

## **Spin-Orbit Coupling on Surfaces and in Molecules - from Rashba to molecular magnets and OLEDs**

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I will present recent STM/STS results of systems where spin-orbit coupling plays an important role:

1. The well-known Bi/Cu(111) surface alloy exhibits several Rashba-split surface states. Through spectroscopic mapping of electronic standing waves, various intra- and interband scattering channels can be detected. A simultaneous analysis permits a full recovery of the surface-band structure including the Rashba splitting. In the unoccupied region, we find significant deviations from theoretical predictions.
2. Within a major strategy of synthesizing simple molecular magnets in an atom-by-atom fashion via STM manipulation, we performed a thorough adsorption study of the organic molecule cyclooctatetraene (COT) on noble metals. We found different degrees of molecule-substrate hybridization that cannot be understood within a simple charge-transfer picture. The results have important consequences for the bottom-up assembly of lanthanide COT-based molecular magnets.
3. State-of-the-art OLED devices are based on phosphorescent molecules ("triplet emitters"). The strong spin-orbit coupling of these heavy-metal complexes can reach light-conversion efficiencies up to 100% compared to only 25% for purely organic fluorescent molecules. I will present STM and STS results of a new class of square-planar Pt-based triplet emitters that show interesting modified properties at the organic-metal interface that may allow for new, dramatically simplified OLED architectures.