

SUMMARY OF AMES LABORATORY ACTIVITIES INVOLVING NANO-SCALE MATERIALS

Group Leader/Research Program	Project Name (Funding Source)	Location	Summary	ES&H Concerns	Readiness Review
Lin (Lead) Bakac, Angelici, Pruski / Chemical & Biological Sciences (Lin)	Chemical Energy (Selective and Efficient Catalysis in 3D Controlled Environment) - U.S. Department of Energy	2702-2710 Gilman	Novel silica-based, single-site mesoporous catalysts with controlled, nanostructured morphology and surface properties will be prepared. The control of specific chemical properties, spatial distribution, and concentrations of various catalytic functional groups on the pore walls will be achieved by a synthetic approach referred to as multifunctionalization.	Materials are in solution. Inhalation potential is negligible.	Activity # 30200.015 - Catalyst Research
Houk (Lead) Porter, Smith, Yeung / Chemical & Biological Sciences (Lin)	Separations and Analyses (Chemical Analysis of Nanodomains) - U.S. Department of Energy	B8 Spedding	Microenvironments on surfaces are being characterized for novel catalytic and separation schemes, including mapping surface heterogeneities and studying interactions at microstructures created by monolayers and porous polymers.	Samples introduced into the ICP are nanoscale but completely are contained and subsequently destroyed in the ICP. No inhalation potential.	Activity # 31317.002 - Analytical Research
Kessler (Lead) Akinc / Environmental & Protection Sciences (Baldwin)	Environmentally Benign Repair of Composites Using High Temperature Cyanate Ester Nanocomposites - Strategic Environmental Research & Development Program, Department of Defense	3305 Gilman	Project involves design and evaluation of low viscosity resins reinforced with nanosize alumina particles for the repair of advanced composites.	Nanocomposites are in resins. No inhalation potential.	Activity # 30300.029 - SERDP: Environmentally Benign Repair
Mallapragada / Materials Chemistry (Mallapragada)	Bioinspired Materials: Aptamer-Mediated Templates for Hybrid Elastic Nanomagnets - U.S. Department of Energy	136 Spedding	Research involves the design of hierarchically self-assembled synthetic polymeric materials that serve as templates for directed growth of magnetite nanocrystals in a process mediated by aptamers (singly stranded nucleic acids capable of molecular recognition) and mineralization proteins.	Viscous polymers are used; "micelles" are created in the nanorange and "grown" to the micro range; all work is done in solution; all base materials are biocompatible (non-toxic). Inhalation potential is negligible.	Activity # 30600.020 - Synthesis & characterization of novel block co-polymers.
Mallapragada / Materials Chemistry (Mallapragada)	Bioinspired Materials: Self-Assembled Polymer-Hydroxyapatite Nanocomposites - U.S. Department of Energy	136 Spedding	Techniques are being developed to synthesize and characterize novel bioinspired synthetic polymeric materials that mimic living systems in their abilities to switch among several states in response to the environment pH, temperature), self-assemble build complex structures hierarchically, and serve as directed templates for biomineralization/biometallization processes.	Viscous polymers are used; "micelles" are created in the nanorange and "grown" to the micro range; all work is done in solution; all base materials are biocompatible (non-toxic). Inhalation potential is negligible.	Activity # 30600.020 - Synthesis & characterization of novel block co-polymers.

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Canfield / Condensed Matter Physics (Canfield)	Plasma Synthesized Doped Boron Nanopowder for MgB₂ Superconductors	A020 Zaffarano Hall	Superconducting and normal state diagnostic measurements will be made on doped MgB ₂ materials. Materials provided by Specialty Materials in Lowell, MA.	Nano-scale materials received in sealed vials. Particles agglomerate into larger particles that range in diameter from 1- 10 micrometers. The materials are loaded into tantalum tubes and sealed. They are then heated, etc. There is no potential for aerosolization of nano- scale particles outside of glove box.	Activity # 30511.002 - Crystal Growth
Prozorov / Condensed Matter Physics (Harmon)	Magnetic Nanocomposite Materials - National Science Foundation	A020 Zaffarano Hall	Pellet preparation involving doping of aluminum oxide with iron pentacarbonyl by making slurry with decane followed by sonication.	Weighing process done on bench; respirator worn during process; weighing takes 1-2 minutes. Inhalation potential is negligible.	Activity # 30500.007 - Operation of Superconductivity, Magnetism, Low Temp Laboratory