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The effect of temperature gradient on block copolymer thin film under non-neutral surface condition: simulation and experiment JUNE HUH, WON HO JO, School of Materials Science and Engineering, Seoul National University, HUI JOON JUNG, CHEOLMIN PARK, Department of Mechanical Engineering, Yonsei University — Using both computer simulation and experiment, we study the effect of directional moving of temperature gradient on the structure organization in diblock copolymer thin films bound to the surfaces that favor one of the block components. To simulate the time evolution of the morphological development in the block copolymer film under temperature gradient, the dynamical evolution equation based on Cahn-Hilliard-Cook model is numerically integrated on $L \times L \times D$ grid cell. Three different block copolymer morphologies of lamellar, cylindrical and spherical structures confined between non-neutral flat surfaces are initially generated by a rapid quenching from their disordered states and then the temperature gradient ($\nabla_x T$ where T is the temperature and x is one of the direction parallel to the surface) is slowly moved along the x-direction. We find from both simulation and experiment that in the case of lamellar film $\nabla_x T$ always promotes the lamellar layering irrespective of film thickness, remedying all the bumpy lamellar planes to become completely flat. We also find that in the case of cylindrical and spherical morphologies the temperature gradient enhances the spatial symmetry of mesophases.

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