**CEFIC-LRI ECO22**

**Advancing the use of passive sampling in risk assessment and management of contaminated sediments: an inter-laboratory comparison study on measurements of freely dissolved (bioavailable) concentrations using different passive sampling formats**

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| In the CEFIC-LRI ECO22 project, an inter-laboratory comparison study was performed on ex situ passive sampling in sediments. The main objectives were to map the state of the science in passively sampling sediments, identify sources of variability, provide recommendations and practical guidance for standardized passive sampling, and advance the use of passive sampling outside the scientific domain by increasing confidence in the use of technique. The study was performed by a consortium of 11 research laboratories and included experiments with 14 passive sampling formats on 3 sediments and 25 target chemicals (PAHs and PCBs). The resulting overall inter-laboratory variability was large, but standardization of methods halved the observed variability. The remaining variability was mostly due to factors that were not related to passive sampling itself, i.e., sediment heterogeneity and analytical chemistry. Excluding the latter source of variability showed that passive sampling results can have a high precision and a very low inter-method variability (< factor of 1.7). The results of the project demonstrate that passive sampling, irrespective of the specific method used, is fit for implementation in risk assessment and management of contaminated sediments, provided that method setup and performance, as well as chemical analyses are quality-controlled.  |

**Executive Summary**

The main objective of the CEFIC-LRI ECO22 project was to advance the use of passive sampling in risk assessment and management of contaminated sediments, through the performance of an inter-laboratory comparison study. Passive sampling methods (i.e., partitioning-based, non-depletive extractions with polymers) are used to determine freely dissolved concentrations (*C*free) of organic chemicals in surface water and pore water of sediments and soils, and represent the most widely-used and well-characterized methods for assessing bioavailable concentrations in sediments. While there has been some progress in regulatory acceptance of passive sampling for sediment risk assessment, adoption has been slow, partly due to a lack of consensus among scientists on the best approach and validation across laboratories on the methods. Therefore, an international inter-laboratory comparison study on different passive sampling formats was performed in the CEFIC-LRI ECO22 project, in order to (1) map the state of the science in determining *C*free in sediments with (*ex situ*) passive sampling; (2) identify the sources of variability by means of tiered experiments; (3) provide recommendations and practical guidance for standardized *C*free determinations; and (4) increase confidence in the use of passive sampling and to advance its use outside the scientific domain. The inter-laboratory comparison study was performed by a consortium of 11 research laboratories with a track record in passive sampling, and included experiments with 14 passive sampling formats (different polymers, suppliers, shapes, thicknesses) on 3 sediments and 25 target chemicals (PAHs and PCBs). The resulting overall inter-laboratory variability was large; the averaged (all chemicals, samplers, and sediments) variation factor measured 10, but for certain chemicals the reported concentrations varied over more than 2 orders of magnitude. Standardization of methods halved the observed variability. The remaining variability was mostly due to factors that were not related to passive sampling itself, i.e., sediment heterogeneity and analytical chemistry (identification, integration, and calibration of the target compounds). Excluding the latter source of variability by performing all analyses in one laboratory showed that *C*free can be determined with high precision, having a very low inter-method (i.e., passive sampler) variability (< factor of 1.7). It is concluded that passive sampling, irrespective of the specific method used, is fit for implementation in risk assessment and management of contaminated sediments, provided that chemical analyses are quality-controlled and standard protocols are being followed. As a follow-up of the CEFIC LRI ECO22 project, practical guidance (a proposed standard protocol) will be prepared jointly by the participants of the inter-laboratory comparison study.