Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Synergistic templated self-assembly of cellulose nanocrystals in thin block copolymer films DANIELLE GROLMAN, The University of Akron, JEFFREY GILMAN, CHELSEA DAVIS, National Institute of Standards and Technology, ALAMGIR KARIM, The University of Akron — Nanofillers in thin polymer films offer unique advantage to potentially modify the film's thermal, optical, electrical and mechanical properties due to the high surface area to volume ratio and intrinsic property change at the nanoscale. Nanofilled polymer films have been shown to exhibit unusual film stability to dewetting with a nonmonotonic behavior with nanofiller loading, potentially arising from factors such as competitive phase behavior and filler aggregation, particularly in the high nanofiller concentration limit. In this regard, block copolymer films can act as ideal nanoscale structured templates to selectively sequester and organize nanofillers. In conjunction with incorporated cellulose nanocrystals (CNCs), we seek to understand how individual anisotropic nanofillers can provide synergistic reinforcement to inherently anisotropic nanostructured block copolymer films. A clear enhancement in the Young's Modulus was observed with increased CNC loading using strain-induced elastic buckling instability for mechanical measurements (SIEBIMM) for thin films. To this end, we examine the nanoscale to microscale morphology of the blend film through AFM, TEM and grazing incidence small-angle x-ray scattering (GISAXS), and CNC dispersion and percolation through high-intensity grazing incidence wide-angle x-ray scattering (GIWAXS) analysis.

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Date submitted: 14 Nov 2014 Electronic form version 1.4