

Symmetry Breaking in the Core-Level Photoionization of N₂

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The fragmentation of N₂, induced through the absorption of a single photon by a core electron, may proceed through a variety of reaction channels. Previously [1,2,3], the reaction involving breakup into the *symmetric* charge-state of two N⁺ ions was investigated by the COLTRIMS technique, in which fragments from individual photo-fragmentation events were measured in coincidence and their momenta deduced [4].

Here we used first light from the newly-built variable-polarization soft-X-ray beamline P04 at the synchrotron radiation source Petra III to perform measurements within our Photon-Ion Spectrometer (PIPE) collaboration. Using the approach described in [1] we measured ions and electrons in time-coincidence for both the symmetric- and asymmetric-breakup of the N₂ molecule after core ionization by a 417 eV photon. Photoelectrons were measured over the full 4 π angle and N⁺ and N⁺⁺ ions within counter-oriented 12 degree acceptance cones. Fig. 1(a) and (b) show, respectively, the angular distribution of the photoelectron, in the molecular frame, for symmetric- and asymmetric breakup. Data showing the interplay between the angular-emission patterns for the Auger electrons and the photoelectron will be presented.

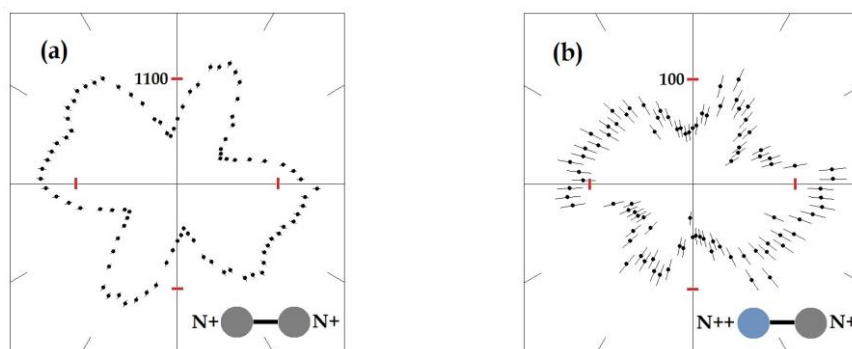


Fig. 1. Molecular-frame angular distributions for the photoelectron within the polarization plane of circularly polarized light. The orientation of the internuclear axis is indicated.

References:

[1] M. S. Schöffler *et al.*, *Science* **320**, 920 (2008).

[2] Th. Weber *et al.*, *J. Phys. B* **34**, 3669 (2001).

[3] T. Jahnke *et al.*, *PRL* **88**, 073002 (2002).

[4] R. Dörner *et al.*, *Phys. Rep.* **330**, 95 (2000).