

Shape Control to Pure Phase of Iron Pyrite (FeS₂) by Using Facial Hot Injection Method

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In this works, the pure phase of cubic and spherical FeS₂ NCs with the size of 80 nm and 40 nm, respectively, could be obtained by using trioctylamine and oleylamine as the solvent to dissolve the sulfur source in a facile and efficient hot injection synthesis. The formation for pure phase and shape control is based on the condition of active sulfur source, a secondary sulfur source, which could be formed by reacting between sulfur element and primary amine. It is shown that only the active sulfur source can facilitate the formation FeS₂ pure phase from the FeS phase to FeS₂ phase via Fe₃S₄ phase. Addition, different “active” sulfur conditions could have been main reason to achieve shape control. In the poor “active” sulfur condition, the {100} facet of FeS₂ NCs could be preferred to form cube shape of FeS₂ NCs. In the rich “active” sulfur condition, the {111} or {210} facets could be preferred to form spherical shape of FeS₂ NCs. The obtained FeS₂ pyrite NCs demonstrated the pure phase and good optical properties which is considered for further application in practical and low cost photovoltaic materials.