Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Sorting Category: 12.7.1 (E)

The Duality of Nanoscale Friction: Amontons' Law vs. Superlubricity U. D. SCHWARZ, Dept. of Mech. Eng,, Yale University, D. DIETZEL, Institute of Physics, University of Munster, Germany, C. RITTER, Dept. of Mech. Eng,, Yale University, T. MONNINGHOFF, H. FUCHS, A. SCHIRMEISEN, Institute of Physics, University of Munster, Germany — One of the most fundamental questions in nanotribology is the contact area dependence of frictional forces on the nanometer scale. Unfortunately, conventional friction force microscopy techniques are limited for analyzing this problem due to the unknown and ill-defined tip-sample contact. This limitation can be circumvented by measuring the lateral force signal during the manipulation of nanoscale particles with a well-defined, clean contact to the substrate. In our study, the samples under investigation were metallic islands with diameters between 50-500 nm grown by thermal evaporation of antimony on highly oriented pyrolytic graphite (HOPG). Experiments that included the controlled manipulation of a large number of nanoparticles in ultrahigh vacuum show two distinct frictional states during particle sliding: While some particles show finite friction increasing linearly with interface area, thus reinforcing Amontons' law at the nanoscale, other particles assume a state of frictionless or 'superlubric' sliding. Additional experiments revealed a similar result even in air, which can be explained by contamination effects of the interface that alter the frictional properties.

[X] Prefer Oral Session
[ ] Prefer Poster Session

Udo D. Schwarz
udo.schwarz@yale.edu

Date submitted: 27 Nov 2007

Electronic form version 1.4