DTU Library

Passive dosing as a tool to derive fugacity capacities of a variety of leaves for semi-volatile persistent organic contaminants

Bolinius, D. J.; Mayer, Philipp; MacLeod, M.; Mclachlan, Michael S.; Jahnke, A.

Published in:
Science Across Bridges, Borders and Boundaries

Publication date:
2014

Document Version
Publisher's PDF, also known as Version of record

TH071 Passive dosing as a tool to derive fugacity capacities of a variety of leaves for semi-volatile persistent organic contaminants.

D.J. Bolinius, Department of applied environmental science; P. Mayer, Technical University of Denmark / Department of Environmental Engineering; M. MacLeod, ITM Stockhom University / Dept of Applied Environmental Science ITM; M.S. McLachlan, Stockholm University; A. Jahnke, Stockholm University / Department of Applied Environmental Science ITM. The silicone polydimethylsiloxane (PDMS) has proven useful as a tool in experimental environmental chemistry: It has been applied successfully as a passive sampler[1] as well as a reliable donor in passive dosing experiments[2]. In this study we extend the application of PDMS as a passive dosing source to derive fugacity capacities (*Z*) of a variety of matrices for semi-volatile persistent organic contaminants. *Z*, expressed in mol m^{-3} Pa^{-1}, is a measure of the extent to which a chemical can be absorbed by a given matrix at a specific temperature. It is an important and frequently used parameter in modeling the environmental fate of chemicals[3]. Our experimental apparatus, based on Mayer et al.[4], consists of a thin disc of the sample wedged between 2 layers of PDMS loaded with the chemicals of interest. The PDMS is left to equilibrate with the sample and based on the known *Z* values of the PDMS for these chemicals, the *Z* value of the sample can be derived. The ease of the setup makes the approach suitable to measure the *Z* values of a wide variety of matrices. The challenge lies in keeping the PDMS the dominant reservoir of the chemical in the system. Analyzing tissues that are too rich in lipid risks depleting the PDMS to the extent that it becomes hard to accurately determine the fugacity capacity. Within the scope of our studies focusing on the so-called 'forest filter effect' we have applied the method to a variety of leaves. Existing multimedia chemical fate models that incorporate a forest compartment currently only assign two different Z values for foliage: One for conifers one for deciduous trees[5]. The composition of leaves is highly variable however. By measuring *Z* for a wide variety of foliage and linking these values to species-specific properties, we hope to achieve a better understanding of the cycling of semi-volatile persistent organic chemicals in forest systems. New *Z* values can easily be incorporated into existing fugacity based models or translated to leaf/air partitioning ratios. **References:** Reichenberg, F. et al. (2008). *Chem. Cent. J.* **2**, 8 Smith, K. E. C. et al. (2010). *Chem. Res. Toxicol.* **23,** 55–65. Mackay, D. (2001). Multimedia Environmental Models: The Fugacity Approach. Lewis Publishers, Chelsea, MI. Mayer, P. et al. (2005). *Environ. Sci. Technol.* **39**, 6123-6129. Wania, F. et al. (2006). *Environ. Modell. Softw.* **21,** 868–884.