

Analysis of Polycyclic Aromatic Hydrocarbons (PAHs) Using a Core Enhanced Technology Accucore HPLC Column

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Abstract

This application note demonstrates the use of the Thermo Scientific Accucore RP-MS HPLC column for the separation of sixteen PAHs.

Introduction

Accucore™ HPLC columns use Core Enhanced Technology™ to facilitate fast and high efficiency separations. The 2.6 µm diameter particles are not totally porous, but rather have a solid core and a porous outer layer. The optimized phase bonding creates a series of high coverage, robust phases. Accucore RP-MS uses an optimized alkyl chain length for more effective coverage of the silica surface. This coverage results in a significant reduction in secondary interactions and thus highly efficient peaks with very low tailing. The tightly controlled 2.6 µm diameter of Accucore particles results in much lower backpressures than typically seen with sub-2 µm materials.

This group of sixteen PAHs are targeted by the United States Environmental Protection Agency (EPA Method 610) as priority pollutants. They are often found in soil and sediment and are known to be carcinogenic, mutagenic and teratogenic. Natural sources of PAHs include volcanic activity and forest fires. Man-made sources of PAHs include incomplete combustion of fossil fuels, waste incineration, tobacco smoke and barbequed meat.

The separation of these sixteen PAHs is demonstrated in this application.



Experimental details

Chemicals and Reagents	Part Number
Fisher Scientific HPLC grade water	W/0106/17
Fisher Scientific HPLC grade acetonitrile	A/0626/17
Fisher Scientific HPLC grade methanol	M/4056/17
NSC Mass Spec Certified 2 mL clear vial with blue bonded PTFE silicone cap	MSCERT4000-34W

Sample Preparation

PAH calibration mix bought in from Sigma Aldrich contained 10 µg/mL of each of the following components in acetonitrile: naphthalene, acenaphthylene, acenaphthene, fluorene, phenanthrene, anthracene, fluoranthene, pyrene, benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, dibenzo(a,h)anthracene, benzo(ghi)perylene, indeno(1,2,3-cd)pyrene.

Separation Conditions	Part Number		
Instrumentation:	Thermo Scientific Accela UHPLC System		
Column:	Accucore RP-MS 2.6 µm, 150 mm x 2.1 mm 17626-152130		
Measured pressure:	460 bar		
Column temperature:	25 °C		
Injection volume:	2 µL		
Flow rate:	0.4 mL/min		
UV detection:	254 nm		
Mobile phase A:	water		
Mobile phase B:	methanol		
Mobile phase C:	acetonitrile		
Gradient:			
Time	A%	B%	C%
0.00	40	40	20
0.50	40	40	20
20.00	0	0	100

Key Words

- Polycyclic aromatic hydrocarbons (PAHs)
- Accucore RP-MS
- Fused core
- Superficially porous
- Core enhanced technology
- Environmental

Results

The analysis was carried out on an Accucore RP-MS 2.6 μm , 150 x 2.1 mm column. The sixteen PAHs eluted in approximately sixteen minutes (Figure 1). Replicate injections of the PAH mix showed that Accucore RP-MS produced stable and reproducible results (Table 2).

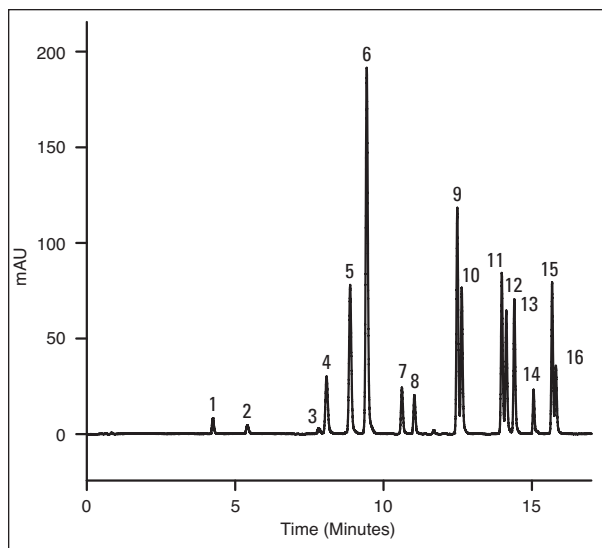


Figure 1: Separation of sixteen PAHs on an Accucore RP-MS 2.6 μm , 150 mm x 2.1 mm column

Conclusions

The Accucore RP-MS column successfully separated sixteen PAHs in approximately sixteen minutes. Accucore RP-MS columns are therefore an excellent choice for the analysis of PAHs.

Analyte	Analyte Name	Retention Time (minutes)	% RSD on Retention Time
1	Naphthalene	4.26	0.59
2	Acenaphthylene	5.43	0.58
3	Acenaphthene	7.83	0.38
4	Fluorene	8.10	0.37
5	Phenanthrene	8.89	0.32
6	Anthracene	9.45	0.28
7	Fluoranthene	10.63	0.21
8	Pyrene	11.05	0.20
9	Chrysene	12.49	0.17
10	Benzo(a)anthracene	12.65	0.17
11	Benzo(b)fluoranthene	14.00	0.15
12	Benzo(k)fluoranthene	14.15	0.14
13	Benzo(a)pyrene	14.41	0.13
14	Dibenzo(a,h)anthracene	15.06	0.12
15	Indeno(1,2,3-cd)pyrene	15.69	0.11
16	Benzo(ghi)perylene	15.81	0.11

Table 2: Method precision (%RSD) for sixteen PAHs (data calculated from six replicate injections)

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