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Cotransport of microorganisms and metallic colloids in quartz sand or iron oxide-coated sand under real site hydrogeological conditions

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The need for studying the fate and transport of engineered and naturally-occurring nanoparticles is of great concern in the past decade. Wudalianchi scenic spot as a famous International Geological Park has the biggest cold spring in China, which is also one of the three biggest cold spring in the world, with a history of over 200 years using in drinking and medical purpose. Thousands of tourists all over the world travelling here each year to enjoy the high quality mineral water and take a bath in the cold spring and "mud-bath" with special medication purposes. Recreation activities gave rise to the engineered nanomaterials (ENMs) releasing into the water environment and increase the risk of contamination. Therefore, it is necessary to evaluate the effect of ENMs-exposure in natural environment and how it influences the transport of microorganisms of Wudalianchi in/without the presence of natural colloids (humic acid) under a series of ion strength.

A thorough critical literature review of both work in the study site and the bio/nano-particle transport in porous media was a kick-off of the study. With support of the site investigations and sampling of groundwater, surface water and surface mud/soils, further numerical modelling of the hydrogeochemical speciation of the groundwater was carried out, indicating comprehensive water-rock interactions of this particular region. Metallic nanoparticles (MNPs), including metals, metal oxides and other metal-containing nanoparticles, are produced and ubiquitously applied to medical, cosmetic, photonics and catalysis industries, etc. TiO_2, a widely used raw material for cosmetic industries (e.g., sunscreens), was used in this study to represent MNPs. The microorganisms used in this study were extracted from the soil in Wudalianchi. Humic acid (HA), a key component of dissolved organic matter (DOM) chosen as the natural colloids in this study, are ubiquitous and significant constituents in soils and water environment that plays an important part in many soil and water processes. The column experiments were carried out using homogeneously charged (quartz sand) and heterogeneously charged (iron oxide-coated sand) porous media.

References:

Yang, X., Zhang, Y., Chen, F., & Yang, Y. (2015). Interplay of natural organic matter with flow rate and particle size on colloid transport: Experimentation, visualization, and modeling. Environmental science & technology, 49(22), 13385-13393.

Yang, X., Yin, Z., Chen, F., Hu, J., & Yang, Y. (2015). Organic matter induced mobilization of polymer-coated silver nanoparticles from water-saturated sand. Science of the Total Environment, 529, 182-190.

Wen, Y. J., Yang, Y. S., Ren, H. J., Du, X. Q., Yang, X. Y., Zhang, L. Y., & Wang, X. S. (2015). Chemical–biological hybrid reactive zones and their impact on biodiversity of remediation of the nitrobenzene and aniline contaminated groundwater. Chemical Engineering Journal, 280, 233-240.