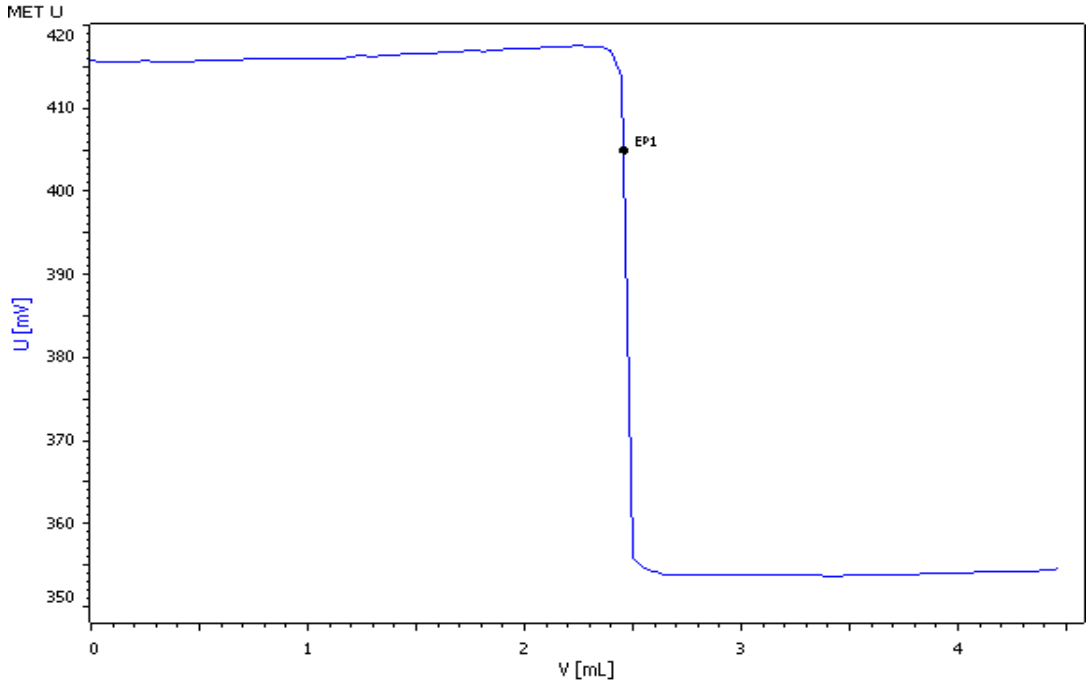
Titration Application Note T–141

Automated photometric determination of manganese using the Optrode



Manganese can be determined as Mn(II) in aqueous solutions at pH 10 with Eriochrome Black T as indicator. For making sure that all the manganese is present in its divalent form, ascorbic acid is added. As manganese hydroxides are not soluble in aqueous solution, triethanolamine (TEA) is added to prevent precipitation. For indication, the Optrode is used at a wavelength of 610 nm.

Metrohm

Method description

Sample

Aqueous solution of manganese (0.05 mol/L)

Sample preparation

No sample preparation is required

Configuration

907 Titrando	2.907.0020
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 x 200 mL	6.2041.830
800 Dosino, 3 x	2.800.0010
802 Stirrer	2.802.0020
5 mL Dosing unit	6.3032.150
10 mL Dosing unit	6.3032.210
50 mL Dosing unit	6.3032.250
Disposable PP sample beaker, 200 mL, 1000 pieces	6.1459.310

Solutions and reagents

EDTA solution	c(EDTA) = 0.1 mol/L If possible this solution should be bought from a supplier.
Eriochrome Black T	100 mg Eriochrome Black T and 100 mg ascorbic acid are dissolved in 100 mL deion. water
Buffer pH 10	54 g ammonium chloride and 350 mL w(NH_3) = 25% are given into a 1 L volumetric flask and filled up to the mark with deion. water.
w(TEA) = 16%	40 g triethanolamine is dissolved in approx. 150 mL deion. water and the pH is adjusted to between 4.5 and 5.5 with c(HCl) = 6 mol/L.
Ascorbic acid	puriss p.a., >99%

Analysis

5 to 15 mL manganese standard is given into a 200 mL beaker. A tip of spatula of ascorbic acid, as well as 10 mL w(TEA) = 16% are added. After dissolution of the ascorbic acid an addition of 0.5 mL Eriochrome Black T indicator solution and 10 mL buffer pH 10 is carried out. The solution is titrated with c(Na_2EDTA) = 0.1 mol/L until after the equivalence point.

Parameters

Mode	MET U
Stirring rate	8
Signal drift	20 mV/min
Min. waiting time	0 s
Max. waiting time	38 s
Volume increment	0.05 mL
EP recognition	Greatest
Stop volume	10 mL
Stop EP	1
Volume after EP	2 mL

Results

Mean results (n = 7)

Mn content / (g/L)	2.170
s(rel) / %	0.29