**Cefic LRI ECO43 - Layman summary**

To evaluate their environmental safety, chemicals are characterized in terms of environmental fate and effects. Chemicals with a low solubility in water may end up in sediments; hence, any effects of these substances on sediment-dwelling organisms should be mapped. Standard tests and protocols are available for testing ‘sediment toxicity’ of chemicals, but the application of these to chemicals with a very low solubility in water (very hydrophobic organic chemicals; VHOCs) often leads to biased and unreliable results, because VHOCs are difficult-to-test chemicals, which are very challenging to work with.

The general objective of the Cefic LRI ECO43 project was to improve sediment toxicity testing design, performance, and data interpretation for VHOCs and to develop guidance on these aspects to maximize realism and value of future testing and support product and environmental safety assessment. To achieve this objective, a critical literature review, modelling activities, and many dedicated laboratory experiments were carried out. The experimental work focused on obtaining new knowledge on the (concentration-dependent) phase distribution of VHOCs in sediments, the optimal way of adding VHOCs to sediment (spiking) and homogenization, the quantification of VHOC exposure concentrations in sediments, the uptake rates of VHOCs in sediment-dwelling organisms, the impact of VHOC-sediment contact time on toxicity, and the effects of organism fouling with neat substances (‘oiling’) on toxicity assay responses.

The literature review suggested that the majority of published studies on VHOCs applied inappropriate spiking and/or mixing, which potentially resulted in either false positive or false negative toxicity results. Subsequent laboratory experiments indicated that currently recommended standard protocols may actually lead to the underlying artifacts. These can be circumvented by applying the right way of spiking and intensive, mechanical mixing. Following the spiking, sediments should be intensively mixed, preferably on a roller couch at high speed for 1-2 weeks. This produces a chemically-homogeneous system, minimizes the occurrence of precipitates and oily phases, and leads to stable results during the subsequent toxicity assays. Uptake of VHOCs in test organisms from spiked sediment appeared to be faster than expected and standard toxicity assays lasting for 28 days therefore are appropriate for these chemicals. Further project results showed that exposure quantification of VHOCs in sediments is possible with so-called ‘passive sampling’. This technique, for which a standard protocol was published as part of the project, additionally can be used to estimate the aqueous solubility of VHOCs and to identify the concentration in sediment above which the chemicals start forming a neat phase (oily phase or crystals): the so-called critical separate phase concentration (CSPC). CSPCs for several test VHOCs were determined to be in the range of 1000-3000 mg/kg sediment. Above this concentration, test organisms may get ‘fouled’ by the spiked substance, leading to physical effects, which should be distinguished from actual, biochemical toxicity. Discriminating between actual toxicity and physical effects is possible by combining tests using specific organisms with a broad test concentration range and passive sampling to localize the CSPC.

Based on the results and experience gained in the ECO43 project, practical guidance and recommendations with respect to the design, performance, data interpretation, and future research in sediment toxicity testing with VHOCs are provided.