Magnetic Hyperthermia with cobalt ferrite nanoparticles: the Influence of Particle Size

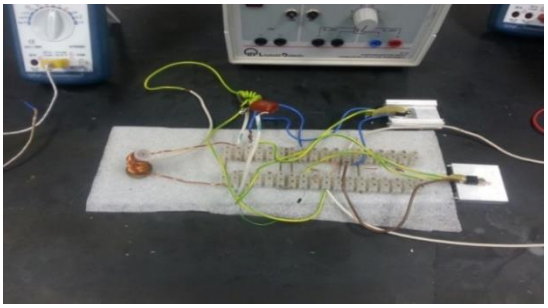
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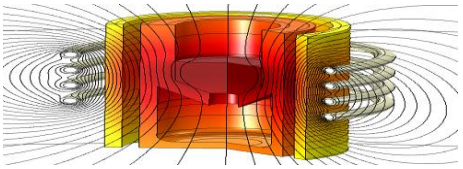
Abstract (300 word limit)

Abstract: Magnetic nanoparticles possess unique properties which can be applied in nanomedicine, they address targets such as cellular therapy, tissue repair, nanobiosensors, drug delivery, magnetic resonance imaging and magnetic fluid hyperthermia. In this work, different sized cobalt ferrite nanoparticls (CFNP) were selectively synthesized with narrow size distribution, by using chemical precipitation methods, to aim for finding the optimum particle size which has high heating efficiency in the applied magnetic field. The obtained powder was calcined at different temperature (600 °C, 800 °C, 900 °C, and 1000 °C). The sample which characterized by Transmission Electron Microscopy (TEM) confirmed the formation of single-phase CFNP in the range 10–115 nm depending on the annealing temperature. Localized magnetic particle hyperthermia treatment using ferrimagnetic nanoparticles continue to be an active area of medical research. So, homemade induction heater was designed. The heater was designed to be capable of generating high frequency, strong alternative magnetic fields (8 $kA \cdot m^{-1}$, 135 kHz). In vitro heating efficiencies in test tube, at a MNPs concentration of 250 mg $CFNP \cdot ml^{-1}$, were measured in the applied field. The temperature increase (ΔT) of the tube content at 60 s was 29.9 °C for MNPs of 18 nm, 26.7 °C for 25 nm, 25 °C for 60 nm and 22.9 °C for MNPs of 95 nm. The smallest nanoparticles (18 nm) exhibiting a high heating efficiency. In conclusion, it was found that the size of the CFNP increased with increasing the calcined temperature at which the synthesis of the nanoparticles was performed. The heating efficiency of the particles was improved with decreasing particle size from 95 nm to 18 nm in the alternating magnetic field.

Keywords: Cobalt ferrite, nanoparticls size, hyperthermia..

Image







Recent Publications (minimum 5)

1. Hassan R. A., Alharbi A. A, ALLehyani S. H. A. Preparation, Characterization of Cobalt Ferrite Nanoparticls *IJLSR*, 2016,. 4(4), 11-26.
2. . Issa, B., Obadiah, I. M., Albas, B. A., & Haik, Y.. Magnetic nanoparticles: surface effects and properties related to biomedicine applications. *International journal of molecular sciences*, 2013, 14(11), 21266-21305.
3. Andrade, Â., Fabris, J., Ferreira, R., & Domingues, R. *Coating nanomagnetic particles for biomedical applications*. INTECH Open Access Publisher, 2011
4. Lahonian, M. Diffusion of Magnetic Nanoparticles within a Biological Tissue during Magnetic. *Fluid Hyperthermia*, 2013.



Biography (150 word limit)

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Notes/Comments: