Permeable reactive barrier materials – *In-situ* Monitoring of performance in the laboratory

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Acid mine drainage (AMD) can be a big environmental problem. Some industrial operations, especially the mining industry, produce heavy metal sewage or leachate, e.g. pyrit or other metal sulfids. It results in metal (e.g. iron) and/or sulfide and acidity loads into natural waters. One solution to remediate AMD is a permeable reactive barrier (PRB). For gound water it can achieve a neutralization of the AMD and removal of heavy metals, but requires a site-specific design.

We will built a PRB under laboratory condition which reduces the iron sulphate concentration of AMD. We work under anaerobic condition, because only under this condition the reduction is useful. The experimental data will be used to model a long time period by using MIN3P.

We monitor the pH value and the oxygen concentration during the removal in the whole PRB. We use optical sensors, which are established in our institute. Sensor foils [1] are used to gain two-dimensional resolved information about oxygen and pH gradients within the PRB. An additional set of sensors namely fibre optical chemical sensors [2] are used to obtain depth information about the quantities. A fluorescein derivative is used to monitor changes in pH value and a palladium porphyrin is applied to monitor oxygen changes, respectively. The sensor dyes are incorporate into a polymeric matrix. The sensors are illuminated and the fluorescence intensity is recorded and converted into pH values and oxygen concentrations.

The first step is to run a series of column experiments to evaluate a combination of materials. This involves different organic matter compositions for iron and sulphat removal which are the main pollutant within the river Spree. The most efficient combination will be used to built up a PRB at laboratory scale where the removal of iron and sulphate will be monitored *in-situ* by optical sensors.

[1] N. Rudolph-Mohr et al. (2014), *Ann. Bot.*, **114**, 1779–1787. [2] M. Reuß (2018), master thesis, Universität Potsdam.