UNH Materials Science Seminar

13:10-14:00, Wednesday, Feb. 24, 2010
DeMeritt Hall 240
University of New Hampshire

Advances in the Syntheses of Polymer Colloids: Living/Controlled Radical Polymerizations in Aqueous Dispersed Systems and the Preparation of Stimuli-Responsive Particles Using Switchable Surfactants

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Living/controlled radical polymerization (L/CRP) has stimulated widespread research activity in both academic and industrial laboratories. L/CRP has been extensively studied, primarily for solution and bulk polymerization, so that our current level of understanding has reached a level where L/CRP should be considered a readily accessible tool in radical polymerizations. L/CRP has made it possible to prepare a range of novel nano-structured/ nano-engineered materials. Adaptation of L/CRP to aqueous dispersions has proven to be more challenging but significant advances have been made [1,2]. Ongoing research efforts are gradually shifting from implementation of L/CRP in aqueous dispersed systems to exploiting L/CRP systems for synthesis of functional nano-particles and polymer structures not easily accessible in homogeneous systems (e.g. ultrahigh molecular weight polymer). In recent years, our research group has conducted in-depth studies of L/CRP (SFRP, ATRP) in aqueous dispersions. The first part of this presentation will review progress in this field, addressing experimental and theoretical issues related to successfully and practically conducting L/CRP in aqueous dispersions. Discussion will include an assessment of the capabilities and limitations of L/CRP, and concerns related to industrial development and commercialization of L/CRP processes.

The second part of the lecture will introduce new research on the use of CO_2 switchable surfactants to make polymer colloids. A switchable surfactant is defined as a surfactant that can be *reversibly* converted into a molecule with greatly reduced or even negligible surface activity, upon application of a trigger. Carbon dioxide can be used as a trigger to switch a neutral amine or amidine into a charged form ("on" state). Purging the system with inert gas or air will remove the CO_2 and switch the charged compound back into a neutral amine or amidine ("off" state) [3]. The application of this concept to emulsion polymerizations will be described.

References

1. Cunningham, M.F. **2008,** *Progress in Polymer Science*, 33, 365-398.
2. Cunningham, M.F. **2002,** *Progress in Polymer Science*, 27, 1039-1067.
3. Liu, Y.; Jessop, P. G.; Cunningham, M.; Eckert, C. A.; Liotta, C. L. *Science* **2006**, *313*, 958-960.

Host: Prof. John Tsavalas, ×2293