Titer determination of $Na_2S_2O_3$

Description

This application report describes the general procedure for the titer determination of Sodium thiosulfate solutions.
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 or higher
Exchangeable Unit	WA 20
Electrode	Pt 62, Pt 62 RG
Cable	L 1 A (only for electrodes with plug head)
Stirrer	TM 50, TM 235
Lab accessoires	Glas beaker 150 ml
	Magnetic stirrer bar 30 mm

Reagents

1	$Na_2S_2O_3$ solution
2	KIO_3 volumetric standard material
3	Potassium iodide
4	Hydrochloric acid 5%
5	Electrolyte solution L300 (if Pt 62 is used)
6	Distilled Water
All reagents should be in analytical grade or better.	

Titration procedure

Reagents

The KIO_3 volumetric standard is dried as described in the corresponding certificate of analysis.

Cleaning and storage of the electrode

The electrode is rinsed with distilled water. The electrolyte solution L300 is suitable for storage of the Pt 62. Distilled water can be used for storage of the Pt 62 RG.

Sample preparation

The amount of volumetric standard depends on the size of the burette and the concentration of the $Na_2S_2O_3$. 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 KIO_3 can be estimated according to this rule of thumb:

$$W\ [g] = 0.5 * Concentration[mol/l]$$

At lower concentrations than 0.1 mol/l, the required amount of reference material is very small and difficult to weigh. Here the following method is recommended: a larger amount of KIO_3 (W_{KIO3}) is weighed into a flask. For this, distilled water (W_{H2O}) is weighted in and the KIO_3 dissolved in it. The amount of distilled water should be 100 - 200 times of the amount of KIO_3. From this solution, an aliquot A is weighed. The amount of KIO_3 contained therein is calculated according to the following formula:

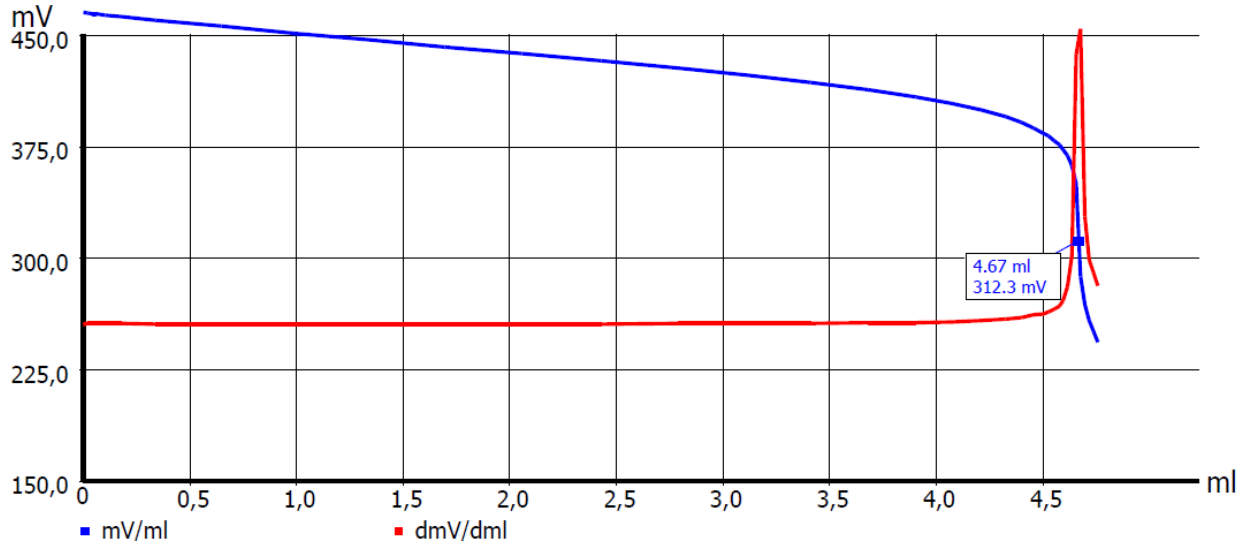
$$W\ [g] = \frac{W_{KIO3}\ [g]}{(W_{KIO3}\ [g] + W_{H2O}[g])} * A\ [g]$$

To determine the titer of a 0.1 mol/l $Na_2S_2O_3$ - solution, about 0.05 g KIO_3 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. 5 ml HCl 5% and 1g of KI are added. The titration is done with the Na2S2O3 - solution to an equivalence point. The consumption should be about 5 - 15 ml.

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

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

Titration parameter



Default method	---		
Method type	Automatic titration		
Modus	Dynamic		
Measured value	mV		
Measuring speed / drift	User defined	Minimum holding time	3 s
		Maximum holding time	15 s
		Measuring time	3 s
		Drift	10 mV/min
Initial waiting time	0 s		
Dynamic	steep	Max step size	1.0 ml
		Slope max ml	10
		Min. step size	0.02 ml
		Slope min. ml	120
Damping	none	Titration direction	decrease
Pretitration	off	Delay time	0 s
End value	off		
EQ	On (1)	Slope value	700
Max. titration volume	50 ml		
Dosing speed	100%	Filling speed	30 s

When titrating with very low concentrated $Na_2S_2O_3$ – solution, the potential jump at the EQ is flatter. In this case the slope value for the EQ should be decreased.

Calculation:

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

B	0	Blank value
W	man	Weight of the sample [g]
F2	6	Conversion factor
EQ1		Consumption of titrant until first Equivalence point
M	214	Molecular mass of KIO_3
F1	0,001	Conversion factor

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

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

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