**Investigating the impact of particulate organic matter on the oxygen depletion during bank filtration**

Uranchimeg Bayarsaikhan, Aki Sebastian Ruhl, Martin Jekel

Technische Universität Berlin, Chair of Water Quality Control, Sekr. KF4, Straße des 17. Juni 135, 10623 Berlin, Germany, aki.s.ruhl@tu-berlin.

Bank filtration is a powerful and established barrier for pathogens and pollutants, especially in urban areas such as Berlin. Wastewater treatment plants release a number of organic micropollutants (OMP) into surface waters that are partly used as drinking water resource. The degradation of OMP during bank filtration depends on the redox conditions. Although there are substances such as iodinated X-ray contrast media that are only transformed under anaerobic conditions, a number of substances are more efficiently removed in the presence of oxygen. However, dissolved oxygen in the surface water might be quickly consumed in the upper bank layers by aerobic degradation of organic sediments and thus the aquifer treatment turns anoxic. The influence of particulate organic matter (POC) on the oxygen consumption during bank infiltration and the resulting redox conditions is not well known yet. The present study aimed at identifying the impact of various leaves as terrestrial POC on the oxygen consumption and chemical parameters including OMP concentrations in the first few centimeters of bank filtration.

Leaf litter from typical regional trees (beach, oak, maple and others) was collected in autumn and dried at 50°C. Each sort was separately milled and both fine (<63 µm) and coarse (>200 µm) fractions were discarded. The pulverized leaves were suspended in tap water and deposited on water saturated technical sand (ca. 40 mm height) in small glass columns (37 mm ID). A continuous flow of (6 mL/h or 13.4 cm per day) of OMP containing tap water through 9 columns and one reference column was controlled with a peristaltic pump. The complete effluent was collected and weighed to monitor the volume flow and to facilitate closed balances of water constituents.

Analyses of the solid phase compositions revealed carbon contents between ca. 40 and 50% depending on the leaf. Directly after deposition of the leaf suspensions, breakthrough of fine leaf powder and leaching of soluble constituents caused elevated turbidities (up to 52 NTU) and great concentrations of dissolved and total organic carbon (up to several hundred mg/L). Size exclusion chromatography revealed that the different leaves released significantly differing substances ranging from large compounds to low molecular weight organics. However, after a few days the effluent DOC and TOC concentrations approached the background concentrations. Initially, oxygen concentrations decreased from around 8 mg/L in the influent to concentrations around 0 mg/L indicating complete oxygen consumption within the short travel distance of only 40 mm. After 60 days of operation there was still a substantial oxygen consumption. OMP concentrations were not significantly affected by the microbial processes.

The results demonstrate that oxygen can be completely depleted within the first few centimeters of the bank in the presence of terrestrial POC. Trees at bank filtration sites thus might have a significant impact on the redox conditions during bank filtration. The aerobic microbiological activity does not affect concentrations of several OMP e.g. via co-metabolic pathways.