Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Synthesis of surface functionalized magnetic nanoparticles and their polymer nanocomposites M.J. MINER, M.B. MORALES, P. PODDAR, H. SRIKANTH, Physics, Univ. of South Florida, S.M. SKIDMORE, T.M. WELLER, Electrical Engineering, Univ. of South Florida — Magnetic nanoparticles embedded in polymer matrices are good examples of functional nanostructures with excellent potential in applications such as tunable microwave devices, EMI shielding, flexible electronics etc. Control over the dispersion of the nanoparticle phase embedded in a polymer matrix is critical and often challenging. To achieve excellent dispersion, competition between polymer-polymer and polymer-particle interactions must be balanced to avoid clustering of particles in polymer nanocomposites. In earlier work, we had demonstrated the successful synthesis of 2μm thick spin coated nanocomposite PMMA films with Fe_3O_4 (mean size 15nm) nanoparticle inclusions exhibiting superparamagnetic behavior. In this work, we will present our attempts to achieve thicker films more suitable for microwave applications and a study of the role of surface functionalization of ferrite nanoparticles synthesized using co-precipitation and hydrothermal routes. Cross-sectional SEM and TEM studies as well as magnetic characterization using a Physical Property Measurement System will be presented and discussed. We will also report on the microwave response of these films using a coplanar waveguide fixture. Work at USF supported by NSF through a GOALI grant from NSF-DMII.

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Date submitted: 03 Dec 2007 Electronic form version 1.4