

The Flexible Characteristic of Reversible and Robust Nanohair Fastener

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Dry adhesion caused by Nanoscale contact comes up to important scientific issue. Herein, we introduce bendable nanohairy locking fastener system with high shear strength and mechanically flexible backing. The polymeric patches like velcro are composed of an array of straight nanohairs with 100 nm diameter and 1 μ m height. To fabricate high aspect vertical nanohairs, we used UV molding method with appropriately flexible and rigid polyurethane acrylate material on PET substrate. Two identical nanohairy patches are easily merged and locked each other induced by van der Waals force. Because nanohairs can be arrayed with high density $\sim 4 \times 10^8$ /cm², we can obtain high shear adhesion force on flat surface (~ 22 N/cm²). Furthermore, we can obtain nanohairy locking system with maximum shear adhesion ~ 48 N/cm² of curved surface due to flexibility of PET substrate. We confirm the tendency that shear adhesion force increases, as radius of curvature increases.

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