Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Facile Fabrication of 3-D Nanoparticle Arrays in Thin Films toward Photonic Materials JOSEPH KAO, SEONG-JUN JEONG, VIVIAN PENG-WEI CHUANG, PETER JIN BAI, UC Berkeley, ZHEN ZHANG, CHENG SUN, Northwestern University, TING XU, UC Berkeley — 3-D hierarchical assemblies of nanoparticles in thin films enable one to exploit their collective properties to generate functional electronic, magnetic, and photonic materials. Among many templates, block copolymer-based supramolecules is one of the most promising candidates since they combines solution processiblity and high precision in nanoparticle spatial distribution. Herein, we report a facile way of fabricating 3-D nanoparticle arrays in thin films of diblock copolymer-based supramolecules exhibiting bandgap in the visible regime. The entropy-dominant assembly drives the formation of 3-D lattice of nanoparticle arrays with precise inter-array spacings in thin films. The coupling effect between the precisely positioned nanoparticle arrays with adjustable lattice spacings in the hierarchically-structured nanocomposites allows potentially interesting optical properties.

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Date submitted: 10 Nov 2011 Electronic form version 1.4