

UNH Materials Science Seminar

11:10-12:00, Thursday, November 13, 2008

DeMeritt Hall 238

University of New Hampshire

Microwave, Photo- & Thermally Responsive PNIPAm - Gold Nanoparticle Microgels

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Microwave-, photo- and thermo-responsive polymer microgels that range in size from 500-800 μm and are swollen with water were prepared by a novel microarray technique. We used a liquid-liquid dispersion technique in a system of three immiscible liquids to prepare PNIPAm-co-AM core-shell capsules loaded with AuNP. The spontaneous encapsulation is a result of the formation of double oil-in-water-in-oil (o/w/o) emulsion. It is facilitated by adjusting the balance of the interfacial tensions between the aqueous phase (in which a water-soluble drug can be dissolved), the monomer phase and the continuous phase. The water-in-oil (w/o) droplets containing 26 wt% NIPAm and Am monomers, 0.1 wt% Tween-80 surfactant, FITC fluorescent dye and colloidal gold nanoparticles spontaneously developed a core-shell morphology that was fixed by in-situ photopolymerization. The results demonstrate new reversibly swelling and deswelling AuNP/PNIPAm hybrid core-shell microcapsules and microgels that can be actuated by visible light and/or microwave radiation (≤ 1250 nm) and/or temperature. This is the first study to demonstrate that incorporating AuNPs speeds up the response kinetics of PNIPAm, and hence enhances the sensitivity to external stimuli of PNIPAm. These microgels can have potential applications for microfluidic switches or microactuators, photosensors, and various nanomedicine applications in controlled delivery and release.

Bridgette M. Budhlall is an Assistant Professor in Department of Plastics Engineering at University of Massachusetts Lowell. She received a B.S. from University of the West-Indies and a Ph.D. from Lehigh University. Her research focus is at the intersection of colloidal science and polymer science. She was most recently a research assistant professor at North Carolina State University where she worked on developing smart materials for nanomedicine applications. Dr. Budhlall also has eight years experience working in industry, most recently at Air Products and Chemicals, Inc. where she worked in the synthesis of latexes for coatings and developed photoresist polymers and immersion fluids for microlithography applications.

Host: Professor Marshall Ming x1446