

## PHOTOELECTRON DIFFRACTION FROM FIXED-IN-SPACE MOLECULES OF ETHYLENE (C<sub>2</sub>H<sub>4</sub>)

T.U. Osipov<sup>1</sup>, C.L. Cocke<sup>1</sup>, R. Doerner<sup>2</sup>, A.L. Landers<sup>3</sup>, T. Webber<sup>4</sup>, O. Jagutski<sup>4</sup>, A. Demian-Braeuning<sup>4</sup>, H. Braeuning<sup>5</sup>, M.H. Prior<sup>6</sup>, H. Schmidt-Boecking<sup>4</sup> and A. Cassimi<sup>7</sup>

- 1) Department of Physics, Kansas State University, Manhattan, KS 66506
- 2) Institut für Kernphysik, Universität Freiburg, Germany
- 3) Department of Physics, Western Michigan University, Kalamazoo, MI 49008
- 4) Institut für Kernphysik, Universität Frankfurt, Germany
- 5) Institut für Kernphysik, Universität Giessen, Germany
- 6) Lawrence Berkeley National Laboratory, Berkeley, CA 94720
- 7) CIRIL/CEA/CNRS, Caen, France

Free molecules of ethylene (C<sub>2</sub>H<sub>4</sub>) have been photo-ionized by X-rays just above the carbon K-edge. This photo ionization is followed with high probability by an Auger decay and a subsequent molecular dissociation. Using a momentum-imaging technique, the momenta of the photoelectron and all charged molecular fragments were measured in coincidence. This allowed for the extraction of the  $\sigma$  and  $\pi$  ionization cross sections with high accuracy. The photoelectron angular distribution, as a function of molecular orientation with respect to the polarization axis, was then obtained. This distribution reveals the sharp f-wave structure as shown in Fig. 1. The photoelectron yield, as a function of X-ray energy, shows the presence of a shape resonance around 10-15 eV above the ionization potential of the carbon K-shell electron. Thus, the specific information about complex amplitudes of the partial waves describing the photoelectron outgoing wave was extracted. These amplitudes can be used to provide information about the molecular potential in which the photoelectron moves.

The results of this experiment were found to be in a good agreement with Haack *et al.* theoretical predictions [1].

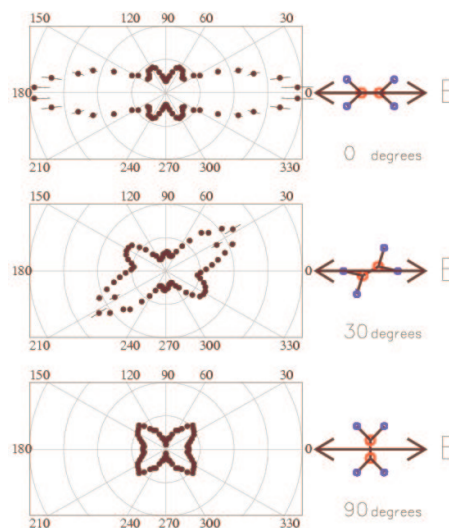


Figure 1: Photoelectron Angular distribution from C<sub>2</sub>H<sub>4</sub> by linearly polarized light of 302eV. The orientation of the molecule with respect to the polarization axis is shown.

### References:

- 1) N. Haack *et al.* Phys. Rev. Lett. 84, 614-617 (2000)

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