Aberration Correction of SR-XPEEM with Moving Focus Method

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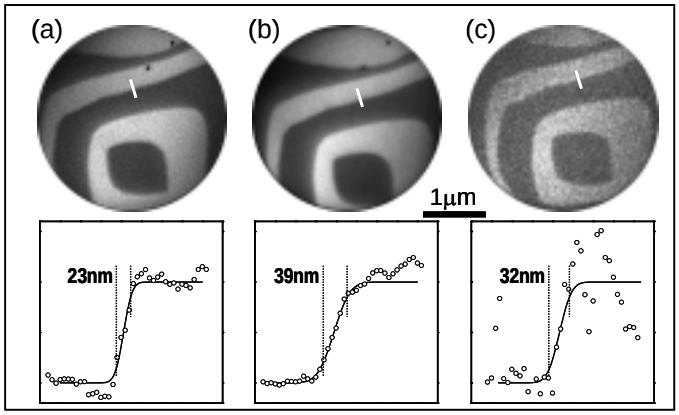
The X-ray exited PEEM (XPEEM) with SR gives spatially resolved chemical state information of surfaces. The spatial resolution of SR-XPEEM is limited by the spherical and chromatic aberrations of the objective lens. SMART project [1] adopted the electron mirror corrector. The fast time resolved technique can also correct both spherical and chromatic aberration [2]. We have proposed a moving focus method to correct the spherical aberration and demonstrated its ability using UV-excited PEEM [3] and tried to apply the moving focus method to XPEEM.

Experiments was carried out at the nanospectroscopy beamline BL 1.2L of ELETTRA. The sample was 2D Au layer on W(110) and Au 4f electrons were used for imaging. To minimize the effect of the chromatic aberration, the narrow energy slit (0.25eV) was adopted. The contrast aperture whose diameter is 100 μm was used to enhance the spherical aberration.

Figure shows the gold 4f images and cross sections for (a) adopting the moving focus (30sec x11frames) method with high frequency enhanced filter, with 100μmϕ contrast aperture, (b) accumulated (330sec, 30sec x11frames) with 100μmϕ and (c) accumulated (660sec, 30sec x22frames) with 20 μmϕ. The images (c) have low intensity due to the small size aperture and the double number frames were accumulated to improve the signal to noise ratio. The edge profile adopting the moving focus method was improved even using the 5 times larger contrast aperture and the intensity is improved by 25 times, which is very effective to obtain the core electron images because the signal of the core-excited photo-electrons have very low intensity.



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[2] G.Schönhense and H.Spiecker, *J. Vac. Sci. Technol.* B20 (2002) 2526.
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