Contact and Adhesion Mechanics of Biomimetic Fibrillar Interfaces

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Theoretical and experimental studies of fibrillar contact surfaces, like those found in geckos and insects, have shown that these surfaces are capable of both greater strength and toughness than flat control surfaces of the same materials. However, these properties have been difficult to achieve in synthetic fibrillar mimic structures, due in large part to their inability to attain intimate contact over a large surface area. We have developed a new biomimetic interface that combines fibrils with a thin plate. Adhesion experiments using a double cantilever beam geometry and contact via a spherical indenter show that this structure out-performs a flat control in all cases. In addition to these experimental findings, we will present analyses of the mechanics of these structures to show the dependence of adhesion on various design factors, such as fibrillar and spatular dimensions and material.