Time-resolved science using the COLTRIMS technique

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During the last 15 years a novel decay mechanism of excited atoms has been discovered and investigated. This so-called "Interatomic Coulombic Decay" (ICD) [1,2] involves the chemical environment of the electronically excited atom or molecule: the excitation energy is transferred to a neighbor of the initially excited particle usually ionizing that neighbor. It turned out that ICD is a very common decay route in nature as it occurs across van der Waals and hydrogen bonds. The time evolution of ICD is predicted to be highly complex, as its efficiency strongly depends on the distance of the atoms involved and this distance typically changes during the decay.

Here we present a direct measurement of the temporal evolution of ICD using a novel experimental approach [3,4] as well as theoretical results. The results show the evolution of the vibrational wave packet of a NeKr dimer during the decay. So we gain insight into the complex behavior of ICD in the time domain.

Figure 1 shows the norm of the wave packet as a function of the IC-decay time, i.e. temporal behavior of the survival probability of the intermediate state prior to ICD. Two photon energies as well as theory are included. The data points are extracted from two datasets employing two different photon energies in order to access different decay times: for the black points a photoelectron kinetic energy of 120 meV was chosen while the red points belong to a dataset with a photoelectron energy of 200 meV.

The newest status of the experimental and theoretical results including recapture of the photoelectron in case of very strong Post Collision Interaction will be presented.

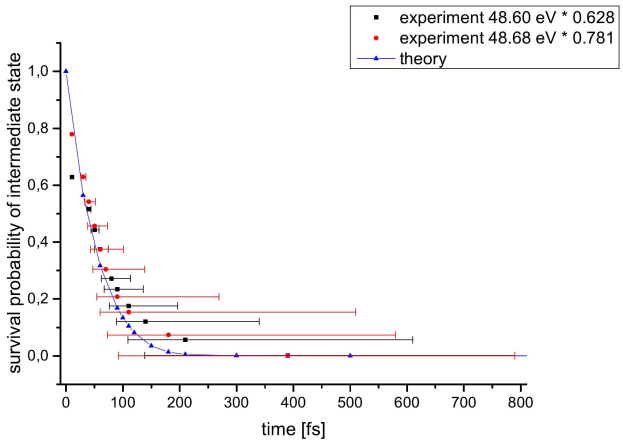

Figure 1 : Results: Norm of the wave packet as a function of the IC-decay, i.e. temporal behavior of the survival probability of the intermediate state prior to ICD.

References

[1] L. S. Cederbaum et al., Phys. Rev. Lett. **79**, 4778 (1997).
[2] T. Jahnke et al., Phys. Rev. Lett. **93**, 163401 (2004).
[3] F. Trinter et al., Phys. Rev. Lett. **111**, 093401 (2013).
[4] U. Frühling et al., J. Electron Spectrosc. Relat. Phenom. **204**, 237 (2015).