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Application Note
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Titer Determination of Strong Bases

CHEMICAL SERIES

Introduction

This application report describes the general procedure for the titer determination of aqueous strong bases like Sodium hydroxide and 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 YSI, the term "Titer" describes the exact concentration in mol/l and not the dimensionless factor.

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Instrument
TL 7000 or higher
Magnetic stirrer TM 235 or similar
WA 20

Electrode, Cable, and Electrolyte
N 62 or A 7780 1M-DIN-ID or Similar
L 1 A Cable (Only for Electrodes with Plug Head)

Lab Accessories
Glass Beaker 150 ml
Magnetic Stirrer Bar 30 mm

Reagents	
1	The base from which the titer is to be determined
2	Distilled water
3	Potassiumhydrogenphthalate (KHPht) – certified reference material, volumetric standard
4	KCl solution 3 mol/l
5	Soda lime (a mixture of solid NaOH and $Ca(OH)_2$)
All reagents should be in analytical grade or better.	

Titration Procedure

Reagents

The KHPht volumetric standard is dried as described in the corresponding certificate of analysis, mostly 3h at 105°C.

The base solutions can absorb CO_2 from the atmosphere and thus alter their content. The reagent bottles with alkaline reagents are closed with CO_2 absorption tubes. These contain soda lime, a mixture of solid NaOH and $Ca(OH)_2$. This must be exchanged regularly. An indicator in soda lime indicates the exchange too late.

For very accurate titrations with very low concentrated bases they can be used under inert gas like nitrogen.

Cleaning and Storage of the Electrode

Use distilled water for cleaning the electrode. For storage use KCl solution 3 mol/l or 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 TRIS can be estimated according to this rule of thumb:

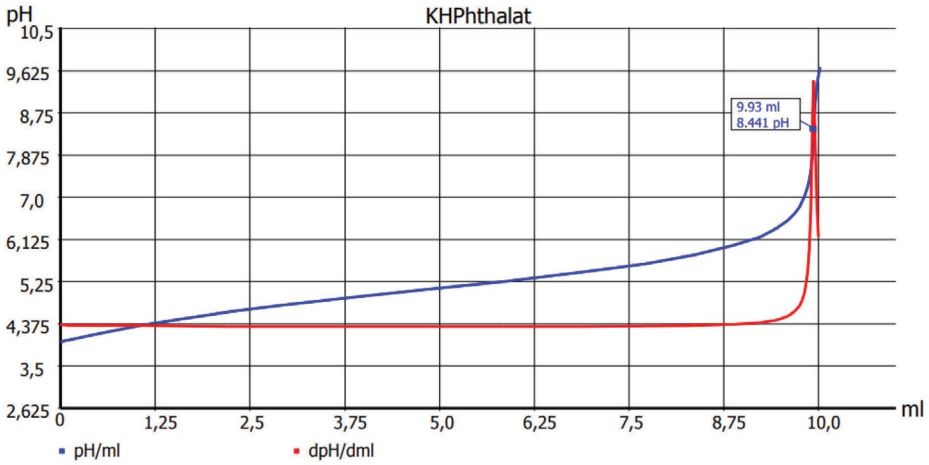
$$W\,[g] = 2 * Concentration[mol/l]$$

To determine the titer of a 0.1 mol/l base, about 0.2 g KHPht volumetric standard are weighed into a 150 ml beaker with an accuracy of 0.1 mg and filled up to 80 ml with distilled water. When the KHPht is completely dissolved, it is titrated with the base to an EQ.

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

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

Titration parameter



Default Method - Titre NaOH			
Method type	Automatic Titration		
Mode	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	2.5		
EQ	On	Slope Value	700
Max. Titration Volume	20 ml		
Dosing Speed	100%	Filling Speed	30 s

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

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.

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