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Iron nitride nanoparticles synthesized by inert gas condensation PRASANNA SHAH, BRENT FORD, ANDREW DEAN, DIANDRA PELECKY, Department of Physics, University of Texas at Dallas, Richardson TX 75080 — Inert gas condensation (IGC) is a highly versatile technique to synthesize monodisperse nanoparticles (NP). Earlier research done in our group on iron oxide nanoparticles and Fe- and Co- based fluids suggests that these NP's are well suited for magnetic drug delivery, however, their utility would be dramatically enhanced if they exhibited higher saturation magnetization. Iron-oxide nanoparticles are the most commonly studied system; however, the saturation magnetization (70-90 emu/g) is considerably lower than pure Fe (210 emu/g). Fe NPs tend to oxidize easily, so we are exploring Fe-N and Fe-C alternatives. We have used IGC to synthesize Fe-N nanoparticles (mean sizes $\sim$ 10-20 nm) using Fe deposition followed by gaseous nitrogenation, and via reactive inert-gas condensation. Post-deposition nitrogenation does not form Fe-N phases, nor protect the nanoparticles from oxidation. By reactive sputtering with varying relative concentration of N:Ar, we can produce Fe_xN phases ranging from x=1 (non-magnetic γ-FeN) x=4. A systematic study of nitride phase formation as a function of Ar/N_2 ratio during sputtering will be reported.

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