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Nota applicativa

Determination of Polycyclic Aromatic Hydrocarbons in Municipal and Industrial Wastewater

Waters Corporation

This is an Application Brief and does not contain a detailed Experimental section.

Abstract

This Application note demonstrates the determination of Polycyclic Aromatic Hydrocarbons in municipal and industrial wastewater.

Introduction

Polycyclic aromatic hydrocarbons (PAHs) are one of the most widespread 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]anthracene, 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
Column:	Waters PAH 4.6 x 250 mm @ 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

Liquid/liquid extraction with $MeCl_2$

Eluent preparation

Filter and degas through a 0.45 µm filter.

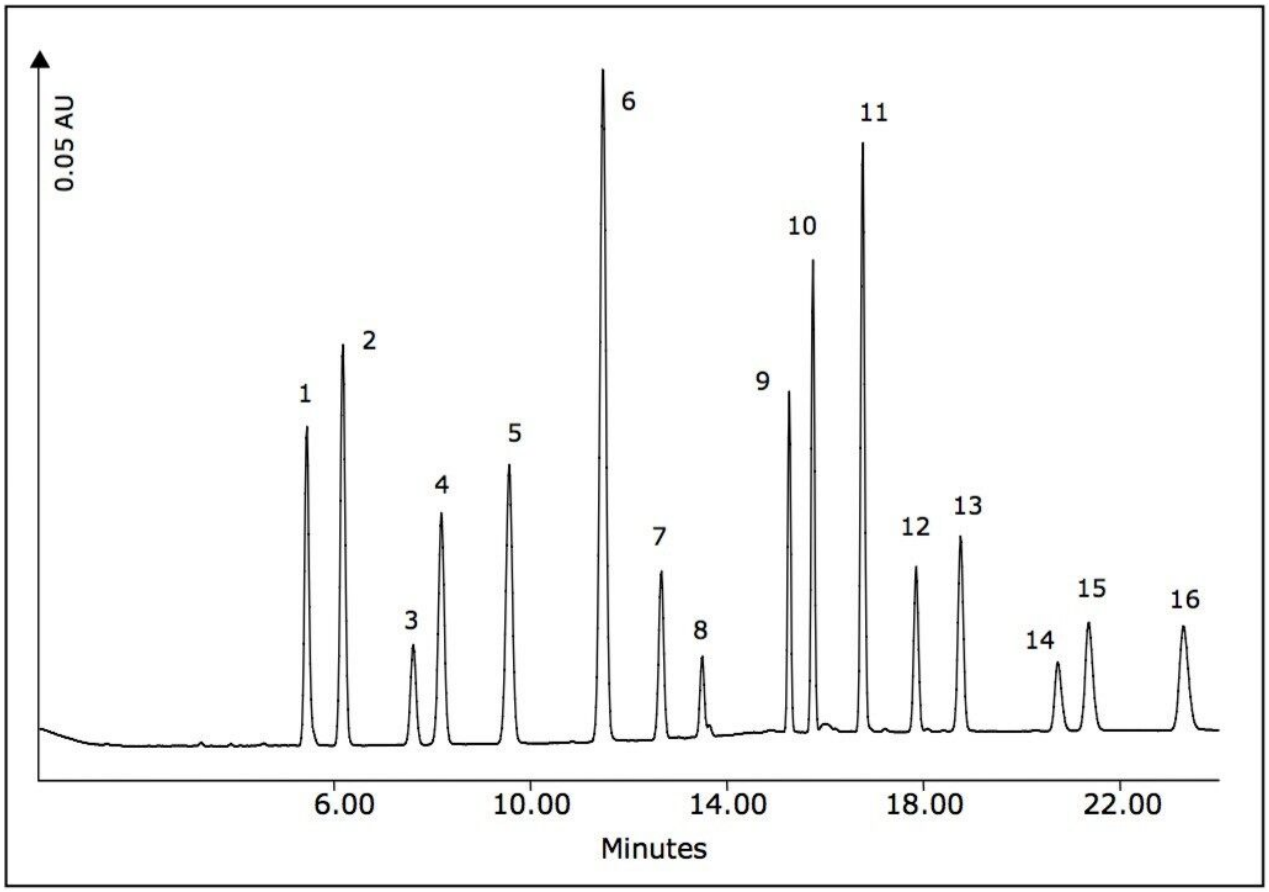
A: Water

B: Acetonitrile

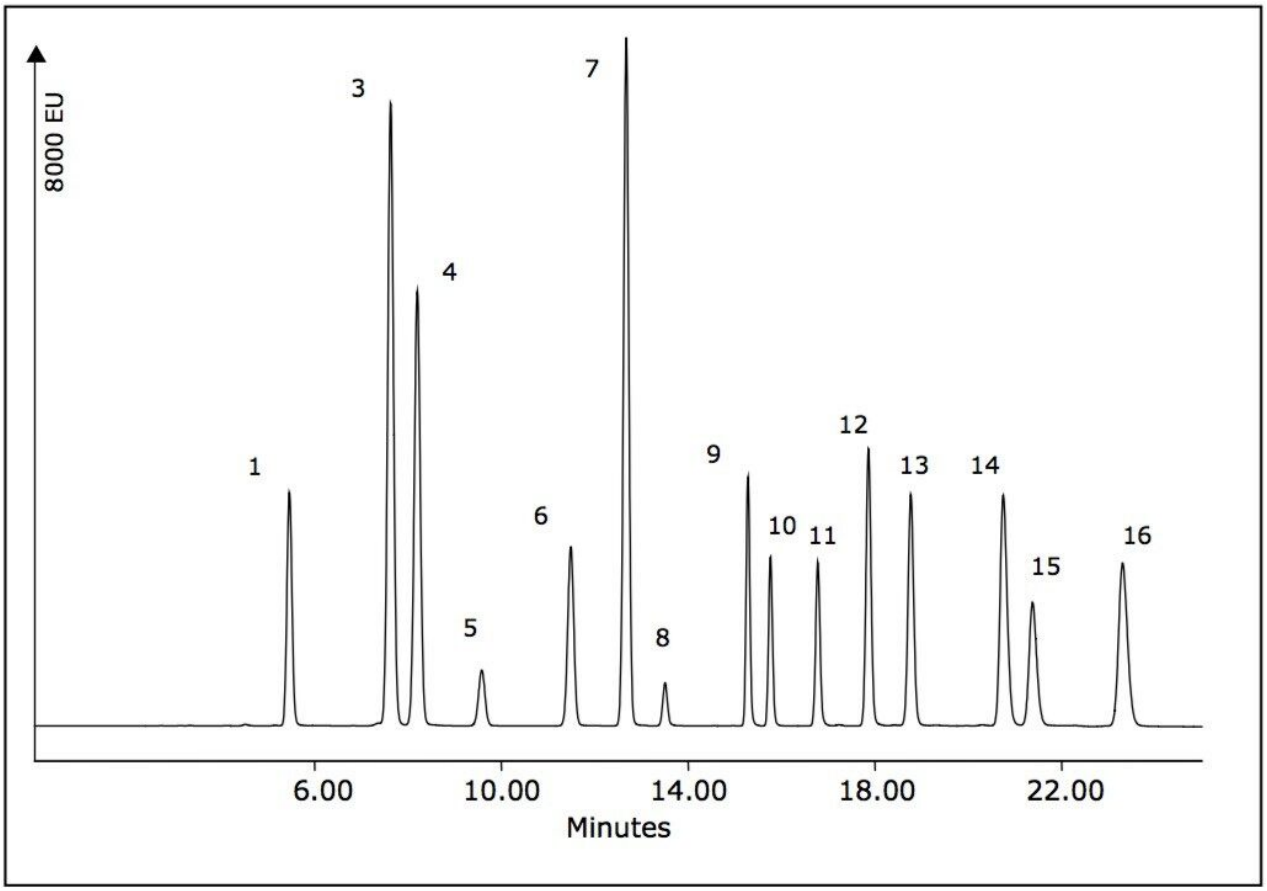
Time	Flow	%A	%B	Curve
Initial	1.2	40	60	-
12.0	1.2	0	100	9
23.0	1.2	40	60	11

Eluent gradient.

Results and Discussion



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



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

	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.

PAH target analytes.

References

1. The Determination of Biodegradation Products of PAH Using LC-MS/MS: WA20747
2. PAHs in Drinking Water – Oasis Solution: WA31764.127
3. Waters PAH Columns Improve Analysis of PAH Compounds: 720000382EN

Featured Products

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

Empower 3 Chromatography Data Software <https://www.waters.com/513188>

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

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

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