Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Novel liquid crystal phase transition of linear defects in an epitaxial layer of DNA-nanoparticle superlattices[1] SAIJIE PAN, NIELS BOON, MONICA OLVERA DE LA CRUZ, Northwestern Univ — We use Monte Carlo simulations and mean-field theory to study a lattice model system in which DNA-coated nanoparticles form an epitaxial layer onto a patterned bcc (100) template. If nanoparticles only attach to the so-called "center" sites, each of which is the center of a unit cell in the square lattice template, it would result in a perfect bcc epitaxial layer. However, defects arise due to attachment to "edge" sites and "corner" sites. In simulation, we show that edge-binding defects prefer to form linear clusters in horizontal and vertical directions. These linear defects can undergo a second-order isotropic-nematic phase transition in some regimes. A mean-field approach is introduced to provide theoretical descriptions for the system in each of the phases and predict the critical phase transition conditions. Striking agreement is observed between the theory and simulation.

[1]This work was supported by the the Air Force Office of Scientific Research (AFOSR) Multidisciplinary University Research Initiative (MURI) FA9550-11-1-0275.

Saijie Pan
Northwestern Univ

Date submitted: 06 Nov 2015 Electronic form version 1.4