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Mobility of engineered inorganic nanoparticles in porous media

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Besides the excellent properties and great potential for various industrial, medical, pharmaceutical, cosmetic, and life science applications, engineered inorganic nanoparticles (EINP) can show also disadvantages concerning increasing risk potential with increasing application, if they are released in the environmental systems. EINP can influence microbial activity and can show toxic effects (Fabrega et al., 2009). Similar to the inorganic natural colloids, EINP can be transported in soil and groundwater systems (Metreveli et al., 2005). Furthermore, due to the large surface area and high sorption and complex formation capacity, EINP can facilitate transport of different contaminants.

In this study the mobility behaviour of EINP and their effect on the transport of different metal(loid) species in water saturated porous media was investigated. For these experiments laboratory column system was used. The column was filled with quartz sand. The interactions between EINP and metal(loid)s were characterised by coupling of asymmetrical flow field flow fractionation (AF4) with inductively coupled plasma mass spectrometer (ICP-MS). As EINP laponite (synthetic three layer clay mineral), and as metal(loid)s Cu, Pb, Zn, Pt and As were used. In AF4 experiments sorption of metal(loid)s on the surface of EINP could be observed. The extent of interactions was influenced by pH value and was different for different metal(loid)s. Laboratory column experiments showed high mobility of EINP, which facilitated transport of most of metal(loid)s in water saturated porous media. Furthermore the migration of synthetic silver nanoparticles in natural soil columns was determined in leaching experiments.

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References:

Fabrega, J., Fawcett, S. R., Renshaw, J. C. Lead, J. R. 2009. Silver nanoparticle impact on bacterial growth: Effect of pH, concentration, and organic matter. Environ. Sci. Technol. 43 (19): 7285–7290

Metreveli, G., Kaulisch, E.-M., Frimmel, F. H. 2005. Coupling of a column system with ICP-MS for the characterisation of colloid mediated metal(loid) transport in porous media. Acta Hydrochim. Hydrobiol. 33 (4): 337-345