Performance of the Original SiC Grating with Varied Line Spacing, Spin-LEED Analyzer and Circular Polarization of Photoelectron Diffraction from Si(001)

Masaki TANIGUCHI [1], Shigemasa SUGA [2], Hiroshi DAIMON [2] and Masami FUJISAWA [3]
and other members of the Subgroup

1)Department of Materials Sciences, Hiroshima University, Higashihiroshima, 724
2)Department of Material Physics, Faculty of Engineering Sciences, Osaka University, Toyonaka, Osaka, 560
3)Synchrotron Radiation Laboratory, Institute for Solid State Physics, The University of Tokyo, Tanashi, Tokyo, 188

Development of a high resolution soft x-ray monochromator against the high thermal load of the synchrotron radiation is a necessity for detailed study of electronic states of solids. We have developed a plane grating monochromator with original SiC gratings with varied line spacing(VLSPGM) which realize the self focussing without focussing mirrors. The monochromator is installed at the revolver undulator beam line of Photon Factory and tested. Figure 1 shows the gas absorption spectrum of the Ar 2p core state[1]. A resolution better than 5000 is stably realized in this case.

Spin analysis of core photoemission spectra is strongly required to understand the final state interactions taking place in magnetic materials. As shown in Fig.2, the W(001) spin LEED analyzer is developed and tested on this beam line from the revolver undulator installed with the VLSPGM. The test experiment was done on Ni single crystal[2].

Two dimensional photoelectron spectroscopy is now opening new fields such as photoelectron holography or complete study of the photoelectron diffraction patterns. Figure 3 shows the details of the 2-dimensional display type electron analyzer which is recently developed for such purposes. Figure 4 demonstrates the circular dichroism of the photo-electron diffraction patterns from the Si 2p core state from the Si(001) surface[3]. The experiment was performed at the helical undulator beam line of the Accumulation Ring of KEK. By use of this method one can analyze the 3-dimensional structure of various surfaces[4].

References

[1] M.Fujisawa, A.Harasawa, A.Agui, M.Watanabe, A.Kakizaki, S.Shin, T.Ishii, Y.Saitoh and S.Suga, 1995 Activity Report of Synchrotron Radiation Laboratory, Institute for Solid State Physics, The University of Tokyo.

[2] Y.Saitoh, T.Matsushita, S.Imada, H.Daimon, S.Suga, J.Fujii, K.Shimada, A.Kakizaki, K.Ono, M.Fujisawa, T.Kinoshita and T.Ishii, to be published.

[3] H.Daimon, T.Nakatani, S.Imada, S.Suga, Y.Kagoshima and T.Miyahara, Jpn,J.Appl.Phys.32,L1480-(1993).

[4] H.Daimon, S.Imada and S.Suga, to be published.