

Self Recovery of Clustered Hydrogel Micro-pillars

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Slanted high aspect ratio (HAR) pillars have been applied in many regimes such as directional wetting, directional adhesion, or cell alignment. However, HAR pillars exposed to humid environments are clustered after water evaporation due to capillary force. In order to recover the clustered pillars to the original shape, few attempts have been made utilizing external forces such as ultrasonic energy, mechanical force. Nonetheless, these approaches are either too costly or too complex. Here, we present an automatic shape recovery of clustered slanted micro-pillars by exploiting the modulus changes of hydrogel materials. The slanted hydrogel micro-pillars are fabricated using soft lithography from the oblique dry-etched master. We observed the clustering and recovery of the hydrogel micro-pillars by using an optical as well as an environmental scanning electron microscope. To understand the recovery by modulus changes, we compared the adhesion force between pillars and the restoring force. Furthermore, we demonstrated a simple application of optical transparency change by the clustering and the recovery of slanted micro-pillars.