Synthesis of functionalized superparamagnetic iron oxide nanoparticles from a common precursor and their application as heavy metal and actinide sorbents

COLL 465

Marvin G. Warner, marvin.warner@pnl.gov[1], Cynthia L. Warner, cynthia.warner@pnl.gov[2], R. Shane Addleman, shane.addleman@pnl.gov[3], Tim C. Droubay, Tim.Droubay@pnl.gov[1], Mark Engelhard, mark.engelhard@pnl.gov[4], Joseph D. Davidson, joseph.davidson@pnl.gov[3], Anthony D. Cinson, anthony.cinson@pnl.gov[2], Michael A. Nash[5], and Wassana Yantasee, Wassana.Yantasee@pnl.gov[6]. (1) Fundamental and Computational Science Directorate, Pacific Northwest National Laboratory, PO Box 999, MS K8-87, Richland, WA 99352, (2) National Security Directorate, Pacific Northwest National Laboratory, PO Box 999, MS K4-12, Richland, WA 99352, (3) Materials Synthesis and Modification, Pacific Northwest National Laboratory, MS K2-12, PO Box 999, Richland, WA 99352, (4) Environmental Molecular Sciences Laboratory, Pacific Northwest National Laboratory, Richland, WA 99352, (5) Department of Bioengineering, University of Washington, Seattle, WA 98195, (6) Energy and Environment Directorate, Pacific Northwest National Laboratory, MS K2-44, PO Box 999, Richland, WA 99352

A simple and versatile technique to generate ligand stabilized iron oxide nanoparticles containing different ω-functionalities with specificities toward heavy metals and actinides from a common, easy to synthesize precursor will be presented. The resulting nanoparticles are designed to contain affinity ligands that make them excellent sorbent materials for a variety of heavy metals from contaminated aqueous systems such as river water and ground water as well as actinides from clinical samples such as blood and urine. Functionalized superparamagnetic nanoparticles make ideal reagents for extraction of heavy metal and actinide contaminants from environmental and clinical samples since they are easily removed from the media once bound to the contaminant by simply applying a magnetic field. In addition, these engineered nanomaterials have an inherently high active surface area (often > 100 m^2/g) making them ideal sorbent materials for these types of applications.

Applications in Nanoscience
2:00 PM-5:10 PM, Thursday, March 26, 2009 Salt Palace Convention Center -- 151 G, Oral

Division of Colloid & Surface Chemistry

The 237th ACS National Meeting, Salt Lake City, UT, March 22-26, 2009