Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Magnetic hyperthermia and photothermal effect of functionalized Fe_3O_4 nanoparticles for biomedical applications MD EHSAN SADAT, DONGLU SHI, DAVID B MAST, University of Cincinnati — The heating of nanoparticle loaded tissue surrogates for potential applications in cancer therapy was achieved when the superparamagnetic Fe_3O_4 nanoparticles were subjected to either high frequency alternating (AC) magnetic fields or near infra-red (NIR) radiation. Four nanoparticles systems were studied, where each system was distinct in terms of the arrangement, surface modification and physical confinement of the Fe_3O_4 nanoparticles. It was observed that the thermal response of each nanoparticle system to AC magnetic fields was different and could be described in terms of linear response theory and by taking into account the dipole-dipole interaction for closely packed nanoparticle systems. It was also shown that the same nanoparticle systems could be effectively heated when illuminated with NIR radiation at 785 nm and 808 nm. The measured optical absorption and scattering of the Fe_3O_4 nanoparticle systems was analyzed in terms of Mie scattering theory. The overall results from this study clearly demonstrate that the temperature increase of Fe_3O_4 nanoparticle loaded tissue surrogate samples to therapeutic levels could be achieved using AC magnetic fields and NIR radiation.

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Date submitted: 14 Nov 2013 Electronic form version 1.4