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Relationship between friction and quasicrystallinity; friction anisotropy in a decagonal Al-Ni-Co quasicrystal surface JEONG YOUNG PARK, D. F. OGLETREE, M. SALMERON, Lawrence Berkeley National Lab. University of California, Berkeley, R. A. RIBEIRO, P. C. CANFIELD, Ames Laboratory, Dept. of Physics & Astronomy, Iowa State Univ, C. J. JENKS, P. A. THIEL, Ames Laboratory, Dept. of Chemistry, Iowa State Univ — We investigated the nanoscale tribological properties of a decagonal quasicrystal using a combination of atomic force microscopy (AFM) and scanning tunneling microscopy (STM) in ultrahigh vacuum. This combination permitted a variety of in situ measurements, including atomic- scale structure, friction and adhesion force, tip-sample current, and topography. We found that thiol-passivated tips can be used for reproducible studies of the tip-quasicrystal contact while non-passivated probes adhere irreversibly to the clean quasicrystalline surface causing permanent modifications. The most remarkable results were obtained on the 2-fold surface of the Al-Ni-Co decagonal quasicrystal where atoms are arranged periodically along the 10-fold axis and aperiodically in the perpendicular direction. Strong friction anisotropy was observed on this surface, with high friction along the periodic direction, and low friction in the aperiodic direction. These results reveal a strong connection between interface atomic structure and the mechanisms by which energy is dissipated, which likely include electronic or phononic contributions, or both.

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