Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Surface Reactivity of Core Shell Iron-Iron Oxide Nanoclusters towards Breakdown of Carbon Tetrachloride MANINDER K. TARSEM S., YOU QIANG, Department of Physics, University of Idaho, Moscow, ID 83844, HONGSEOK KIM, Pusan National University, Korea, 609-735, JAMES E. AMONETTE, DONALD R. BAER, Pacific Northwest National Laboratory, Richland, WA 99352 — Zero-valent iron (ZVI) is one of the technologies for groundwater remediation to reduce contaminants by removal of mobile chlorinated hydrocarbons. Iron-Iron oxide (Fe/Fe_3O_4) nanoclusters (NCs) made in our laboratory using cluster deposition technique have enhanced reactivity towards targeted contaminants due to the presence of ZVI protected by a passivated oxide shell. Here, we investigate the effectiveness of the Fe/Fe_3O_4NCs in reducing carbon tetrachloride (CT) under laboratory conditions. The reactivity of the NCs was investigated by conducting unbuffered aqueous batch experiments to reduce CT at room temperature. Initial results show that 80% of the degradation of CT resulted in the formation of dichloromethane (DCM) and chloroform (CF); the remainder likely followed a competing pathway to yield nonhazardous products such as CO. The production of undesirable hydrogenated products such as DCM and CF suggests that the dominant reaction pathway occurs through hydrogen (H) atom transfer via H atoms generated by corrosion of the iron. Comparative experiments with ZVI NCs prepared by other methods are underway and the results will be reported. Future work is to analyze and understand factors that control the reaction pathways between desirable and undesirable products.

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Date submitted: 19 Dec 2011 Electronic form version 1.4