

Cold molecular ions: Single molecule studies

M. Drewsen

*QUANTOP - Danish National Research Foundation Center of Quantum Optics,
Department of Physics and Astronomy, University of Aarhus, Denmark*

In ion traps, the translational motion of molecular ions can effectively be sympathetically cooled to temperature in the mK range through the Coulomb interaction with laser cooled atomic ions. At such low temperatures the molecular ions typically become part of spatial ordered structures (Coulomb crystals) in which the individual molecules can be localized within a few μm^3 . The extreme situation of having only a single laser-cooled atomic ion interacting with a single molecular ion is an ideal starting point for many single molecule studies. By applying a rather simple non-destructive technique for the identification of the single molecular ion in such a situations relying on an *in situ* mass measurement of the molecule, we have recently studied photofragmentation of singly charged Aniline ions ($\text{C}_6\text{H}_7\text{N}^+$) as well as isotope effects in the reaction of Mg^+ ions with a H_2 , HD, and D_2 molecules. In the talk, I will discuss these recent single molecular ion experiments as well as some future prospects.