

PAH Determination in Sediment

SpeedExtractor E-916:

Extraction of Sediment using the SpeedExtractor E-916 for the Determination of Polycyclic Aromatic Hydrocarbons (PAHs)

Polycyclic aromatic hydrocarbons (PAH) are of concern because some compounds have been identified as carcinogenic, mutagenic and teratogenic. Sediment samples from a round robin program (SETOC 2008/4, Wepal, Wageningen University) were extracted according to EPA 3545A [1] with the SpeedExtractor E-916 and analyzed by GC-MS. The results correspond to the values found by the round robin testing and show high recovery and low variation.

1. Introduction

Polycyclic aromatic hydrocarbons (PAHs) are chemical compounds that consist of fused aromatic rings and do not contain heteroatoms or carry substituents. The lead substance benzo(a)pyrene is shown in Figure 1.

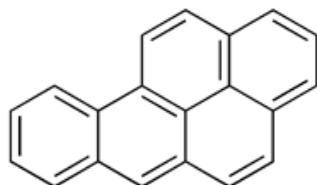


Figure 1: Benzo(a)pyrene

PAHs occur in oil, coal and tar produced by cal carbonization, but not in bitumen. They are also found in grilled meat, cigarette smoke and automobile exhaust. PAHs are persistent, ubiquitous and some of them have carcinogenic, mutagenic and teratogenic properties.

2. Experimental

Instrumentation: SpeedExtractor E-916 with 20 mL cells, GC-MS Varian 3000

Samples: 4 samples from the SETOC 2008/4 round robin program, Wepal, Wageningen University

Approx. 3 g of dry sample was mixed with 10 g of sand and filled into the extraction cell. After addition of the internal standard solution the samples were extracted using the parameters shown in Table 1. A four-fold extraction was performed. The received extracts were analyzed by GC-MS.

Table 1: Extraction method for Speed-Extractor E-916

Parameter	Value
Temperature	100° C
Pressure	120 bar
Solvent	Acetone 50% Hexane 50%
Cells	20 mL
Vials	240 mL
Cycles	2
Heat-up	1 min
Hold	10 min
Discharge	2 min
Flush with solvent	1 min
Flush with gas	2 min

3. Results

The results correspond to the values found by the round robin testing and show good recovery and low variation. The results for the lead substance benzo(a)pyrene are shown in Table 2. The total extraction time was about 40 min, and approx. 50 mL of solvent per cell was used.

Table 2: Values for benzo(a)pyrene, SpeedExtractor: RSD for four-fold extraction, SETOC: RSD for results from the participating 43 laboratories of the round robin.

	SpeedExtractor E-916		SETOC	
	Mean Value µg/kg	RSD % (n=4)	Mean Value µg/kg	RSD % (n=43)
Sample 1	495	9	463	13
Sample 2	239	10	211	22
Sample 3	1046	8	989	10
Sample 4	1484	7	1330	14

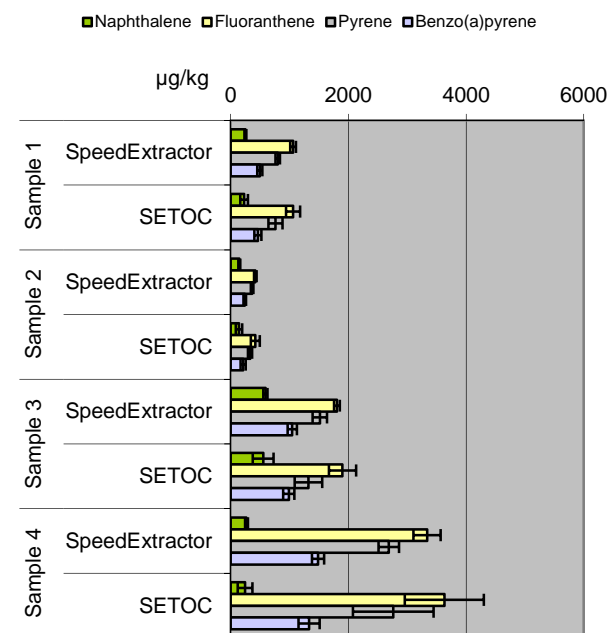


Figure 1: Selection of PAHs

4. Conclusion

The extraction by SpeedExtractor E-916 represents a reliable and comparable procedure for the determination of PAH in sediments.

5. References

[1] U.S. Environmental Protection Agency. Method 3545A, Pressurized Fluid Extraction (PFE)

For more detailed information refer to Application note 008/2009