Synthesis and Magnetic Characterization of Maghemite Nanoparticles Designed for Targeted Cancer Therapy

K. PISANE, E. DESPEAUX, P.M. GANNETT, M.S. SEEHRA, Departments of Physics and Basic Pharmaceutical Sciences, West Virginia University — Adopting the procedure described by Hyeon et al [1], oleic acid coated maghemite nanoparticles of 7 nm average size as determined by TEM were synthesized for use in targeted cancer therapy. Here we report their magnetic properties. Using a PPMS magnetometer, magnetization (M) vs. temperature (2 K - 350 K) and magnetic field (up to ± 90 kOe) was measured under the zero-field-cooled (ZFC) and field-cooled (FC) conditions. The results for H = 100 Oe show a blocking temperature $T_B = 35 K$ which shifts to lower temperatures with increase in H. For $T > T_B$, isotherms of M vs. H were measured at several temperatures and, following the procedures reported recently [2], data were fitted to a modified Langevin function: $M = M_0 L(\mu_p H/k_B T) + \chi_a H$ with $\mu_p \approx 7500 \mu_B$ per particle. Using this magnitude of $\mu_p$, particle diameter $D = 6.9$ nm is determined which agrees with the TEM data. Procedures for in vitro studies include coating with biocompatible polymer and functionalization with therapeutic and targeting ligands. Toxicity testing and determination of in vivo activity are in progress.


1Supported in part by IGERT NSF Grant #DGE-1144676.