Application Note B-TA2006

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B-TA2006 - TG-MS of Tobacco: Part 1

Introduction

Analysis of volatile components and pyrolysis gases generated from tobacco is strongly required for health hazard considerations. In order to utilize waste materials such as tobacco stems—which are generated in large quantities during the tobacco commercialization process—as a biomass resource, the pyrolysis process must be investigated in detail. Therefore, using STA/GC-MS equipped with a visualization function, we investigated the shape and color changes of tobacco leaves during heating, as well as the gases produced.

Measurement and analysis example

About 5 mg of commercial cigarettes were prepared and the temperature was raised from room temperature to 600°C at 20°C/min in helium. Electron ionization (EI) and photoionization (PI) were used for MS ionization. The TG-MS results are shown in Figure 1. It was observed that the tobacco leaf changed from brown to black and continued to shrink with increased temperature. When focusing on the evolved gases during the mass loss up to 300°C, H_2O (*m/z*18) was first observed during the mass loss at around 100°C. Since multiple organic gases in addition to H_2O and CO_2 (*m/z*44) evolved simultaneously at around 200°C to 300°C, the identification of organic gases was difficult using EI alone. Therefore, PI, which can easily confirm only molecular ions, was used in combination with EI. As a result, nicotine (m/z162) and 4H-Pyran-4-one, 2,3-dihydro-3,5-dihydroxy-6-methyl- (*m/z*144) were found to be generated at around 200°C, and hydroquinone (*m/z*110) at around 300°C, respectively.

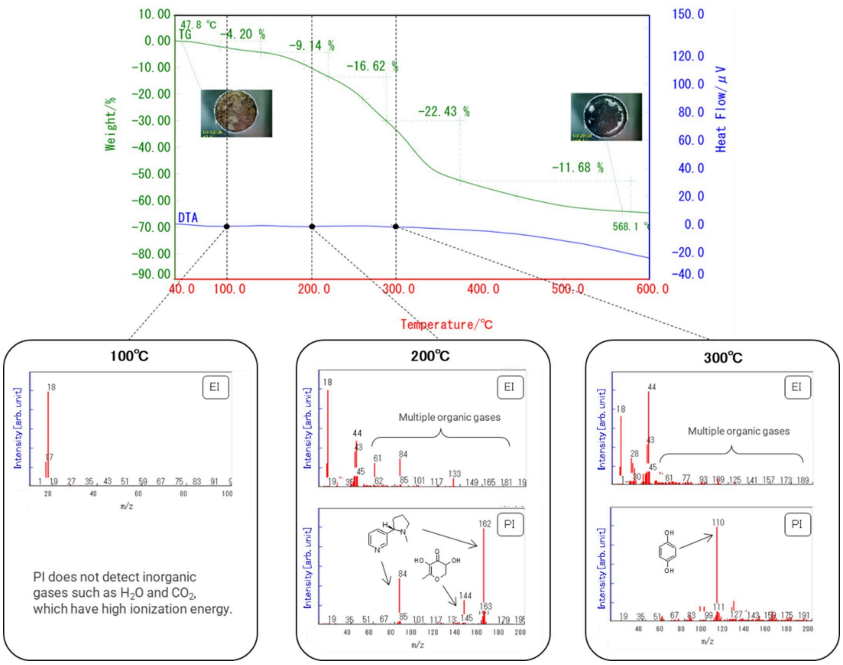
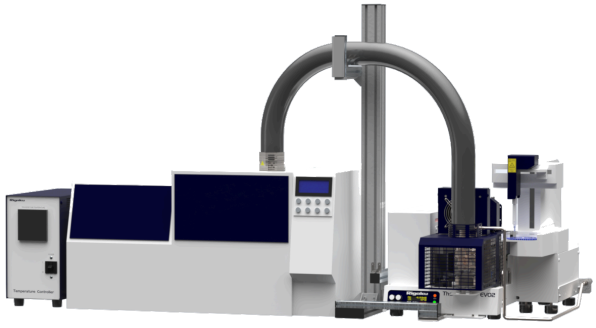


Figure 1: TG-DTA of commercially available cigarettes and sample images and mass spectra at each temperature

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.