Determination of total hardness in Water

Description

The determination of the total hardness in water is done by titration with the sodium salt of ethylenediaminetetraethanoic acid (EDTA), the detection is carried out with a Cu electrode and Cu-EDTA. The sum of EDTA complexable ions is determined. The result is calculated as mmol / l.

Instruments

Titrator	TL 5000 or higher
Electrode	Cu 1100 PLH
Cable	L 1 A
Reference electrode	B 2920+
cable	L 1 N
Stirrer	Magnetic stirrer TM 235 or similar
Lab accessory	Glass beaker 150 ml
	Magnetic stirrer bar 30 mm

Reagents

1	Na_2EDTA 0.1 mol/l
2	Ammonia solution 25%
3	Ammonium chloride
4	Copper-EDTA solution 0.1 mol/l $(Cu(NH_4)_2$-EDTA)
5	Distilled Water
6	Electrolyte solution L300
All reagents should be of analytical grade or better.	

Titration procedure

Reagents

The titer determination of the EDTA solution is carried out as described in the application note "Titer determination of EDTA".

Buffer solution pH 10
Dissolve 54.0 g of ammonium chloride in a little water, add 350 ml of ammonia solution 25% and make up to 1.0 liter with water.

Cleaning of the electrode

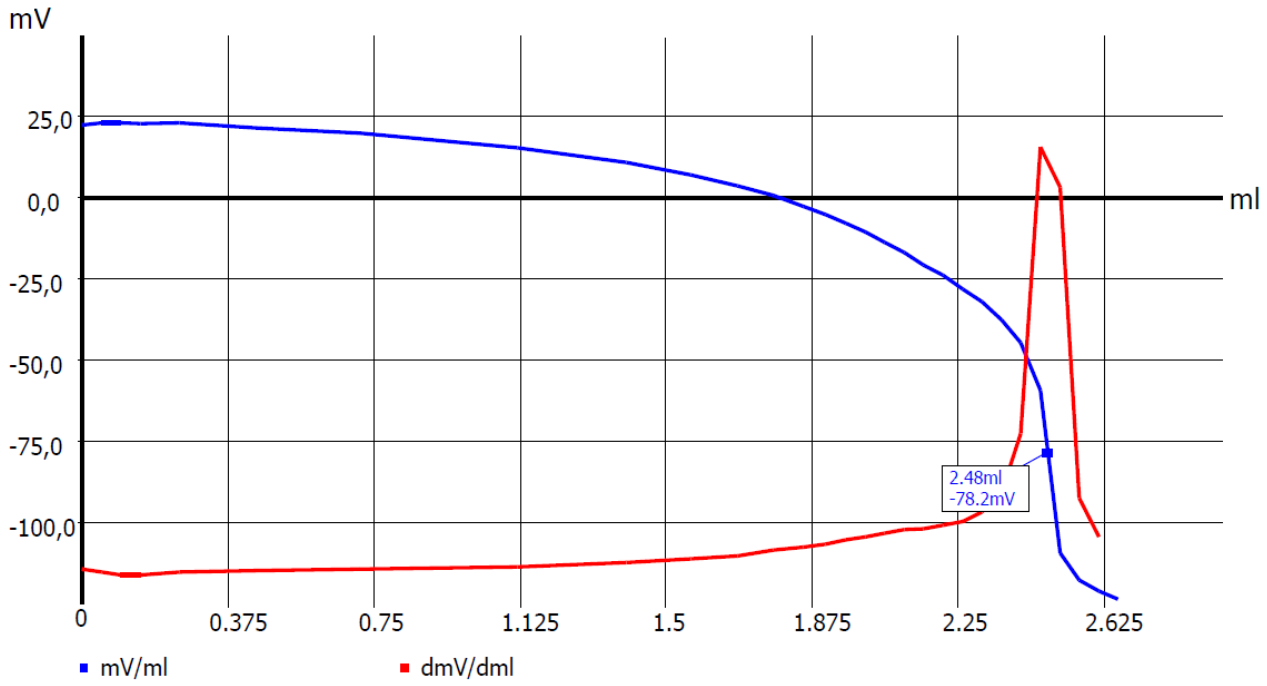
The electrodes are cleaned with distilled water. The Cu 1100 is stored clean and dry, for the storage of the reference electrode use electrolyte solution L300.

Sample preparation

100.00 ml of sample are placed in a 150 ml beaker, 5 ml buffer solution pH 10 and 1 ml of Cu-EDTA 0.1 mol / l are added. Then it is titrated with Na_2EDTA 0.1 mol / l. The consumption should be about 5 - 15 ml. For very hard water samples, the amount of sample may be reduced, for very soft water samples, a lower concentration EDTA solution may be needed.

Titration parameter

Sample titration



Default method	Total hardness		
Method type	Automatic titration		
Modus	Dynamic		
Measured value	mV		
Measuring speed / drift	User defined	Minimum holding time	5 s
		Maximum holding time	12 s
		Measuring time	4 s
		Drift	3 mV/min
Initial waiting time	0 s		
Dynamic	flat	Max step size	0.5 ml
		Slope max ml	10
		Min. step size	0.05 ml
		Slope min. ml	120
Damping	none	Titration direction	decrease
Pretitration	off	Delay time	0 s
End value	off		
EQ	On (1)	Slope value	120
Max. titration volume	20 ml		
Dosing speed	100%	Filling speed	30 s

Calculation:

$$Result\ [mmol/l] = \frac{(EQ1 - B) * T * M * F1}{W * F2}$$

B	0	Blank value
EQ1		Consumption of titrant at first Equivalence point
T	WA	Actual concentration of the titrant
M	1	
V	man	sample volume [ml]
F1	1000	Conversion factor
F2	1	Conversion factor

If the result is needed in other units than mmol / l, it can be calculated with the following factors F2:

Unit		**F2**
mmol/l	mmol/l	1
German hardness	°dH	0,1783
French hardness	°fH	0,1
ppm $CaCO_3$	ppm	0,01

Xylem Analytics Germany Sales GmbH & Co. KG,
SI Analytics
Erich-Dombrowski-Straße 4 • 55127 Mainz, Germany

Tel+ 49 6131 894-5111
TechInfo.xags@xylem.com
xylemanalytics.com

2025/10/09

xylem
Let's Solve Water