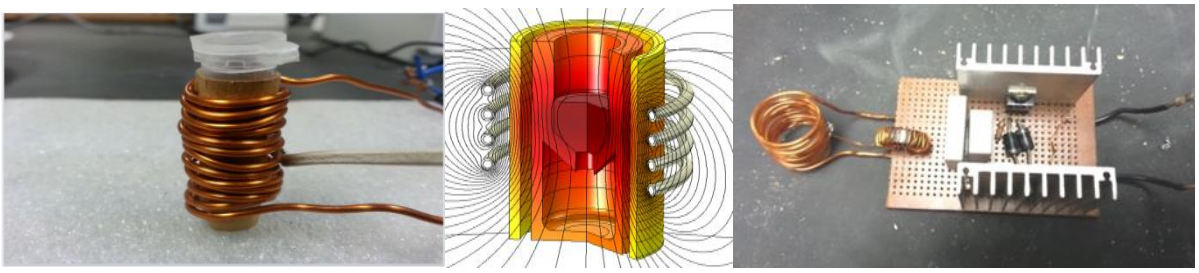
Magnetic Hyperthermia using cobalt ferrite nanoparticles: the Influence of Particle Size

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Abstract: Nanoparticles possess unique properties which can be applied in medical applications, they address targets such as cellular therapy, tissue repair, nano-biosensors, drug delivery, magnetic resonance imaging and magnetic fluid hyperthermia. In this work, different sized cobalt ferrite nanoparticls (CFNP) were 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 application. So, homemade induction heater was designed. The induction heater was designed to be capable of generating high frequency, strong alternative magnetic fields (8 kA·m^{-1}, 135 kHz). In vitro heating efficiencies in test tube, at a MNPs concentration of 250 mg CFNP·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, we 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.

Image

Recent Publications (minimum 5)

1. R. SEOUDI, S.H.A. ALLEHYANI, D.A. SAID , A.R. LASHIN, and A. ABOUELSAYED1, (2016). Preparation, Characterization, and Size Control of Chemically Synthesized CdS Nanoparticles Capped with Poly(ethylene glycol),. Journal of ELECTRONIC MATERIALS, 2016.
2. Mouaaz Nahas, M. Sabry, , Saud Al-Lehyani . Feasibility Study of Solar Energy Steam Generator for Rural Electrification, Energy and Power Engineering 2015.
3. S.H.A. ALLEHYANI, R. SEOUDI, D.A. SAID, A.R. LASHIN, and A. ABOUELSAYED, (2015) Synthesis, Characterization, and Size Control of Zinc Sulfide Nanoparticles Capped by Poly(ethylene glycol), Journal of Elec Material, DOI 10.1007/s11664-015-3974-3.
4. Mohamed Sabry, Mouaaz Nahas and Saud H. Al-Lehyani Simulation of a Standalone, Portable Steam Generator Driven by a Solar Concentrator. Energies 2015, 8, 3867-3881; doi:10.3390/en8053867
5. R. A. Hassan, A. A Alharbi, S. H. A. ALLehyani (2008) Preparation, Characterization of Cobalt Ferrite Nanoparticls Vol. 4, Issue 4, pp: (11-26), Month: October - December 2016..



Biography (150 word limit)

Prof allehyani S. Hl has his expertise in managing and preparing nanoparticles of different sized cobalt ferrite nanoparticls (CFNP) which 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..

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Notes/Comments: