

Abstract for an Invited Paper
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Probing Dynamics from Within in Negative Ions, Neutral Molecules and van der Waals Clusters¹

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We have investigated with unprecedented levels of detail, processes and phenomena involving photodetachment of negative ions and photoionization of molecules and van der Waals clusters using the brightness, spectral resolution, tunability and polarization of the Advanced Light Source at Lawrence Berkeley National Laboratory. Photodetachment of negative ions exhibit structure and processes differing substantially from corresponding processes in neutral and positive ions, owing to the dominance of correlation in both the initial and final states. We will report on investigations carried out in inner-valence CN^- molecules giving rise to absolute double photodetachment cross sections as well as on fragmentation of negative ions clusters. We will also present absolute inner-shell photodetachment of atoms leading to multi-Auger decay [1] and discuss threshold laws [2] and PCI effects [3]. The measurements were conducted using collinear photon-ion spectroscopy. The evolution of inner-shell photoionization of clusters, as a function of photon energy, will be presented and compared to analogous measurements in atoms. The measurements were conducted using angle resolved two-dimensional photoelectron spectroscopy. Molecular fragmentation results using an ion imaging detector will briefly be presented.

[1] R. C. Bilodeau, J. D. Bozek, G. D. Ackerman, N. D. Gibson, C. W. Walter, A. Aguilar, G. Turri, I. Dumitriu and N. Berrah, PRA **72**, 050701(R), 2005.

[2] R. C. Bilodeau, J. D. Bozek, N. D. Gibson, C. W. Walter, G. D. Ackerman, I. Dumitriu, and N. Berrah, Phys. Rev. Lett. **95**, 083001 (2005).

[3] R. C. Bilodeau, J. D. Bozek, A. Aguilar, G. D. Ackerman, and N. Berrah, (in press PRA brief report).

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