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Direction dependence of static friction for commensurate and moderately incommensurate surfaces MICHAEL WOLLOCH, Vienna University of Technology / Austrian Center of Competence for Tribology, PETER MOHN, JOSEF REDINGER, Vienna University of Technology, ANDRAS VERNES, Austrian Center of Competence for Tribology — We present results from our calculations of quasi-static sliding of two atomically flat surfaces in dry, wearless contact using the Density Functional Theory package *VASP*. The main focus of our work was to determine to which extent commensurability of the surfaces and the sliding direction effects the friction force. The examined systems include commensurable fcc (111) Aluminium slabs and moderately incommensurate surfaces like bcc (110) Titanium on hcp (001) Titanium. A model consistent with stick-slip friction was devised to calculate the friction forces along sliding paths of up to 1 μm on a quantum mechanical basis. To map all forces and energies for rigid and relaxed atomic positions the top slab was scanned over the bottom one on a properly fine grid, which covers the entire unit cell. In this manner, it is shown that the mean friction force depends on the sliding direction and that due to relaxations incommensurate paths may result, counter-intuitively, in higher friction then commensurate ones.

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