Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Dynamic gold nanoparticle, polymer-based composites MILLICENT FIRESTONE, ANN JUNGHANS, STEVEN HAYDEN, JAROSLAW MAJESKI, Los Alamos National Laboratory, CINT, LUJAN TEAM — Artificial polymer-based biomembranes may serve as a foundational architecture for the integration and spatial organization of metal nanoparticles forming functional nanocomposites. Nonionic triblock copolymer (PEO-PPO-PEO), lipid-based gels, containing Au nanoparticles (NPs) can be prepared by either external doping of the preformed nanoparticles or by in-situ reduction of Au $^{3+}$. Neutron reflectivity on quartz supported thin films of the Au NP –doped polymer-based biomembranes was used to determine the location of the Au. The nanoparticles were found to preferentially reside within the ethylene oxide chains located at the interface of the bulk water channels and the amphiphile bilayers. The embedded Au nanoparticles can act as localized heat sinks, inducing changes in the polymer conformation. The collective, thermally-triggered expansion and contraction of the EO chains modulate the mesophase structure of the gels. Synchrotron X-ray scattering (SAXS) was used to monitor mesophase structure as a function of both temperature and photo-irradiation. These studies represent a first step towards designingexternally-responsive polymer-nanoparticle composites.

Millicent Firestone
Los Alamos National Laboratory

Date submitted: 15 Nov 2013 Electronic form version 1.4