Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Theoretical Description of the Self-Assembly Dynamics of DNA-functionalized Nanoparticles CHIA WEI HSU, Wesleyan University, FRANCESCO SCIORTINO, University La Sapienza, FRANCIS STARR, Wesleyan University — Nanoparticles (NP) functionalized with DNA strands can assemble into networks with unusual structure and phase behavior. Properties of such materials are known from computational studies, but a deeper understanding requires a theoretical description of the assembly process. As a step toward this goal, we show that the kinetics of self-assembly of a mixture of NP functionalized by two or three DNA strands can be quantitatively described by the Flory-Stockmayer (FS) theory of gelation. Below the percolation threshold for the DNA-linked NP network, the FS theory also accurately describes the cluster size distribution. These results rely on the formation of nearly loopless structures; a more general theoretical description remains to be developed. In addition, we show that at equilibrium, the diffusion of nanoparticles is connected to the formation of bonds through a simple relation.

Chia Wei Hsu
Wesleyan University

Date submitted: 05 Jan 2010 Electronic form version 1.4