

COST P9 short term scientific mission – report

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Host: Bernd Huber, CIRIL-GANIL, Caen, France

During the visit first experiments were performed to study the interaction of multiply charged ions with small biomolecular clusters. Clusters were formed within a cluster aggregation source, where nucleobases were evaporated at temperatures around 470 K. When entering a liquid nitrogen-cooled He-atmosphere (~1-10 mbar) condensation occurred and mixed clusters formed. The cluster distribution was analysed by TOF-mass spectrometry.

We investigated aggregation of uracil, thymine, adenine + thymine and adenine + cytosine mixtures. Cluster formation was observed for all species (see fig.1 for an example). We also identified fragmentation pathways not present in the fragmentation of the isolated species by comparing the cluster data to single nucleobase studies performed in Groningen in the past.

Regarding the stability of the clusters, magic numbers seem to influence the spectra. For the adenine+ thymine mixture, the peak intensities seemed to be non-statistical, indicating an influence of the fact, that this base pair can have Watson-Crick type hydrogen bonds.

Besides the acquisition of large amounts of coincidence data, which remains to be analysed, considerable experience was obtained on the difficulties involved in aggregation of nucleobases. Frequently, skimmers and diaphragms were clogged with nucleobase crystals and the cluster source had to be cleaned. Adjustments in the design of the source to the needs of nucleobase aggregation have to be done.

It is envisioned to continue the collaboration in the near future, based on the results of this pioneering study.

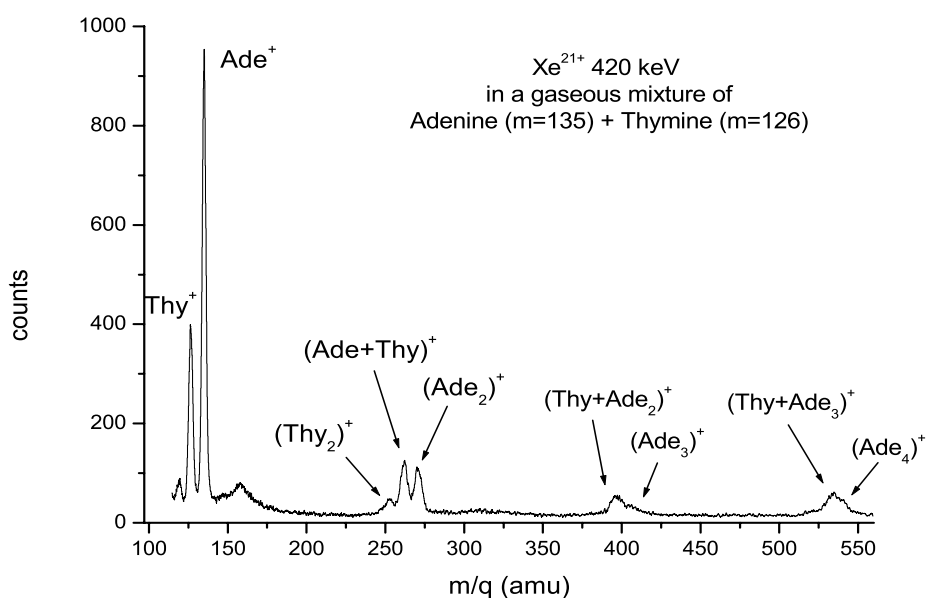


Fig.1 Mass per charge spectrum obtained for a gaseous mixture of Adenine and Thymine with Xe^{+21} ions of energy 420 keV at GANIL, Caen.