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Shape and size selection of Au nanorods by reversible flocculation. KYOUNGWEON PARK, Air Force Research Laboratory, WEI LU, University of Michigan, HILMAR KOERNER, RICHARD VAIA, Air Force Research Laboratory — For gold nanorods (GNRs) synthesized by wet chemical method, spherical particles as a byproduct is inevitable. Efficient and rapid approaches to separate the NRs are critical to optimize the nanostructure-dependent optical properties and not bias conclusions due to existence of spherical impurities. Relatively monodisperse GNRs can be separated from smaller size spheres through repeated centrifugation steps. The number of centrifugation steps, though, must be minimized to avoid irreversible aggregation of rods due to the loss of their capping surfactant. As an alternative, we demonstrate that size selection of GNRs can be achieved by the formation of controlled flocculates of GNRs, driven by an attractive depletion interaction between the NRs induced by surfactant micelles above a critical concentration. The flocculates sediment after a few hours. Separation yields as high as 90 % in number of particles were obtained without any damage to the surface of NRs. Flocculation is reversible upon varying the concentration of surfactant. The effect of the aspect ratio of rods and surfactant micelle structure on the flocculation is discussed with regards to concentration, type and mixing ratio of binary surfactants. The effect of electrostatic interaction is also considered through the impact of different types of electrolytes.

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