Iron oxide nanoparticles can be obtained through different methods and have been widely investigated for its potential use in different applications. In this work magnetite nanoparticles were synthesized using chemical co-precipitation at room temperature. NaOH and NH₄OH were used as precipitating agents under nitrogen atmosphere and by applying vigorous stirring. Structural and physical characterization was achieved by using Transmission electron microscopy, X-ray diffraction and Dynamic light scattering. Our results showed differences in size and morphology, depending on the precipitating agent. The NaOH-magnetite nanoparticles showed a mixture of cubic-spherical morphology meanwhile the NH₄OH-magnetite nanoparticles were mainly aspheric. Results from X-ray diffraction presented magnetite diffraction pattern when compare to the standard PDF 89-0691. Lattice parameter for NaOH-magnetite and NH₄OH-magnetite was 0.8371 nm that is less than the reported of 0.8396 nm. This could be an indicator of oxidation of the crystal surface and formation of the maghemite phase when the nanoparticles were exposed to air. The average size of the nanocrystals was 13 nm for NaOH-magnetite and NH₄OH-magnetite. From Dynamic light scattering experiments the NaOH-magnetite nanoparticles presented an average Z diameter larger than NH₄OH-magnetite (253 nm vs 152 nm); this may be to a less stability in water, which provoked a higher aggregation degree. Polydispersity Index for NaOH-magnetite was 0.445 and for NH₄OH-magnetite was 0.397. According to the International Organisation for Standardisation NaOH-magnetite nanoparticles were widely polydisperse whereas NH₄OH-magnetite nanoparticles were moderately polydisperse. Our results showed that the chemical co-precipitation method at room temperature can achieve good quality and synthesized nanoparticles similar to those obtained by other more complex techniques.

Keywords: chemical co-precipitation, dynamic light scattering, X-ray diffraction

References:


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