PHOIBOS Analyzer Performance in defined area XPS

Application Notes

The XPS performance of the PHOIBOS 100 MCD-5 and PHOIBOS 150 MCD-9 analyzer was determined using a Ag/Cu edge with a broad-illuminating X-ray source (Mg K_α, 300 W). The sample was transferred into vacuum and cleaned by standard ion sputtering (Ar^+, 2 keV). The acceptance area was determined by moving the sample perpendicular to the surface normal. Photoemission spectra of the Ag $3d_{5/2}$ region were recorded when scanning over the Ag/Cu edge and the peak height was determined as a function of lateral displacement (see fig. 1-3).

PHOIBOS 100 MCD-5 XPS Performance in Small Area Modes

Fig.1

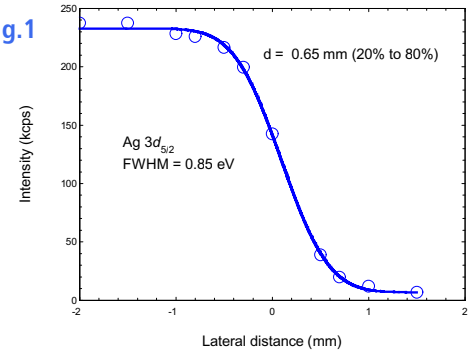


Fig.2

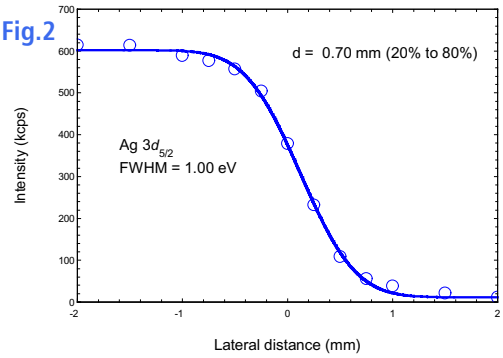


Fig.3

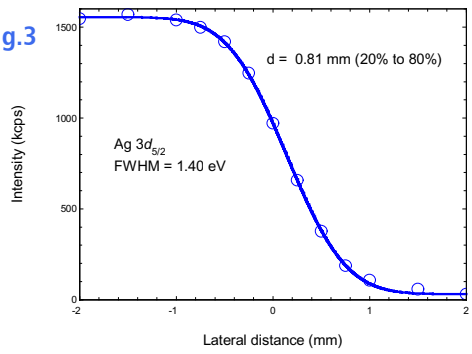
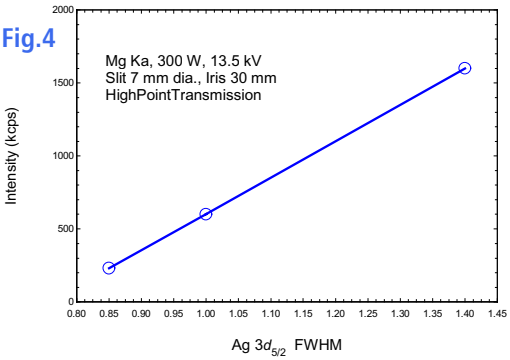
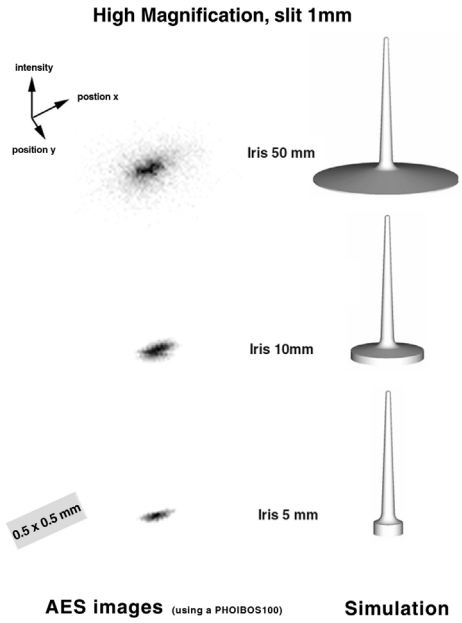


Fig.4



For the measurements the analyzer was set to the Small Area mode (SM) with a round entrance slit of 7 mm diameter and the Iris was closed to 30 mm. No exit slit was used. The acceptance area was determined as the lateral distance between 20% and 80% of the Ag $3d_{5/2}$ peak height.

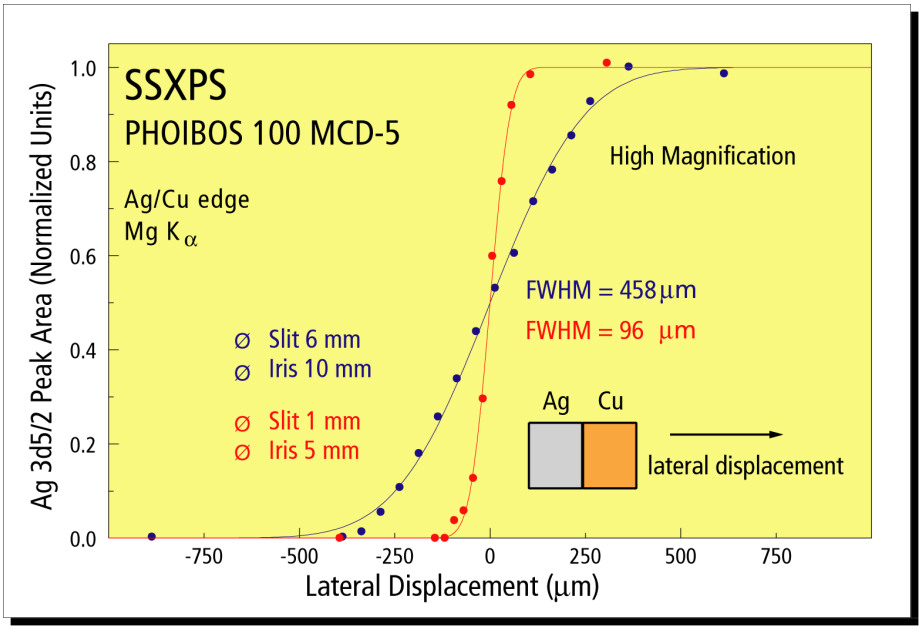
Due to lens aberrations electrons emitted at larger angles relative to normal emission could find a path to the analyzer entrance. With an Iris aperture these electrons can be eliminated. Furthermore the Iris Aperture can be used to continuously adjust the angular acceptance of the analyzer. In the upper case the acceptance was about ±9°.



For small area analysis the iris aperture may be used to sharpen up the analysis area. The low tail intensity forms a disc whose area integrated intensity can achieve the same order of magnitude like the intensity in the peak. By the use of the iris aperture primary these intensities will be suppressed.

The optimum settings for the iris aperture depend on the slit size and the desired quality of the analysis area. The intensity-position function for the analyzer is a Gaussian function but with higher intensities in the tail regions. By the use of the iris aperture these intensities will be suppressed.

For small area analysis a lateral resolution down to 100 µm is available using the High Magnification Mode and the Iris aperture.



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For some specific acceptance areas count rates measured for Ag $3d_{5/2}$ with 300 W Mg K_α are given in the table below. The settings are selected for optimum count rates at a given acceptance area.

Acceptance Area	**Count rate for FWHM = 0.85 eV PHOIBOS 100 MCD-5 PHOIBOS 150 MCD-9**	**Count rate for FWHM = 1.00 eV PHOIBOS 100 MCD-5 PHOIBOS 150 MCD-9**	**Count rate for FWHM = 1.40 eV PHOIBOS 100 MCD-5 PHOIBOS 150 MCD-9**	**Setting**
1×2 mm^2	700 kcps 1400 kcps	1950 kcps 3900 kcps	5000 kcps 10000 kps	Small Area Slit 7x20 mm Iris 30 mm
Ø 0.3 mm	28 kcps 56 kcps	55 kcps 110 kcps	95 kcps 190 kcps	High Magnification Slit 3 mm dia. Iris 20 mm
Ø 0.3 mm	42 kcps 84 kcps	77 kcps 154 kcps	125 kcps 250 kcps	High Magnification2 Slit 3 mm dia. Iris 20 mm
Ø 0.1 mm	0.26 kcps 0.52 kcps	0.6 kcps 1.2 kcps	1 kcps 2 kcps	High Magnification Slit 1 mm dia. Iris 5 mm
Ø 0.1 mm	0.28 kcps 0.56 kcps	0.7 kcps 1.4 kcps	0.9 kcps 1.8 kcps	High Magnification2 Slit 1 mm dia. Iris 5 mm

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