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**Characterization of magnetic nanoparticles using Magnetic Hyperthermia System (MHS) for the application in cancer treatment** M.E. SADAT, RONAK PATEL, DAVID B. MAST, DONGLU SHI, University of Cincinnati, SERGEY L. BUD'KO, Ames Laboratory and Department of Physics and Astronomy, Iowa State University, JIAMING ZHANG, University of Michigan, HONG XU, Med-X Institute, Shanghai Jiao Tong University, Shanghai, China —
In this study, the heating profiles of various concentrations of three $Fe_3O_4$ magnetic nanoparticle systems were measured when the nanoparticles were exposed to alternating magnetic fields in a RF Magnetic Hyperthermia System. The $Fe_3O_4$ core nanoparticles of each system were approximately 10nm in diameter, but each system had different nanoparticle configurations and surface modifications. The heating profiles were used to investigate the dominant heating mechanism, the heat transfer into the surrounding fluid, and the overall effectiveness of each nanoparticle system for possible use in hyperthermia cancer treatments. Magnetization measurements showed that all samples were superparamagnetic in nature with almost zero retentivity and coercivity. For all samples, the saturation magnetization was observed to increase linearly with increasing concentration of $Fe_3O_4$. Five different concentrations of the three $Fe_3O_4$ nanoparticle samples were exposed to a 13.56 MHz alternating magnetic field with an amplitude of 4500 A/m, while the solution temperature was measured as a function of time using an optical fiber temperature probe. A correlation was observed between the heating rate, the initial susceptibility, and the type of surface modification of the $Fe_3O_4$ nanoparticles.

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