

Polychlorinated biphenyls in sediment

UniversalExtractor E-800: Soxhlet warm extraction of a sediment sample using the UniversalExtractor E-800 for the determination of polychlorinated biphenyls (PCBs)

Polychlorinated biphenyls (PCBs) are a class of organic compounds based on biphenyl substituted with 1-10 chlorine atoms. There are 209 different congeners. To simplify the description, they are usually specified with a number from 1 to 209.

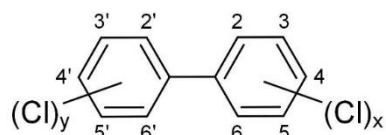


Figure 1: Formula of polychlorinated biphenyls.

Till the 1980s PCBs were used as coolants and dielectric fluid in transformers, flame retardants, hydraulic fluids, additives in plastics and for many other applications. They are toxic, persistent and bioaccumulate in terrestrial and aquatic biosystems and are ubiquitous in the environment. Production and use is nowadays banned nearly worldwide.

1. Introduction

This Short Note describes the extraction and determination of PCBs in a dried sediment SETOC sample according to EPA 3541 [1]. The sample was extracted with the UniversalExtractor E-800 using the Soxhlet warm mode. The quantification was done by Labor Veritas Zurich, an ISO 17025 accredited laboratory.

2. Experimental

Equipment: UniversalExtractor E-800, Syncore® Analyst with 1 mL appendix vessels, GC-MS/MS.

Samples: sediment sample, SETOC 777 (61), dry sample. 10 g sample was weighed in an extraction thimble and mixed with 10 g sodium sulfate. 1 mL internal Standard was added. The thimble was placed into the extraction chamber of the UniversalExtractor E-800 and the optical sensor was adjusted to the sample height. The sample was extracted using the parameters shown in Table 1.

Table 1: Extraction method for UniversalExtractor E-800.

Parameter	Value
Extraction method	Soxhlet warm
Solvent	n-Hexane / Acetone (1:1)
Solvent volume	150 mL
Extraction time	180 min
Extraction heating level	11
Chamber heating level	3
Rinse time	5 min
Rinse heating level	11
Drying time	5 min
Drying heating level	10

After extraction, the extract was transferred into 1 mL appendix vessels and concentrated using the Syncore Analyst. The analysis was carried on GC-MS/MS.

3. Results

The results of the PCB determination in a sediment sample are shown in Table 2. The results corresponded to the values of the round robin testing and showed good recovery and low variation.

Table 2: Results of the PCB determination using the UniversalExtractor E-800 and GC/MS (n=3).

	E-800		SETOC	
	Mean µg/kg	rsd %	Recovery %	Consensus value µg/kg
PCB 28	19.7	0.6	99	20.0
PCB 52	20.8	3.1	113	18.4
PCB 101	20.4	0.7	86	23.8
PCB 118	13.9	0.7	97	14.4
PCB 138	19.9	13.1	-	-
PCB 153	28.0	8.8	94	29.8
PCB 180	14.7	5.8	108	13.6

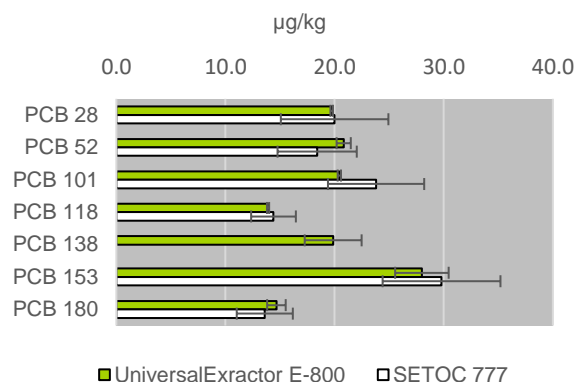


Figure 2: Results of the PCB determination using the UniversalExtractor E-800 (n= 3) and SETOC consensus values.

4. Conclusion

The method presented in this Short Note demonstrates that the extraction by UniversalExtractor E-800 using the Soxhlet warm mode is a fast and reliable way to extract PCBs from sediment samples.

5. Acknowledgement

We greatly acknowledge Labor Veritas Zürich, Mr. P. Leupin and Mr. O. Altgott for their support for the development of this Short Note.

6. References

- [1] U.S. Environmental Protection Agency. Method 3541, Automated Soxhlet Extraction.
- [2] SETOC Round Robin, <http://www.wepal.nl/website/products/SEToc.htm>

For more detailed information refer to Application note 359/2019