



Environmental Nanoscale Research in the DOE Office of Science

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Nanoscale Research in DOE Office of Science

- Office of Basic Energy Science (BES)
 - Major source of funding for nanoscale research in DOE SC
 - Supporting construction of 5 Nanoscale Research Centers
- Office of Biological and Environmental Research (BER)
 - Supports bio/environmental research, some of which has nano-components

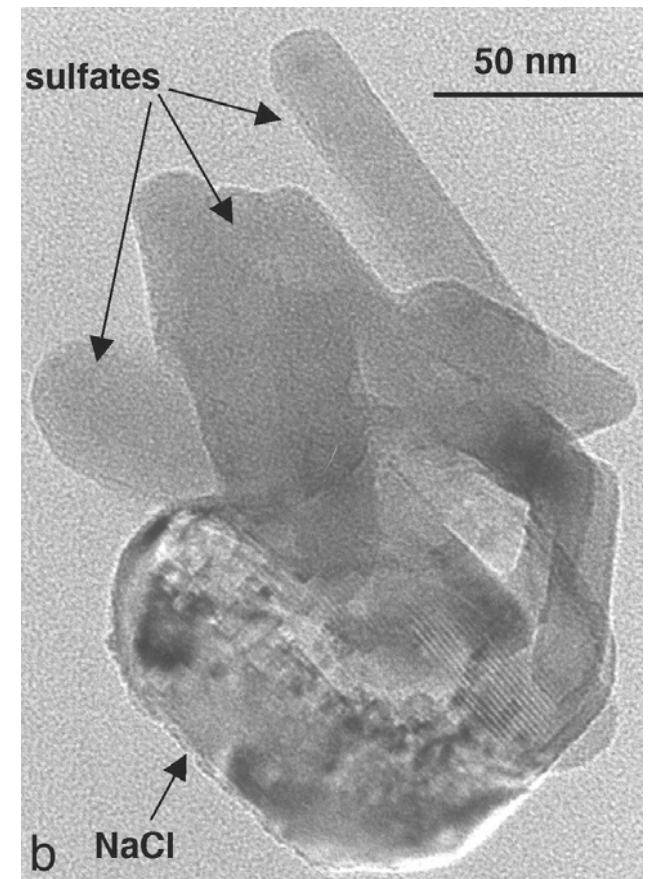


Funded Research

DOE Office of Basic Energy Science

- Funded through open solicitation
- Examples of nano-projects include:

- Jill Banfield (UC Berkeley)
 - Nanoparticle Products of Microbial Biomineralization of U, Fe, and Zn
- Alexandra Navrotsky (UC Davis)
 - Thermodynamics of nanomaterials
- DJ Wesolowski (ORNL)
 - Nanoscale Complexity at the Oxide-Water Interface

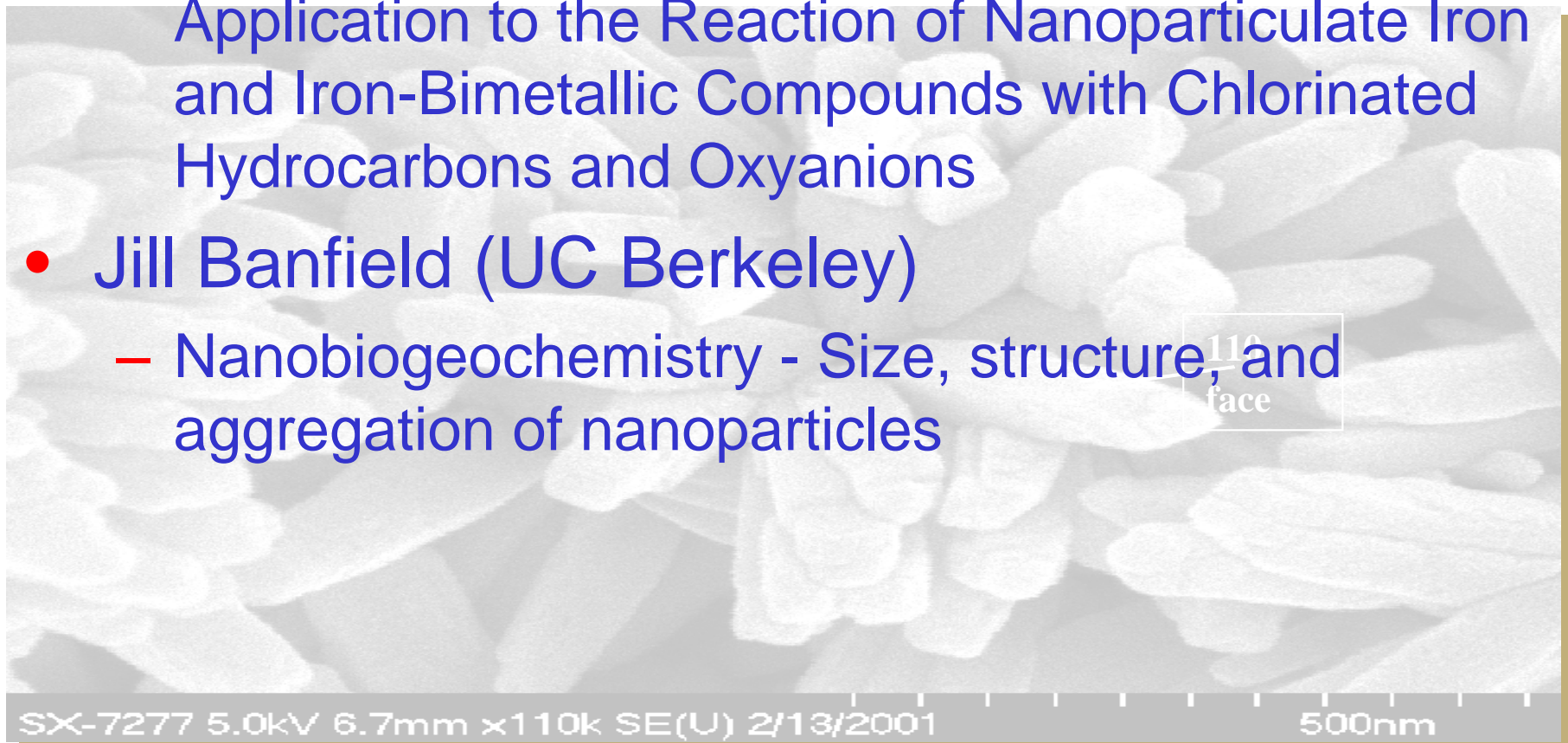




Funded Research

DOE Office of Basic Energy Science

- Don Baer, PNNL (co-funded with BER)
 - The Reaction Specificity of Nanoparticles in Solution: Application to the Reaction of Nanoparticulate Iron and Iron-Bimetallic Compounds with Chlorinated Hydrocarbons and Oxyanions
- Jill Banfield (UC Berkeley)
 - Nanobiogeochemistry - Size, structure, and aggregation of nanoparticles





Nanoscale Science Research Centers

- Supported by Office of Basic Energy Sciences
- Supports the National Nanotechnology Initiative
- Five new Nanoscale Science Research Centers (NSRCs) to support the synthesis, processing, fabrication, and analysis of materials at the nanoscale
- Premier user centers for interdisciplinary research at the nanoscale
- Provide a gateway to existing major BES user facilities for X-ray, neutron, or electron scattering
- NSRCs will contain clean rooms; laboratories for nanofabrication and one-of-a-kind signature instruments



Nanoscale Science Research Centers (under design or construction)

- Center for Nanophase Materials Sciences (ORNL)
Integrate nanoscale science research with neutron science, synthesis science, and theory/modeling/simulation to address nano-dimensioned soft materials, complex nanophase materials systems, and the crosscutting areas of interfaces and reduced dimensionality that become scientifically critical on the nanoscale. Utilize ORNL's unique capabilities in neutron scattering.
- Molecular Foundry (LBNL)
Provide laboratories equipped with state-of-the-art equipment for materials science, physics, chemistry, biology, and molecular biology
- Center for Integrated Nanotechnologies (LANL & SNL)
Focus on the path from scientific discovery to the integration of nanostructures into the micro- and macro-worlds
- Center for Functional Nanomaterials (LBNL)
Investigate chemical and physical response of nanomaterials to make functional materials such as sensors, activators, and energy-conversion devices using existing facilities such as the National Synchrotron Light Source and the Laser Electron Accelerator facility
- Center for Nanoscale Materials (ANL)
 - Conduct research in advanced magnetic materials, complex oxides, nanophotonics, and bio-inorganic hybrids. An x-ray nanoprobe beam line at the Advanced Photon Source will be fabricated and run by the Center for use by its users. The facility will use existing facilities such as the Advanced Photon Source, the Intense Pulsed Neutron Source, and the Electron Microscopy Center



Funded Research

DOE Office of Biological & Environmental Research (EMSP)

- Jiamin Wan, LBNL
 - Quantifying and Predicting Reactive Transport of Uranium in Waste Plumes: Are Colloids and Nanoparticles Important?
- George Redden, INEEL
 - Transport, Targeting and Applications of Functional Nanoparticles for Degradation of Chlorinated Organic Solvents
- Meng-Dawn Cheng, ORNL
 - Physico-Chemical Dynamics of Nanoparticle Formation during Laser Decontamination and Characterization



Funded Research

DOE Office of Biological & Environmental Research (EMSP)

- Michael Ramsey, ORNL
 - Nanofluidic Structures for Electrokinetic-Based Hydraulic Pumps
- Don Baer, PNNL (co-funded with BES)
 - Reaction Specificity of Nanoparticles in Solution: Applications to the Reaction of Nanoparticulate Iron and Iron-Biometallic Compounds with Chlorinated Hydrocarbons
- Jay Grate, PNNL
 - Armored Enzyme Nanoparticles for Remediation of Subsurface Contaminants
- Yuehe Lin, PNNL
 - Portable Analyzer Based on Microfluidics/Nanoengineered Electrochemical Sensors for In-situ Characterization of Mixed Wastes



Funded Research

DOE Office of Biological & Environmental Research (EMSL)

- Environmental Molecular Sciences Laboratory
- Located on DOE Hanford Site
- National scientific user facility
- Interfacial and Nanoscale Science Facility
 - Produce & characterize nanoscale materials
 - Study reactions at nanoscale
 - Develop analytical techniques for nanoscale surface chemistry



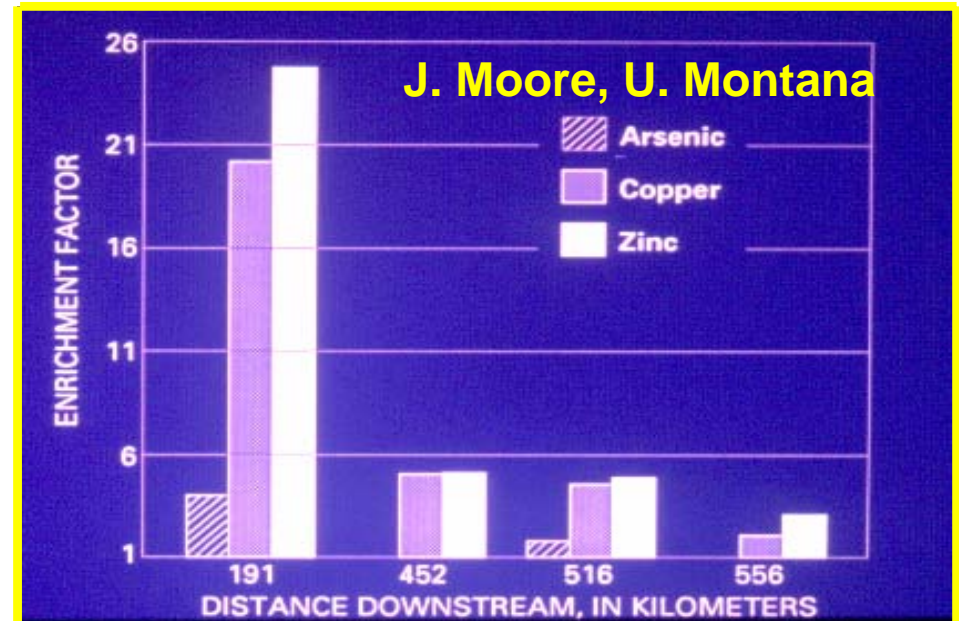
Integrated Projects

- Selective Reactivity of Fe Nanoparticles
- Nanoparticle synthesis, characterization and reactivity*
 - D. R. Baer, Paul Tratnyek (OHSU)
 - J.E. Amonette, J.C. Linehan, Klaus Pecher, R.L. Penn, (University of Minnesota)
- Theory
 - E.J. Bylaska, M. Dupuis, A.A. El-Azab, M. Gutowski, J.R. Rustad,
- Vacuum Based Growth and Reactivity
 - S. A. Chambers, B.D. Kay, Z. Dohnalek

*Funded by BES Chemical Sciences and BER EMSP



Environmental nano-issues: Long range stability of nano particles





DOE Nano Summit

Nanoscale Science & Our Energy Future

- Emerging research opportunities and priorities in nanoscale science and technology for our energy future
- Sessions on nanoscale science and the hydrogen economy; ethical, social, and environmental considerations; nanoscale science, energy efficiency, renewable energy and energy supply
- For further details, including registration information, please visit the Nano Summit website at: <https://public.ornl.gov/conf/nanosummit2004/>
- June 23-24, 2004, Marriott Wardman Park, Washington, D.C.