**Characterization of the reaction behavior of metal-based (nano)particles towards common groundwater pollutants**

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Groundwater contamination is a persistent issue all over the world. Since groundwater is one of the most important sources for drinking water supply groundwater remediation is one of the major tasks within protection of the environment. To this effect current studies are aiming at implementing the injection of reducing or oxidizing agents into the subsurface in order to allow for a treatment of source and plume areas (Cundy et al. 2006). Linked to such an in-situ remediation technology are preceding investigations regarding the transport properties of the injected (nano)particles, their eco-toxicity and their reactivity towards the target contaminant.

The work presented here is focusing on characterizing the reaction behavior of metal based (nano)particles, namely zero-valent metal particles such as Fe0 or Al0 for reduction processes as well as ferrates (VI) for oxidation processes. In order to assess the long-term behavior of the tested particles and their efficiency of remediation for the degradation of common groundwater pollutants (e.g. chlorinated hydrocarbons) under flow-through, thus field-similar conditions, column experiments are conducted. The columns with a length of 100 or 200 cm and an inner diameter of 3.6 cm are filled with quartz sand and the particles to be investigated. According to the setup either an aqueous contaminant solution is pumped through the columns with a flow velocity similar to a ground water situation. With this setup a plume remediation can be simulated. Alternatively, only degassed water can be passed through the columns in order to simulate source zone. In this case the contaminant is embedded into the column as contaminant phase during filling. Before and after each column sampling ports are installed for analyzing the contaminant concentration and the concentration of the degradation products in solution. Quantitation of gaseous reaction products or by-products is enabled by means of gas traps. pH and redox potential can be measured online.

The results of the reactivity tests in columns will be presented along with considerations towards the potential applicability of the tested particles with regard to a field study, including aspects of a later remediation technology.

References:

A. Cundy, L. Hopkinson, R.L.D. Whitby, Sci Total Environ 400 (2008) 42-51.

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