ARPES Studies of Hf(0001) Monocrystal

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We present first ARPES studies of the electronic structure of the Hf(0001) surface. High-Z materials have attracted much interest, because the strong spin-orbit coupling in combination with the broken inversion symmetry and an important effective electric field at the surface results in a spin-momentum locking. Spin-polarized electrons at the surface are of interest in physics and novel applications in electronics and data processing [1], [2]. Surprisingly, ARPES studies of Hf surfaces are entirely missing in literature to our best knowledge. The main effort is concentrated to hafnium-based oxides that replaced, from 2007, the silicon oxide as a gate insulator in field-effect transistors because of their high dielectric constant.
As this is the case for tungsten, the hafnium surface is very sensitive to oxidation. In the cleaning procedure (ion bombardment and annealing) we finely tuned the annealing temperature yielding a high-quality unreconstructed surface. Our ground state as well as one-step calculations for the He II photon energy are in a very good agreement with the measured valence band spectra. 4*f* core-level spectra reveal that the surface component at the Hf(0001) surface is situated on the higher binding energy side of the bulk peak, on the contrary to all W crystallographic faces [3], [4].

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