Is equilibrium sampling applicable in routine sediment monitoring?

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587 Is equilibrium sampling applicable in routine sediment monitoring? S. Schaefer, German Federal Institute of Hydrology; C. Antoni, Goethe University; C. Moehlenkamp, Federal Institute of Hydrology; E. Claus, Federal Institute of Hydrology BfG; G. Reifferscheid, Biochemistry and Ecotoxicology; P. Heininger, Federal Institute of Hydrology; P. Mayer, Technical University of Denmark / Department of Environmental Engineering. Freely dissolved concentrations (C_{free}) of hydrophobic organic contaminants in sediments are considered to be the effective concentrations and are more indicative of potential exposure of aquatic organisms than total concentrations (C_{total}). Passive equilibrium sampling approaches can be used to measure C_{free} in sediment pore water. Thereby, glass jars with silicone coatings of few µm thickness are very convenient for routine monitoring campaigns since the risky and time-consuming equilibration is done in the laboratory. Tedious time-serious measurements are avoided by incubating sediment sub-samples in coated glass jars with different thicknesses of silicone for validation of equilibrium sampling. Though the German Federal Institute of Hydrology has regularly monitored sediments from the German part of the River Elbe for total concentrations of, e.g., polychlorinated biphenyls (PCBs) and Dichlordiphenyltrichlorethane (DDT) and their metabolites since the 1990s, C_{free} in these sediments are largely unkown. Coated glass jars were applied to sediments from the River Elbe in order to measure C_{free} of PCBs as well as DDT and their metabolites. For this purpose, sediments were sampled at ten stations within the German part of the River Elbe from the Czech border to the wire near Geesthacht. Sediments were incubated in silicone coated glass jars for two weeks in the laboratory, the silicone was extracted and analysed by GC/MS/MS detection. Analyte amounts in silicone were proportional to the amount of silicone for all investigated contaminants and sampling sites confirming equilibrium sampling. C_{free} were in the pg / L range for PCBs and up to the lower ng / L range for DDT metabolites. Patterns of PCB accumulation in equilibrium samplers with highest values primarily for PCB 138 and PCB 153 were similar to C_{total} quantified by traditional exhaustive extraction and analysis. Though, C_{total} of p,p'-DDT are high in the River Elbe, p,p'-DDT was rarely detected in equilibrium sampling extracts and could only be quantified in sediments from two stations hinting at a strong binding of p,p'-DDT to sediment particles. In comparison with other DDT metabolites, C_{free} of DDD isomers were highest. Overall, C_{free} of PCBs and DDT metabolites clearly reflect the contamination of the river Elbe. For PCBs, estimated concentrations in biota ($C_{sed, lipid}$) obtained by equilibrium sampler data highly correlate with bioaccumulation in fish.