330e Role of Surface Roughness and Texture on Adhesion and Friction

Kenny Rosenberg, Bruno Zappone, Marcel Benz, and Jacob N. Israelachvili

Experiments on the adhesion and friction of rough polymer and nanoparticle-coated surfaces have been carried out using a Surface Forces Apparatus to determine the role of surface roughness and ‘texture' (i.e., ordered versus disordered roughness, and different ‘types' of roughness) on adhesion and friction. The aim is to establish how difference parameters affect adhesion and, if possible, establish possible universal trends and quantitative scaling relations. As expected, rougher surfaces adhere more weakly, but the deformability (stiffness) of a material plays an important role in addition to the texture and surface energy. Of equal interest to the adhesion force is the effective local stiffness of a rough surface or particle (e.g., under compression), this being the repulsive component of the overall interaction force between two rough surfaces. This repulsion is not linear, i.e., the effective stiffness is not a single valued number, but closer to an exponential, and it appears to follow certain scaling laws, which may be important for understanding the compaction of dense colloidal suspensions. Preliminary friction results on the same surfaces show that smoother surfaces show higher friction.