Titration of Nicotine in Liquids

Description

Liquids for e-cigarettes contain nicotine. This nicotine can be titrated with perchloric acid in glacial acetic acid similar to pharmaceutical bases. The main components of this liquids are glycols, glycerine and water.
A pH electrode with a filling of LiCl in ethanol or in glacial acetic acid is used as electrode.
For nicotine, the European pharmacopeia describes a titration with 0.1 mol/l perchloric acid, the sample is dissolved in 30 ml glacial acetic acid. Because of the water content of these liquids it is often better to use more glacial acetic acid.
The result is calculated in mg/ml of nicotine.

Instruments

Titrator	TL 7000 or higher
Electrode	N 6480 Eth (electrolyte L 5034) or N 6480 eis or N 61 eis (electrolyte L 5014 for both options)
Cable	L1A
Stirrer	Magnetic stirrer TM 235 or similar
Titration tip	Long version TZ 1643 required
Lab accessoires	Glas beaker 100 or 150 ml
	Magnetic stirrer bar 30 mm

Reagents

1	Perchloric acid in glacial acetic acid 0.1 mol/l
2	Glacial acetic acid
3	Electrolyte L 5034 (LiCl/ethanol) or L 5014 (LiCl/glacial acetic acid)
All reagents should be in analytical grade or better.	

Titration procedure

Reagents

The titer determination of the $HClO_4$ solution is carried out as described in the application report "Titer determination of Perchloric acid in glacial acetic acid".

Cleaning and storage of the electrode

Use Ethanol or Iso propyl alcohol for cleaning the electrode. For storage use the same electrolyte solution used in the electrode, L 5034 (N6480 eth) or L 5014 (N 6480 eis / N 61 eis).

Sample preparation

The sample is placed in a beaker and filled up to 30 - 60 ml with glacial acetic acid. Then it is titrated with $HClO_4$ 0.1 mol / l. The amount of nicotine should be 20 – 60mg for each titration.

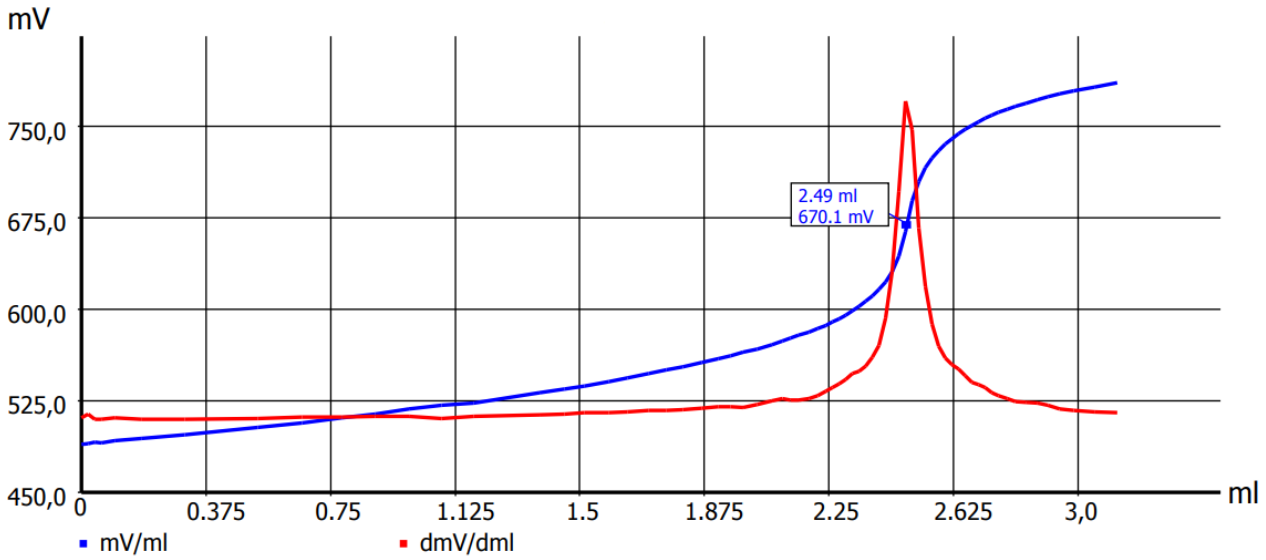
The density of the perchloric acid in glacial acetic acid depends strongly on the temperature. It is recommended to measure and document the temperature at which the titration was carried out. The temperature at the titer determination should be identical to the temperature at the sample titration. If the temperature is different, the volume can be corrected according to the European pharmacopeia:

$$EQ_{corr} = EQ1 * (1 + (T_1 - T_2) * 0.0011$$

EQ1	Consumption of titrant at first Equivalence point
EQ_{corr}	Corrected Volume of titrant
T_1	Temperature at titer determination
T_2	Temperature at sample titration

Titration parameter

Sample titration



Default method	---		
Method type	Automatic titration		
Modus	Dynamic		
Measured value	mV		
Measuring speed / drift	User defined	Minimum holding time	4 s
		Maximum holding time	20 s
		Measuring time	3 s
		drift	10 mV/min
Initial waiting time	0 s		
Dynamic	average	Max step size	1.0 ml
		Slope max ml	10
		Min. step size	0.02 ml
		Slope min. ml	120
Damping	Average	Titration direction	increase
Pretitration	off	Delay time	0 s
End value	off		
EQ	On(1)	Slope value	300
Max. titration volume	20 ml		
Dosing speed	100%	Filling speed	30 s

Calculation:

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

B	0	Blank value
EQ1		Consumption of titrant at first Equivalence point
T	WA	Actual concentration of the titrant
M	162,23	Molecular mass of nicotine
V	man	Volume of the sample
F1	1	Conversion factor
F2	2	Conversion factor

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

2025/10/09