



SEMINAR

11th December 2020, 14:00–15:00h

Zoom virtual meeting <https://desy.zoom.us/j/98681068603>
(Meeting-ID: 986 8106 8603, Password: 468219)

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Fragmentation of molecular clusters by synchrotron radiation - a first contribution to atmospheric chemistry

Molecular clusters exist in nature, particularly in the atmosphere where, for example, water clusters are intermediates in cloud formation that significantly contribute to IR absorption [1]. When other molecules, such as NH₃, H₂SO₄ and organic molecules, mix with water clusters, the nucleation mechanism is altered and the resulting cluster can become an important center of condensation [2]. Similarly charged molecular clusters are expected to have a great influence on aerosol particle formation [3]. In this case, the charge transfer mechanisms are of great importance for the reactivity of the particles, in particular for the networks bound to hydrogen. However, a crucial step towards a deeper understanding of charge / proton transfer mechanisms is to study active molecules in-situ with the same level of detail as isolated molecules.

Our approach is to study using synchrotron radiation in the soft X-ray range and advanced 3D charged particle momentum imaging spectrometers, the final ionic products formed during fragmentation. In small clusters, this approach can provide detailed information on energy transfer at the atomic level during the Coulomb explosion (eg [4]). We have extended this technique to larger clusters with sizes of 1 nm containing a few tens of molecules using site selective ionization to localize the initial charges [5]. We will present our recent results obtained at MAX IV on several molecular clusters, with a particular emphasis on mixed ammonia / water clusters [6].

- [1] P. Chylek et al. Geophys. Res. Lett. 24, 2015 (1997)
- [2] M. Kulmala et al. Science 318, 89 (2007)
- [3] S.-H. Lee et al Science, 301, 1886 (2003)
- [4] T. Jahnke. J. Phys. B: 48, 082001 (2015)
- [5] B. Oostenrijk et al. Phys. Chem. Chem. Phys. 20, 2932 (2018)
- [6] B. Oostenrijk et al. Phys. Chem. Chem. Phys. 21, 25749 (2019)