

Experimental verification of a model describing solid phase microextraction (SPME) of freely dissolved organic pollutants in sediment porewater

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ABSTRACT

To verify a theoretical mass balance and multiple compartment partitioning model developed to predict freely dissolved concentrations (FDCs) of hydrophobic organic chemicals (HOCs) using negligible depletion-solid phase microextraction (nd-SPME), a series of sediment slurry experiments were performed using disposable poly(dimethyl)siloxane (PDMS) coated solid phase microextraction (SPME) fibers and ¹⁴C-radiolabeled HOC analogs. First, pre-calibration of disposable PDMS coated fibers for four model compounds (phenanthrene, PCB 52, PCB 153 and *p,p'*-DDE) with good precision ($\leq 10\%$) was achieved. Second, sediment slurries spiked and aged with the radiolabeled analogs were extracted by SPME with manipulation of the sediment slurry mass or the PDMS coating volume. The measured extent of depletion by SPME (x_e) decreased with increasing sediment mass (m_s); conversely, x_e increased with increasing PDMS coating volume (V_f), which is consistent with the theoretical prediction from our previous model (Yang *et al.* 2007b). Moreover, the SPME-measured FDCs ($C_{pw,SPME}$) followed the order of phenanthrene > PCB 52 > *p,p'*-DDE > PCB 153, and the measured and predicted C_{pw} values were not substantially different from empirically determined values except for *p,p'*-DDE.

Full Text

ftp://ftp.sccwrp.org/pub/download/DOCUMENTS/AnnualReports/2008AnnualReport/AR08_029_038.pdf