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Application Note

High resolution 3D spin-ARPES with DA30-L and VLEED and VUV5k

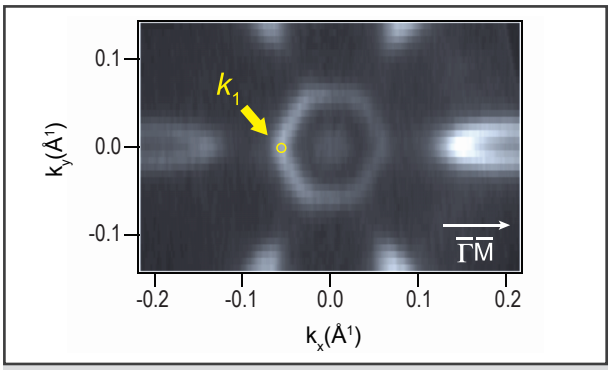

Figure 1: Constant energy ARPES intensity map at E_F for the Bi(111) surface recorded in the ARPES deflection mode with a 6.994 eV laser. The image is a summation of the photoelectron intensity in a 5 meV energy window centered at EF.

In this application note we show results from a high resolution Spin-ARPES experiment of Bi(111) using the DA30-L with a 3D VLEED type detector and a VUV5k by Yaji et al., Review of Scientific Instruments 87, 053111 (2016), (https://doi.org/10.1063/1.4948738).

Figure 1 displays the constant energy laser-ARPES map with the indicated position of the mono-chromatic He I (hv = 21.22 eV) spin and angle-resolved measurement shown in Figure 2.
The Spin-ARPES spectra were acquired with energy and angular resolutions set to 7 meV and 0.7°, which are the same challenging conditions as in the laser-SARPES measurements also included in the paper. The acquisition time of a pair of spectra is 3 h. One may note that the intensity of the laser and cross section for p-block elements, such as Bi, at 7 eV both strongly favor the efficiency of the 7eV laser over the 21 eV VUV5k experiment, and despite this Yaji et al. succeed in demonstrating that the DA30-L with VLEED detectors can provide very high-reso-lution spin-resolved spectra also with the He lamp proving excellent stability of the instrumentation.
Data courtesy: Dr Koichiro Yaji, ISSP, Univ. of Tokyo.

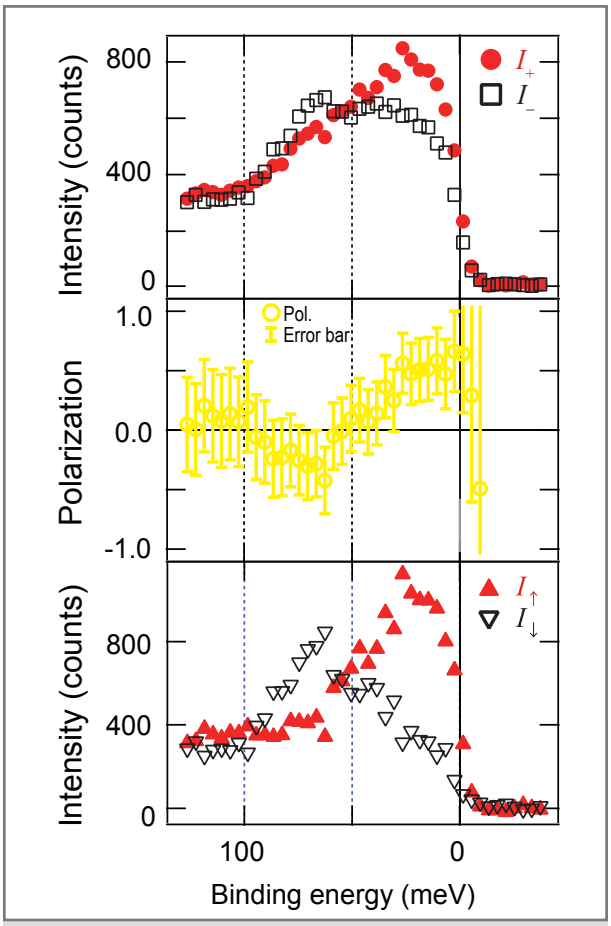

Figure 2: Spin-ARPES spectra with the VUV5k He lamp measured at k_1 in Fig.1. The spin detector was set to be sensitive to the spin polarization direction P_y. The upper panel represents the raw spectra. The calculated spin polarization is exhibited in the middle panel. The bottom panel represents the obtained spin-up ($I_\uparrow$) and spin-down ($I_\downarrow$) spectra.

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