COLLOQUIUM

MECHANICAL ENGINEERING

The Department of Mechanical Engineering presents:

Dr. Regina Ragan

Assistant Professor

Department of Chemical Engineering & Materials Science

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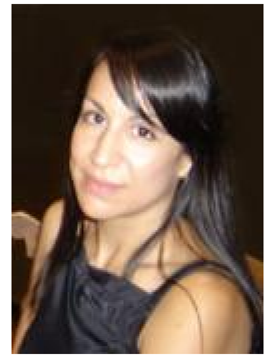

Friday, October 16th
11:10AM-12:00PM
Bourns Hall A265

Design and Characterization of Metal Nanoassemblies from Nanocatalysts to Plasmonic Hotspots

Abstract: The generation of new technology often stems from discovery of physical phenomena, bold ideas for utilization, and focused work on implementation. In the case of metal systems, it has been discovered that unique optical, chemical and electrical properties are exhibited in structures when feature size is scaled down to molecular length scales. For example, metal nanoparticle based architectures have shown the capacity for transmission of electromagnetic energy and production of highly localized electromagnetic fields for use as optical interconnects and sensors. Metal nanocatalysts exhibit chemical selectivity and higher activity than their bulk counterparts and one-dimensional, ballistic transport in self-assembled, metallic systems has been observed in carbon nanotubes and yttrium disilicide wires for use as low resistance interconnects.

In my group, we are interested in both fundamental understanding of physical properties as feature size decreases and thermodynamic processes governing rational assembly of nanostructures on molecular length scales. For implementation in devices as catalysts, low resistance inter-connects, and non-linear optical components, metal structures must be fabricated on length scales where properties are enhanced by quantum effects. Self-organization of atomic and molecular ensembles on surfaces allows for implementation of metal nanosystems having feature size and atomically controlled interfaces that are typically unattainable using lithographic techniques. State of the art surface analytical techniques, particularly scanning probe microscopy, are used to characterize systems at atomic length scales. I will present a few novel self-organization synthesis routes for the fabrication of metallic and bimetallic nanostructures in regular arrays immobilized on substrates followed by characterization of electronic and optical properties.

Bio: Prof. Regina Ragan received her B.S. summa cum laude in Material Science and Engineering in 1996 from the University of California, Los Angeles and Ph.D. in Applied Physics in 2002 from the California Institute of Technology. From 2002-2004 she was a postdoctoral research scholar in the Information & Quantum Systems Laboratory at Hewlett Packard. Since 2004, she has been an Assistant Professor of Chemical Engineering and Materials Science at the University of California, Irvine. Her research interests include self-assembly or directed self-assembly of molecular based or metallic nanosystems and the use of state of the art analytical techniques for (a) fundamental understanding of assembly processes and to (b) characterize the effect of structure, interfaces and materials on device performance. She is a recent recipient of the National Science Foundation Faculty Early CAREER Award.