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Atomic friction studies on well-defined surfaces

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Atomic friction studies have been performed by means of a friction force microscope (FFM) in ultrahigh vacuum, where well-defined surfaces can be prepared. A home-built FFM allows us to study lateral forces as low as 0.05 nN using rectangular silicon cantilevers. Furthermore, comparison with dissipation measurements performed in non-contact mode are possible. Recent experimental results are presented and discussed in the framework of a one-dimensional Tomlinson model which includes thermal activation. Atomic-scale stick-slip processes on a metallic surface could be repeatedly measured on Cu(111), while the Cu(100) surface was distorted by the tip during the scanning process. A logarithmic velocity dependence of atomic friction has been measured on Cu(111) and NaCl(100) for low scanning velocities. The dissipation found in stick-slip measurements is compared to the power loss detected in dynamic non-contact measurement.

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