CFEL SCIENCE

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Seminar Room IV, CFEL (Bldg. 99, 01.111)

Max Planck Research Department for Structural Dynamics

SEMINAR

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Structural and electronic properties of bismuth-surfaces on Cu(111)

Considering Moore's law, the complexity of an integrated circuit on a computer chip duplicates every 18 months. Trying to stick to this law, the industry has to make huge efforts in fundamental research. As a potential next step, one idea is to use a new degree of freedom in electronics, the electron spin. For this, new materials have to be found that enable to distinguish between different spin states. Promising systems are the so-called Rashba systems. They are characterized by spin-split surface states due to strong spin-orbit coupling. The electronic dispersion in such systems is split in k-direction and the different bands are strongly spin-polarized. Famous Rashba systems under investigation recently are alloys on noble metal surfaces. We have examined one of these systems, Bi/Cu(111), by STM and STS measurements. Evaluating standing waves of the Rashba-split surface states of the BiCu2 surface alloy, we have enhanced a barely used concept for measuring surface-state dispersions and compared the results with ARPES measurements and DFT calculations.

We have found that in STS measurements we could see the four expected Rashba bands very well. In the FFT analysis we observed different scattering processes like inter- and intraband transitions of the different Rashba bands, both expected and unexpected ones. The expected ones are in nice agreement with ARPES measurements, whereas the unexpected ones are not fully understood so far.

In conclusion our results help to understand the different scattering processes and to acquire detailed information on the band dispersion, Rashba-splitting, and spin polarization.

Host: Sebastian Loth, MPSD-DNES, CFEL