

Increase Polycyclic Aromatic Hydrocarbon Sample Throughput

With UHPLC and HPLC Column Options

By Michelle Long, Environmental Innovations Chemist

- Two stationary phases optimized for PAH resolution.
- 3.5 minute EPA 610 and 6 minute EU PAH analyses by UHPLC.
- Portugal PAHs resolved by isocratic HPLC in 4 minutes.

Polycyclic aromatic hydrocarbons (PAHs) are environmental contaminants resulting primarily from the incomplete combustion of organic materials. PAHs are an increasing human health concern, as this group of chemicals includes several known or suspected carcinogens. Exposure usually occurs by eating charbroiled foods, inhaling fumes from automobile or industrial emissions, or from other sources such as burning coal, wood, and tobacco. PAHs are also present in some medicines, plastics, and pesticides. National and international regulatory agencies provide target analyte lists and, although these lists are not identical, a number of compounds are common across the recommended lists. Here we analyze target compounds from the United States Environmental Protection Agency (EPA), European Union (EU), and Portugal lists by UHPLC and HPLC. Procedures shown use optimized stationary phases and provide analysis times of 3.5 to 6 minutes, allowing labs to achieve significantly faster sample throughput.

Two Phases Optimized for PAHs

Although most HPLC methods recommend a C18 column, the Pinnacle™ II PAH and Pinnacle™ DB PAH stationary phases both have been optimized specifically for polycyclic aromatic hydrocarbons and offer greater selectivity for these compounds. Pinnacle™ II PAH columns are available in standard formats, while the Pinnacle™ DB PAH columns are offered on 1.9µm silica. To demonstrate the fast analysis times and optimal selectivity of these phases, US, EU, and Portugal lists were analyzed on 1.9µm Pinnacle™ DB PAH columns using ultra-high pressure liquid chromatography (UHPLC). Portugal PAHs were also analyzed isocratically on a Pinnacle™ II PAH (50mm x 3.2mm, 4µm) column. Conventional HPLC was used for the Portugal list because, since only five analytes are included on the target list, fast analysis times and high sample throughput can be achieved without the high backpressures associated with UHPLC.

Fully Resolve PAHs in 3.5 to 6 Minutes

The 1.9µm Pinnacle™ DB PAH column resolved all 18 US EPA 610 analytes in less than 3.5 minutes (Figure 1). The column was held at a constant temperature of 30°C to improve overall peak shape. The priority PAHs included in EU recommendation 256/2005 were also analyzed on the 1.9µm Pinnacle™ DB PAH column and were separated in less than 6 minutes (Figure 2). Using the 1.9µm Pinnacle™ DB PAH column pairs the stationary phase's high selectivity for PAHs with the increased efficiency and fast analysis times of UHPLC. The Portugal PAH list was analyzed by UHPLC (data not shown), but was also analyzed by conventional HPLC using a 4µm Pinnacle™ II PAH column. All target analytes were resolved in less than 4 minutes (Figure 3).

For the analysis of polycyclic aromatic hydrocarbons, two stationary phases provide optimum results. The Pinnacle™ II PAH phase is available in standard column dimensions while the Pinnacle™ DB PAH phase is available in 1.9µm particle size dimensions. Both alkyl phases have been optimized specifically for PAHs and offer exceptionally fast analysis times, providing a significant opportunity to labs interested in increasing sample throughput.

Acknowledgement

Thanks to JASCO for supplying the JASCO X-LC system used for this work.

Figure 1 Baseline resolve EPA 610 PAHs in less than 3.5 minutes on 1.9µm Pinnacle™ DB PAH columns.

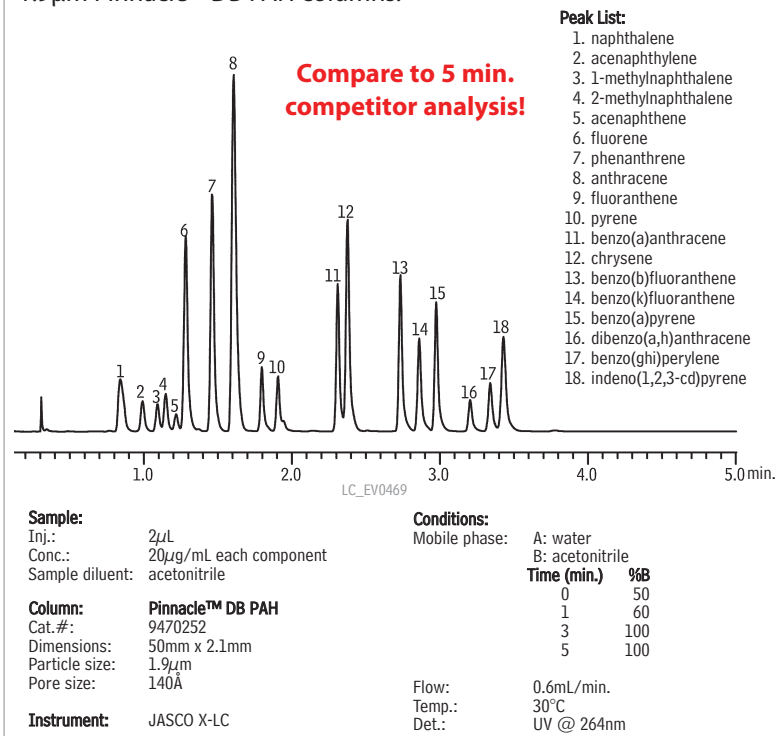
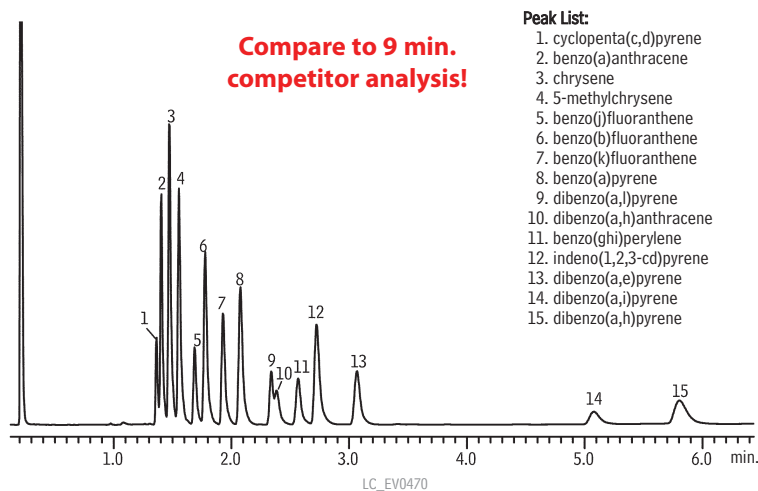


Figure 2 Excellent resolution of EU PAHs on 1.9 μ m Pinnacle™ DB PAH columns.



- Peak List:**
1. cyclopenta(c,d)pyrene
 2. benzo(a)anthracene
 3. chrysene
 4. 5-methylchrysene
 5. benzo(j)fluoranthene
 6. benzo(b)fluoranthene
 7. benzo(k)fluoranthene
 8. benzo(a)pyrene
 9. dibenzo(a,l)pyrene
 10. dibenzo(a,h)anthracene
 11. benzo(ghi)perylene
 12. indeno(1,2,3-cd)pyrene
 13. dibenzo(a,e)pyrene
 14. dibenzo(a,i)pyrene
 15. dibenzo(a,h)pyrene

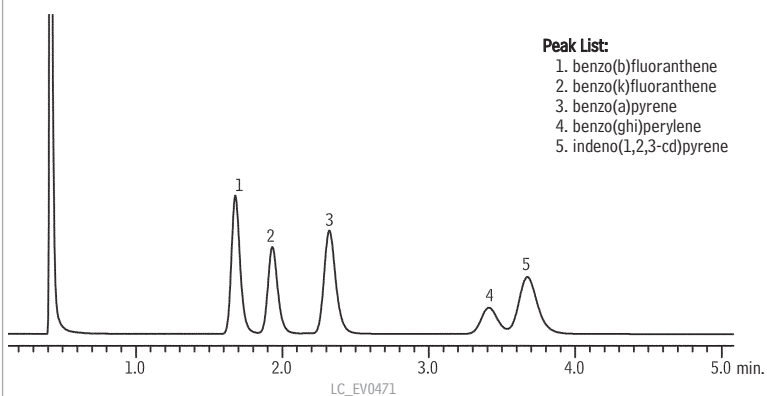
Sample:
Inj.: 2 μ L
Conc.: 20 μ g/mL each component
Sample diluent: acetonitrile

Column: Pinnacle™ DB PAH
Cat. #: 9470252
Dimensions: 50mm x 2.1mm
Particle size: 1.9 μ m
Pore size: 140Å

Instrument: JASCO X-LC

Conditions:
Mobile phase: A: water
B: acetonitrile
Time (min.) %B
0 50
1 90
2 95
5 100
7 100
Flow: 0.6mL/min.
Temp.: 30°C
Det.: UV @ 264nm

Figure 3 Simple, isocratic separation of Portugal PAHs on 4 μ m Pinnacle™ II PAH columns.



- Peak List:**
1. benzo(b)fluoranthene
 2. benzo(k)fluoranthene
 3. benzo(a)pyrene
 4. benzo(ghi)perylene
 5. indeno(1,2,3-cd)pyrene

Sample:
Inj.: 2 μ L
Conc.: 20 μ g/mL each component
Sample diluent: acetonitrile

Column: Pinnacle™ II PAH
Cat. #: 9219453
Dimensions: 50mm x 3.2mm
Particle size: 4 μ m
Pore size: 110Å

Instrument: JASCO X-LC

Conditions:
Mobile phase: water:acetonitrile, 5:95 (v/v)
Flow: 0.6mL/min.
Temp.: 30°C
Det.: UV @ 264nm

Pinnacle™ II PAH Columns

Physical Characteristics:

particle size: 4 μ m, spherical pH range: 2.5 to 10
pore size: 110Å temperature limit: 80°C
endcap: fully endcapped

4μm Column, 3.2mm	cat. #
50mm	9219453

Pinnacle™ DB PAH UHPLC Columns

Physical Characteristics:

particle size: 1.9 μ m pH range: 2.5 to 7.5
pore size: 140Å temperature limit: 80°C
endcap: yes

1.9μm Column, 2.1mm	cat. #
50mm	9470252

ordering note

For guard cartridges for these columns, visit our website at www.restek.com.

The Choice Is Yours

Pinnacle™ DB 1.9 μ m columns
offer the widest variety of
stationary phases for UHPLC

Aqueous C18 PFP Propyl Biphenyl
Cyano Silica C18 IBD C8 X3 PAH

**New phases
now available!**
Cyano • IBD • C8
X3 • PAH

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