard into a beaker on a magnetic stirrer.
2. Immerse the electrode in the standard and record the mV value E1
3. Add 10ml of the Sulphate sample slowly to the standard while stirring.
4. Record the new stable potential E2.

Calculation

$$C_u = C_s \left[\frac{V_u + V_s}{V_u} \right] \left[10^{\Delta E/S} - \frac{V_s}{V_s + V_u} \right]$$

where:

- C_u = Concentration of the unknown sulphate
- C_s = Concentration of Ba²⁺
- V_s = Volume of the standard BaCl₂
- V_u = Volume of the sulphate sample
- ΔE = Change in electrode potential in mV
- S = Slope of the electrode in mV

If the sample has been diluted do not forget to multiply the end result by the dilution factor.

The Barium ISE lends itself well to work with automatic titrators providing a sharp endpoint as long as Methanol is added to the titration vessel.