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Putting a new spin on unoccupied electronic states

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Inverse photoemission provides experimental information on the unoccupied electronic states, which is complementary to that obtained by photoemission about the occupied states. The first experimental demonstration of inverse photoemission in the vacuum ultraviolet energy range in 1977 [1] was followed by an important add-on in 1982, the use of spin-polarized electrons [2]. This pioneering experiment opened the way to reveal the spin character of unoccupied electron states in ferromagnets [3]. In this contribution, I will describe the technical development of spin-resolved inverse photoemission with respect to efficiency as well as energy, momentum and spin resolution since the beginning until today [4]. I will give a review about important results obtained by this technique. For about three decades, exchange-split electron states of majority and minority spin character at ferromagnetic surfaces and in ultrathin films were the topics of interest. Since recently, spin textures in momentum space caused by spin-orbit interaction in Rashba systems and topological insulators offer a new field of application for spin-resolved inverse photoemission [5]. I will present a selection of examples, from small and giant Rashba splittings to rotating spins with chiral texture, influenced by the specific symmetry of the system and the orbital character of the respective states. [1] V. Dose, Appl. Phys. 14, 117 (1977)
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