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3-Dimensional Imaging of Evolving Block Copolymer Microstructure using Laser Scanning Confocal Microscopy WONMOK LEE, JONGSEUNG YOON, HYUNJUNG LEE, EDWIN L. THOMAS, Department of Materials Science and Engineering, M.I.T., Cambridge, MA — Block copolymers (BCPs) exhibit various periodic structures through microphase separation with tunable domain shape and size via choice of molecular weight, chain architecture, etc. To extract detailed morphological information of BCPs, microscopic tools such as transmission electron microscopy and atomic force microscopy have been widely used due to the superior imaging capability. However, these methods provide only 2-D info and are not very suitable to following dynamic bulk processes in real time. Structural information over 3-D space is often crucial to elucidate the BCP microstructure in detail and to understand the role of nucleation and defects in various types of phase transitions and ordering processes. Laser scanning confocal microscopy (LSCM) is a unique optical microscopic technique capable of 3-D imaging of various microstructures (resolution limit $>$ 200nm) in non-destructive manner. This length scale can be readily reached with BCPs having 0.5M g/mol molecular weights. We employ LSCM to investigate the 3-D morphology of various BCP self-assemblies including well-ordered cylindrical BCP obtained by directional solidification. We expect LSCM will enable us to explore a variety of unprecedented morphological phenomena related to BCP self-assembly.

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