Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Exploiting Photo-induced Reactions in Polymeric Thin Films to Create Hierarchically Ordered, Defect-free Materials RUI TRAVASSO, OLGA KUKSENOK, ANNA BALAZS, University of Pittsburgh — Computer simulations reveal how photo-induced chemical reactions in polymeric thin films can be exploited to create long-range order in materials whose features range from the submicron to the nanoscale. The process is initiated by shining a spatially uniform light on a 2D photosensitive AB binary blend, which thereby undergoes both a reversible chemical reaction and phase separation. When a well-collimated, higher intensity light is rastered over the sample, the system forms defect-free, spatially periodic structures, which resemble the phases of microphase-separated diblock copolymers. We then add a non-reactive homopolymer C, which is immiscible with both A and B. This component localizes in regions that are irradiated with a higher intensity light and one can effectively write a pattern of C onto the AB film. Rastering over the ternary blend with the collimated light now leads to hierarchically ordered patterns of A, B and C. The findings point to a facile, non-intrusive process for manufacturing high quality polymeric devices in a low-cost, efficient manner.

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Date submitted: 29 Nov 2005 Electronic form version 1.4