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Buckling of Patterned Top Films DOKYEONG KWON, Seoul Natl Univ, HYO SEON SUH, University of Chicago, KOOKHEON CHAR, Seoul Natl Univ — 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 on the top. Recently, many studies on the microstructure created by the buckling with flat top films have been reported and physics behind them has almost been well received. However, only a few work has been done for the buckling structure with micro- or nano-patterned top films and buckling mechanics for patterned top film-PDMS bilayers has not yet been established in detail. Here, we present the buckling of various patterned top films placed on top of elastomeric PDMS substrates. Geometrical patterns were prepared by unconventional lithography techniques such as thermal imprinting of polystyrene (PS) films. Buckling instability was induced by applying mechanical stress to the patterned top surface-PDMS bilayers. Resulting buckled structures showed different mechanical structures as shape and structural parameters of the top thin films were varied. The structural changes were analyzed by introducing a beam theory or a plate theory for the simple modeling of the top surfaces, giving insights on the buckling mechanics of top films with complicated patterns placed on PDMS substrates.

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