

Publication

Atomic-scale stick slip

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Atomic-scale stick-slip is one of the fundamental friction processes. It has been observed on layered materials, such as graphite, or ionic crystals, such as NaCl(001). Recently, wearless friction was also observed on clean metallic surfaces, such as Cu(111). The friction force vs. lateral position traces show stick slip with the periodicity of the atomic lattice. The probing tip sticks at certain positions, builds up elastic deformation until a threshold value is reached. Then the tip jumps one unit cell to the next sticking site. Friction force loops show that the energy which is released during one slip is typically 1 eV. The velocity dependence of atomic-scale stick-slip was investigated. A logarithmic dependence of friction as a function of velocity is found. The results are discussed in terms of a Tomlinson model, which takes into account thermal activation. At low velocities, the tip may slip at lower lateral forces because of thermal activation. At higher velocities the probability is lower to overcome the barrier by thermal activation.

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