

Titration of Nicotine in Liquids

TITRATION SERIES



Introduction

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 solution of LiCl in ethanol or in glacial acetic acid is recommended for this application.

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.



a xylem brand

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 accessories	Glass 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 HClO₄ 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 HClO₄ 0.1 mol/l. The amount of nicotine should be 20 - 60mg for each titration.

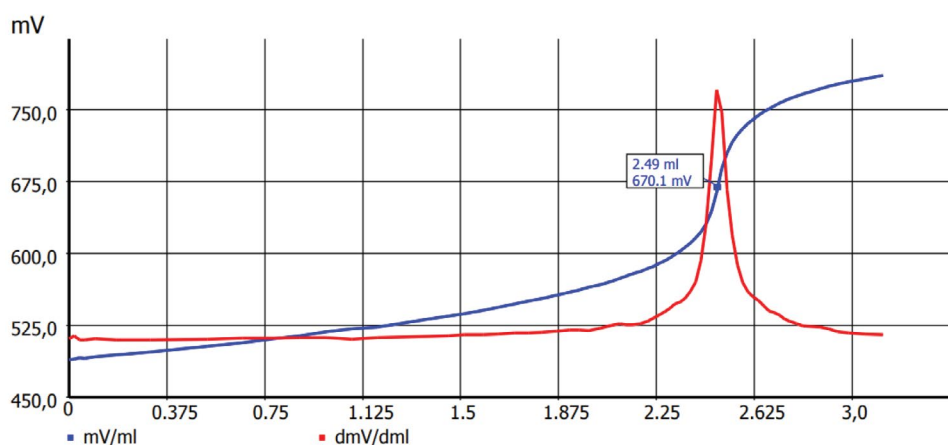
The density of the perchloric acid in glacial acetic acid depends strongly on the temperature. It is recommended to measure and document the temperature at which the titration was carried out. The temperature at the titer determination should be identical to the temperature at the sample titration. If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

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

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
Initial waiting time:	0 s
Dynamic:	Average
Damping:	Average
Pretitration:	Off
End value:	Off
EQ:	On (1)
Max. titration volume:	20 mL
Dosing speed:	100%

Minimum holding time:	4 s
Maximum holding time:	20 s
Measuring time:	3 s
Drift:	10 mV / min

Max step size:	1.0 mL
Slope max mL:	10
Min. step size:	0.02 mL
Slope min. mL:	120
Titration direction:	Increase
Delay time:	0 s

Slope value:	300
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Filling speed:	30 s
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Calculation:

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

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

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