

## Supercritical Fluid Extraction (SFE) of Airborne Particulate Matters as Preparation for HPLC Analysis of Benzo(a)pyrene

Among 234 airborne pollutants the polycyclic aromatic hydrocarbon benzo-(a)-pyrene has been assigned as one of the priority pollutants by Central Environment Council, Ministry of the Environment, Japan. This material is reported to have carcinogenic and other adverse health effects and the monitoring has been conducted to determine its origins.

The conventional measurement method requires time-consuming Soxhlet extraction of collected particulate matters using benzene and other hazardous organic solvents. We have investigated the applicability of Supercritical Fluid Extraction of benzo(a)pyrene in airborne particulate matters using carbon dioxide as a sample preparation method for HPLC analysis.

Fig. 1 shows the sample collection and pretreatment procedures. Fig. 2 shows the HPLC chromatogram of the extract containing benzo(a)pyrene with a fluorescence detector. In this method, the collection recovery was 95.4% (in comparison with that by ultrasonic extraction, n=3). The use of carbon dioxide supercritical fluid provides an easy, fast, and highly efficient extraction method.

**Keywords:** *Benzo(a)pyrene; SFE; Fluorescence detection; Airborne particulate matters; HPLC*

### Conditions

#### [ SFE ]

System: SCF-201  
 Extraction vessel: 10 mL (capacity)  
 CO<sub>2</sub> flow rate: 3.0 mL/min  
 CH<sub>3</sub>OH flow rate: 0.3 mL/min  
 Extraction Pressure: 30 Mpa  
 Extraction temp.: 80°C  
 Trap column: SCFpak SIL C1 TP (4.6 mm I.D. x 35 mm)  
 Extraction time: 55 min with a mixture of CO<sub>2</sub> and CH<sub>3</sub>OH and then 10 min with pure CO<sub>2</sub>

#### [ HPLC ]

Column: Crestpak PAHs  
 Column temp.: 40°C  
 Eluent: H<sub>2</sub>O/CH<sub>3</sub>CN (15/85)  
 Flow rate: 1.0 mL/min  
 Wavelengths: Ex 365 nm, Em 410 nm, Gain x 100  
 Sample: the extract of airborne particulate matters  
 Injection volume: 20 µL

1. A high volume air sampler equipped with a quartz fiber filter (sampling area 18 x 23 cm) was run at 1000 L/min for 24 hrs (collected air volume 1440 m<sup>3</sup>).
2. Fifteen-millimeter diameter pieces were punched out from the filter and a set of 10 pieces were subjected to supercritical fluid extraction and the extract was collected.
3. Components trapped on the trap column was eluted with 27 mL of acetonitrile and the effluent was collected.
4. The extract in 2 and the wash liquid in 3 were made up to 50 mL with acetonitrile.
5. 20 mL was injected into the HPLC.

Fig. 1 Collection of airborne particulate matters and sample preparation

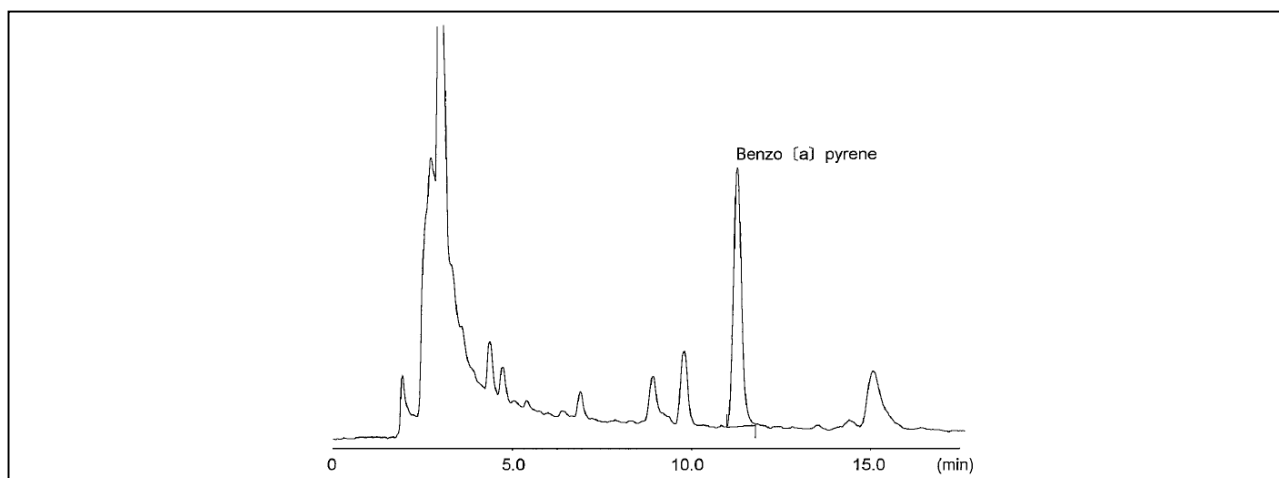


Fig. 2 Chromatogram of benzo(a)pyrene in the extract with a fluorescence detector

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