

Performance Test of a Reflectron-Type Mass Spectrometer for Soft-Xray Photochemistry

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The soft X-ray photochemistry branch of the BL27SU beamline has been constructed for the high resolution study of soft X-ray interaction with matter, in particular the inner-shell excitation and ionization of atoms and molecules and subsequent processes. As the branch as a whole was still at the construction stage during this term of user cycles, we performed some off-line tests of analyzers, especially of the reflectron-type time-of-flight mass spectrometer (RTOF).

For generating photoelectrons and photoions, HeI resonance radiation at 58.4 nm was used. A capillary helium discharge lamp was operated at about 40W with a flow of helium gas at a few Torr. The detectors for ions and electrons were Micro Sphere Plate (MSP). After proper outgassing, their characteristics were carefully examined.

Optimum operating conditions of the RTOF were determined by monitoring count rates of electrons, ions, and coincidence signals, as well as those for individual ions, while varying voltages on various electrodes. Samples used were Ar, air, and C_2H_5OH .

Electron count rates were always found to be much higher than those of ions. This is probably due to stray photoelectrons from metal walls. Typically, with about 2.2×10^{-6} Torr air as a sample and using the lamp conditions described above, the electron, ion, and coincidence count rates of 49000, 200, and 70 cps were obtained. A TOF mass spectrum obtained for 2×10^{-6} Torr C_2H_5OH is shown in Fig.1, which shows that the peak of the fragment ion CH_2OH^+ ($m/e=31$) is clearly resolved from that of background O_2^+ ($m/e=32$).

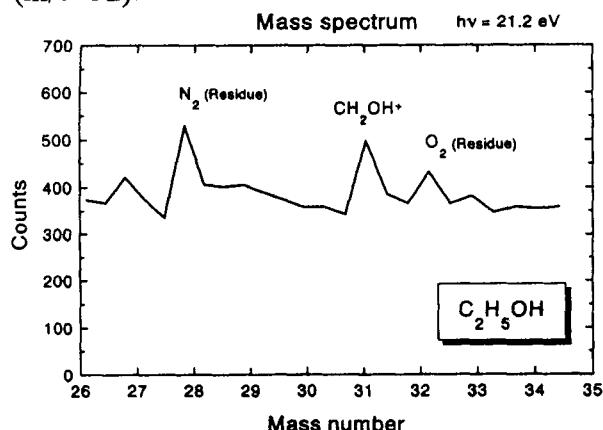


Fig.1. A TOF mass spectrum of C_2H_5OH with background air, obtained using the RTOF of BL27SU.