Application Note B-TA2007

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B-TA2007 - TG-MS of Tobacco: Part 2

Introduction

Analysis of volatile components and decomposition gases generated from tobacco is strongly required in order to consider health hazards. The pyrolysis process of a large amount of waste products—such as tobacco stems—produced in the tobacco commercialization process needs to be investigated in detail to utilize them as a biomass resource. STA/GC-MS was used to investigate the differences in the amount of gases evolved from different tobacco products.

Measurement and analysis example

Approximately 5 mg of three types of commercially available cigarettes (A, B, C) were prepared and heated in helium from room temperature to 600°C at 20°C/min. Photoionization (PI) was used for MS ionization.

A comparison of the thermal behavior of nicotine (*m/z* 162), hydroxymethylfurfural (*m/z* 126), and hydroquinone (*m/z* 110) evolved gases for each sample is shown in Figure 1. Nicotine, which causes tobacco dependence, shows a peak of evolved gases just before 200°C, and the amount of gases produced is clearly lower in A than in B and C. Hydroxymethylfurfural, which is produced by the decomposition of sugar, is produced at a slightly higher temperature than nicotine, and the amount produced increases in the sample order of C < A < B. The peak components around 320°C are assumed to be attributed to other evolved gases. Hydroquinone, which is speculated to be a degradation product of cellulose and lignin, shows an occurrence peak around 300°C, indicating that there is no significant difference between the cigarettes.

Thus, in addition to qualifying the evolved gases, results from MS can easily be compared among cigarettes, which are difficult to distinguish based on TG mass loss alone. In addition, the use of soft ionization, such as PI or chemical ionization (CI), where only ions corresponding to molecular weight are easily identified, may make it easier to make comparisons of the evolved gases between cigarettes than electron ionization (EI), where the mass spectrum is more complex due to fragment ions.

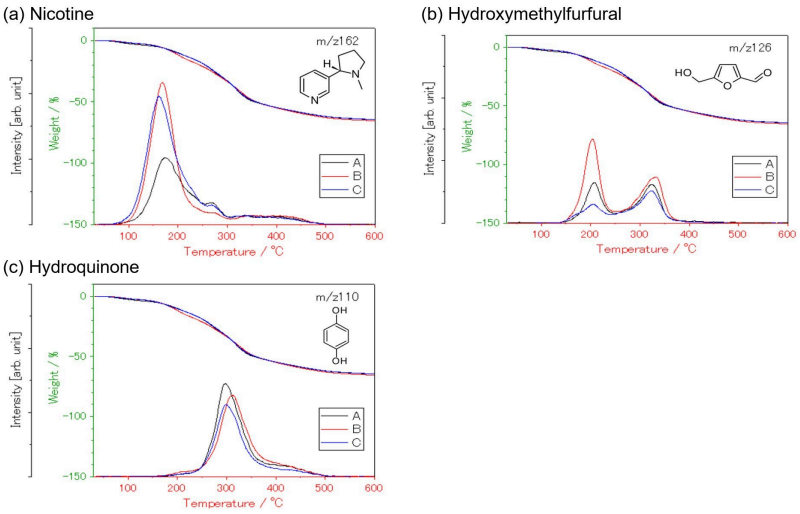
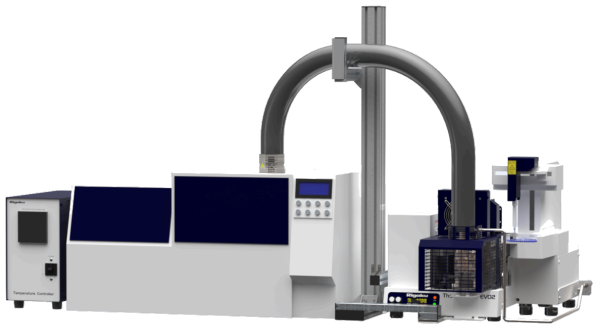


Figure 1: Comparison of MS ion chromatograms of gases evolved from each commercial cigarette

Recommended equipment and software

- Sample observation STA8122 and MASS-IF, GCMS
- Vullios software, 3D analysis software

Related products



Sample observation STA/GC-MS

TG-GCMS measurements while observing the sample.