Orientation Control of Block Copolymer Thin Films on Substrates with Well-Defined Roughness

주영우, 서효선, 김현미[1], 조명래[1], 박 윤[1], 김기범[1], 차국헌*
서울대학교 지능형 유도조합체 연구단; [1]서울대학교
(khchar@snu.ac.kr*)

Many recent research has focused on the fact that the perpendicular orientation of block copolymer (BCP) films is preferred over the parallel orientation when the BCP films are placed on rough surfaces. However, the quantitative and systematic analysis to investigate the effect of substrate roughness, such as period and/or amplitude of a given roughness, on the microdomain orientation of BCP films has not been fully explored yet. In the present study, we utilized various E-beam lithographic techniques to analyze the effect of substrate roughness in more systematic way. The HSQ patterns with well-defined periods and amplitudes were realized by the Atomic Image Projection E-beam Lithography. In addition, well-defined silicon oxide patterns were also obtained using ordinary E-beam lithography. The line width and period of the patterns were finely tuned during the E-beam writing while the depth of the patterns was controlled by the reactive ion etching on the patterned substrates. On the prepared substrates, we deposited symmetric PS-b-PMMA diblock copolymers and observed the effect of individual roughness factors on the BCP thin films.