

Photoelectron Diffraction from Fixed-in-Space Acetylene Molecules.*

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Free molecules of acetylene have been photo-ionized by X-rays just above the carbon K-edge. This photoionization is followed with high probability by an Auger decay and subsequent molecular dissociation. Using a momentum-imaging technique, the momenta of the photoelectron and all charged molecular fragments were measured in coincidence. The photoelectron angular distribution, as a function of molecular orientation with respect to the polarization axis, was then obtained. The photoelectron yield, as a function of X-ray energy, shows the presence of a shape resonance around 15-20eV above the ionization potential of the carbon K-shell electron. From this the amplitudes and phases of the partial waves describing the photoelectron outgoing wave were obtained. These amplitudes can be used to provide information about the molecular potential in which the photoelectron moves.

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