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Contact area dependence of frictional forces: Moving adsorbed antimony nanoparticles UDO SCHWARZ, Yale University, New Haven, CLAUDIA RITTER, Humboldt University, Berlin, MARKUS HEYDE, Fritz-Haber Institute, Berlin, KLAUS RADEMANN, Humboldt University, Berlin — Despite its daily-life importance, the fundamentals of friction are still insufficiently understood. In particular, the interplay between friction, adhesion, "true" contact area, and crystalline structure at the interface is an issue of current debate. In this work, antimony nanoparticles grown on highly oriented pyrolytic graphite and molybdenum disulfide were used as a model system to investigate the contact area dependence of frictional forces. This system allows to accurately determine both the interface structure and the effective contact area. Controlled translation of the antimony nanoparticles was induced by the action of the oscillating tip in a dynamic force microscope. During manipulation, the power dissipated due to tip-sample interactions was recorded. We found that the threshold value of the power dissipation needed for translation depends linearly on the contact area between the antimony particles and the substrate. Assuming a linear relationship between dissipated power and frictional forces implies a direct proportionality between friction and contact area. Particles smaller than 10000 nm^2 in size, however, were found to show lower dissipation than expected, which might be explained by structural lubricity.

Udo Schwarz
Yale University, New Haven

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