

## MO 26 Poster: Photochemistry

Zeit: Dienstag 16:30–18:30

Raum: Labsaal

MO 26.1 Di 16:30 Labsaal

**The role of superexcited states in photoionization and photofragmentation of HCl** — ●CHRISTOF MAUL<sup>1</sup>, KARL-HEINZ GERICKE<sup>1</sup>, and ALEXEY CHICHININ<sup>1,2</sup> — <sup>1</sup>Institut für Physikalische und Theoretische Chemie, TU Braunschweig, 38106 Braunschweig, Germany — <sup>2</sup>Institute of Chemical Kinetics and Combustion, Russian Academy of Sciences, 630090 Novosibirsk, Russia

HCl is known for competition of ionization and fragmentation when excited by two-photon absorption from its ground state  $X^1\Sigma^+$  into the  $B^1\Sigma^+$  state. The competition between fragmentation and ionization is initiated by absorption of a third photon, yielding either  $HCl^+$  or electronically excited  $H^*$  and  $Cl^*$  fragments. These species will produce  $H^+$  and  $Cl^+$  by absorption of a fourth photon. Besides the ground ionic state  $X^2\Pi$  a multitude of neutral, mostly Rydberg, states are accessible by absorption of the third photon. These Rydberg states are called superexcited if they lie at higher energies than the molecular ionization potential.

Observing speed and spatial distributions of  $H^+$ ,  $Cl^+$ , and  $HCl^+$ , one can determine the nature of the states accessed after absorption of the third photon. The  $B^1\Sigma^+$  state which is produced in the first two-photon absorption step, is unique in that it exhibits a pronounced double minimum well which results in an extremely broad range of internuclear distances for absorption of the third photon. This allows to also access repulsive Rydberg states which we believe to be the major contributors to the fragmentation channels, while ionization is likely to be due to a combination of direct and autoionization processes.

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**Trapping and cooling of molecular ions:**

**Towards ultrafast imaging of single molecule structural changes** — ●STEFFEN KAHRA and TOBIAS SCHÄTZ — Max-Planck-Institut für Quantenoptik, Garching

Knowledge about the spacial structure of bio-molecules is a vital prerequisite for a detailed understanding of their functional behaviour in natural environment. In some cases photoexcitation followed by rapid internal structural reorganization of the molecule establishes the basis for ultrafast processes in biology. So far – besides indirect spectroscopic methods dependent on models based on certain theoretic assumptions – there is no technique available to follow these structural changes on the required femtosecond timescale. We propose an experimental scheme using molecular ions in a Paul-trap. Having them sympathetically cooled by ancilla  $Mg^+$ -ions and aligned by short fs-laser pulses we could benefit from very recent progress in development of short and intense laser sources. They allow the generation of single electron pulses with few fs time resolution. These electrons will be diffracted by the charge density of the isolated molecular ion and thereby leave a measurable signature of its instantaneous structure. For the first time it would be possible to directly observe molecular restructuring by time resolved single electron diffraction on aligned single molecular ions.