Supporting Information

Influence of Humidity on Grip and Release Adhesion Mechanisms for Gecko-Inspired Microfibrillar Surfaces

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Parameters for Hamaker constant calculations

The Hamaker constants were calculated using Lifshitz theory (Eq. 2) for each system with glass interacting with PDMS and either air or water as the intervening medium with dielectric constants and refractive indices from Table S1 below.

Table S1. Dielectric constant and refractive index used in Equation 3 to calculate Hamaker constants.

Material	Dielectric constant, ε	Refractive index, n
Glass	4.6	1.474
Air	1	1.000
Water	80	1.333
PDMS	2.5	1.41

Static friction force vs. preload

Friction forces, $F_{||}$, were measured as a function of preload, L at every humidity level using a flat PDMS sample. The friction forces increase monotonically with increasing preload at each humidity, as shown in Figure S1.

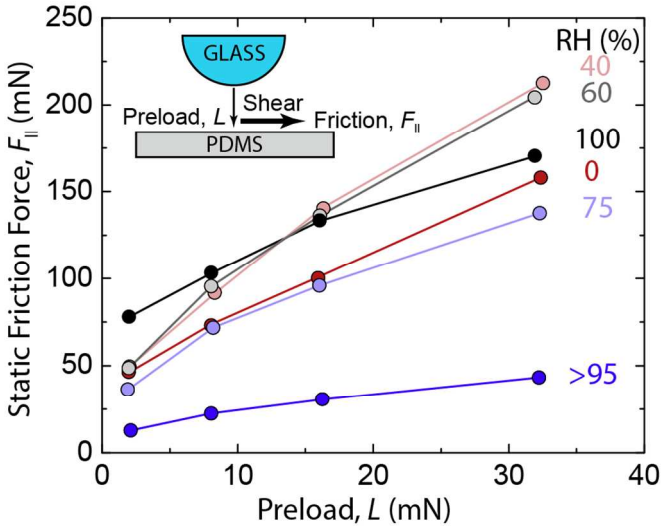

Figure S1. Static friction force, $F_{||}$ as a function of preload, L, on flat PDMS. Results are presented for the full range of relative humidity, 0 % (red), 40 % (pink), 60 % (gray), 75 % (lavender), > 95 % (blue), and 100% underwater (black). The friction force increases with increasing preload in a non-linear fashion.

The same friction force measurements were performed on the microstructured surface, both shearing along the tilt (static friction force $F_{||}^{+}$) and against the tilt (static friction force $F_{||}^{-}$). Results are shown in Figure S2.

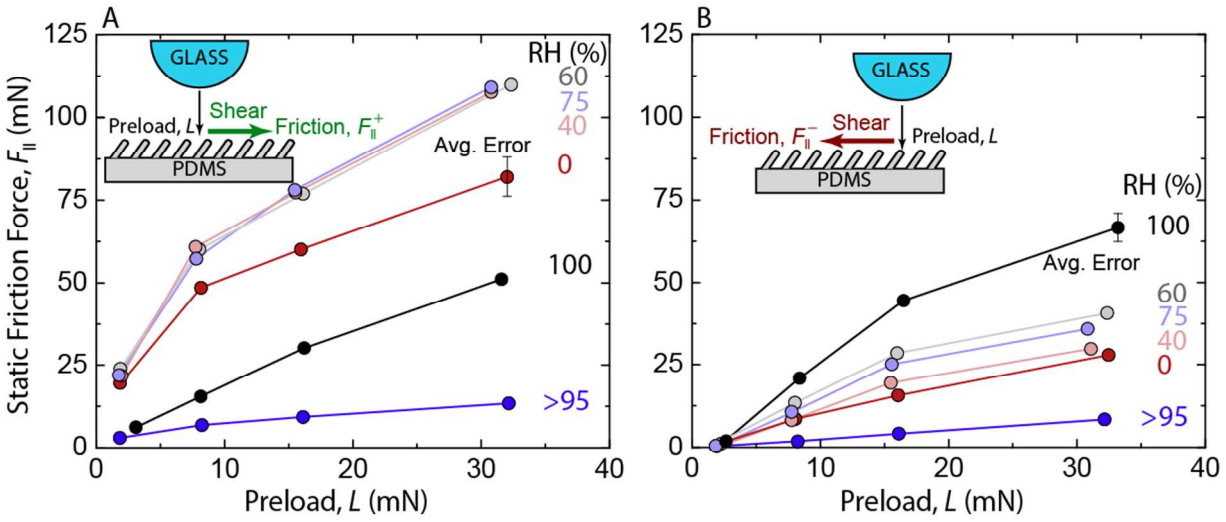

Figure S2. Static friction force, $F_{||}$, as a function of preload, *L*, on micro-structured PDMS for both shear with the tilt (A) and against the tilt (B). Results are presented for the full range of relative humidity, 0 % (red), 40 % (pink), 60 % (gray), 75 % (lavender), > 95 % (blue), and 100% underwater (black). In both cases the friction forces increase with increasing preload.