

Guidance for using solid-phase microextraction in fish bioconcentration studies according to OECD TG 305

L. Boehm¹, C. Rauert², R. Duering¹, Christian Schlechtriem³

¹Justus Liebig University Giessen, Institute of Soil Science and Soil Conservation, Germany

²Federal Environment Agency (UBA), Wörlitzer Pl. 1, 06844 Dessau-Roßlau, Germany

³Fraunhofer IME, Department of Ecotoxicology, Auf dem Aberg 1, 57392 Schmallenberg, Germany

Fish bioconcentration studies needed for the safety assessment of chemicals are commonly performed according to the OECD Test Guideline 305 (OECD TG 305). The studies result in a bioconcentration factor (BCF) calculated by the chemical's concentration in fish divided by its concentration in the water phase. The method most often used for the extraction of the water phase is conventional solvent extraction by liquid-liquid extraction (LLE), which is considered as an exhaustive extraction method yielding total water concentrations. However, conventional water analysis in fish bioconcentration studies can result in an underestimation of BCF values of highly hydrophobic organic chemicals (HOCs) when their freely dissolved water concentrations are reduced by sorption to organic matter but total water concentrations are extracted. However, with solid-phase microextraction (SPME), the discrimination between total and freely dissolved analyte concentrations is possible. Therefore, the 2012 revised OECD TG 305 recommends the use of SPME for the extraction of water concentrations of (highly) HOCs. The use of SPME in fish bioconcentration studies will be explained in a Guidance Document on OECD TG 305, which will be finalized in 2017. The present contribution presents relevant information on SPME as given in the upcoming Guidance Document supported by results from a bioconcentration study with rainbow trout, where three (highly) HOCs were extracted comparatively by LLE and SPME. These results help to explain factors influencing bioconcentration systems and provide relevant insights about the use of different extraction methods in fish bioconcentration studies with highly HOCs carried out according to OECD TG 305.