Titer determination of $Ce(SO_4)_2$

Description

This application report describes the general procedure for the titer determination of Cer(IV)sulfate 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 (only for TL 7000 or higher)
Electrode	Pt 62, Pt 62 RG
Cable	L 1 A
Stirrer	TM 50, TM 235
Lab accessoires	Glas beaker 150 ml
	Magnetic stirrer bar 30 mm

Reagents

1	Cer(IV)sulfate solution from which the titer is to be determined
2	Iron(II) ethylenediammonium sulfate volumetric reference material
3	Sulfuric acid 25%
4	Electrolyte solution L300 (if Pt 62 is used)
5	Distilled Water
6	Sulfuric acid 96%

Titration procedure

Reagents

The Iron (II) ethylenediammonium sulfate volumetric reference material is dried as described in the corresponding certificate of analysis.

$Ce(SO_4)_2$ – solution 0,1 mol/L

40,43g $Ce(SO_4)_2$ x $4H_2O$ and 50mL H_2SO_4 are dissolved in about 750 mL dist. Water. After cooling down it is made up to 1.0 L.
$Ce(SO_4)_2$ – solution 0,1 mol/L is also available as ready-to-use solution.

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 $Ce(SO_4)_2$ - solution 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 Iron(II) ethylenediammonium sulfate can be estimated according to this rule of thumb:

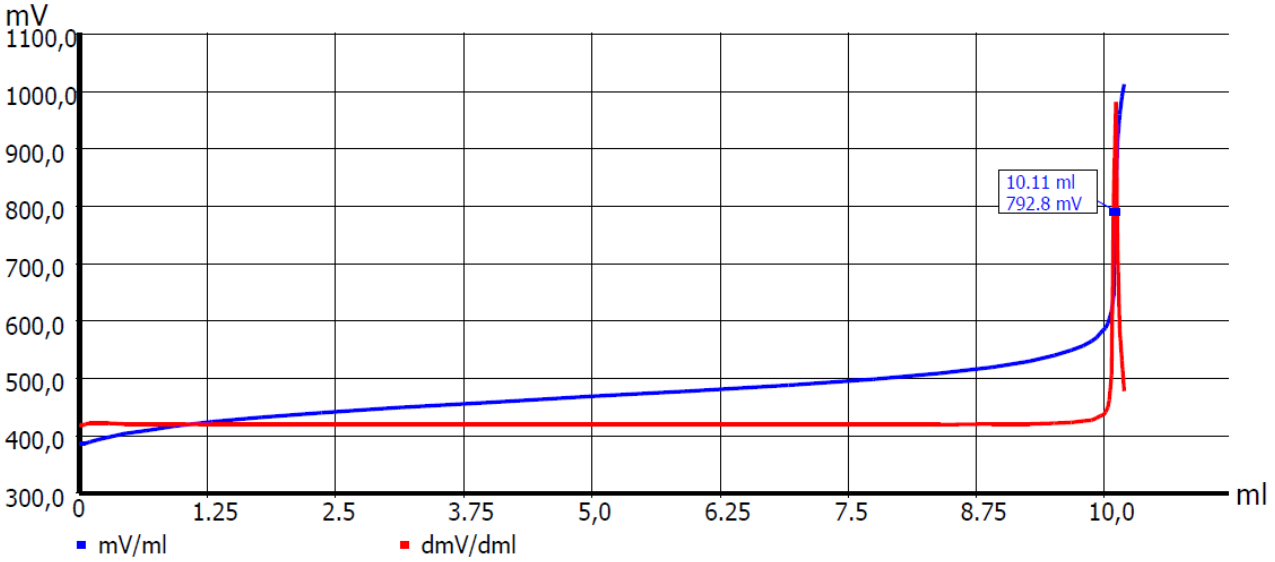
$$W\ [g] = 3{,}8 * Concentration[mol/L]$$

To determine the titer of a 0.1 mol/l $Ce(SO_4)_2$ – solution, about 0.38 g Iron(II) ethylenediammonium sulfate volumetric standard are weighed into a 150 mL beaker, 20 mL H_2SO_4 25% are added and made up to 80 mL with distilled water. The titration is done with the Ce(SO4)2 - 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	230
Damping	none	Titration direction	increase
Pretitration	off	Delay time	0 s
End value	off		
EQ	On (1)	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
EQ1		Consumption of titrant until first Equivalence point
M	382,14	Molecular mass of Iron(II) ethylenediammonium sulfate
F1	1	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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