Titer determination of EDTA

Description

This application report describes the general procedure for the titer determination of EDTA solutions. As reference material $CaCO_3$ or Zink is used.
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 or higher
Exchangeable Unit	WA 20 (only for TL 7000 or higher)
Electrode	Cu 1100
Cable	L 1 A
Reference electrode	B 2920+
Cable	L 1 N
Stirrer	Magnetic stirrer TM 235 or similar
Lab accessoires	Glas beaker 150 ml
	Magnetic stirrer bar 30 mm

Reagents

1	Na_2EDTA - solution
2	Calcium carbonate certified reference material, volumetric standard
3	Zink certified reference material, volumetric standard
4	Ammonia solution 25%
5	Ammonium chloride
6	Copper-EDTA solution 0.1 mol/l ($Cu(NH_4)_2$-EDTA)
7	Hydrochloric acid 25%
8	Distilled water
9	Elektrolyt solution L300
All reagents should be in analytical grade or better.	

Titration procedure

Reagents

Buffer solution pH 10
Dissolve 54.0 g of ammonium chloride in a little water, add 350 ml of ammonia solution 25% and make up to 1.0 liter with water.

The $CaCO_3$ or Zn volumetric standard is dried as described in the corresponding certificate of analysis.

Cleaning and storage of the electrode

The electrodes are cleaned with distilled water. The Cu 1100 is stored clean and dry, for the storage of the reference electrode use electrolyte solution L300.

Sample preparation

The $CaCO_3$ or Zn volumetric standard is dried as described in the corresponding certificate of analysis.

The amount of volumetric standard depends on the size of the burette and the concentration of the EDTA. 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 $CaCO_3$ can be estimated according to this rule of thumb:

$$W\ [g] = 1 * Concentration[mol/l]$$

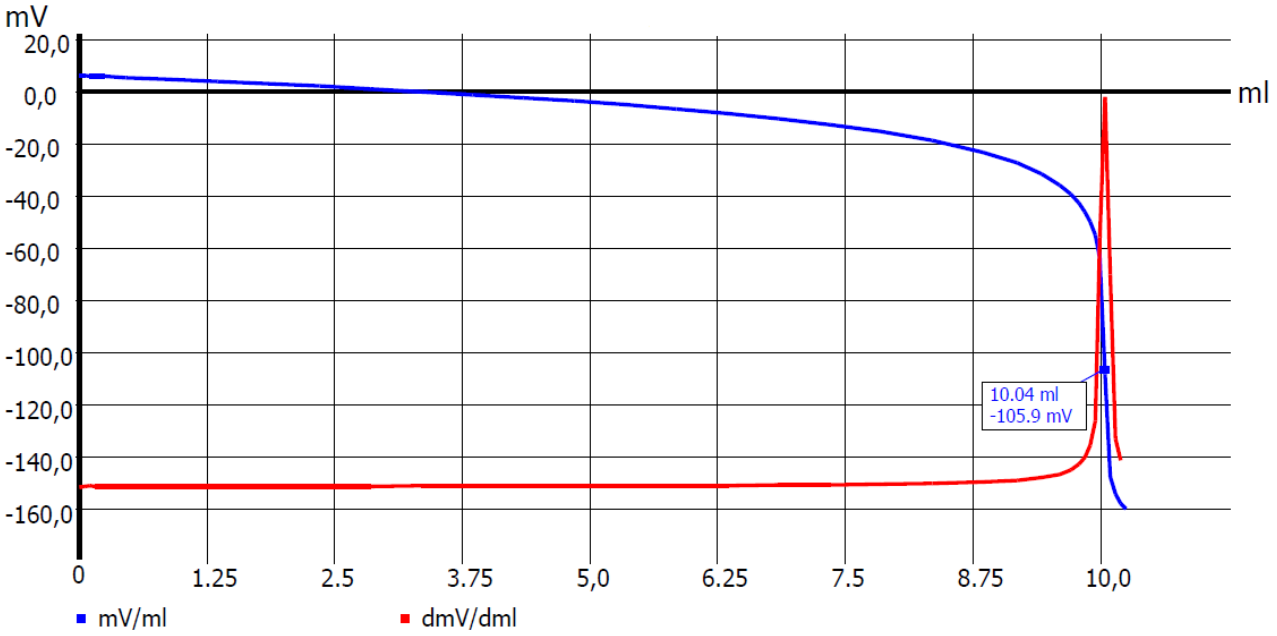
At lower concentrations than 0.1 mol/l, the required amount of reference material is very small and difficult to weigh. Here it is usefull to use a liquid Ca-standard (e.g. 1000mg/l).

To determine the titer of a 0.1 mol/l EDTA- solution, about 0.1 g $CaCO_3$ (or Zinc) volumetric standard are weighed into a 150 ml beaker and 4 ml HCl 25% are added. After complete dissolution of the reference material, the solution is made up to 60 ml with distilled water and the pH is adjusted to weak acid – neutral with Ammonia. 5 ml buffer solution pH 10 and 1 ml of Cu-EDTA 0.1 mol / l are added. The titration is done with the EDTA - 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	Titer EDTA		
Method type	Automatic titration		
Modus	Dynamic		
Measured value	mV		
Measuring speed / drift	User defined	Minimum holding time	5 s
		Maximum holding time	15 s
		Measuring time	3 s
		Drift	5 mV/min
Initial waiting time	0 s		
Dynamic	flat	Max step size	0.5 ml
		Slope max ml	10
		Min. step size	0.05 ml
		Slope min. ml	120
Damping	none	Titration direction	decrease
Pretitration	off	Delay time	0 s
End value	off		
EQ	On (1)	Slope value	120
Max. titration volume	20 ml		
Dosing speed	100%	Filling speed	30 s

When titrating with very low concentrated EDTA – 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	1000	Conversion factor
EQ1		Consumption of titrant until first Equivalence point
M	100,09	Molecular mass of KIO_3
F1	1	Conversion factor

If Zinc is used as reference material instead of $CaCO_3$, the molar mass of Zinc with M = 65.38 must be used for M.
We recommend to write the exact concentration T to the Exchangable Unit (WA) automatically.

Any questions? Please contact the application team:

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