

Removal of Cr^{6+} from groundwater by nano-scale zero valent iron particles produced with green tea extract

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Material and Methods

Nano-scale zero valent iron (NZVI) particles were produced by reduction of Fe^{3+} ions by green tea extract in ethanol-water mixture. Productivity of the NZVI was enhanced by optimized ethanol-water ratio. Produced NZVI suspension was transported through quartz sand and natural sand columns. Reduction and adsorption of Cr^{6+} by the produced NZVI were confirmed by batch adsorption experiments, and by injecting Cr^{6+} solution through natural sand columns with NZVI embedded.

Discussion of Results

The produced NZVI has a diameter of 10-20 nm, and the highest productivity of NZVI was achieved in ethanol: water 10:1 V/V solution. Prepared NZVI could be stable for several days without sedimentation. 90 mg/L of Cr^{6+} can be reduced to Cr^{3+} within 5 minutes completely. NZVI has good transport ability in quartz sand and natural sand columns. The embedded NZVI in natural sand can completely remove 10 mg/L Cr^{6+} from the groundwater flowing through the column (Figure 1). All these results indicate this kind of NZVI could be applied in the remediation of Cr^{6+} contaminated groundwater.

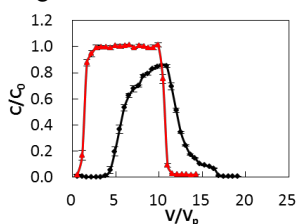


Figure 1 Break through curves of 10 mg/L Cr^{6+} solution in 10 cm column with natural sand (red) and in natural sand with green tea extract produced NZVI embedded (black).