2002A0609-NS1-np BL27SU c-branch

F1s photoelectron diffraction from CF_4

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An outgoing photoelectron from a core orbital is diffracted by the atoms in the molecule. Photoelectron angular distribution (PAD) in the molecular frame thus reflects the molecular structure. We measured F 1s PADs of fixed-in-space CF_4 molecules at the photon energies of 725 and 755 eV using an electron and an ion time-of-fight spectrometers equipped with position sensitive detectors. Molecular orientation is determined by measuring the momenta of F^+ and CF_3^+ ions in coincidence. The photoelectron diffraction patterns are obtained from the PADs from fixed-in-space CF_4.

Figure 1 (a) shows an F 1s PAD from fixed-in-space CF_4 measured at 725 eV, which corresponds to 30eV above threshold. The X-axis is the angle between the CF_3^+-F^+ axis and the direction of the emitted photoelectron. The Y-axis is the angle between the E vector of incident photon and the CF_3^+-F^+ axis. Photoelectrons are mainly ejected parallel to the E vector. Figure 1 (b) is a diffraction pattern of F 1s photoelectrons, which is derived from projecting Fig.1 (a) to the X-axis.

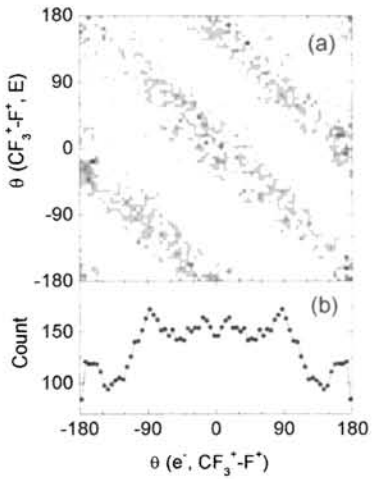

Figure1. (a) F 1s photoelectron angular distribution of CF_4 measured at 725 eV. (b) Diffraction pattern of F 1s photoelectron.

2002A0624-NM-nP BL27 / Soft-X-ray CVD

Preparation of fluoride thin films by high-flux soft X-ray ablation

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Recently, high-flux soft X-rays from undulator can be available at the third generation facilities such as SPring-8. Then the application to thin film production and processing is expected by using the synchrotoron radiation. We have so far reported that glass plate has been etched at high speed by irradiation with soft X-rays from bending magnet. In this report, we have irradiated the fluoride with high-flux soft X-ray from the undulator of BL27 beamline, and made the thin films.

The experimental apparatus is shown in upper inset of Figure 1. A powder tablet of CaF_2 which is hardened by pressing is used as a target. The target is irradiated with SR by the incidence angle 45° and a Si(100) substrate is put in parallel to the target away from the target with 15 mm. The target was irradiated with SR for 50 minutes at RT, when the undulator gap was 80 mm. Then interference fringes is observed on the film grown on the Si substrate, and the thickness of the thin film was 1800 nm. Figure 1 shows XPS spectrum of this thin film. Ca and F peaks are observed clearly. The peak of Ca is shifted to a high energy side, that of F is shifted to a low energy side. Thus, it is considered that the thin film including Ca and F has been deposited.

Figure 2 shows the XRD spectrum of the sample by 2θ scan. CaF_2 (111) and (220) peaks are observed. So, this thin film is a little crystallized. CaF_2 thin film is produced without heating. Although, deposition rate of MgF_2 is smaller than that of CaF_2. Crystallinity of MgF_2 thin film is bad.

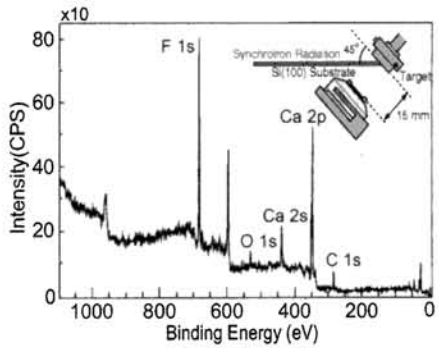

Figure 1: XPS spectrum of the CaF_2 thin film on Si substrate and the experimental apparatus.

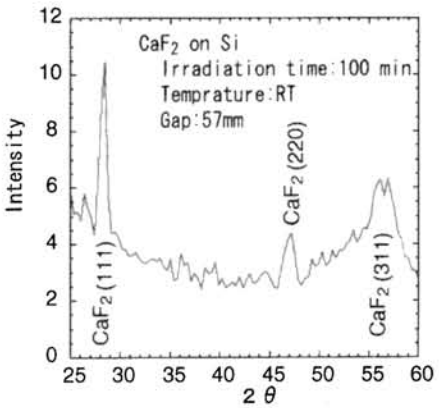

Figure 2: XRD spectrum of the CaF_2 thin film on Si substrate.