Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Fast Fabrication of Hierarchically-Structured Nanocomposites in Thin Films JOSEPH KAO, PETER BAI, SEONG-JUN JEONG, VIVIAN PENG-WEI CHUANG, TING XU, UC Berkeley — Significant attention has been given to developing bottom-up routes to direct hierarchical assemblies of nanoparticles in thin films for applications such as novel electronics, energy harvesting modules, and photonic materials. It remains challenging to control the self-assembly of the nanocomspites in a short period of time using methods compatible with scalable manufacturing. Here, we report a facile method utilizing solvent vapor annealing to precisely control the morphologies of nanocomposite thin films (PS-b-P4VP(PDP)$_x$ with nanoparticles) in the time scale of minutes. By controlling the solvent vapor pressure during the annealing process, the orientations of the microdomains and the nanoparticles can be tailored. Long range-ordered lateral morphologies of the nanocomposites can be obtained. In-situ GISAXS experiments show that the fast assembly process may be attributed to the nature of the supramolecules. The rate of solvent evaporation has been identified as a critical factor in controlling the final morphologies of the nanocomposites.

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Date submitted: 10 Nov 2011 Electronic form version 1.4