"Chemical Control of Magnetic Spinel Ferrite Nanoparticles and their Biomedical Applications"

Z. John Zhang
School of Chemistry and Biochemistry, Georgia Institute of Technology

Abstract
Understanding and control of the unique superparamagnetic properties in nanoparticles is of great fundamental importance in magnetism and for the rational design of magnetic nanoparticles for biomedical applications. The high compositional flexibility of spinel ferrites, $\text{MFe}_2\text{O}_4$ ($\text{M} = \text{Mn}, \text{Mg}, \text{Zn}, \text{Co}, \text{Fe}$ etc.) offers great opportunities for designing and fine-tuning the size and magnetic properties of nanoparticles. This seminar will discuss how, by manipulating quantum couplings at the atomic level, the magnetic anisotropy energy barrier $E_A$ can be controlled. As the size of nanoparticles decreases, the surface plays an increasingly crucial role. There are correlations between the morphology of nanoparticles and the magnetic surface anisotropy, and therefore the magnetic properties will change significantly after chemical modification on the surface of nanoparticles. The interactions between magnetic nanoparticles and biological entities such as antibodies and cells will be discussed as well.