Magnetite-Alginate-AOT nanoparticles based drug delivery platform

Iron oxide having the magnetite structure is a widely used biomaterial, having applications ranging from cell separation and drug delivery to hyperthermia. In order to increase the efficacy of drug treatments, magnetite nanoparticles can be incorporated into a composite system with a surfactant-polymer nanoparticle, which can act as a platform for sustained and enhanced cellular delivery of water-soluble molecules. Here we report a composite formulation based on magnetite and Alginate-aerosol OT (AOT) nanoparticles formulated using an emulsion-cross-linking process loaded with Rhodamine 6G. We prepared two set of nanoparticles by using Ca$^{2+}$ or Fe$^{2+}$ to cross-link the alginate polymer. Additionally, we added ∼8 nm diameter Fe$_3$O$_4$ magnetic nanoparticles prepared by a soft chemical method to these alginate-AOT nanoparticles. The resulting composites were superparamagnetic at room temperature, with a saturation magnetization of approximately 0.006 emu/g of solution. We will present detailed studies on the structural and magnetic properties of these samples. We will also discuss HPLC measurements on Rhodamine uploading in these composites.