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Harnessing polymer gels to regulate friction between sliding surfaces[1] HASSAN MASOUD, ALEXANDER ALEXEEV, Georgia Institute of Technology, George W. Woodruff School of Mechanical Engineering — We examine the microscale tribological behavior of a pair of gel coated surfaces separated by a thin layer of lubricant. The soft, elastic gel is modeled using a bond-bending lattice spring model that captures the micromechanics of a random network of interconnected filaments. We couple this model with the dissipative particle dynamics that explicitly models the hydrodynamics of a viscous fluid. We probe how elasticity and internal structure of compliant gels affect the tribological behavior and examine how gel elasticity can be harnessed to regulate friction between sliding surfaces. We also study the effect of lubricant composition and the inclusion of nanoscopic particles of different shapes on the friction forces between wet compliant surfaces. Our findings could be useful for developing new methods for regulating friction and reducing wear of lubricated surfaces and also for understanding the micro-mechanics of friction in biological systems.

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