

# Reactivity of alkalis with water clusters studied in helium nanodroplets

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Molecules attached to superfluid helium nanodroplets have been studied for quite some time in order to study the properties of matter at low temperatures and in the environment of a size limited quantum fluid. Recently, new directions of such studies in terms of short-time dynamics [1] and metal clusters [2] have been reviewed. The variety of dopants has been widely extended. We demonstrated that using kilohertz laser ablation both fragile biomolecules as e.g. Guanine, as well as refractory metals could be efficiently doped in helium droplets [3]. In order to study reaction processes we successively loaded helium droplets with water clusters and alkali atoms (Fig. 1). Even at the millikelvin temperatures of the droplets we clearly find signatures of chemical reactivity. Analyzing photo-ionization mass spectra we can detect peculiar differences in the reactivity depending on the alkali used (Na, K, Rb, Cs).

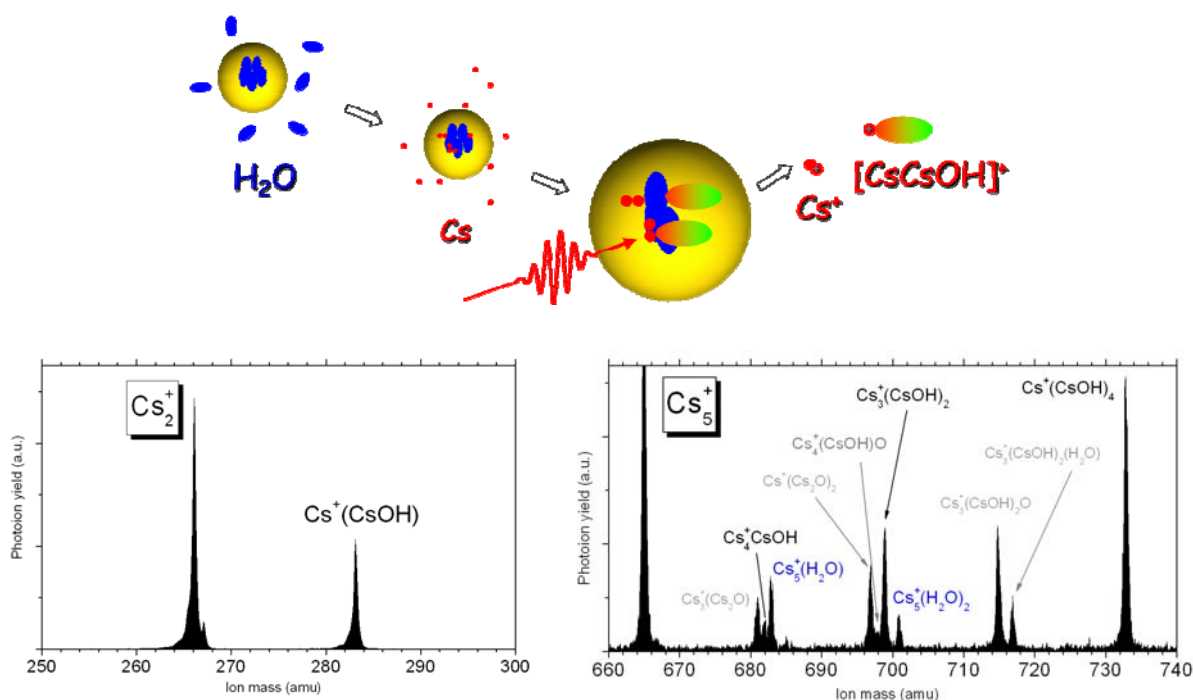


Fig.1: Illustration of an alkali – water reaction inside a helium nanodroplet. The graphs plot mass spectra of all products containing two and five cesium atoms, respectively.

- [1] Frank Stienkemeier, Kevin K. Lehmann, J. Phys. B. **39**, R127–R166 (2006).
- [2] Tiggesbäumker J., Stienkemeier F., PCCP **9** (34), 4748–4770 (2007).
- [3] M. Mudrich, B. Forkl, S. Mueller, M. Dvorak, O. Bünermann, F. Stienkemeier, Rev. Sci Instr., **78**, 103106 (2007).