

Application Note AN-T-175

# Nicotine content in tobacco

## Cost-efficient method using non-aqueous titration

Nicotine is an N-containing alkaloid that stimulates the parasympathetic nervous system, and is both highly addictive and dangerous to human health. Its toxic threshold value lies between 30–60 mg or 0.8 mg/kg, respectively. Nicotine content determination in tobacco products is therefore crucial. This Application Note exhibits an easy and straightforward method for nicotine determination in tobacco by non-aqueous titration.

Before the titration is performed, an extraction of the nicotine from tobacco is necessary. The extraction step is done using an appropriate solvent and barium chloride. Barium chloride leads to a more selective extraction of nicotine in comparison to situations in which it is not present.

Results determined by GC and IC are given as a comparison. In comparison to chromatographic methods, titration is an «absolute method», meaning it is not necessary to calibrate the system prior to the analyses.

### SAMPLE AND SAMPLE PREPARATION

The nicotine is extracted from ground tobacco leaves by using barium chloride and an extraction mixture containing chloroform and toluene in a ratio of 1:9.

Determinations by GC have shown that this extraction method is very selective to nicotine as only one peak appeared in the GC chromatogram.

## EXPERIMENTAL

The analyses are carried out using a 907 Titrando equipped with a Solvotrode easyClean. An aliquot of the extraction solution is transferred to a beaker, filled up with ethanol (in order to immerse the glass membrane and diaphragm of the electrode), and then titrated with standardized perchloric acid in glacial acetic acid until after the first equivalence point is reached.



**Figure 1.** Titrando system consisting of a 907 instrument in combination with tiamo.

## RESULTS

Steep and smooth titration curves are obtained for all analyses.

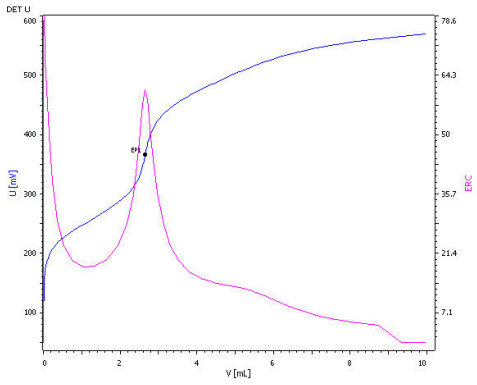



**Figure 2.** Titration curve of nicotine with perchloric acid after extracting the nicotine from tobacco.

**Table 1.** Results of the determination of nicotine with titration, ion chromatography (IC), and gas chromatography (GC).

| | n | Mean value / % | SD(abs)/ % | SD(rel) /% |
|---|---|---|---|---|
| Titration | 3 | 1.355 | 0.014 | 1.03 |
| IC | 1 | 1.41 | - | - |
| GC | 5 | 1.313 | 0.005 | 0.40 |

## CONCLUSION

Nicotine is normally either determined by GC or by HPLC. The initial cost for these analytical instruments is relatively high. In comparison, titration is lower priced and affordable for nearly every laboratory. As seen in Table 1, the results between the analyses with GC and titration are comparable. Therefore, titration offers a competitive method to analyze nicotine in tobacco.

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## CONFIGURATION



OMNIS Titrator Oil

The OMNIS Titrator Oil offers you the complete package for all conventional analyses of petrochemical products. The package contains the OMNIS Advanced Titrator with magnetic and rod stirrer, a 20 mL cylinder unit, a d-Solvotrode for nonaqueous acid-base titration and one stand-alone OMNIS Software license.