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Contact Adhesion of Wrinkled Surfaces CHELSEA DAVIS, ALFRED CROSBY, University of Massachusetts Amherst — Inspired by examples in nature, recent research advances have demonstrated the ability to use topographic surface patterns rather than chemical modifications to control surface properties such as adhesion, wettability, and friction. Although most synthetic efforts have focused on the use of complicated lithographically-fabricated fibrillar structures, the use of spontaneously formed structures, such as surface wrinkles, have also proven advantageous. Wrinkles present many attributes, such as discretized length scales, which play an important role in adhesion control, yet the exact mechanisms for this control are not fully understood. We present a systematic study of the contact adhesion mechanics between a flat, rigid surface and a soft wrinkled surface. The wrinkles are fabricated using a technique that allows the effects of residual surface stresses and wrinkle topography to be decoupled in the context of adhesion control. We find that the maximum separation force for the wrinkled-flat interfaces increases with decreasing values of wrinkle wavelength and amplitude. These trends can be understood through the development of a simple scaling relationship, which links wrinkle geometry and materials properties to the maximum separation force.

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