Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Vertically Oriented Microdomains of Lamellar Block Copolymer Films with High Temperature Gradient Cold Zone Annealing MONALI BASUTKAR, Univ of Akron, SAUMIL SAMANT, Intel Corporation, JOSEPH STRZALKA, Argonne National Laboratory, ALAMGIR KARIM, Univ of Akron — Directed Self-Assembly (DSA) to orient lamellar Block Copolymer (l-BCP) microdomains vertical is essential to future nanotechnology applications ranging from ion conducting membranes for batteries to nanolithography owing to their high surface area to volume ratio, aspect ratio and smooth sidewall profile. Progress has been made in developing vertically ordered l-BCP thin films through strategies such as neutral substrate brushes and top coats, graphoepitaxy, nanoscale roughness, etc. We report the DSA design and development of highly ordered vertical l-BCP microdomains of polystyrene-b-polymethyl methacrylate films by a dynamic thermal gradient process, Cold Zone Annealing with Sharp thermal gradient (CZA-S). This rapid (2-4 min.) one-step CZA-S process demonstrates vertical ordering in l-BCP films that are multiple times thicker than the domain spacing L_o (upto 850nm, $23L_o$) without any substrate pretreatment. We demonstrate the dynamics of nanostructure formation and morphology evolution in l-BCP films along the CZA-S thermal gradient through *insitu* Grazing Incidence Small Angle X-ray Scattering that reveals fundamental insights into the physics of vertical ordering in l-BCPs through this process.

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Date submitted: 10 Nov 2016 Electronic form version 1.4