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The Structural Change of Buckling Depending on the Directional Mechanical Heterogeneity of Top Thin Films DOKYEONG KWON, Seoul National University, HYO SEON SUH, University of Chicago, KOOKHEON CHAR, Seoul National University — Buckling of thin films on elastomeric substrates such as polydimethylsiloxane (PDMS) is the well-known phenomenon in buckling instability originating from the moduli mismatch between a substrate and a thin film placed at the top. Recently, many studies on the microstructure created by the buckling have been reported but most of the work has introduced only mechanically homogeneous top thin films, which has constant Young's modulus throughout whole film. Here, we present the buckling of mechanically heterogeneous thin films on top of PDMS substrates. Mechanically heterogeneous top films were prepared by either polystyrene (PS) films with topographic patterns or oriented block copolymer (BCP) thin films. Buckling instability was induced by applying a mechanical stress to the top film-PDMS bilayer. Resulting buckled structure made hierarchical structure along with smaller-scale structures, which is topographic PS structure or oriented BCP structure. Due to the directional mechanical heterogeneity of top films, resulting buckled structures showed structural change depending on the alignment of top films with respect to the buckled direction of a substrate. This work could give insights on new patterning technique, utilizing both nano-sized patterns and micro-sized patterns at the same time.

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