The BRACE CENTRE FOR WATER RESOURCES MANAGEMENT

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SURFACE REACTIONS AND MODIFICATION OF IRON AND IRON OXIDE NANOPARTICLES FOR ENVIRONMENTAL REMEDIATION

Nanoscale zerovalent iron (nZVI) has often been reported to have a high efficiency of contaminant removal for several contaminants of great concern, including aqueous arsenic species, yet the transformations and translocation of contaminants at and within the nanoparticles are not clearly understood. Investigations of surface reactions between nZVI and arsenite, As(III), using high-resolution X-ray photoelectron spectroscopy (HR-XPS) demonstrated for the first time stratified distributions of multiple arsenic valence states within the iron nanoparticles and revealed that As(III) oxidation and reduction can occur in parallel in separate regions of the nanoparticles. *In situ* time-dependent X-ray absorption spectroscopy (XAS) measurements of the arsenic core level for nZVI in anoxic As(III) solutions have further illuminated the role of intraparticle diffusion and reduction in affecting the chemical state and spatial distribution of arsenic in nZVI materials. In other studies we demonstrated that surface modification of iron oxide nanoparticles could tune the transport properties so that a desired retention in a porous medium can be achieved. These results suggest that augmentation of soils with iron to enhance biological processes such as uranium reduction via iron reducing bacteria, e.g., *Geobacter sp*., might be achieved via the injection of iron nanoparticles into the subsurface.

Bruce Koel is a Professor of Chemical and Biological Engineering at Princeton University, and Associated Faculty member in Chemistry, Mechanical and Aerospace Engineering (MAE), and the Princeton Institute for the Science and Technology of Materials (PRISM). He is the author of over 250 papers, including 10 book chapters, and holds one patent. He initiated the *Chemical Reactions at Surfaces* Gordon Research Conference in 1991, and he received the George A. Olah Award in Hydrocarbon or Petroleum Chemistry from the ACS in 2007. Prof. Koel received his Ph.D. in Chemistry from The University of Texas at Austin in 1981.

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McGill Downtown Campus, Macdonald Engineering Building, Room MD497
11:00 am - 12:00 pm

EVERYONE WELCOME