



Biodegradation testing of hydrophobic chemicals in mixtures at low concentrations – covering the chemical space of petroleum hydrocarbons

Birch, Heidi; Hammershøj, Rikke Høst; Mayer, Philipp

Published in:
SETAC Europe 27th Annual Meeting Abstract Book

Publication date:
2017

Document Version
Peer reviewed version

[Link back to DTU Orbit](#)

Citation (APA):
Birch, H., Hammershøj, R. H., & Mayer, P. (2017). Biodegradation testing of hydrophobic chemicals in mixtures at low concentrations – covering the chemical space of petroleum hydrocarbons. In *SETAC Europe 27th Annual Meeting Abstract Book*

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

Biodegradation testing of hydrophobic chemicals in mixtures at low concentrations – covering the chemical space of petroleum hydrocarbons

Heidi Birch, Rikke Hammershøj, Philipp Mayer

Technical University of Denmark, Department of Environmental Engineering, Bygningstorvet, Building 115, 2800 Kgs. Lyngby, Denmark. hbir@env.dtu.dk, rikkeh@env.dtu.dk, philm@env.dtu.dk

Petroleum products are complex mixtures of varying composition containing thousands of hydrocarbons each with their own physicochemical properties and degradation kinetics. One approach for risk assessment of these products is therefore to group the hydrocarbons by carbon number and chemical class i.e. hydrocarbon blocks. However, the biodegradation kinetic data varies in quantity and quality for the different hydrocarbon blocks, hampering the characterization of their fate properties. In this study, biodegradation kinetics of a large number of hydrocarbons aiming to cover the chemical space of petroleum hydrocarbons, were therefore determined at ng/L to µg/L concentrations in surface water, seawater and activated sludge filtrate. Two hydrocarbon mixtures were prepared, comprising a total of 53 chemicals including paraffins, naphthenics and aromatic hydrocarbons from C8 to C20. Passive dosing from silicone rod loaded with the mixtures was used to prepare stock solutions. Test systems were then prepared using stock solution diluted with the surface water, seawater or activated sludge filtrate. Test systems were incubated at 20 °C on a roller for up to 98 days and analyzed using GC-MS and fully automated Solid Phase Micro Extraction. Results were normalized to parallel measurements of abiotic controls prior to evaluation of biodegradation kinetics. Degradation was generally faster in the activated sludge filtrate than in the seawater and lakewater. In the activated sludge filtrate lag phases were < 9 days for the 49 hydrocarbons that were degraded within test duration. Degradation rate constants and corresponding half-lives were determined for 44 of the hydrocarbons. In lakewater and seawater, less test chemicals were degraded within the test duration compared to the activated sludge filtrate.

Keywords: Biodegradation, Degradation, Partitioning, Surface water