

## **514g Nanocrystal Interparticle Interactions in Organic and Supercritical Solvents**

*Aaron E. Saunders, Keith P. Johnston, and Brian A. Korgel*

Small-angle X-ray scattering (SAXS) is used to measure interparticle interactions between gold nanocrystals dispersed in organic and supercritical solvents. These interactions are fundamentally related to nanocrystal phase behavior and self-assembly processes, and provide insight into ligand design for forming stable concentrated dispersions in supercritical fluids.

Alkanethiol-coated gold nanocrystals exhibit weak interactions in organic solvents. A Zimm analysis is used to extract second virial coefficients from SAXS data to determine interaction strength and whether the nanocrystals attract or repel each other. The sign and magnitude of the second virial coefficients are found to be size-dependent, and indicate that the curvature of the nanocrystal surface and the ligand geometry both play a large part in determining the degree of steric stability.

Supercritical fluids are also of interest for nanocrystal processing, as interaction strength and deposition kinetics can be tuned by changing the solvent density. We have used SAXS to measure effective interparticle potentials between nanocrystals in supercritical carbon dioxide as a function of the solvent characteristics (temperature, density, etc.) and ligand chemistry. We find that differences in ligand structure strongly affect the nanocrystal stability and solubility; for example, whether the nanocrystals are well dispersed or are present as flocculates in solution.