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Enhanced Magnetic Properties in Nanoparticle-Filled CNTs K. STOJAK, S. CHANDRA, H. KHURSHID, M.H. PHAN, H. SRIKANTH, University of South Florida, Physics — There has been much interest in magnetic polymer nanocomposites (MPNCs) recently due to potential applications for EMI shielding, tunable EM devices and flexible electronics. In past studies, using ferrite fillers, we have shown MPNCs to be magnetically tunable when passing a microwave signal through films under the influence of an external magnetic field. We extend this study to include nanoparticle-filled multi-walled carbon nanotubes (CNTs) synthesized by CVD. These high-aspect ratio magnetic nanostructures, with tunable anisotropy, are of particular interest in enhancing magnetic and microwave responses in existing MPNCs. CNTs have an average diameter and length of 300nm and 6 μm, respectively and are partially filled with $CoFe_2O_4$ and $NiFe_2O_4$ nanoparticles (NPs) ($\sim$ 7nm). When comparing NPs to NP-filled CNTs, T_B increases by $\sim$ 40K and relaxation time, τ_0, increases several orders of magnitude, indicating that enclosing NPs in CNTs enhances interparticle interactions. Structural and magnetic characterization were completed using XRD, TEM and Quantum Design PPMS, using VSM and ACMS options.

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