

Iron pyrite: Pure phase synthesis and shape control by facile hot injection method

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Pure phases of cubic and spherical FeS₂ nanocrystals (NCs) with the mean size of 80 nm and 30 nm, respectively, were obtained using trioctylamine and oleylamine as the solvents to dissolve the sulfur source via a facile and efficient hot injection method. The pure phase formation and shape control was strongly dependent on the concentration of active sulfur source (H₂S) that could be formed by reaction between sulfur element and a primary amine. Only the chemically active sulfur source could facilitate the formation of pure FeS₂ phase from a FeS phase via a Fe₃S₄ phase. In addition, different sulfur rates released of different sulfur solvent are believed to be the main factor to drive the orientation attachment to obtain different shapes of FeS₂ NCs. The FeS₂ pyrite NCs obtained from the controlled synthesis method of this study were in pure phase and exhibited good optical properties, and are believed to have potential applications to various energy devices including low-cost photovoltaics.