# Fragmentation of multiply-charged carbon clusters.

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*Fragmentation d'agrégats de carbone multichargés .*

*Nous avons mesuré la fragmentation d'agrégats de carbone multichargés créés par collision atomique de haute vitesse à l'aide du détecteur AGAT au Tandem d'Orsay. Le dispositif expérimental permet d'isoler un agrégat de charge donnée et de résoudre tous ses états de fragmentations. En utilisant les résultats d'un modèle de fragmentation statistique nous avons extrait des figures de fragmentation les énergies d'excitations électroniques associées à une simple, double, et triple ionisation. Ces résultats montrent qu'il est possible d'associer la même distribution d'énergie pour chaque éjection d'électron.*

We measured 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=2n MeV (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 states. The detection method has been firstly applied to resolve the complete fragmentation of neutral [3] and singly charged $C_n$ [4] clusters. 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 [3]. 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 [5]). Preliminary results show that it is possible to associate the same energy deposit to each electron ejection, as illustrated in figure 1 for the special case of $C_9^+$.

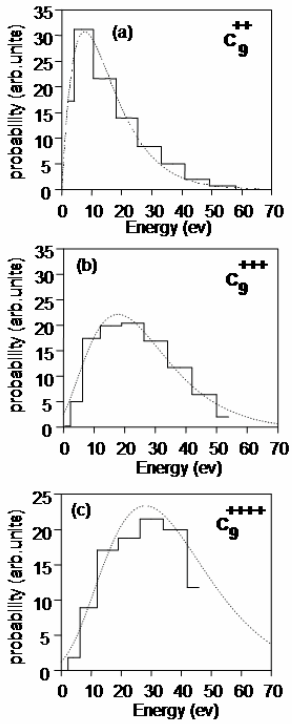


Figure 1: Internal energy distributions (solid lines), extracted from measured branching ratios, for $C_9^{++}$ (a), $C_9^{+++}$ (b) and $C_9^{++++}$ (c). Dotted lines: analytical fit of the distribution in (a), once and two times auto-convoluted, after subtraction of the incident internal energy (cluster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

References :

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