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Surface Friction of Polyacrylamide Hydrogel Particles[1] NICHOLAS CUCCIA, JUSTIN BURTON, Emory University, Department of Physics — Polyacrylamide hydrogel particles have recently become a popular system for modeling low-friction, granular materials near the jamming transition. Because a gel consists of a polymer network filled with solvent, its frictional behavior is often explained using a combination of hydrodynamic lubrication and polymer-surface interactions. As a result, the frictional coefficient can vary between 0.001 and 0.03 depending on several factors such as contact area, sliding velocity, normal force, and the gel surface chemistry. Most tribological measurements of hydrogels utilize two flat surfaces, where the contact area is not well-defined. We have built a custom, low-force tribometer to measure the single-contact frictional properties of spherical hydrogel particles on flat hydrogel surfaces under a variety of measurement conditions. At high velocities (> 1 cm/s), the friction coefficient depends linearly on velocity, but does not tend to zero at zero velocity. We also compare our measurements to solid particles (steel, glass, etc.) on hydrogel surfaces, which exhibit larger frictional forces, and show less dependence on velocity. A physical model for the friction which includes the lubrication layer between the deformed surfaces will be discussed.

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