UNIVERSITÄT DUISBURG ESSEN

PHYSIK

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Advanced spin-resolved momentum microscopy

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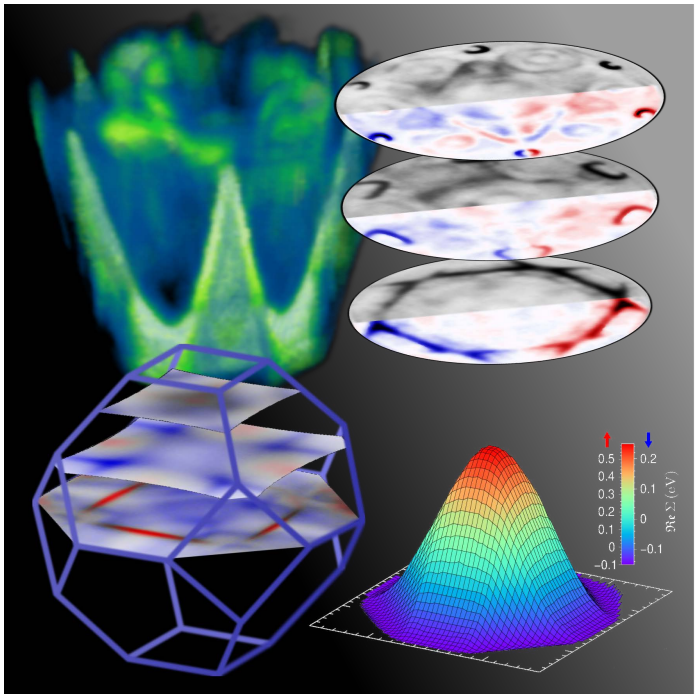

A fundamental concept in solid state physics describes the degrees of freedom of electrons in a solid by the relation of the energy E vs. the crystal momentum k in a band structure of independent quasi particles. Of particular importance is the spin of the electron, that gives rise to phenomena like ferromagnetism, superconductivity, spin-polarized surface states, and recently, the discovery of new material classes with complex spin textures like topological insulators.
On the experimental side, the novel concept of momentum microscopy evolved to provide an intuitive and comprehensive insight to these band structures. A momentum microscope captures the complete 2π solid angle of emitted photoelectrons into a high resolution image of electronic states in reciprocal space [1]. With the introduction of imaging spin analyzers the efficiency of spin-resolved measurements experienced a tremendous boost [2], such that the electron spin now becomes routinely accessible in photoemission experiments.
We will discuss examples and prospects, covering spin-resolved Fermi surface tomography, the quantitative analysis of electron correlations in a ferromagnet, and the rapid band-structure mapping by use of synchrotron radiation and time-of-flight momentum microscopy [3].

[1] C. Tusche, A. Krasyuk, J. Kirschner, Ultramicroscopy 159, p. 520 (2015)
[2] C. Tusche, et al., Appl. Phys. Lett. 99, 032505 (2011)
[3] C. Tusche, et al., Appl. Phys. Lett.108, 261602 (2016)