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Momentum Imaging of the Photo Double Ionization of Ethylene Molecules: A kinematically complete experiment SUN LEE, LBNL & UC Davis, TIMUR OSIPOV, THORSTEN WEBER, ALI BELKACEM, LBNL — The direct Photo Double Ionization (PDI) is a process that arises essentially because of the electron correlation. After successfully studying the PDI of hydrogen molecules in the past our goal is to extend our knowledge from a sigma bonding system to a pi bonding system. Ethylene is an ideal candidate, because it is the simplest hydrocarbon with a pi bond. Thus we investigated the PDI of ethylene near its threshold in order to unravel unique and important intertwining of electron correlation in inter-shell and intra-shell cases and the subsequent molecular dynamics. We focused on the following reaction: $C_2H_4 + h\nu \rightarrow C_2H_4^{2+} + 2e^- \rightarrow 2e^- + CH_2^+ + CH_2^+$ Using the COLTRIMS (COLd Target Recoil Ion Momentum Spectroscopy) technique, we were able to detect two ejected electrons and nascent photo-fragments, i.e. the recoil CH_2^+ ions in coincidence, thus a kinematically complete experiment was performed. From this we derived the angular distributions of the emitted photoelectrons in reference to the fixed in space molecular axis and the linear polarization of the incoming light (40eV). In addition we were able to determine the electronic energy sharing as well as the internuclear distance at the instant of photo absorption.

Timur Osipov
Lawrence Berkeley Nat'l Lab

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