FRAGMENTATION OF MULTIPLY-CHARGED CARBON CLUSTERS

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We present results concerning fragmentation of multiply-charged carbon clusters $C_n^{q+}$ (n=5-10, q=2-4) produced by single (SI), double (DI) and triple (TI) ionization of $C_n^+$ projectiles in $C_n^+$-He collisions. The experiments have been performed at the Tandem facility in Orsay (France) with beams of $C_n^+$ clusters of kinetic energy E=2nMeV (constant velocity $v_p$=2.6 a.u). The experimental set-up allows to isolate clusters of a given charge state [1] and, thanks to a new detection method [2], to resolve its fragmentation state. The detection method has been first applied to resolve the complete fragmentation of neutral $C_n$ clusters [3-4]. It is here applied for the first time to the resolution of the fragmentation of charged clusters.

The number of observed dissociation channels for $C_n^{q+}$ is extremely high (for instance 120 observed channels for $C_{10}^{++}$), which reflects a large distribution of internal energy for these clusters and a large number of final combinations. We intended to extract this energy distribution from the measured branching ratios in a given number of emitted fragments, as done on neutral clusters [4]. In order to relate the number of emitted fragments to the cluster internal energy, we used calculated dissociation energies for neutral [5], singly charged [6] and doubly charged [7] carbon clusters and assumed all triply and quadruply charged clusters to be unstable (all fragmentation channels being exothermic). The energy stored in vibration, rotation and kinetic energy of the fragments has been estimated, on the grounds of the statistical Metropolis Monte Carlo (MMMC) fragmentation theory (see the companion abstract [4]). Preliminary results show that it is possible to associate the same energy deposit to each electron ejection, as illustrated in the figure 1 for the special case of $C_9^+$. Other cases will be presented at the conference. In addition all individual branching ratios, within a given number of emitted fragments, will also be presented.

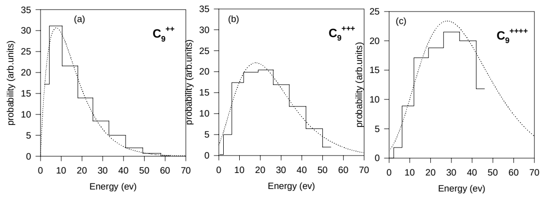


**Figure 1:** Internal energy distributions (solid lines), extracted from measured branching ratios, for $C_9^{++}$ (a), $C_9^{+++}$ (b) and $C_9^{++++}$ (c). Dotted lines: analytical fit of the distribution in (a), once and two times auto-convoluted, after subtraction of the incident internal energy (cluster temperature), in (b) and (c) respectively.

## References

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