Titer determination of NaOH and other strong bases

Description

This application report describes the general procedure for the titer determination of NaOH and other aqueous strong bases like Potassium hydroxide. The procedure is also usable for strong bases like Potassium hydroxide and Tetrabutylammonium hydroxide in water-soluble organic solvents like alcohols. This procedure is usable for base solutions up to 3 mol/l.
The titer is a dimensionless number about 1 for correcting the indicated concentration. In the software of the titration devices and application reports from SI Analytics®, the term “Titer“ describes the exact concentration in mol/l and not the dimensionless factor.

Instruments

Titrator	TL 5000, TL 7000, TL 7750, TL 7800
Exchangeable Unit	WA 10, WA 20, WA 50
Electrode	N 62, A 162 2M DIN ID, A 7780 1M-DIN-ID or similar
Cable	L 1 A (only for electrodes with plug head)
Lab accessoires	Magnetic stirrer TM 235 or similar
	Glas beaker 150 ml

Reagents

1	NaOH solution from which the titer is to be determined
2	Distilled water
3	Potassiumhydrogenphthalate (KHPht) – certified reference material, volumetric standard
4	Soda lime
All reagents should be in analytical grade or better.	

Titration procedure

Reagents

NaOH solution
NaOH is available as a ready-to-use solution.
Alkaline solutions quickly absorbs CO_2 from the air and thus become unusable. The solution must therefore be protected from CO_2 with a CO_2 absorbent such as soda lime. For this purpose, a dry tube filled with soda lime is placed on the storage bottle.

Potassium hydrogen phthalate
The KHPht volumetric standard is dried as described in the corresponding certificate of analysis.

Cleaning and storage of the electrode
Use distilled water for cleaning the electrode. For storage use the same electrolyte solution as used in the electrode or storage electrolyte solution L 911.

Sample preparation
The amount of volumetric standard depends on the size of the burette and the concentration of the Base. The amount should be chosen so that about half of the burette volume is consumed. The most common is the 20 ml burette. The required quantity of KHPht can be estimated according to this rule of thumb:

$$W\ [g] = 2 * Concentration[mol/l]$$

For low concentrations (e.g. 0.01 mol/l), the required amount of reference material is very small and difficult to weigh. The following method is used: a larger quantity of KHPht (W_{KHPht}) is weighed into a flask. For this purpose, 100 - 200 times the amount of distilled water (W_{H2O}) is weighed and the KHPht is dissolved in it. An aliquot of A is weighed out of this solution for titration. The amount of KHPht contained in it is calculated according to the following formula:

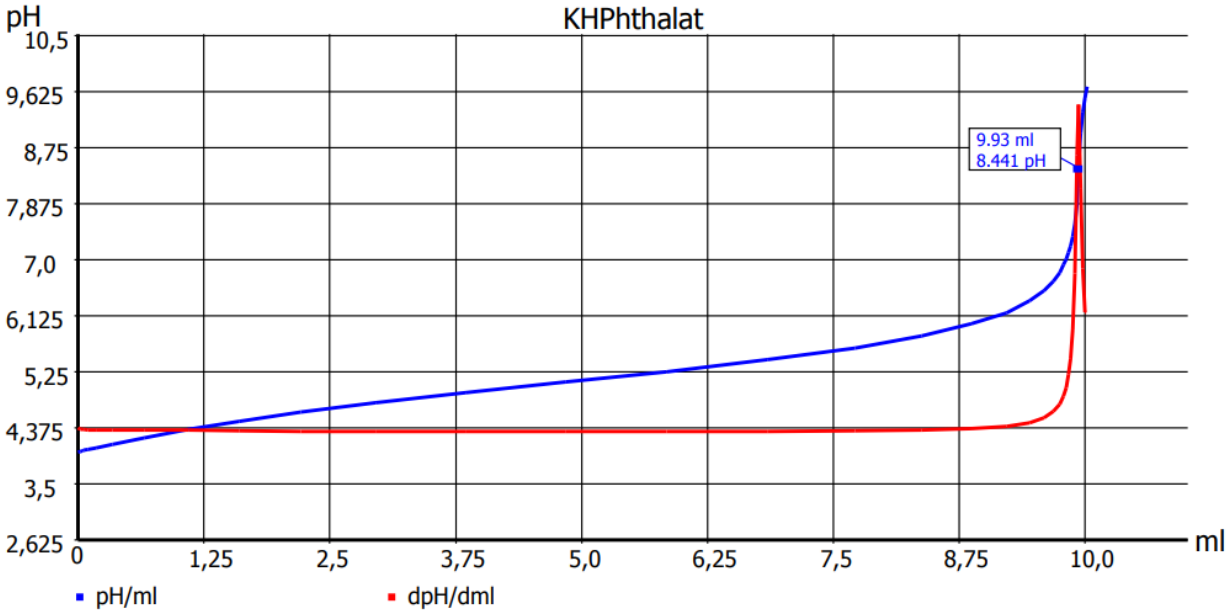
$$W\ [g] = \frac{W_{KHPht}\ [g]}{(W_{KHPht}\ [g] + W_{H2O}[g])} * A\ [g]$$

To determine the titer of a 0.1 mol/l NaOH, about 0.2 g KHPht volumetric standard are weighed into a 150 ml beaker and made up to 60-80 ml with distilled water. When the KHPht is completely dissolved, it is titrated with the NaOH to an equivalence point.

If the specified assay of the volumetric standard is different from 100%, the weight for calculating the concentration must be corrected:

$$W = \frac{Weight * specified\ assay\ \%}{100}$$

Titration parameter



Default method	Titre NaOH		
Method type	Automatic titration		
Modus	Dynamic		
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		
Dynamic	Steep	Max step size	1.0 ml
		Slope max ml	15
		Min. step size	0,02 ml
		Slope min. ml	230
Damping	None	Titration direction	Increase
Pretitration	off	Delay time	0 s
End value	12		
EQ	on	Slope value	700
Max. titration volume	20 ml		
Dosing speed	100%	Filling speed	30 s

Calculation:

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

B	0	Blank value
W	man	Weight of the sample [g]
F2	1000	Conversion factor ml - l
EQ1		Consumption of titrant until first Equivalence point
M	204,22	Molecular mass
F1	1	Conversion factor

We recommend to write the exact concentration T to the Exchangable Unit (WA) automatically.

Any questions? Please contact the application team:

Xylem Analytics Germany Sales GmbH & Co. KG, SI Analytics
Hattenbergstraße 10
D-55122 Mainz, Germany
Telefon: + 49 6131 66 5126
Fax: + 49 6131 66 5101
E-Mail: titration@si-analytics.com