

Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Position and orientation of gold nanorods in vertical cylinder diblock copolymer films BORIS RASIN, BEN LINDSAY, XINGCHEN YE, Univ of Pennsylvania, JEFFREY METH, DuPont Co., CHRISTOPHER MURRAY, ROBERT RIGGLEMAN, RUSSELL COMPOSTO, Univ of Pennsylvania — The location and orientation of gold nanorods (AuNRs) in diblock copolymer films with a vertical cylinder morphology was studied. Poly(styrene-*b*-2-vinylpyridine) (PS-*b*-P2VP) films containing AuNRs grafted with P2VP were prepared and solvent annealed. The solvent annealed films had a microdomain structure of vertical P2VP cylinders in a PS matrix. Nanocomposites (NCs) were prepared with 70 nm x 12 nm and 101 nm x 16 nm AuNRs. For NCs prepared with the shorter and thinner AuNRs, NRs near the surface were found to mainly align parallel to the surface. The AuNRs either bridged two neighboring P2VP cylinders or collocated on top of one P2VP cylinder. For NCs prepared with the longer and thicker AuNRs, the NRs mainly bridged adjacent P2VP cylinders. For greater insight into the system SCFT simulations were used to compare the free energy differences between vertically aligned, bridging and isolated NR positions. In agreement with experiments, simulations demonstrate that the lowest free energy corresponds to NRs that span two cylinders. These simulations also show the expected behavior of the P2VP domains beneath the NR and provide guidance for selecting NR dimensions that would result in vertical orientation.

Boris Rasin
Univ of Pennsylvania

Date submitted: 11 Nov 2016

Electronic form version 1.4