

Effect of stirring speed on particle size in the synthesis of magnetic nanoparticles for biomedical applications

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The effect of stirring speed on particle size in the synthesis of magnetite nanoparticles was investigated. Magnetite nanoparticles from size 7.7-10.2 nm were prepared by the technique of thermal decomposition of acetylacetonate iron (III) at different agitation speeds; from 0.0 rpm up to 240 rpm, in a reaction flask with a diameter of 15.24 cm. Results show that the speed of agitation in the synthesis is a critical value for determining the size of the particles. At 100 rpm (maintaining constant the reaction conditions), the particles reached a maximum size of 10.4 nm. All synthesized nanoparticles showed superparamagnetic behavior at room temperature. Finally, a study of growth kinetics was conducted at a stirring speed of 100 rpm and it showed that when magnetite nanoparticles are synthesized their growth over the time of the synthesis exhibits sigmoidal behavior. The kinetic of growth showed a pattern similar to presented by bacteria and autocatalytic reactions, since in these cases a stage of rapid growth is followed by one of slow growth and so on until finally becomes asymptotic to the end value. This behavior gives an indication that particles grow at the expense of others newly formed. The data were fitted to a function type BiDoseResp (double Boltzman function). Thus, it was concluded that given the size and size distribution obtained, these particles are candidates for biomedical applications, as in controlled drug release or hyperthermia.

Biography

Jose de Jesus Ibarra-Sanchez has completed his Master's in Chemical Engineering from the University of Guanajuato, Mexico. Since 2011, he is a Ph.D. Student at the same university. He has published two papers.

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