Time resolved relaxation dynamics of Ak atoms attached to He nanodroplets: the Rb 5p case

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We study dynamics of Rb atoms attached to the surface of He nanodroplets and excited to the droplet perturbed 5p states by means of femtosecond (fs) pump-probe photoelectron and photoion imaging spectroscopy and time of flight mass spectrometry. Relaxation from $\prod_{3/2}$ to $\prod_{1/2}$ is observed to occur with a time constant of ~1ns, causing dopant ejection.

In this poster presentation, experimental results addressing droplet induced relaxation following electronic excitation of Rb atoms attached to He nanodroplets will be presented.

In a two-color fs pump-probe scheme, the pseudodiatomic $\prod_{1/2}$, $\prod_{3/2}$, and $\sum_{1/2}$ states correlating to the 5p states of Rb are excited. Subsequently, emerging Rb and $RbHe_{n=1,2}$ products are ionized. Velocity Map Imaging of photoions and photoelectrons allows to detect charged photofragments angularly and energetically resolved. Photoelectron spectra suggest the presence of an efficient relaxation mechanism from the $\prod_{3/2}$ state to the $\prod_{1/2}$ state as proposed by Brühl et al. [1]. The time constants of the different occurring processes as well as the relation between electronic relaxation and exciplex formation will be discussed. This experimental study is complementary to theoretical work based on time dependent density functional theory. It is an extension of recent combined theoretical and experimental work focusing on the real time excited state dynamics of doped He nanodroplets[2].

In addition, results referring to the hot topic talk “Highly excited molecular iodine inside helium nanodroplets” will be presented.

References

[1] F. R. Brühl, R. A. Trasca and W. E. Ernst, J. Chem. Phys., **115**, 10220 (2001).
[2] J. v. Vangerow, F. Coppens, A. Leal, M. Pi, M. Barranco, N. Halberstadt, F. Stienkemeier and M. Mudrich, J. Phys. Chem. Lett., **8**, 307-312 (2017).

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