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Synthesis and characterization of functional magnetic nanocomposites J. GASS, J. SANDERS, S. SRINATH, H. SRIKANTH, Functional Materials Laboratory, Physics Department, University of South Florida, Tampa, FL 33620, USA — Magnetic nanoparticles and carbon nanotubes have been excellent functional materials that could be dispersed in polymer matrices for various applications. However, uniform dispersion of particles in polymers without agglomeration is quite challenging. We have fabricated PMMA/polypyrrole bilayer structures embedded with Fe_3O_4 magnetite nanoparticles synthesized using wet chemical synthesis. Agglomeration-free dispersion of nanoparticles was achieved by coating the particles with surfactants and by dissolving both the particles and PMMA in chlorobenzene. Structural characterization was done using XRD and TEM. Magnetic properties of the bilayer structures indicated superparamagnetic behavior that is desirable for RF applications as the magnetic losses are reduced. Our polymer nanocomposite bilayer films with conducting polymer coatings are potential candidates for tunable RF applications with integrated EMI suppression. We will also report on our studies of pumped ferrofluids flowing past carbon nanotubes that are arranged in microchannel arrays. Magnetization under various flow conditions is investigated and correlated with the hydrodynamic properties. This scheme provides a novel method of energy conversion and storage using nanocomposite materials.

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