Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Ultrafast Characterization of Nanostructures in GaAs
STEPHANIE GILBERT, Vanderbilt University, JASON KAWASAKI, University of California Santa Barbara, ANDREW STEIGERWALD, JUSTIN GREGORY, Vanderbilt University, CHRIS PALMSTRØM, University of California Santa Barbara, NORMAN TOLK, Vanderbilt University — We combine ultrafast pump-probe and optoacoustic spectroscopy with magneto-optical Kerr rotation measurements to characterize embedded, self-assembled magnetically active nanostructures in a GaAs host matrix. We observe variations in the pump-probe and optoacoustic signals depending on the composition and growth characteristics of the embedded layers. Further, we observe (a) distinct behaviors in the femtosecond response of the composite structures when the probe photon energy is tuned near the GaAs band edge and (b) strong modulation of the optoacoustic signal inside the embedded layer. These results indicate an effective change in the transient femtosecond response of the composite structure, likely originating in strain effects due to the presence of nanoparticles within the host lattice. We additionally probe ultrafast magneto-optical interactions through time-resolved Kerr measurements. Finally, we present a potential method for high-resolution depth-dependent magnetic characterization by combining the Kerr rotation and optoacoustic experimental techniques.

Stephanie Gilbert
Vanderbilt University

Date submitted: 08 Dec 2011 Electronic form version 1.4