Application Note

230005X

High Speed Separation of Polycyclic Aromatic Hydrocarbons by Extreme Liquid Chromatography(X-LC®) and its Application to Analysis of Environmental Sample

Introduction

Polycyclic aromatic hydrocarbons (PAHs), which consist of fused aromatic rings, are produced by incomplete combustion of carbon-containing fuels such as diesel and coal. Some of them are suspected to be carcinogens, requiring the analysis of environmental PAHs. We examined the usefulness of X-LC for the separation and determination of PAHs.

Experimental

The X-LC system utilized in this experiment was a JASCO X-LC system consisting of two of a 3185PU pump, 3080DG mobile phase degasser, 3080MX mixing unit, 3067CO column oven, 3120FP fluorescence detector, 3059AS autosampler, and ChromNAV chromatography data system. The separation column is Zorbax Eclipse PAH (2.1 mm ID x 50 mmL, 1.8 µm). PAHs in dust of a diesel engine was extracted 8 hours using a soxhlet apparatus with dichloromethane as a extraction solvent.

Results and Discussion

Figure 1 shows an X-LC chromatogram of standard mixture of 15 components of PAHs (200 pg each). We obtained chromatograms using gradient elution and time program of excitation and emission wavelengths of the fluorescence detector. The X-LC system provides an analysis time 3 times shorter than conventional HPLC. Figure 2 shows an X-LC chromatogram obtained from the dust of the diesel engine. Eight components appear with rather good separations.

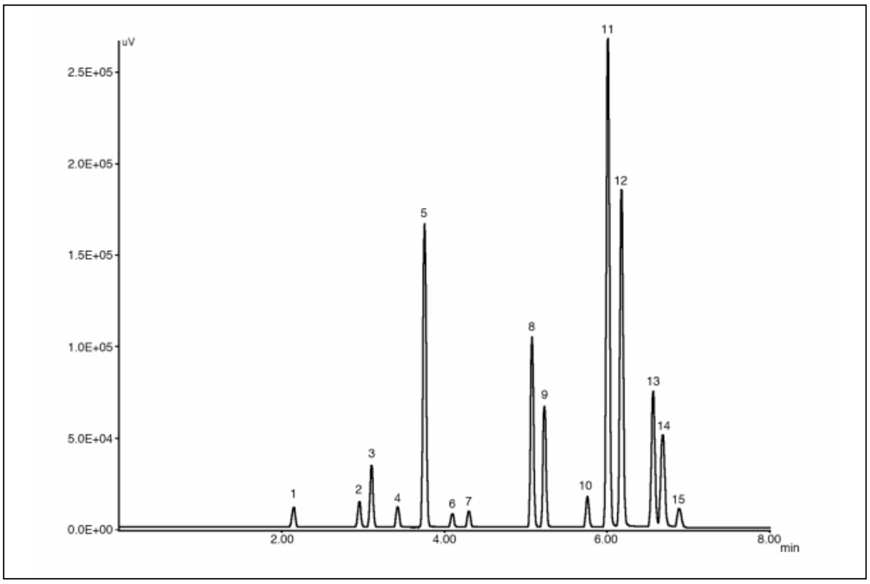

Figure 1 X-LC chromatogram of standard mixture of PAHs

Peaks : 1=Naphthalene, 2=Acenaphthene, 3=Fluorene, 4=Phenanthrene, 5=Anthracene, 6=Fluoranthene, 7=Pyrene, 8=Benzo(a)anthracene, 9=Chrysene, 10=Benzo(b)fluoranthene, 11=Benzo(k)fluoranthene, 12=Benzo(a)pyrene, 13=Dibenzo(a,h)anthracene, 14=Benzo(g,h,i)perylene, 15=Indeno(1,2,3-c,d)pyrene) (200 pg each).

Chromatographic conditions: column = Zorbax Eclipse PAH(2.1 mmID. x 50 mmL., 1.8 µm); mobile phase = A(water), B(acetonitrile), A/B(60/40, 0 min) — A/B(32/68, 3.5 min) — A/B(0/100, 6 min) — A/B(0/100, 8.2 min) — A/B(60/40, 8.3 min); flow rate=0.6 mL/min; column temperature=30° C, wavelength = Ex/Em (280 nm / 330 nm, 0 min) — (260 nm / 340 nm, 2.65min) — (250 nm / 420 nm, 3.55 min) — (270 nm / 400 nm, 4.6 min) — (295 nm / 410 nm, 5.9 min) — (290 nm / 500 nm, 6.8 min); injection volume = 1 µL.

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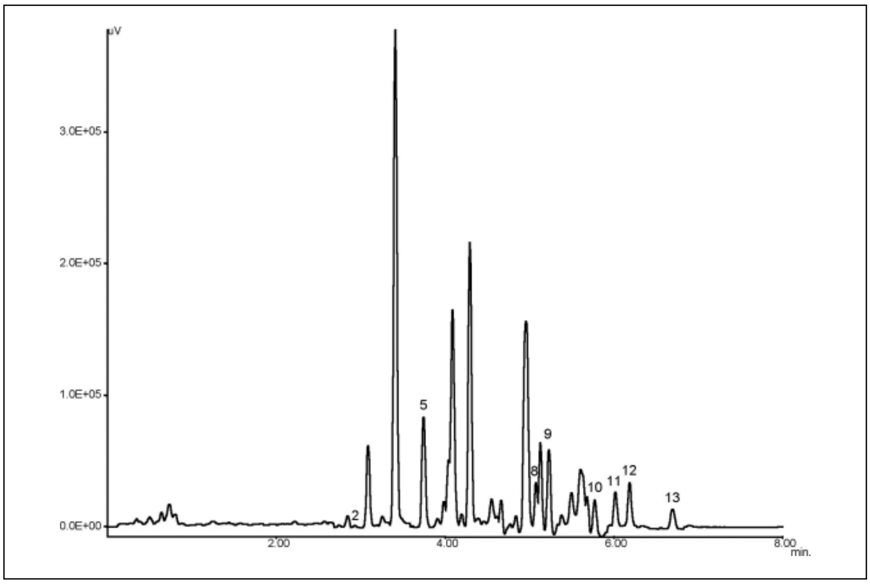

Figure 2 X-LC chromatogram of dust of diesel engine
PAHs were extracted using a soxhlet apparatus.
The other conditions are the same as in Figure 1 caption.

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