

The Department of Chemical Engineering welcomes



Charles R. Zukoski

University of Illinois

March 4, 2008 - Warnock 102- 10:45 A.M.

Presenting a lecture entitled

“Complex Fluid Microstructure, Rheology & Glass Transitions: Effect of Continuous Phase Molecular Weight”

ABSTRACT:

The mechanical properties of suspensions depend dramatically on the suspension microstructure. Microstructure in turn depends on the nature of particle interaction potentials. For those systems that are thermally activated there will be an equilibrium microstructure and thus equilibrium transport properties. One of the model systems used to understand the links between interactions, microstructure and transport properties is that of hard spheres suspended in a Newtonian continuous phase. This model system can be studied experimentally and direct comparisons made with model predictions. With the increase in particle volume fraction, if the particles cannot crystallize, the suspension forms a glass where long range self diffusion is essentially eliminated.

The approach to the glass transition has been studied experimentally and agreement with models is strong. In this talk we discuss what changes as the continuous phase takes on a granularity where the continuous phase molecules have substantial degrees of freedom. In particular, we investigate the mechanics and microstructure of hard sphere suspensions in polymer melts. The particles are composed of silica while we use polyethylene glycols of different weights ranging from small degrees of polymerization through the entanglement molecular weight. These studies are motivated by a desire to understand properties of polymer nanocomposites where the role of particle/polymer segment interactions is poorly understood but the state of particle dispersion is key to composite properties. In this talk I explore equilibrium and nonequilibrium phases of this system and compare with extant theoretical approaches.

Short Biography

Charles F. Zukoski is the Vice Chancellor for Research at the University of Illinois at Urbana Champaign. As Vice Chancellor he has focused on enhancing the impact of the scholarship and research of faculty members across the University through the development of multidisciplinary efforts and increasing university-industry ties. Dr. Zukoski received his undergraduate degree in Physics from Reed College in 1977 and his Ph.D. from Princeton University in Chemical Engineering in 1985. He is recognized as an expert in suspension mechanics and nanoparticle synthesis. Zukoski is the William H. and Janet G. Lycan Professor in the School of Chemical Sciences and was head of the Department of Chemical and Biomolecular Engineering from 1995-2002. Zukoski has won numerous awards for the study of suspensions and is a member of the National Academy of Engineering.

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