Abstract Submitted
for the SES17 Meeting of
The American Physical Society

Novel exchange-coupled core/shell nanoparticles for advanced magnetic hyperthermia[1] CAROLINE COLLINS, Bob Jones University, JOSHUA ROBLES-GARCIA, RAJA DAS, MANH H. PHAN, HARRY SRIKANTH, University of South Florida — Of any disease, probably the most well-known is cancer, and while there are treatments available, a new form of treatment is needed that is safer for the patient. Studies on magnetic nanoparticles (MNPs) have shown their promise in biomedical applications, such as magnetic hyperthermia, which employs MNPs for localized destructive heating of cancer cells. It has been found that as the size of the MNP decreases, the heating efficiency drastically decreases. Recently, however, a large improvement in heating efficiency has been reported in exchange-coupling of MNPs between a soft and a hard magnetic material. In this study, we optimized the heating efficiency of exchange-coupled MNPs composed of a soft magnetic core (Fe_3O_4) and a hard magnetic shell ($CoFe_2O_4$) by tuning both the shape of the nanoparticles and their concentration in solution. The MNPs show high magnetization (˜80 emu/g) and superparamagnetic-like behavior at room temperature. We compare the specific absorption rate (SAR) for each set of MNPs and correlate the results to shape distribution and concentration in solution. This study shows that exchange-coupled MNPs for magnetic hyperthermia are promising as route for non-harmful cancer treatment. A new approach for controlling the inductive heat for cancer treatment using a mixture of spheres and cubes is proposed.

[1]This project is supported by the NSF REU grant 1560090

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Date submitted: 28 Aug 2017 Electronic form version 1.4