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Short Visit Report

Stability of ions trapped in helium clusters

The aim of the visit was to familiarize myself with the technique of molecular trapping by helium clusters. It was planned that molecules with biological relevance, (valine, glycine and water, would be investigated. We managed to perform experiments with all three of these molecules, however the majority of the experiments were carried out on valine. We performed measurements on valine molecules embedded in helium clusters. We recorded the mass spectra of negative ions from valine/helium complexes at different electron impact energies. The formation of various fragment masses originating from the valine molecule were observed. Some of the masses can be attributed to different fragments of the valine molecule (masses?). The ion fragment formation as a function of the electron energy for these masses (measured using standard mass spectrometer) show spectra with multiple peaks which might originate from different fragment ions. Using a high resolution mass spectrometer device in Innsbruck we were able to determine the contribution of different ions in these ion yield spectra. This information is important in estimating the electron-valine reaction pathways and their probabilities.

Negative ion mass spectra ions, produced by electron impact to valine/helium complex showed a very interesting feature. It appears that impact of one electron can induce the formation of peptide bond from two valine molecules, through the release of a water molecule. As this happens at very low temperatures, similar to conditions in the interstellar medium, these findings might be very interesting for astrobiology. However these data need to be verified extensively. Therefore some measurements of water embedded in helium clusters were also performed to see the behaviour of water clusters at cold temperatures. These data are directly relevant to our experiments in Aarhus, where we observed an interesting phenomena, where water on surfaces at cold temperatures is transparent to incoming electrons at very low energies.

These Eipam short visit was very useful and both Aarhus and Innsbruck sides are interested in further cooperation. I also discussed some possibilities of further visits to Prof. Scheier's laboratory in Innsbruck. I think both laboratories can contribute with nice and interesting complementary data for each others work.

I would also like to thank Prof Scheier and his team in Innsbruck for kindness and all the help they offered me while being in Innsbruck..