

Determination of Alkalinity (Carbonate and Bicarbonate hardness)



Application

Use

The alkalinity of water is a measure of its capacity to neutralise acids. The alkalinity of natural water is due to the salts of carbonate, bicarbonate, borates, silicates and phosphates along with the hydroxyl ions in free state. However the major portion of the alkalinity in natural waters is caused by hydroxide, carbonate and bicarbonates which may be ranked in order of their association with high pH values. Alkalinity values provide guidance in applying proper doses of chemicals in water and waste water treatment processes, particularly in coagulation and softening.

The alkalinity of water (formerly also referred to as „p value“ and „m value“ or acid consumption) is defined as the consumption of hydronium ions up to pH 8.3 and pH 4.5. The results can be expressed as mg/L CaCO₃, mmol/l °dH (Grad deutsche Härte/German hardness degree) and other units.

The Alkalinity method is stored as default method inside the TitroLine® 6000/7000/7750 titrators

Appliances

Titration: TL 6000-M2/20 or TL 7000-M2/20 consists of

- Basic device
- Magnetic stirrer TM 235
- 20 mL exchange unit WA 20, with brown glass bottle for titrant complete
- pH combination electrode with integrated temperature sensor (A 162 2M-DIN-ID, N 1052 A, BL 18...)

Electrodes

- see above
- Calibration: DIN buffer pH= 4.00 and pH= 7.00

Application

Reagents

- Titrant: H_2SO_4 or HCl 0.01 – 0.1 mol/l
- Titer: Possible with TRIS (Tris (hydroxymethyl)-aminomethan)

Description

Calibration

The pH combination electrode is calibrated in technical buffer pH=4.00 and pH= 7.00 or in DIN buffer pH= 4.01 and pH= 6.87.

Example of the calibration documentation:

Calibration

Buffers used

pH buffer 1:	TEC_4.000
pH buffer 2:	TEC_7.000

Measured values

pH buffer 1:	TEC_4.000	165.6 mV / 23.4 °C
pH buffer 2:	TEC_7.000	-11.2 mV / 23.0 °C

Calibration data

Slope:	99.4 % / -58.8 mV/pH
Zero point:	pH 6.81 / -11.2 mV
Temperature:	23.4 °C (a)
Date and time:	07.03.13 / 15:04

Determination of the exact concentration of the standard solution (option)

The exact concentration of the titrant can be determined using a titrimetric standard Tris (hydroxymethyl)-aminomethan. TRIS is dried in a desiccator overnight at room temperature before the titer determination is carried out.

The standard method for $\text{HCl}/\text{H}_2\text{SO}_4$ titrant ("titer HCl ") is stored as a default method inside the TitroLine® 6000/7000/7750 titrators. With EDIT/F3 - Default method you can load this method. It is only necessary to change the name of the method:

Factor 2 (F2):	1000.0000
Factor 1 (F1):	1.0000

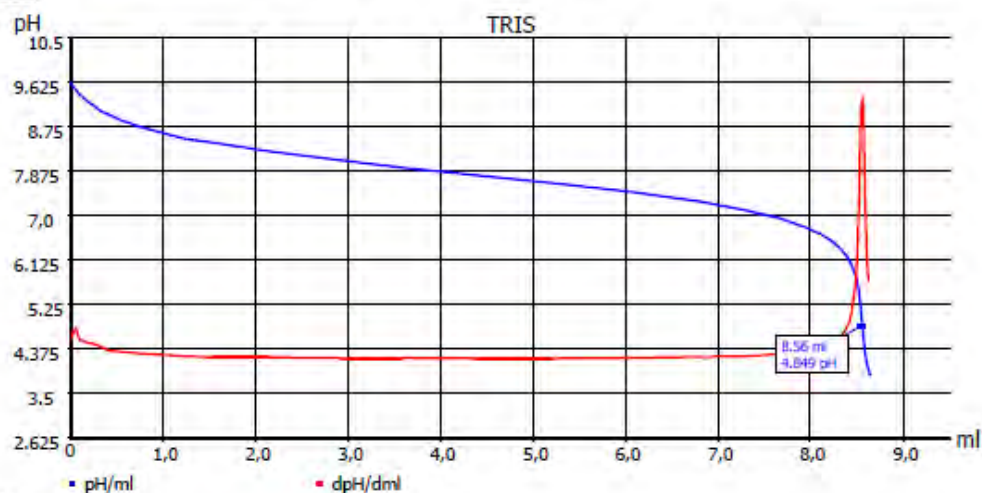
The factor 1 (F1) should be changed to 2 if as titrant 0.05 mol/l H_2SO_4 is used
 In a 100 or 150 ml, 0.2 to 0.3g TRIS are weighed accurately and dissolved in 60/80 mL of dist. water with stirring.

Application

Documentation example for standard titration of H₂SO₄/HCl with TRIS

GLP documentation

Titration graph



Method data

Method name: Titre HCl
 End date: 13.09.12

Titration duration: 3 m 8 s
 End time: 14:39:30

Titration data

Sample ID: TRIS
 Start pH: pH 9.590
 Start temperature: 25.0 °C (m)
 Zero point: pH 6.83 / -10.0 mV
 EQ: 8.560 ml / pH 4.849

Weight: 0.1038 g
 End pH: pH 3.864
 End temperature: 25.0 °C (m)
 Slope: 100.6 % / -59.5 mV/pH
 Titre: 0.1001 mol/l

Calculation formula

Titre: $(W \cdot F2) / ((EQ1 - B) \cdot M \cdot F1) \rightarrow M103$
 Mol (M): 121.14000

Weight (W): man
 Blank value (B): 0.0000 ml
 Statistics: Off

Factor 2 (F2): 1000.0000
 Factor 1 (F1): 1.0000

Application

Method for standard titration of H₂SO₄/HCl with TRIS

Method data overall view

Method name:	Titre HCl	Created at:	09/13/12 14:23:02
Method type:	Automatic titration	Last modification:	09/13/12 14:27:56
Measured value:	pH	Damping settings:	None
Titration mode:	Dynamic	Documentation:	GLP
Dynamic:	Steep		
Measuring speed / drift:	Normal:	minimum holding time:	02 s
		maximum holding time:	15 s
		Measuring time:	02 s
		Drift:	20 mV/min
Initial waiting time:	0 s		
Titration direction:	Decrease		
Pretitration:	Off		
End value:	2.500 pH		
EQ:	On (1)		
Slope value:	Steep	Value:	700

Dosing parameter

Dosing speed:	100 %	Filling speed:	30 s
Maximum dosing volume:	50.00 ml		

Unit values

Unit size:	20ml
Unit ID:	10039005
Reagent:	HCl 0.1 mol/L
Batch ID:	no Charge
Concentration [mol/l]:	0.10070
Determined at:	12/05/11 19:18:45
Expire date:	08/18/12
Opened/compounded:	09/10/11
Test according ISO 8655:	05/10/11
Last modification:	09/13/12 14:35:18

Device information

Device:	TitroLine 7000
Serial number:	00012
Software version:	1230

Titre_HCl_13_09_12-14_36_21.pdf

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Application

Titration of the sample

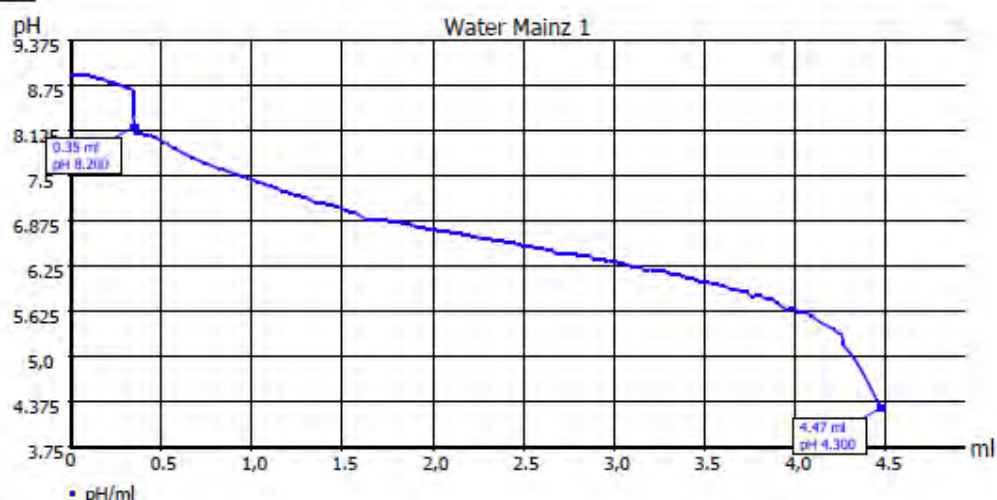
100 ml of water sample are pipetted into a beaker and titrated. If the consumption using HCl mol/l 0.1 should be less than 2 ml, the sample should be repeated using HCl 0.02 mol/l. Considering that this titration is an end-point titration, the titrator should be calibrated on a weekly or daily basis.

Select the Alkalinity method and start the titration.

Result example:

GLP documentation

Titration graph



Method data

Method name: Alkalinity (p+m)
 End date: 22.11.12

Titration duration: 3 m 17 s
 End time: 15:57:02

Titration data

Start pH: pH 8.913
 Start temperature: 21.4 °C (a)
 Zero point: pH 7.00 / 0.0 mV
 EP1: 0.354 ml / pH 8.200
 EP2: 4.475 ml / pH 4.300

Pattern: 100.00000 ml
 End pH: pH 4.259
 End temperature: 21.5 °C (a)
 Slope: 100.0 % / -59.2 mV/pH
 p-value: 0.35 mmol/l
 m-value: 4.47 mmol/l

Calculation formula

p-value: $(EP1-B) \cdot T \cdot M \cdot F1 / (V \cdot F2)$
 m-value: $EP2 \cdot T \cdot M \cdot F1 / (V \cdot F2)$
 Blank value (B): 0.0000 ml
 Factor 1 (F1): 10.0000
 Factor 2 (F2): 0.0100

Mol (M): 1.00000
 Mol (M): 1.00000
 Titre (T): 0.10000000 (m)
 Pattern (V): 100.0000 ml (f)
 Statistics: Off

Application

Method

The method is available as default method in the TL 6000/7000/TL 7750 titrator and ready to use.

Method data overall view

Method name:	Alkalinity (p+m)	Created at:	11/22/12 15:51:09
Method type:	Automatic titration	Last modification:	11/22/12 15:53:15
Measured value:	pH	Damping settings:	None
Titration mode:	End pt.	Documentation:	GLP
Linear steps:	0.020 ml		

Measuring speed / drift:	Normal:	minimum holding time:	02 s
		maximum holding time:	15 s
		Measuring time:	02 s
		Drift:	20 mV/min
Initial waiting time:	0 s		
Titration direction:	Decrease		
Pretitration:	Off		

Endpoint 1:	pH 8.200	delta endpoint 1:	pH 0.500
		Endpoint delay 1:	4 s
Endpoint 2:	pH 4.300	delta endpoint 2:	pH 1.000
		Endpoint delay 2:	10 s

Dosing parameter

Dosing speed:	15 %	Filling speed:	30 s
Maximum dosing volume:	50.00 ml		

Unit values

Unit size:	20ml
Unit ID:	10039005
Reagent:	HCl 0.1 mol/L
Batch ID:	no Charge
Concentration [mol/l]:	0.10030
Determined at:	11/22/12 18:14:29
Expire date:	08/18/12
Opened/compounded:	09/10/11
Test according ISO 8655:	05/10/11
Last modification:	11/22/12 10:14:33

Application

Notes

If you have any questions on the application, you can feel free to contact us..

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