Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Gold Nanoparticle Liquids and Dispersions: Structure and Phase Stability RICHARD VAIA, STEPHEN DIAMANTI, ROBERT MACCUSPIE, HILMAR KOERNER, MITRA YOONESSI, MARK PENDER, Air Force Research Laboratory, Materials and Manufacturing Directorate, WPAFB, OH — By minimizing the volume fraction of the organic corona necessary to generate a net long-range repulsive pair-potential (and thus maximizing inorganic volume fraction), neat nanoparticle assembles may exhibit liquid-like behavior, which affords intriguing possibilities for numerous applications including solvent-less inks for micro-fabrication and compliant electrodes. For example, noble metal nanoparticle fluids have extended the life-cycle of an RF MEMS switch simulator by six-orders of magnitude relative to SAM surfaces and by one hundred times relative to uncoated gold switches by limiting switch failure by adhesion and shorting mechanisms. The thickness of the ionic-liquid corona, comprised of mercaptoethane sulfonate and a mixture of alkyl and PEG quaternary ammonium, is 1.4-1.5 nm, measured by small angle neutron scattering. Evidence of reversible de-aggregation of close-packed assembles of gold nanoparticles is observed around 1-4 wt% in aromatic solvents, and at much lower concentrations in alkanes by small angle x-ray scattering. Thus, in addition to potential technological utility, these functionalized gold nanoparticles are providing experimental avenues to measure the phase stability of nanoparticle dispersions over a wide range of compositions.

Richard Vaia
Air Force Research Laboratory,
Materials and Manufacturing Directorate, WPAFB, OH

Date submitted: 21 Nov 2006 Electronic form version 1.4