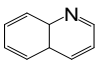
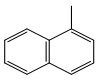
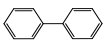
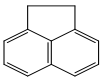
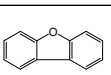
Composition analysis of coal tar by thermal desorption GC/MS
Part 2: Thermal desorption (TD)-GC/MS

[**Background**] In the previous note (PYA1-182E), the optimal furnace temperature for thermal desorption (TD)-GC/MS was determined to be 450 ºC by evolved gas analysis (EGA)-MS of two coal tar samples. In this note, TD-GC/MS measurements were carried out on the same samples to examine the chemical compositions of the two samples.

[**Experimental**] For measurements, a GC/MS system equipped with a Multi-Shot Pyrolyzer (EGA/PY-3030D) directly interfaced to the GC inlet was used. 20 mg of each coal tar sample was dissolved in 1 mL of toluene to prepare a 0.02 mg/µL solution. 10 µL of the solution was put in an Eco-Cup, then 10 µL of a hexane solution of triacontane (C30) (0.1 µg/µL) was added as an internal standard (IS). The Eco-Cup was then introduced into the pyrolyzer furnace heated at 450 ºC for thermal desorption. The thermally desorbed compounds were separated using a separation column (UA1-30M-0.1F) and detected by a mass detector connected via a vent-free GC/MS adapter.

[**Results**] Fig. 1 shows the TD chromatograms of the two coal tar samples, and various aromatic hydrocarbons such as naphthalene and phenanthrene are observed. Comparison of the TD chromatograms shows that the peak area ratios of five compounds listed in Table 1, defined as the ratios of the peak area of aromatic hydrocarbons to those of IS, differ significantly between the two samples. This result demonstrates that TD-GC/MS effectively reveals the compositional differences in coal tar and is a useful technique for detailed compositional characterization.

Table 1 Peak area ratios of compounds to IS.

	Area / C_{30}	Structural formula	Sample A	Sample B
1	Quinoline		9 %	65 %
2	1-Methyl-naphthalene		70 %	212 %
3	Biphenyl		26 %	78 %
4	Acenaphthene		34 %	113 %
5	Dibenzofuran		117 %	201 %

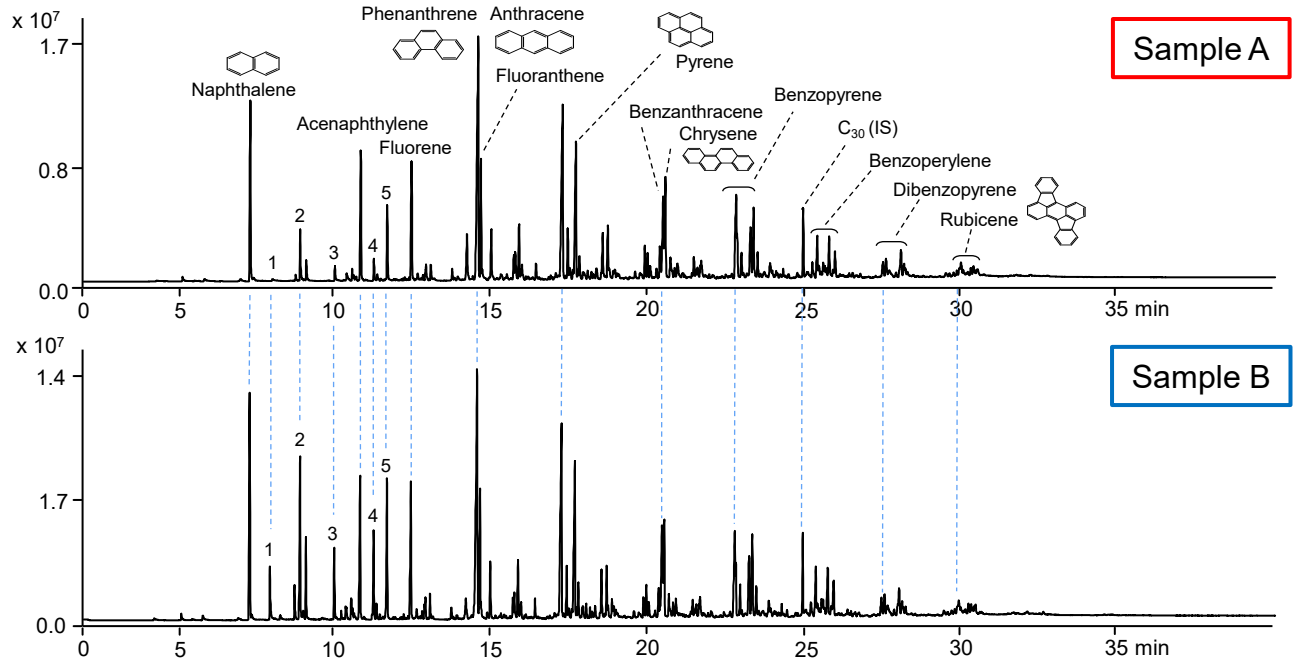


Fig. 1 TD chromatograms of two coal tar samples from different manufacturers.

Furnace temp.: 450 ºC, GC inlet temp.: 300 ºC, GC oven temp.: 40 ºC (0 min) - 350 ºC (10 ºC/min, 9 min hold), Separation column: UA⁺ -1 (dimethylpolysiloxane, *L*=30 m, i.d.=0.25 mm, df=0.1 µm), Column flow rate: 1.0 mL/min, Split ratio: 1/100, MS scan range: *m/z* 29 - 400, Amount of sample: ca. 0.2 mg.

Keywords : Coal tar, Composition analysis, TD-GC/MS, Thermal desorption

Products used : Multi-Shot Pyrolyzer, UA⁺-1, Eco-Cup LF, F-Search, Vent-free GC/MS adapter

Applications : General polymer analysis

Related technical notes : PYA1-182E (Part2)

Please forward your inquiries via our web page or send us a fax message.

R&D and manufactured by :
Frontier Laboratories Ltd.
Phone: (81)24-935-5100 Fax: (81)24-935-5102
www.frontier-lab.com