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Innovative Nanotechnologies for Environmental Remediation

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ABSTRACT

A highly efficient, versatile material having dual characteristics as adsorbent and reductant, nano-scale zero valent iron (NZVI) was synthesized and tested for the removal of two most toxic and abundant groundwater contaminants arsenic (As) and trichloroethylene (TCE). The NZVI was also stabilized by Pd and non-ionic surfactant to make it mobile as a delivery vehicle NZVI (DV-NZVI) in subsurface environment. Batch experiments were performed to determine their feasibility as adsorbents and reductants for As and TCE, respectively at neutral pH. The kinetics of As and TCE sorption was found to be rapid and occurred on a scale of minutes following a pseudo-first-order rate expression with observed reaction rate constants (k_{obs}) was 1000x higher than k_{obs} literature values for arsenic adsorption on micron size ZVI. We used SEM-EDX, AFM, and XRD to characterize particle size, surface morphology, and corrosion layers formed on pristine NZVI and As / or TCE -treated NZVI. The results confirmed that NZVI has great potential to be used in *in-situ* as well as ex-situ groundwater remediation.