PP-16

Development of 1-Dimension Reactive Transport Model to Determine Nitrogen Speciation using Continuous Flow nZVI Columns

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The excess amount of nitrate in drinking water can lead to potential risk to human health and the environment. Nitrate cannot be removed easily from water because of their stability and solubility. Although nitrate present in water is not toxic, it acts as a precursor to form N-nitrosamines, meth hemoglobin when proper physic-chemical conditions are met. Thus the treatment methods based on destruction of nitrates are more appropriate that adsorption or ion exchange processes where nitrate is transferred to immobile phase. Previous data have shown the destruction of nitrate into benign products by nZVI. However, all these experiments were carried in batch mode which does not exactly represent dynamic conditions experienced in the environment. Harmonization of the batch mode data with column experiments is vital prior to recommending these methods into practice. In this project we will design and model the fate of nitrate under continuous flow conditions, the kinetic parameters were validated to meet flow conditions. The evolution of different nitrogen species will be predicted by 1-D reactive transport modeling using PHREEQC. Finally, a new unit process will be designed for nitrate removal in potable waters.

Keywords: Continuous, Flow, Kinetics, Nitrate, n-ZVI, Reduction