Amgen Seminar Series in Chemical Engineering

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The Role of Surface Chemistry on the Synthesis and Application of Metallic Nanoparticles

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Advancements in nanotechnology have lead to a widespread emergence of different techniques for nanoparticle synthesis and application. A vital and often overlooked component in the field is the development of efficient, reduced-cost, and large-scale methods for nanoparticle synthesis and processing. In the case of metallic nanoparticles, less than 10 nanometers in diameter, the role of surface stabilizing ligands becomes very important for both synthesis and processing for different applications. This presentation details our efforts in the role of surface chemistry as it relates to the synthesis, dispersion, deposition, and size fractionation of gold, silver and copper nanoparticles. The presentation will highlight surfactant mediated synthesis of the nanoparticles, demonstrating the role of the surfactant in the synthesis and stabilization, where the surfactant-solvent interaction governs the rate and extent of the synthesis. For this investigation, inelastic neutron scattering and interaction energy models were employed. We have also, recently investigated the role of surface ligand exchange, as a post synthesis modification to impact the nanoparticle dispersibility in desired solvents for enhanced fractionation and targeted assembly. The ability to manipulate the surface chemistry of nanoparticles through synthesis and ligand exchange will significantly broaden the potential applications of metallic nanoparticles.

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