New Era of Photoelectron Spectroscopy: Spin-Resolved and Full-2D-Momentum-Resolved Photoelectron Spectroscopy

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High resolution spin- and angle-resolved photoelectron spectroscopy (SP-ARPES) has been desired over decades to clarify surface and bulk electronic structures of various solids.

The development of a spin-momentum microscope (SP-M.M.) composed of a PEEM type input lens, an aberration suppressed energy filter composed of tandem double hemispherical deflection analyzers (HDAs) in the S-shape configuration, and a 2D imaging spin filter has opened a breakthrough very recently. A very wide ***k*** space can be covered with high energy and momentum resolutions as 12 meV and 0.005 $Å^{-1}$.

Spin dependent 2D (k_x,k_y) images measured at two different electron incidence energies onto a Au/Ir(001) (or a W(001)) target can easily provide accurate spin polarization, $P_s(E_B(k_x,k_y))$.

The 2D multi-channel figure of merit F_{2D} of Au/Ir(001) spin detectionor is $\sim 10^6$ times higher than the single-channel figure of merit f_0 of a Mott detector and a W spin-LEED detector and $\sim 10^4$ times higher than that of the most advanced Fe-O VLEED spin detector.

Examples of SP-ARPES of surface Rashba states on Au(111) and Dirac cone states of topological insulators, Bi_2Se_3 & Bi_2Te_3, are presented. Even μm and sub μm region is easily probed owing to the PEEM type input lens.

References:

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