

Development of new detector for near edge x-ray absorption fine structure spectroscopy measurements combined with ultraviolet photoelectron spectroscopy chamber at BL-8

Masaru Takizawa¹, Hiroyuki Kawakami², and Hidetoshi Namba²

1. Introduction

Near edge x-ray absorption fine structure (NEXAFS) measurement is a powerful tool to investigate the unoccupied states of materials, the orientation of molecules, and so on. Ultraviolet photoelectron spectroscopy (UPS) measurement using synchrotron radiation light gives us a lot of information on the occupied states of materials. At BL-8 of SR center, NEXAFS and UPS measurements have been performed using different measurement chambers. In order to get the insight of the materials, NEXAFS and UPS measurements are required to be performed at the same condition. Therefore, we have developed a new small detector for NEXAFS measurements, which can be installed to UPS chamber. In order to check the new detector, NEXAFS measurements on highly oriented pyrolytic graphite (HOPG) have been performed.

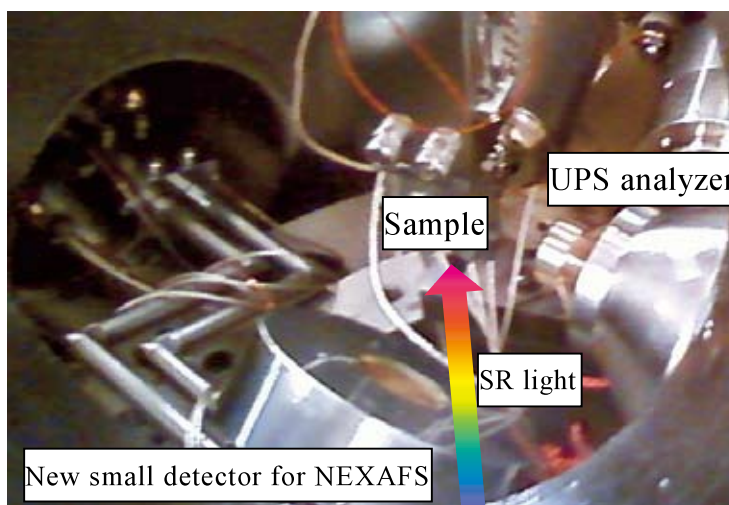


Fig. 1: Photograph inside the UPS chamber at BL-8 with the new small detector for NEXAFS.

¹ Research Organization of Science and Engineering, Ritsumeikan University, 1-1-1 Noji-Higashi, Kusatsu, Shiga 525-8577, Japan.

²Department of Physical Sciences, Faculty of Science and Engineering, Ritsumeikan University, 1-1-1 Noji-Higashi, Kusatsu, Shiga 525-8577, Japan.

2. Experiment

NEXAFS measurements were performed at the BL-8 of SR Center at Ritsumeikan University, equipped with a grazing incidence monochromator with a varied-line-spacing plane grating [1]. Carbon K-edge NEXAFS spectra of HOPG were measured by using the new detector installed to the UPS chamber (Fig. 1). Electrons were collected in partial electron yield mode with the retarding voltage of -150 V.

3. Results

Figure 2 shows C K-edge NEXAFS spectra of HOPG with various incident angles. Many peaks were clearly observed, which are in good agreement with the previous work [2]. The most prominent peak is seen around 285.5 eV. This peak is attributed to the transition from $1s$ to π^* state [2]. With increasing the incident angle, this peak intensity dramatically increases, as shown in Fig. 2. This behavior is interpreted by the dipole selection rules. The present results of the incident angle dependence indicated that the direction of the π^* orbital was normal to the surface, which is consistent with the crystal orientation of HOPG.

4. Summary

We have installed a new small detector for NEXAFS measurements to the UPS chamber at BL-8. NEXAFS measurements on HOPG with various incident angles have confirmed the ability to determine the molecular orientation using the new small detector.

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References

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- [2] R. A. Rozenberg, P. J. Love, and V. Rehn, *Phys. Rev. B* **33**, 4034 (1986).

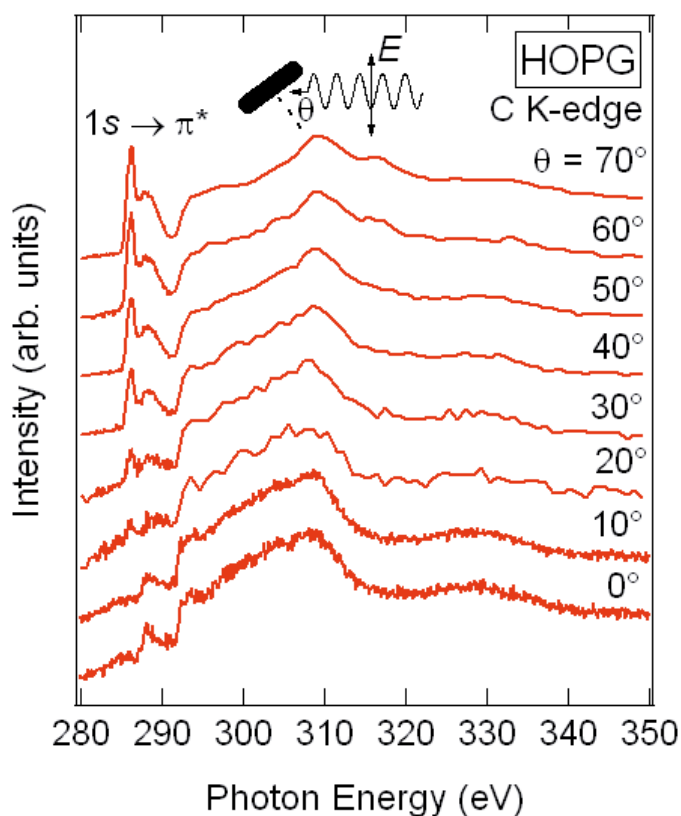


Fig. 2: C K-edge NEXAFS spectra of HOPG with various incident angles. Inset shows the measurement geometry.