

Generalized Synthesis of Monodisperse Nanoparticles and Uniform-sized Nanorods

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We developed a new generalized synthetic procedure to produce monodisperse nanocrystals of many transition metals, metal oxides, and metal sulfides without a size selection process. Highly-crystalline and monodisperse nanocrystals were synthesized from the thermal decomposition of metal-surfactant complexes. So far, we have synthesized monodisperse spherical nanocrystals of Fe, Co, magnetite, cobalt ferrite, manganese ferrite, Ni, MnO, Pd, zirconia, and Au. Very recently, we were able to synthesize 40 gram of monodisperse magnetite nanoparticles without going through a size selection process using inexpensive and environmentally-friendly reagents. By controlling the nucleation and growth processes, we were able to synthesize monodisperse magnetite nanoparticles with particle sizes of 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 16 nm. We developed a new generalized synthetic procedure to produce various nanorods. Diameter-controlled synthesis of magnetic nanorods was achieved. So far we have synthesized nanorods of iron, iron oxide, iron phosphide, cobalt phosphide, manganese phosphide, ZnO, and ZnS. Multi-gram scale synthesis of CdS, ZnS, PbS, and MnS were achieved.