

Femtosecond Soft X-Ray Pump-Probe Dynamics

Stephen R. Leone

JILA, National Institute of Standards and Technology and University of Colorado

Department of Chemistry and Biochemistry and Department of Physics

University of Colorado

Boulder, Colorado 80309-0440

srl@jila.colorado.edu

Ultraviolet photoelectron spectroscopy and x-ray core level photoelectron spectroscopy are important methods used to study the structure and energetics of neutral molecules, radicals, and semiconductor surface processes. A new method is described to obtain camera-like snapshots of the ultraviolet and soft x-ray photoelectron spectra of molecules during their dissociation and transformation. The method uses high order harmonic generation of a Ti:sapphire ultrafast laser. Results are presented on the technique, the characterization of femtosecond soft x-ray pulses, and on the first observations of photoelectron processes of dissociating molecules. The results pave the way for a general new method to probe transient states in molecules, based on the powerful methods of photoelectron spectroscopy that have been so successfully employed for ground state analyses. These concepts will be discussed and future possibilities for considered.

Other information:

Recent co-workers: Lora Nugent-Glandorf, Michael Scheer, Noel Moore, Astrid Mueller, Veronica Bierbaum

Sponsored by the AFOSR and NSF

Recent publication:

L. Nugent-Glandorf, M. Scheer, D. A. Samuels, A. M. Mulhisen, E. R. Grant, X. Yang, V. M. Bierbaum, and S. R. Leone, "Ultrafast time-resolved soft x-ray photoelectron spectroscopy of dissociating Br₂," Phys. Rev. Lett. 87, 193002/1-4 (2001)