1107-49-92 **Harbir Antil** (hantil@gmu.edu), Department of Mathematical Sciences, George Mason University, Fairfax, VA 22030, **Ricardo Nochetto** (rhn@math.umd.edu), Department of Mathematics, University of Maryland, College Park, MD 20742, and **Pablo Venegas*** (pvenegas@umd.edu), Department of Mathematics, University of Maryland, College Park, MD 20742. *Optimal control of Magnetic Nanoparticles.* Preliminary report.

Magnetic drug targeting is an important application of ferrofluids where drugs, with ferromagnetic particles in suspension, are injected into the blood stream. The external magnetic field thus concentrates the drug to the most affected areas, for example, solid tumors. Current approaches lack a proper functional analytic framework which is essential to formulate optimization problems and develop stable numerics, both being crucial in practice. In this work we formulate a PDE constrained optimization problem with a tracking type cost. We develop an adjoint based optimization framework with a state equation consisting of an advection-diffusion equation for the concentration. The solenoidal and irrotational magnetic field acts as a control. Its multiplicative nature is a new and major issue in PDE constrained optimization. (Received January 04, 2015)