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Strongly Modulated Friction of a Film-terminated Ridge-Channel Structure ANAND JAGOTA, ZHENPING HE, Lehigh Univ — An anisotropic elastomeric surface comprising an array of ridges separated by channels of varying width and terminated by a thin film was found to have strongly tunable sliding friction. For small periodic spacing,, when motion is orthogonal to ridges, friction is significantly reduced, primarily due to deformation that causes loss of contact, a not-uncommon phenomenon for structured elastomeric surfaces. In sharp contrast, for a range of ridge-ridge spacing, we find surprisingly strong enhancement of sliding friction accompanied by a transition to complex sub-surface deformation modes, which is distinct from film-terminated fibrillar structures. However, when the motion is parallel to ridges, a different deformation pattern arises resulting diverse tribological performance. We elucidate the necessary conditions required to trigger these deformation modes and show that they enhance friction by creating multiple sliding internal interfaces and by unstable release of stored elastic energy.

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