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Determination of Polycyclic Aromatic Hydrocarbons in Drinking Water by Liquid-Solid Extraction and High Performance Liquid Chromatography with Ultraviolet Detection

Waters Corporation

This is an Application Brief and does not contain a detailed

Experimental section.

Abstract

In this application brief, Polycyclic aromatic hydrocarbons (PAHs) are determined in drinking water by Liquid- Solid extraction and High Performance Liquid Chromatography with Ultraviolet detection.

Introduction

Polycyclic aromatic hydrocarbons (PAHs) are one of the most wide-spread organic pollutants. PAHs are made up of fused aromatic rings and are formed during the combustion of carbon based fuels (wood, coal, diesel), as well as being present in crude oil. The United States Environmental Protection Agency (US EPA) has classified seven PAH compounds as being potentially carcinogenic including benz[a]anthra-cene, benzo[a]pyrene, benzo[b]fluoranthene, benzo[k]fluoranthene, chrysene, dibenz[a,h]anthracene, and indeno[1,2,3-cd]pyrene.

Experimental

HPLC conditions

Instrument:	Waters Alliance HPLC system with PDA and fluorescence detectors
Eluent:	Water/acetonitrile (Table 1)
Column:	Waters PAH 4.6 x 250 mm (part no. 186001265) @ 30 °C
Injection:	20 µL of Supelco Standard EPA 610 (#48743) diluted 1:50 in 40:60 water/acetonitrile

Flow Rate:	1.2 mL/min
Detection:	UV @ 254 nm and fluorescence using timed programmed wavelengths
Data:	Waters Empower software

Sample preparation

Extract with C_{18} cartridge, elute with $MeCl_2$

Eluent preparation

Filter and degas through a 0.45 µm filter.

A: Water

B: Acetonitrile

Eluent gradient

Time	Flow	%A	%B	Curve
Initial	1.2	40	60	-
12	1.2	0	100	9
23	1.2	40	60	11

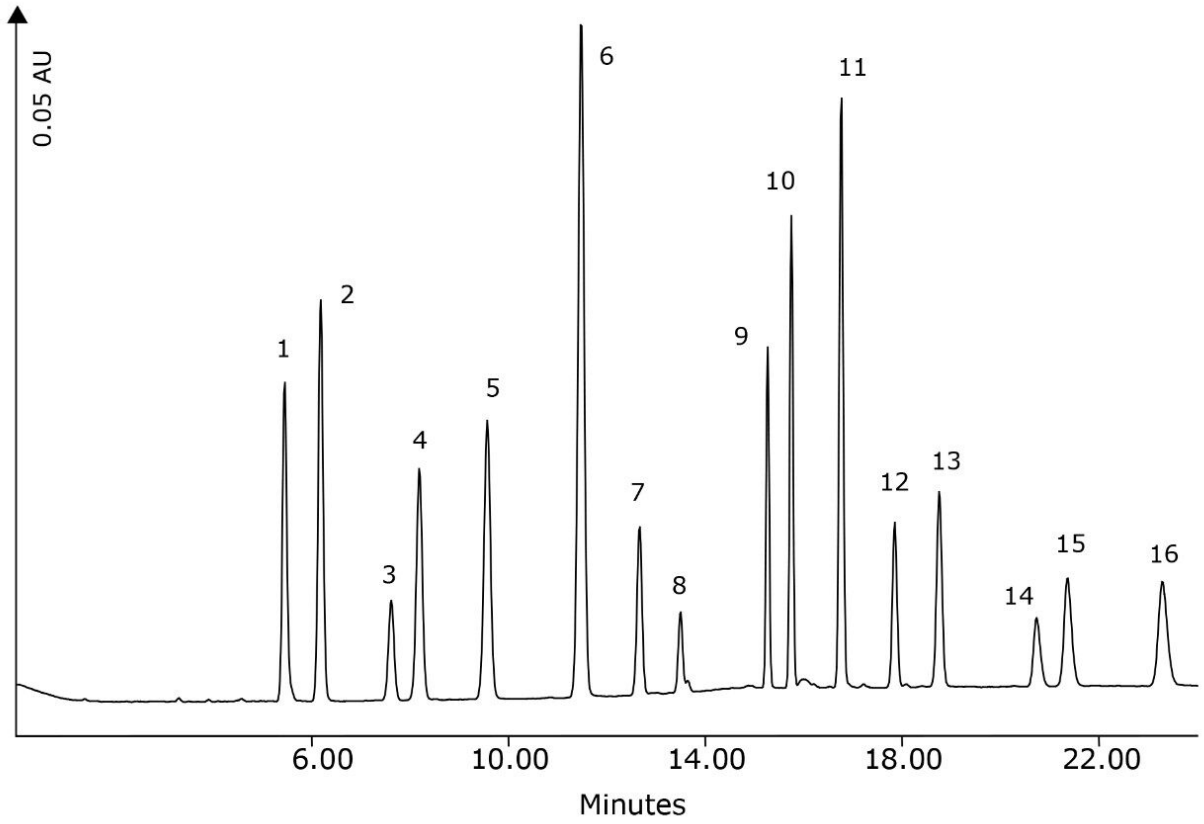
	Analyte	UV Max (nm)	EX (nm)	EM (nm)	Detection Limit (ppb)[1]
1	Naphthalene	220	277	330	0.14
2	Acenaphthylene	229	NA	NA	NA
3	Acenaphthene	227	270	323	0.01
4	Fluorene	261	265	310	0.03
5	Phenanthrene	251	252	365	0.02
6	Anthracene	252	250	402	0.01
7	Fluoranthene	236	284	467	0.02
8	Pyrene	240	332	378	0.01
9	Benzo(a)anthracene	287	284	390	0.01
10	Chrysene	267	270	367	0.04
11	Benzo(b)fluoranthene	256	298	436	0.09
12	Benzo(k)fluoranthene	307	303	432	0.01
13	Benzo(a)pyrene[2]	296	280	410	0.03
14	Dibenzo(a,h)anthracene	297	294	398	0.01
15	Benzo(g,h,I)perylene	299	290	420	0.03
16	Indeno(1,2,3-cd)pyrene	250	305	480	0.49

[1] *Fluorescence mode used for detection limit determination, no pre-concentration. Seven replicates per 40 CFR pt. 136 App. B.*

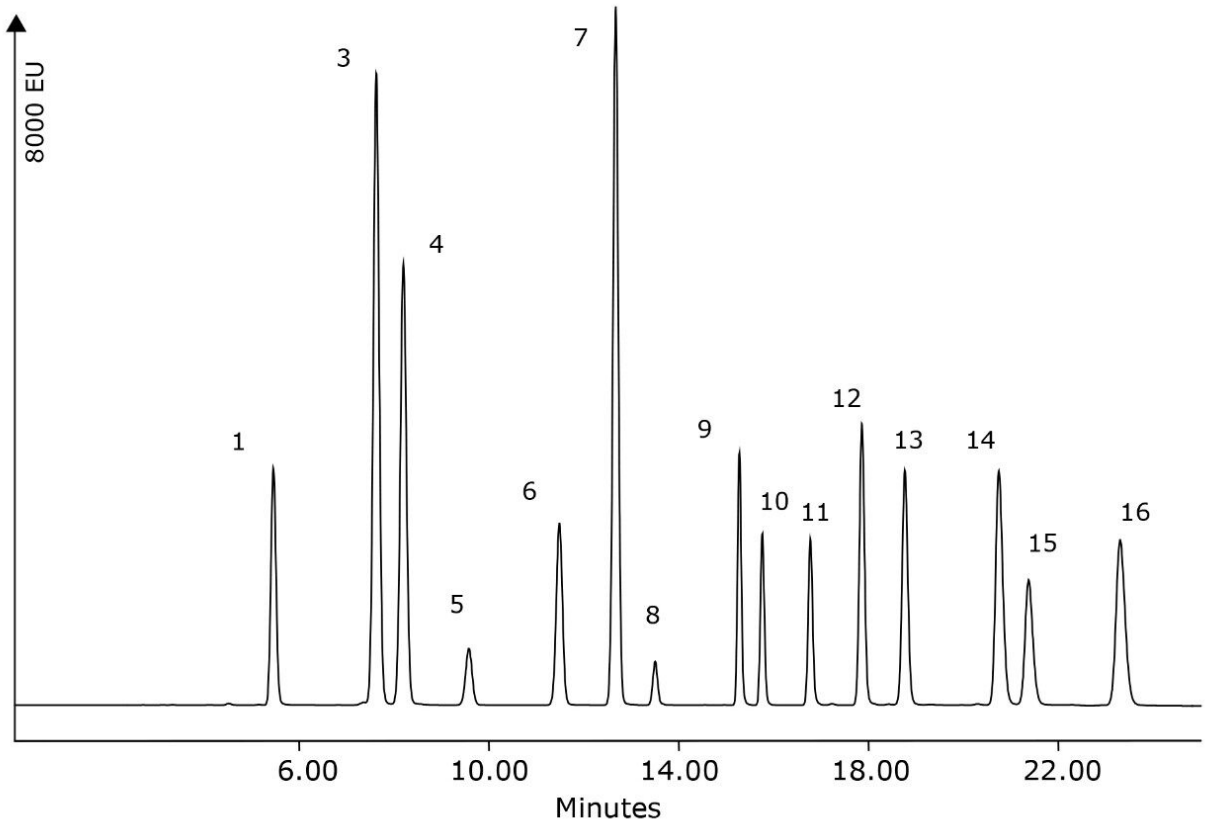
[2] *Regulated compound; action level 0.17 ppb.*

Results and Discussion

PAH target analytes.



Standard chromatogram, UV @ 254 nm, 1-20 ppm PAH analytes.



Standard chromatogram, fluorescence/programmed wavelengths, 1-20 ppm PAH analytes.

Featured Products

Alliance HPLC System <https://www.waters.com/534293>

Empower 3 Chromatography Data Software <https://www.waters.com/10190669>

2475 Fluorescence (FLR) Detector <https://www.waters.com/514434>

2998 Photodiode Array (PDA) Detector <https://www.waters.com/1001362>

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