Photoelectron spectroscopy with UVLS and TMM 304

Application Notes

Angle-integrated and angle-resolved photoelectron spectroscopy measurements were performed using the SPECS UVLS ultraviolet-light source in combination with the toroidal-mirror monochromator SPECS TMM 304, which was equipped with two cassettes of optical elements in order utilize the HeI and XeI emission lines with photon energies of hν=21.22eV and hν=8.437eV, respectively. The general view of the UVLS/TMM304 combination is shown in Fig. 1. The monochromator TMM 304 is equipped with LiF window to allow for separating source/monochromator and chamber completely, when using XeI.

All photoelectron intensity measurements were performed on the freshly prepared Ag polycrystalline film (p_{Ar}=1*10^{-5}mbar, E_p=5kV, I_{sample}=10 μA). The photoelectron intensity was measured in the vicinity of the Fermi level of the polycrystalline Ag with sample grounded via picoampermeter AMP 100 for the measurement of the sample leak current. The results are summarized in Figs. 2 and 3, where two sets of measurements are presented for the entrance slit #2 (0.5*20mm^2) and #3 (1*20mm^2).

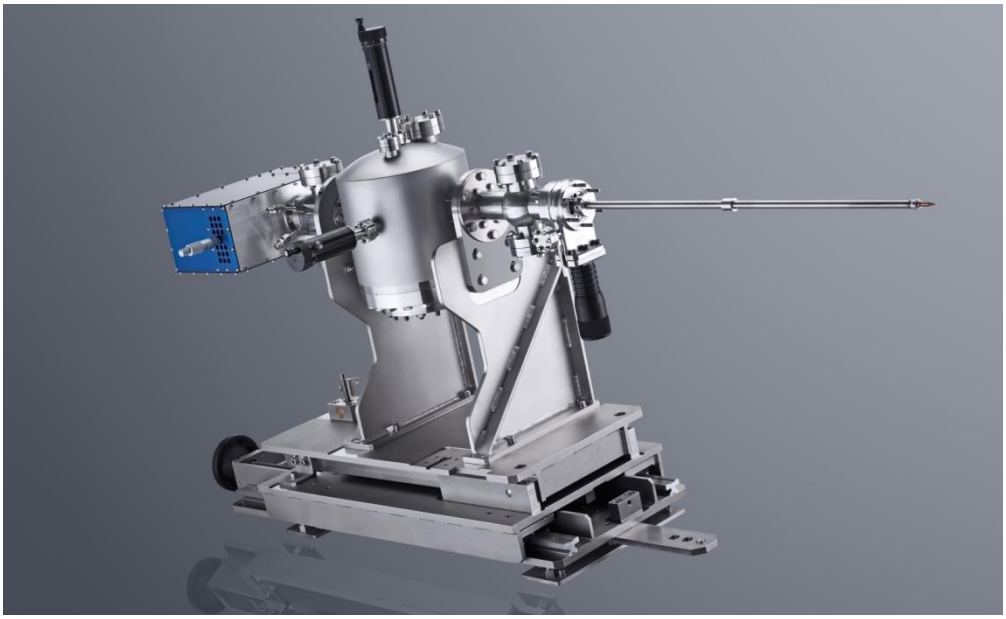

Figure 1: General view of the combination of UVLS and TMM 304 used in the experiment.

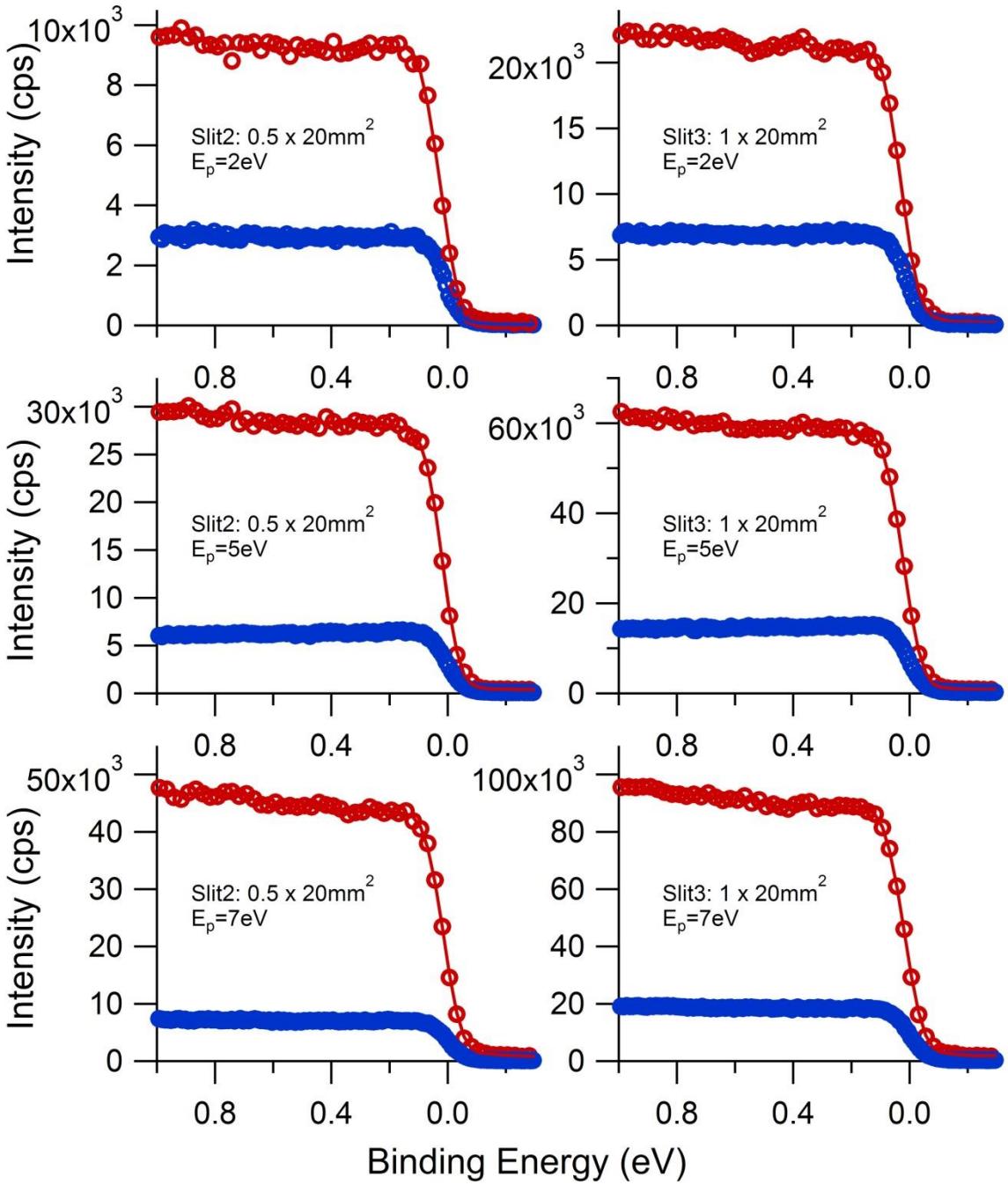

Figure 2: Angle-integrated photoelectron spectra of the polycrystalline Ag sample measured in the vicinity of the Fermi level with HeI (brown symbols) and XeI (blue symbols) ultraviolet light. These measurements were performed for two entrance slits: #2 (0.5*20mm^2) and #3 (1*20mm^2) and different pass energies of the analyzer, E_p. All spectra were recorded at room temperature of the Ag sample.

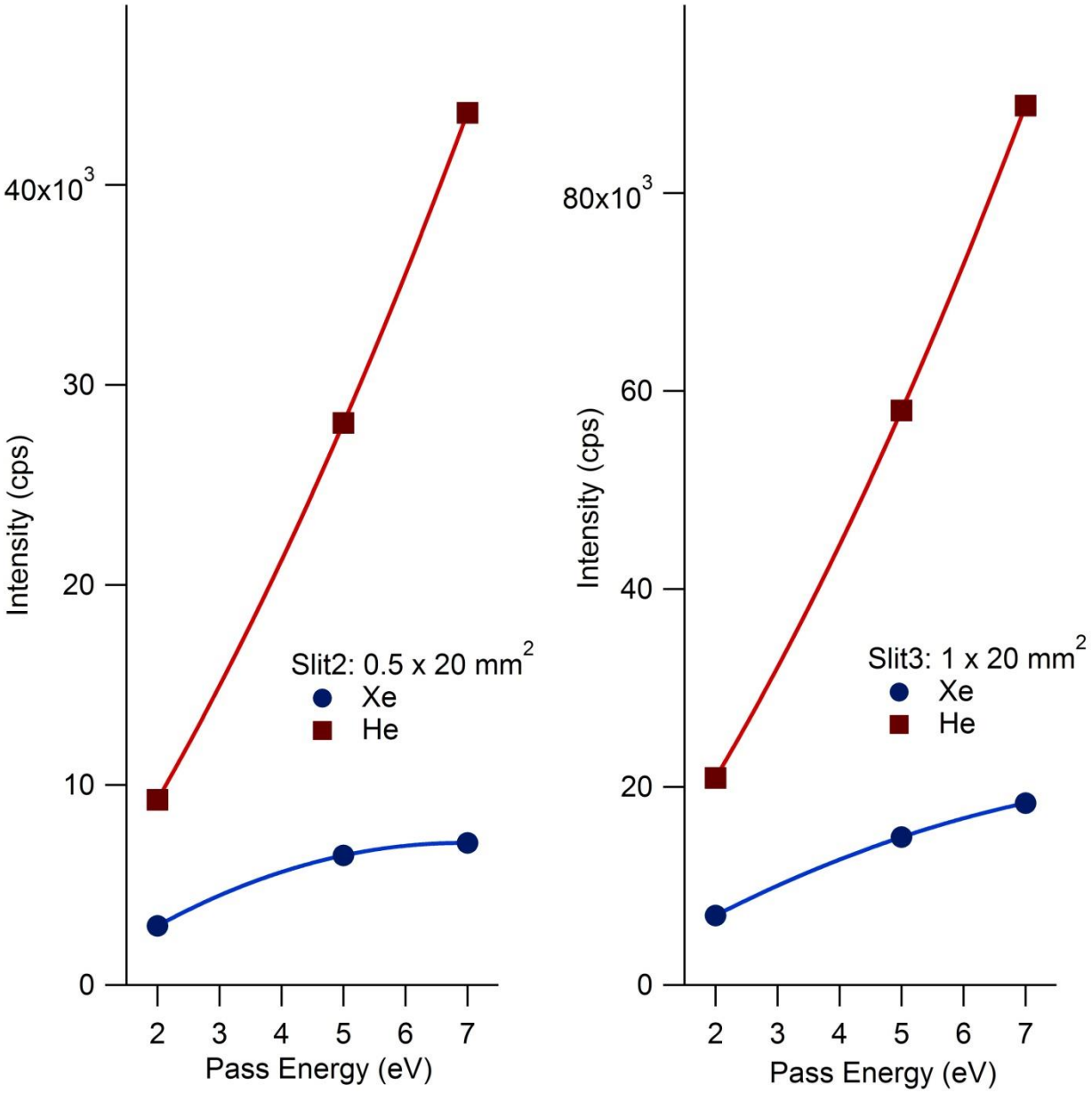

Figure 3: Extracted photoelectron intensity measured on the polycrystalline Ag sample. Raw data are presented in Fig. 2. All points correspond to the binding energy of 0.15eV.

As an example of the application of the UVLS/TMM304 combination to angle-resolved photoelectron spectroscopy we present data measured with XeI radiation (hν=8.437eV) on the graphene/Ir(111) sample. Fig. 4 shows the 2D photoemission intensity map as a function of the binding energy and emission angle. The graphene-protected surface state of the Ir surface was measured in the normal emission geometry with the PHOIBOS150/2D-DLD analyser/detector set in the angular-resolved mode. This surface state of the p_z character shows a Rashba splitting, being clearly resolved in the data, presented.

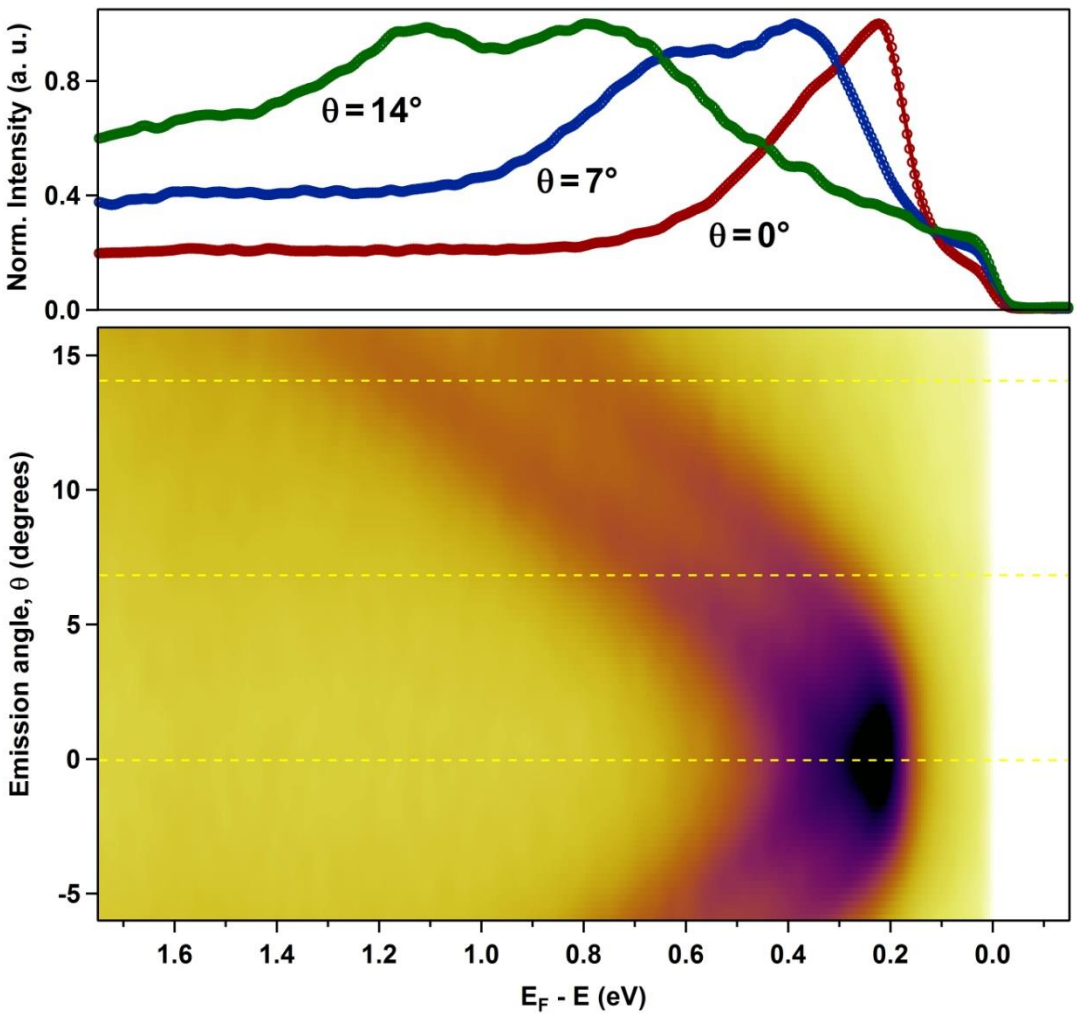

Figure 4: Photoelectron intensity 2D map obtained in normal emission geometry with XeI UV emission line for the graphene/Ir(111) sample. The Rashba split Ir surface state is clearly resolved. Upper panel shows representative spectra extracted from the intensity map for the emission angles 0°, 7°, and 14°, respectively (emission angles are marked by the dashed lines on the lower panel).

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