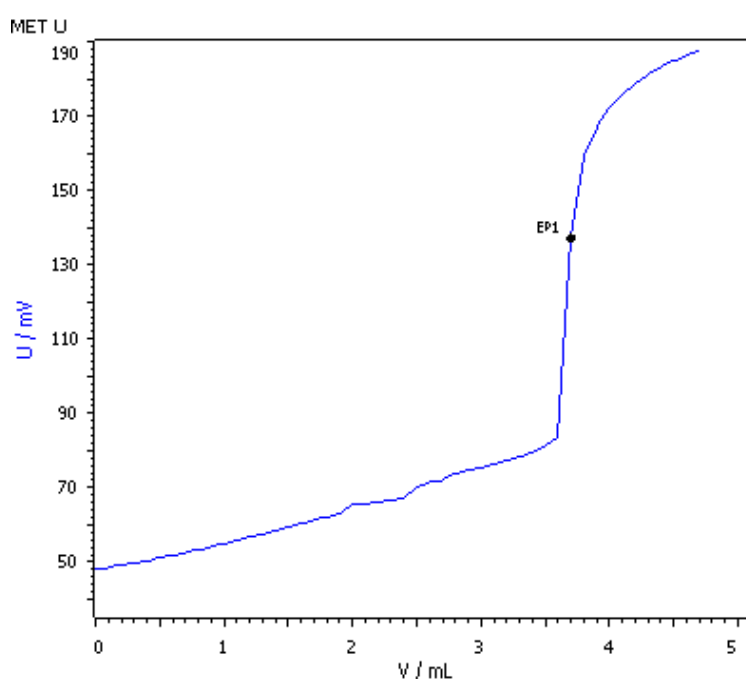


Automated determination of aluminum and magnesium in mixtures using the Cu ISE



Mixtures of aluminum and magnesium ions can be analyzed by back-titration at different pH values. The ion-selective copper electrode is used as indicator electrode. First the aluminum is determined in acidic solution, then the magnesium in alkaline solution.

Method description

Sample

Aqueous mixture of aluminum and magnesium

Sample preparation

Strongly acidic sample solutions (e.g., from acid digestions) are pre-neutralized to pH = 2...3 with c(NaOH) = 1 mol/L.

Configuration

907 Titrand	2.907.0010
815 Robotic USB Sample Processor XL	2.815.0020
786 Swing head	2.786.0040
Swing arm	6.1462.070
Titration head	6.1458.010
Sample rack 28 × 200 mL	6.2041.830
800 Dosino, 5×	2.800.0010
802 Stirrer	2.802.0020
10 mL Dosing unit, 3×	6.3032.210
20 mL Dosing unit	6.3032.220
50 mL Dosing unit	6.3032.250
200 mL PP beakers (1000 ×)	6.1459.310
Cu ISE	6.0502.140
LL ISE Reference	6.0750.100

Solutions

Titrand	c(CuSO ₄) = 0.1 mol/L If possible this solution should be bought from a supplier.
DCTA solution	c(DCTA) = 0.1 mol/L Dissolve 36.463 g DCTA in 400 mL c(NaOH) = 0.5 mol/L and make up to 1 L with deion. H ₂ O.
Acetate buffer pH = 4.7	Dissolve 123 g sodium acetate and 86 mL conc. acetic acid in deion. H ₂ O and make up to 1 L.
Ammonia	w(NH ₃) = 10%

Analysis

Pipet a sample volume containing not more than 12 mg Al³⁺ or 20 mg Mg²⁺ into the titration vessel and dilute with 50 mL deion. H₂O. First the aluminum is determined. Add 6.00 mL c(DCTA) = 0.1 mol/L and 5 mL acetate buffer and allow to react for 1 min under stirring. Afterwards the DCTA excess is back-titrated with c(CuSO₄) = 0.1 mol/L until after the first equivalence point.

Now the magnesium can be determined. Add another 6.00 mL c(DCTA) = 0.1 mol/L and 20 mL w(NH₃) = 10% to the titrated sample solution and back-titrate the DCTA excess with c(CuSO₄) = 0.1 mol/L until after the first equivalence point.

Parameters

Mode	MET U
Stirring rate	8
Signal drift	50 mV/min
Min. waiting time	5 s
Max. waiting time	26 s
Volume increment	0.1 mL
Stop EP	1
Volume after EP	1 mL
EP criterion	30 mV (Al) 15 mV (Mg)
EP recognition	greatest

Results

Mean results (n = 10)

Al content / (g/L)	1.018
s(rel) / %	1.59
Mg content / (g/L)	0.969
s(rel) / %	0.71