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**Exchange-coupled $Fe_3O_4/CoFe_2O_4$ nanoparticles for advanced magnetic hyperthermia** M. GLASSELL, Univ. of South Florida, Univ. of Scranton, J. ROBLES, R. DAS, M.H. PHAN, H. SRIKANTH, Univ. of South Florida — Iron oxide nanoparticles especially $Fe_3O_4$, $\gamma$-$Fe_2O_3$ have been extensively studied for magnetic hyperthermia because of their tunable magnetic properties and stable suspension in superparamagnetic regime. However, their relatively low heating capacity hindered practical application. Recently, a large improvement in heating efficiency has been reported in exchange-coupled nanoparticles with exchange coupling between soft and hard magnetic phases. Here, we systematically studied the effect of core and shell size on the heating efficiency of the $Fe_3O_4/CoFe_2O_4$ core/shell nanoparticles. The nanoparticles were synthesized using thermal decomposition of organometallic precursors. Transmission electron microscopy (TEM) showed formation of spherical shaped $Fe_3O_4$ and $Fe_3O$-/$CoFe_2O_4$ nanoparticles. Magnetic measurements showed high magnetization ($\cong$70 emu/g) and superparamagnetic behavior for the nanoparticles at room temperature. Magnetic hyperthermia results showed a large increase in specific absorption rate (SAR) for 8nm $Fe_3O_4/CoFe_2O_4$ compared to $Fe_3O_4$ nanoparticles of the same size. The heating efficiency of the $Fe_3O_4/CoFe_2O_4$ with 1 nm $CoFe_2O_4$ (shell) increased from 207 to 220 W/g (for 800 Oe) with increase in core size from 6 to 8 nm. The heating efficiency of the $Fe_3O_4/CoFe_2O_4$ with 2 nm $CoFe_2O_4$ (shell) and core size of 8 nm increased from 220 to 460 W/g (for 800 Oe). These exchange-coupled $Fe_3O_4/CoFe_2O_4$ core/shell nanoparticles can be a good candidate for advanced hyperthermia application.

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