Titration of Fluoride with Lanthanum nitrate

Description

The fluoride content is determined by titration with aqueous lanthanum nitrate solution 0.033 mol/l (0.1N). This determination is suitable for aqueous or water-soluble samples.
As buffer, an acetate buffer is often used, but this can lead to too high results. More suitable is the MES buffer used in this application. Sometimes it can also be advantageous if about 50% of isopropanol are added to the sample.
The calculation is carried out as mg/l sodium fluoride.

Instruments

Titrator	TL 5000 or higher
Electrode	F 1100 PLH or F 60
Cable	L 1 A
	B2920+ (not necessary if F 60 is used)
	L 1 N
Stirrer	Magnetic stirrer TM 235 or similar
Lab accessory	Plastic beaker 100 ml
	Magnetic stirrer bar 30 mm

Reagents

1	Lanthanum nitrate solution 0.033 mol/l
2	2-(N-Morpholino)ethansulfonic acid (MES)
3	Sodium hydroxide
4	Distilled Water
5	Isopropyl alcohol
All reagents should be of analytical grade or better.	

Titration procedure

Reagents

$La(NO_3)_3$ solution
14.3g of $La(NO_3)_3$ * 6 H_2O are weighed into a 1 liter volumetric flask and dissolved in dist. Water. After complete dissolution the solution is filled up to 1l with dist. water.
The titer determination can be carried out with sodium fluoride, the same titration parameters are used as in the sample titration.

MES buffer pH 5.5
97.6 g of 2-(N-Morpholino)ethansulfonic acid (MES) are weighed into a 1l volumetric flask and dissolved in about 900 ml dist. Water. After complete dissolution the pH value is adjusted to pH 5.5 with sodium hydroxide and filled up to 1 liter with dist. Water.

Cleaning of the electrode

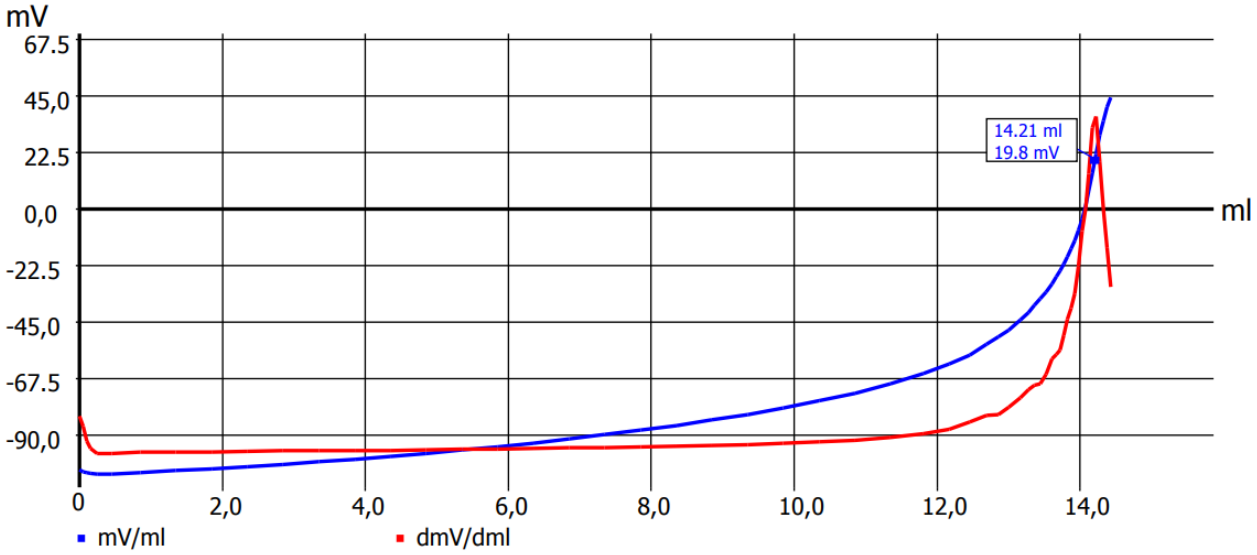
The electrodes are cleaned with distilled water. The F 1100 PLH is stored dry. For the storage of the B2920+ KCl solution 3 mol/l or electrolyte solution L 911 is suitable.

Sample preparation

The sample is pipetted into a 100 ml plastic beaker and made up to about 60 ml with distilled water. 5 ml of the MES buffer solution are added. The pH value should be around pH 5.5, if necessary, more buffer solution must be added. The mixture is titrated with 0.033 mol/l $La(NO_3)_3$ solution to an equivalence point. The consumption should be about 5 - 15 ml.

Titration parameter

Sample titration



Default method	--		
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	3 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	50
Damping	none	Titration direction	increase
Pretitration	off	Delay time	0 s
End value	off		
EQ	On (1)	Slope value	60
Max. titration volume	20 ml		
Dosing speed	100%	Filling speed	30 s

For some samples it may happen that the titration curve is very flat and the titrator does not stop the titration at the EQ. In this case, the slope value for the EQ should be reduced.

For the titer determination of the $La(NO_3)_3$ solution with sodium fluoride, the reference substance is treated the same way as the sample and titrated with the same settings.

Calculation:

$$Result\ [mg/l] = \frac{(EQ1 - B) * T * M * F1}{V * F2}$$

B	0	Blank value
EQ1		Consumption of titrant at first Equivalence point
T	WA	Actual concentration of the titrant
M	41,99	Molecular weight
V	man	sample Volume [ml]
F1	3000	Conversion factor
F2	1	Conversion factor

If the calculation value is not mg/l sodium fluoride, but mg/l F^-, then M is set to the molar mass of F^- 18,998 g/mol.

Calculation of the concentration of the $La(NO_3)_3$ solution:

$$T\ [mol/l] = \frac{W * F2}{(EQ1 - B) * M * F1}$$

B	0	Blank value
EQ1		Consumption of titrant at first Equivalence point
T	WA	Actual concentration of the titrant
M	41,99	Molecular weight
W	man	Sample weight in g
F1	3	Conversion factor
F2	1000	Conversion factor

Any questions? Please contact the application team:

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