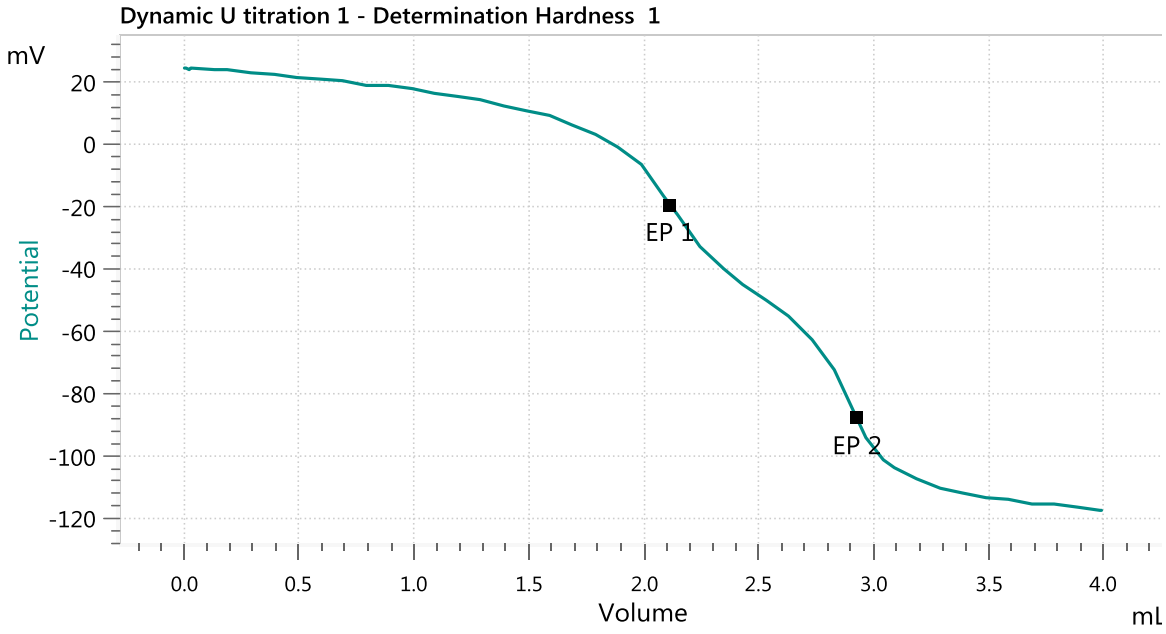
Titration Application Note T-205

Fully automated water analysis by OMNIS



The determination of the physical and chemical parameters as electrical conductivity, pH value, alkalinity, the calcium and magnesium hardness as well as the total hardness are necessary for evaluating the water quality.

A fast and accurate determination in tap water is realized using an automated OMNIS System working in parallel on different workstations. An 856 Conductivity Module with Dosinos extends the system.

Metrohm

Method description

Sample

Tap water Herisau

Sample preparation

No sample preparation is required.

Configuration

Main module Pick&Place L	2.1012.0010
Module base M/L	6.02003.010
Rack base, 2x	6.02001.010
Pick&Place module, 4x	2.1014.0010
"Peristaltic" (4-channel) pump module, 2x	2.1016.0110
Gripper fingers 50 - 72 mm	6.02601.020
OMNIS sample rack 9 x 200 mL, 7x	6.02041.020
Retainer for 200 mL sample beaker	6.02064.020
Beaker adapter for 200 mL sample beaker, 4x	6.01404.020
Titration head 6xNS14 / 3xNS9 (P&P), 4x	6.01403.000
Stirring propeller 20 mm ETFE, 3x	6.01900.030
OMNIS Professional Titrator without stirrer, 2x	2.1001.0010
OMNIS Dosing Module without stirrer, 2x	2.1003.0010
OMNIS Titration Module without stirrer, 2x	2.1002.0010
Digital measuring module, 6x	6.02100.010
Electrode cable plug-in head Q / plug P, 1.5 m, 6x	6.02104.310
OMNIS 10 mL cylinder unit, 3x	6.03001.210
OMNIS 5 mL cylinder unit, 3x	6.03001.150
807 Dosing unit 20 mL, 3x	6.3032.220
OMNIS Rod stirrer "Sample Robot", 3x	2.1006.0010
OMNIS	6.0600.0000
OMNIS Stand-alone license (including one instrument license)	6.06003.010
OMNIS instrument license, 2x	6.06002.010
800 Dosino, 3x	2.800.0010
856 Conductivity module	2.856.0010
Combined dCa ISE	6.00502.300
dAquatrode with Pt1000	6.00202.300
Five-ring conductivity measuring cell with Pt1000, c = 1.0 cm-1	6.0915.130

Solutions

Titrant 1	c(HCl) = 0.1 mol/L, if possible this solution should be bought from a supplier.
Titrant 2	c(EDTA) = 0.1 mol/L, if possible this solution should be bought from a supplier.
Auxiliary solution	24.2 g of TRIS is weighed in and transferred into a 1 L volumetric flask and dissolved in approx. 500 mL dist. H_2O. 12 mL acetyl acetone is added and the solution is made up to the mark with dist. H_2O. This solution can only be used for a few days. It masks Fe^{3+} and Al^{3+} for a better differentiation of Ca^{2+} and Mg^{2+}.

Analysis

100 mL sample is pipetted into a 200 mL disposable beaker. First, the conductivity cell is dipped 3 times for preconditioning into the sample. Then, the conductivity is measured. After pH measurement, the alkalinity was determined by a DET titration using c(HCl) = 0.1 mol/L. Directly after the alkalinity determination, 15 mL of the auxiliary solution is added. The hardness of the sample solution is determined by titration with c(EDTA) = 0.1 mol/L until after the second equivalence point.

Parameters

Conductivity

Mode	MEAS Cond
Drift	Time controlled (no drift control)
Measuring time	60 s
Measuring interval	2 s
Volume increment	50 µL

pH measurement

Mode	MEAS pH
Drift	2 mV/min
Min. waiting time	10 s
Max. waiting time	110 s

Method description

Alkalinity

Mode	DET pH
Drift	50 mV/min
Max. waiting time	26 s
Meas. Point density	4
Min. increment	10 µL
Stop volume	7 mL
EP criterion	5
EP recognition	Greatest

Hardness

Mode	DET U
Drift	50 mV/min
Max. waiting time	26 s
Meas. Point density	4
Min. increment	10 µL
Max. increment	100 µL
Stop volume	4 mL
EP criterion	5
EP recognition	All

Results

Sample (n = 63)	Mean value	s(abs)	s(rel) / %
Conductivity / (mS/cm)	0.546	0.001	0.27
pH	8.079	0.046	0.58
Alkalinity / (mmol/L)	5.674	0.015	0.27
Ca / (mmol/L)	2.133	0.015	0.71
Mg / (mmol/L)	0.814	0.014	1.77
Total hardness / (mmol/L)	2.947	0.013	0.44

Sample (n = 63)	Time
Total duration	04:31:46

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