Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Synthesis, characterization, and fabrication of magnetic nanoparticles for low energy loss applications[1] HONGSEOK YUN, Department of Chemistry, University of Pennsylvania, JUN CHEN, VICKY DOAN-NGUYEN, Department of Materials Science and Engineering, University of Pennsylvania, JAMES KIKKAWA, Department of Physics and Astronomy, University of Pennsylvania, CHRISTOPHER MURRAY, Department of Chemistry, Department of Materials Science and Engineering, University of Pennsylvania — It is important to increase operating frequency of power electronics for miniaturization of components. Magnetic materials are used as inductor cores to increase inductance proportional to their magnetic permeability. However, traditional magnetic materials are not used at high frequency (>100MHz) because of large hysteresis and eddy current loss. Superparamagnetic nanoparticles are good candidates to resolve these problems because they have zero hysteresis loss. In addition, eddy currents can be reduced due to their high electric resistivity originating from the organic ligands on the surface. Magnetic nanoparticles such as $NiFe_2O_4$, $Ni_{1-x}Zn_xFe_2O_4$, $MnFe_3O_4$ and $ZnFe_2O_4$ have been synthesized via high temperature thermal decomposition method and can be tuned to desired size, shape and chemical composition. To understand structural and magnetic properties of nanoparticles, the nanoparticles have been characterized by TEM, SQUID, PPMS, and Network Analyzer. UV-induced polymerization and pressing method have been implemented for film deposition. Finally, AC susceptibility of the nanoparticle film have been measured and discussed for low energy-loss applications.

[1]This work is supported by the Advanced Research Projects Agency - Energy (ARPA-E) program grant number DE-AR0000123.

Hongseok Yun
Department of Chemistry, University of Pennsylvania

Date submitted: 10 Jan 2013 Electronic form version 1.4