University of Zurich[UZH]

eawag aquatic research

Department of Chemistry

Master Thesis

Designing and comparing experimental set-ups to study biotransformation in river biofilms

Description:

Stream biofilms consisting of bacteria, algae and other microorganisms play an essential role in aquatic ecosystems. They have been shown to possess the ability to reduce the concentrations of chemical pollutants via e.g. biotransformation, usually demonstrated in controlled laboratory experiments. Naturally, stream biofilms grow on rocks and pebbles, but also on any other submerged surfaces. In order to evaluate processes, such as, e.g., biotransformation, in a consistent way, it is crucial to develop experimental setups that allow for reproducible research. Therefore, stream biofilms that are used for laboratory experiments are often grown on artificial substrates like, e.g., glass plates. In order to increase the biomass/volume ratio, those biofilms are then usually suspended in water, instead of using them in their attached form. Regardless, the consequences of such modifications from the natural appearance are not well investigated. Also, it is not well understood if results gained with such modified systems still can be translated back to behavior in the natural environment.
This project addresses those knowledge gaps by i) developing test systems that are more representative of naturally grown biofilms than the ones used so far, ii) doing biotransformation experiments with the newly developed systems and iii) comparing the results to a standardized testing system.

Project:

One goal of this project is the development of an experimental setup that allows using stream biofilms in their native form, i.e. on a solid surface (glass slide, stones/pebbles) in contrast to suspending the biofilms. This experimental system will then be used to assess biotransformation of a mixture of environmentally relevant polar organic micropollutants. To do so, test reactors will be spiked with a set of micropollutants and the decrease of these pollutants will be monitored over time by means of high-performance liquid chromatography-high resolution mass spectrometry (HPLC-HRMS). Finally the outcomes of the different experimental setups will be evaluated (i.e. glass vs. stone vs. suspension). The MSc student will learn how to properly plan and set up an experiment, will gain knowledge in sophisticated analytical methods, and learns how to handle and evaluate large chemical datasets.

Keywords: Field work, native stream biofilm, artificial substrates, development of experimental setups, pesticides, pharmaceuticals, microorganisms

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