

BHE-027
Design and Fabrication of Bio-Inspired Adhesives

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Abstract

The remarkable ability of the biological species such as geckos and insects to adhere to and release from various surfaces is owing to the hierarchical micro- and nano-level structures of their adhesive pads. Motivated by these intricate architectures, we plan to design and fabricate structurally patterned synthetic polymers and subject them to adhesion and fracture mechanics tests. What we hope to learn from these bio-mimetic studies is how biology uses topographical features and mechanical properties of adhesive pads to control adhesion to various substrates. These studies will also provide the design criteria for manipulating adhesion in a variety of artificial attachment devices without using the commonly used strategies based on viscoelastic or chemical interactions. Developed bio-inspired adhesives would open new horizons for many advanced engineering applications. As possible applications, they will be used for wall-climbing miniature robots in unstructured environments, reusable and self-cleaning adhesives for novel industrial (general adhesives, textile, tire, pharmacological, sports, entertainment, and toy industries) and space applications.