

Abstract Submitted
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Directionally Sensitive Adhesion of Textured Surfaces JOHN HOWARTER, JUN YOUNG CHUNG, CHRISTOPHER STAFFORD, NIST — Understanding the mechanism of adhesive failure at textured interfaces is critically important to the design of advanced functional surfaces. Many naturally occurring adhesives rely on surface texture or mechanical property gradients to increase fracture toughness without manipulating surface chemistry. By avoiding chemical mechanisms, textured adhesives are able to exhibit reversible, directionally-dependant adhesion. We measured fracture toughness of interfaces with controlled adhesive heterogeneity induced through surface patterning and manipulation of sub-surface structure, thus revealing critical design elements for advanced adhesives. By creating mechanical property discontinuities and gradients at a microstructural level, it is possible to alter the interfacial stress profile prior to crack initiation, thus altering the energy cost for delamination. Geometric shape and orientation of surface texture were also varied to create anisotropic fracture behavior. Our initial designed surfaces have displayed up to 40% reduction in load required to initiate delamination based on solely on changing the direction of crack propagation.

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