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Shape Separation of Gold Nanorods using Centrifugation VIVEK SHARMA, School of Polymer, Textile and Fiber Engineering and Center for Nonlinear Science, KYOUNG WEON PARK, School of Polymer, Textile and Fiber Engineering, MOHAN SRINIVASARAO, School of Polymer, Textile and Fiber Engineering and School of Chemistry and Biochemistry, Georgia Institute of Technology, Atlanta, GA — We describe the shape separation of colloidal gold nanorods using centrifugation. Nanoparticle synthesis is characterized by a polydispersity in the shape and size of particles. Since the shape and size determine the properties and applications of nanoparticles, the separation of nanorods from a mixture of different shapes is necessary. We describe the hydrodynamics of nanorods and nanospheres undergoing centrifugation, elucidating how this can be efficiently exploited for the shape and size separation. For nanoparticles in dilute concentration, the relative sedimentation velocity of rods and spheres is obtained by describing Brownian motion of the particles in presence of external forces, accounting for shape dependent drag, as well as hydrodynamic interaction. The hydrodynamic arguments illustrate the effect of shape and size on both relative sedimentation velocities and concentration profiles. The arguments advanced here, with described caveats, are quite general and applicable to shape and size separation in organic, inorganic and biological systems. In present study, we report the efficient separation of gold nanorods from mixture of shapes obtained from synthesis by the seed mediated method.

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