Colloidal Synthesis of Ferromagnetic CuCr\textsubscript{2}S\textsubscript{4} Nanocrystals and Nanoclusters

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Nanocrystals and nanoclusters of room temperature ferromagnetic spinel CuCr\textsubscript{2}S\textsubscript{4} have been synthesized by a facile solution-based method. The synthesis involves the injection of 1-dodecanethiol into a boiling coordinating solvent containing CuCl\textsubscript{2} and CrCl\textsubscript{3}.6H\textsubscript{2}O. Using octadecylamine (ODA) as a solvent yields cube shaped nanocrystals with an average size of 20 ± 2 nm, while with oleylamine (OA) flower-shaped nanoclusters with an average size of 31 ± 2.5 nm are obtained. Powder X-ray diffraction patterns confirm formation of the pure spinel phase without any impurities in both cases. Magnetic measurements yield saturation magnetization ($M_s$) values of 30 emu/g and 33 emu/g for the octadecylamine and oleylamine capped particles, respectively, at 5 K.

References: