Titration of Alkalinity p + m value (Temporary hardness)

Description

The alkalinity of water is a measure of its ability to neutralize acids. Alkalinity in natural waters is mainly caused by hydroxides, carbonates and bicarbonates.
Determination of the alkalinity (p and m value) in water in mmol/l by titration with 0.1 mol/l hydrochloric acid. The p value corresponds to the color change of phenolphthalein (pH 8.2), the m value corresponds to the color change of methyl orange (pH 4.3). At very low p and m values, a lower concentration hydrochloric acid may also be used.
This titration can also determine the temporary hardness of a water sample.

Instruments

Titrator	TL 5000/TL 6000/7000/7750/7800
Exchange Unit	WA 20
Electrode	N 62 or A 7780 1M-DIN-ID, A 162 2M DIN ID or similar
Cable	L1A (only for electrodes with plug head)
Stirrer	Magnetic stirrer TM 235 or similar
Lab accessory	Glass beaker 150 ml
	Magnetic stirrer bar 30 mm

Reagents

1	Hydrochloric acid 0.1 mol/l
2	DIN Buffer pH 4.01
3	DIN Buffer pH 6.87
4	KCl solution 3 mol/l
All reagents should be of analytical grade or better.	

Titration procedure

Reagents

The titer determination of the HCl 0.1 mol/l is carried out as described in the application report "Titer determination of strong acids".

Cleaning of the electrode

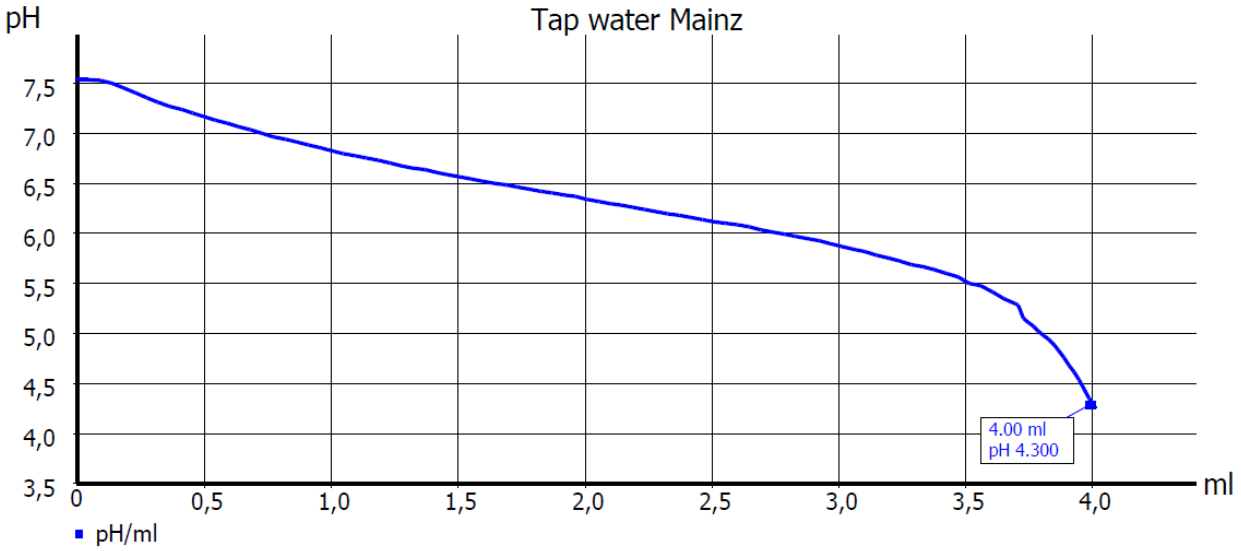
The electrode is cleaned with distilled water. Suitable for storage is KCl solution 3 mol/l or electrolyte solution L 911.
Because this titration is done as an endpoint titration, the electrode must be calibrated periodically (at least weekly). We recommend a 2-point calibration with the DIN buffers pH 4.01 and 6.87.

Sample preparation

100.00 ml of the sample are placed in a 150 ml beaker and then titrated with HCl 0.1 mol / l to the two endpoints pH 8.2 and pH 4.3.

Titration parameter

Sample titration



Default method	Alkalinity (p+m)		
Method type	Automatic titration		
Modus	Endpoint		
Measured value	pH		
Measuring speed / drift	normal	Minimum holding time	2 s
		Maximum holding time	15 s
		Measuring time	2 s
		Drift	20 mV/min
Initial waiting time	0 s		
Step size	0.02 ml		
Dampening	none	Titration direction	decrease
Pretitration	Off	Delay time	0 s
Endpoint 1	8.20 pH	Delta Endpoint	1.0 pH
		Endpoint delay	10 s
Endpoint 2	4.30 pH	Delta Endpoint	1.0 pH
		Endpoint delay	10 s
Max. titration volume	20 ml		
Dosing speed	15%	Filling speed	30 s

Calculation:

Formula 1

$$p - Value\ [mmol/l] = \frac{(EP1 - B) * T * M * F1}{V * F2}$$

EP1		Consumption of titrant at first end point
B	0	Blank value
T	WA	Actual concentration of the titrant
M	1	Molecular weight
V	100	Volume of the sample
F1	10	Conversion factor
F2	0.01	Conversion factor

Formula 2

$$m - Value\ [mmol/l] = \frac{(EP2 - B) * T * M * F1}{V * F2}$$

EP2		Consumption of titrant at second end point
B	0	Blank value
T	WA	Actual concentration of the titrant
M	1	Molecular weight
V	100	Volume of the sample
F1	10	Conversion factor
F2	0.01	Conversion factor

If the carbonate hardness of a water is to be calculated in ° dH, the calculation can be made according to formula 3 *.

Formula 3

$$Temporary\ hardness\ [°dH] = \frac{(EP2 - B) * T * M * F1 * F3}{V * F2}$$

EP2		Consumption of titrant at second end point
B	0	Blank value
T	WA	Actual concentration of the titrant
M	1	Molecular weight
V	100	Volume of the sample
F1	10	Conversion factor
F2	0.01	Conversion factor
F3	5.6	Conversion factor

* This calculation is only applicable if: $2 * p - value < m - value$

Any questions? Please contact the application team:

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