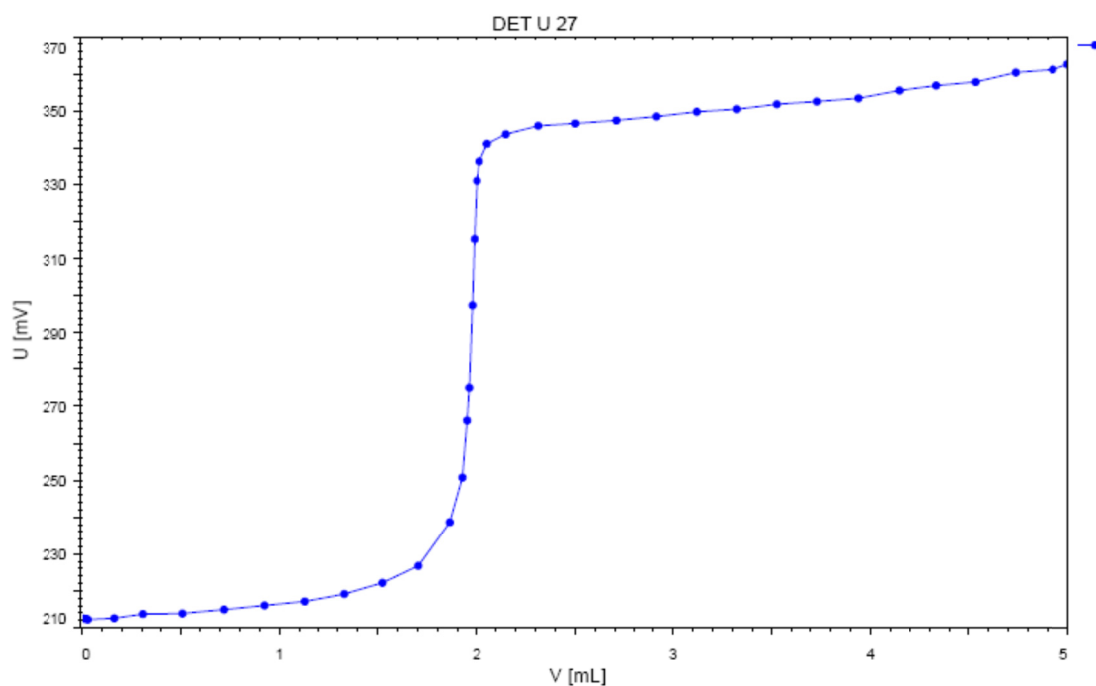


Titration Application Note T-77

Photometric determination of sulfate in aqueous solutions



This Application Note describes the photometric determination of sulfate in aqueous solutions by using the Optrode (520 nm). Sulfate is precipitated with an excess of barium chloride solution. Back-titration of the unreacted barium with EDTA provides the sulfate content.

Method description

Sample

Sulfuric acid

Sample preparation

No sample preparation required

Configuration

907 Titrand	1 x 2.907.0010
800 Dosino	5 x 2.800.0010
Dosing unit 2 mL	1 x 6.3032.120
Dosing unit 10 mL	3 x 6.3032.210
Dosing unit 50 mL	1 x 6.3032.250
802 Rod Stirrer	1 x 2.802.0020
815 Robotic USB SP	1 x 2.815.0110
Sample beaker 250 mL	1 x 6.1432.320
Sample rack 28 x 250 mL	1 x 6.2041.820
Optrode (at 520 nm)	1 x 6.1115.000

Solutions

Titration $c(\text{Na}_2\text{EDTA}) = 0.025 \text{ mol/L}$	Dissolve 9.855 g $\text{Na}_2\text{EDTA} \cdot 2\text{H}_2\text{O}$ in dist. water, add 10 mL $c(\text{NaOH}) = 1 \text{ mol/L}$, and make up to 1 L with dist. water.
Indicator /buffer solution (calmagite)	Dissolve 12.8 g MgEDTA (CAS 14402-88-1) and 0.150 g calmagite (CAS 3147-14-6) indicator in dist. water. Add 400 mL of 25% ammonia and make up to 1 L with dist. water.
Auxiliary solution $c(\text{HCl}) = 1 \text{ mol/L}$	CAS 7647-01-0
Barium chloride solution $c(\text{BaCl}_2) = 0.1 \text{ mol/L}$	Dissolve 24.428 g $\text{BaCl}_2 \cdot 2\text{H}_2\text{O}$ (CAS 10326-27-9) in dist. water and make up to 1 L.

Analysis

To x mL sample solution add 100 mL dist. water, 2 mL hydrochloric acid, and 5 mL barium chloride solution.

After a precipitation time of about 120 s, add 5 mL of buffer solution. Then titrate with $c(\text{Na}_2\text{EDTA}) = 0.025 \text{ mol/L}$ using the DET mode and the Optrode (520 nm).

Parameters

Titration mode	DET U
Measurement drift	50 mV/min
Min. waiting time	0 s
Max. waiting time	26 s
Min. increment	10 μL
EP criterion	5
EP recognition	greatest
Stirring speed	8

Calculations

$$\text{mol/L SO}_4^{2-} = ((C01 \times C02) - (EP1 \times C03)) \times C04/C00$$

EP1 = titrant consumption in mL

C00 = sample volume in mL

C01 = volume of the BaCl_2 solution in mL

C02 = conc. of the BaCl_2 solution in mol/L (0.1)

C03 = conc. of Na_2EDTA solution in mol/L (0.025)

C04 = titer Na_2EDTA (dimensionless unit)

Results

$c(\text{SO}_4^{2-})$ in mol/L	
0.0516 ± 0.0002 (n = 6)	