Assessment of river water quality in catchments: Impact of urbanization on particle bound pollutant fluxes

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Transport of many urban pollutants in rivers is coupled to transport of suspended particles, potentially dominated by storm water overflows and mobilization of legacy contamination of sediments. Concentration of these pollutants depends on the mixture of "polluted" urban and "clean" background particles. In the current study, the total concentration of polycyclic aromatic hydrocarbons (PAHs), the amount of total suspended solids (TSS) and turbidity were measured on a monthly basis in water samples from 5 catchments with contrasting land use in Southwest Germany and 3 catchments in the Bode Basin in Eastern Germany over up to 1.5 years. In addition, single flood events with large changes in turbidity were sampled at high temporal resolution. Linear correlations of turbidity and TSS where obtained over all catchments investigated. From linear regressions of turbidity vs. total PAH concentrations in water, concentrations of PAHs on suspended particles were obtained. These values comprise a robust measure of the average sediment quality in a river network and may be correlated to the degree of urbanization represented by the number of inhabitants per total flux of suspended particles. The findings are promising for other particle-bound contaminant fluxes (PCBs, phosphorus, etc.) and in terms of on-line monitoring of turbidity as a proxy for pollution.

Origin of REE patterns in AMD-impacted areas

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Rare earth elements (REE; La-Lu) are a group of elements with a high potential as process indicators in the system rock/soil and water. Acid mine drainage (AMD)-impacted areas often have high concentrations of REE due to low pH. Moreover, they feature with a pronounced enrichment of middle REE (MREE) a very common phenomenon which is still under debate. Different AMD-impacted sites in Europe were investigated for REE patterns and their origins. Three of them showed the typical MREE-enrichment (Fig. 1) despite different geology (shales, volcanic rocks) and water source (lake, creek, groundwater). Based on a series of pyrite samples, it was found with H_2SO_4 - batch tests that one source for MREE enrichment is the release from pyrite under acidic conditions (Fig. 1), assuming complexation with a metastable S-species [2]. An exception was Ljusnarsberg, a former Swedish Cu mining area. For this site the REE patterns were rather enriched in light REE (LREE, Fig. 1). Saturated column experiments with heap material (pH 2.6-2.7) in combination with H_2SO_4 - batch tests of abundant minerals showed that release from a biotite group member controls the REE pattern in the open pit water to a large part (Fig. 1). Concluding, these results give a new view on REE pattern development in AMD-impacted areas.

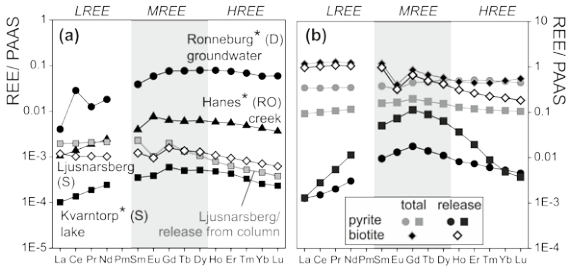

Figure 1: Examples for PAAS [1] normalised REE patterns of **(a)** AMD-impacted water (* from [2]) and effluent of column experiments with heap material of an AMD-impacted area; **(b)** total and released REE of pyrite samples [2] and biotite.

[1] McLennan (1989) *Rev. Min. Geochem.* **21**,169–200. [2] Grawunder *et al.* (subm) *Environ. Sci. Poll. Res.*

DOI:10.1180/minmag.2013.077.5.7