PAH Analysis Using an Agilent J&W DB-5ms Ultra Inert Capillary GC Column

Application Brief

Environmental

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Introduction

Trace- and ultra trace-level polycyclic aromatic hydrocarbon (PAH) analyses are important tools for accessing environmental quality and foodstuff purity worldwide. In this application, trace-level PAH analyses are demonstrated using electron impact single quadrupole scanning mass spectrometry. In these challenging separations, knowing that the GC column has been thoroughly investigated for column inertness gives the analyst higher confidence in the accuracy of the results.

Agilent has implemented a new testing procedure to more effectively evaluate GC column inertness performance. This new testing procedure employs deliberately aggressive probes to thoroughly investigate column inertness and quality. These aggressive probes, including 1-propionic acid, 4-picoline and trimethyl phosphate, are used to verify each column's inertness performance. This is a rigorous approach that establishes consistent baseline inertness profiles for each column in the Agilent J&W Ultra Inert GC column series.

PAH Analysis

In this application, a 16-component PAH standard mixture was evaluated over a concentration range of 0.05 µg/mL to 5 µg/mL on an Agilent J&W DB-5ms Ultra Inert 30 m × 0.25 mm, 0.25 µm capillary GC column (p/n 122-5532UI). Excellent sensitivity was observed for each of these components across the range studied. Good resolution was obtained in a 15-min analysis for each of the PAHs, with the exception of indeno [1,2,3-c,d]pyrene and dibenz[a,h]anthrancene, which were only partially resolved. Figure 1 shows the total ion chromatogram for a standard injection at the 0.5 µg/mL level; GC conditions are listed in Figure 1.

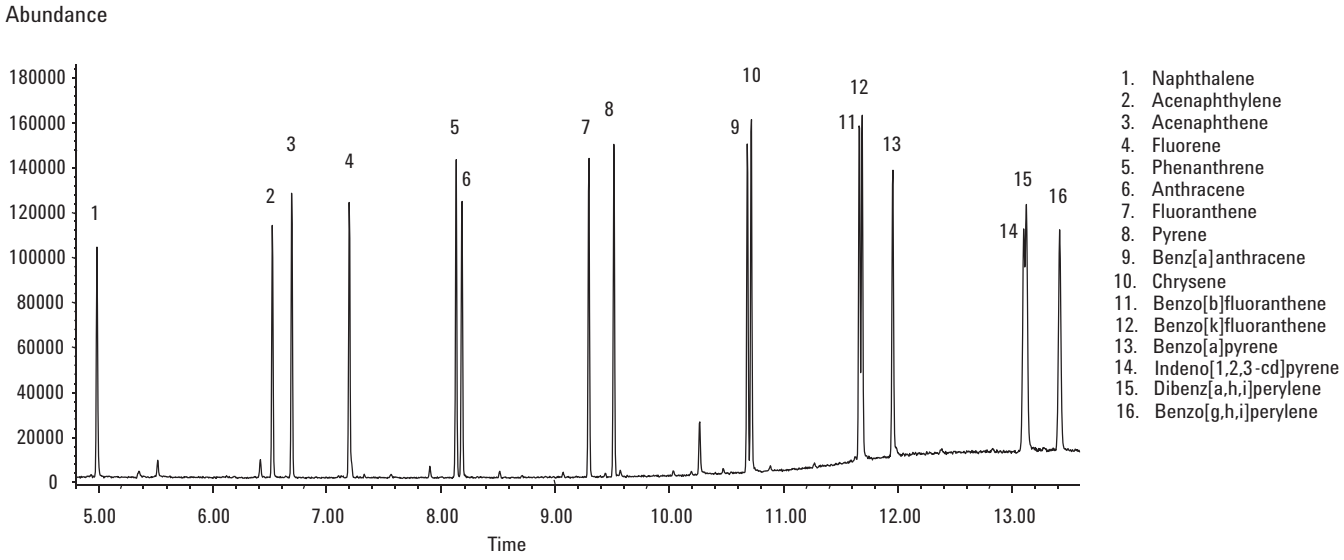

Figure 1. Total ion chromatogram (scanning mode) of a 1 µL injection of the 0.5 µg/mL standard solution on an Agilent J&W DB-5ms Ultra Inert 30 m × 0.25 mm, 0.25 µm capillary GC column (p/n 122-5532UI). This injection represents an on-column loading of 0.5 ng per component.

Table1. Chromatographic Conditions

GC	Agilent 6890N/5973B MSD
Sampler	Agilent 7683B, 5.0 µL syringe (Agilent p/n 5188-5246), 1.0 µL splitless injection, 5 ng each component on column
Carrier	Helium 45 cm/s, constant flow
Inlet	Pulsed splitless; 300 °C, 40 psi until 0.2 min, purge flow 30 mL/min at 0.75 min
Inlet liner	Deactivated dual taper direct connect (Agilent p/n G1544-80700)
Column	Agilent J&W DB-5ms Ultra Inert 30 m × 0.25 mm, 0.25 µm (Agilent p/n 122-5532UI)
Oven	55 °C (1 min) to 320 °C (25 °C/min), hold 3 min
Detection	MSD source at 300 °C, quadrupole at 180 °C, transfer line at 280 °C, scan range 45 to 450 AMU

This application successfully demonstrates the use of an Agilent J&W DB-5ms Ultra Inert capillary GC column for trace-level PAHs in a 15 minute analysis. Linearity was excellent for all 16 PAHs studied, yielding 0.995 or greater R^2 values down to a 0.05 ng column loading of each component. One of the reasons for excellent linearity and high R^2 values is the highly inert surface of the column. The lack of chemically active sites makes these columns excellent choices for trace-level applications.

This study was done exclusively using scanning mode on an Agilent 6890N/5975B GC/MSD equipped with an inert electron impact source. The signal-to-noise ratio for a 0.05 ng on-column loading of benzo[a]pyrene was greater than 9 to 1 with this system. This result clearly shows the power of using an Agilent J&W DB-5ms Ultra Inert column for trace-level PAH analysis.

Access the full application note at:
http://www.chem.agilent.com/Library/applications/5989-9181EN.pdf

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