10th European Conference on Atoms Molecules and Photons
ECAMP X

Fragmentation of multiply-charged small hydrocarbon molecules C_nH^{q+} (n=1-3, q=2-6) produced in high velocity collisions: Branching ratios and associated kinetic energy releases of the H^+ fragment

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In a recent work, we showed how fragmentation of multi-charged carbon clusters strongly evolves with the strength of the coulomb interaction [1]. In order to pursue in this topics, we performed measurements on C_nH^{q+} species and added a new experimental observable through the measurement of the kinetic energy release (KER) of the H^+ fragment. Experiments were performed at the Tandem accelerator in Orsay with beams of C_nH^+ molecules of high velocity (3.6 a.u and 4.5 a.u) colliding with a helium target atom. The experimental set-up has been described elsewhere [2], the only change in the present work being the replacement of the solid-state detector of the H^+ fragment by a position sensitive detector made of three MCP's and a resistive anode.

Multi-ionization cross sections, branching ratios of C_nH^{q+} molecules and KER of H^+ for each channel were extracted. A striking feature that we obtained is the fact that the KER is always far below predictions of the point charge coulomb model (PCCM) even at large q values. For CH^{q+}, we could explain this result, on the basis of electronic state calculations and taking into account the fact that 1s ionization of the carbon atom occurs and has its own dynamics. In agreement with [1], we found that dissipation into kinetic energy of the fragment is favoured when the molecule is multi-charged as compared to the case where it is singly-charged.

[1] M.Chabot et al, this conference .
[2] T.Tuna et al, J.Chem.Phys. **128,** 124312 (2008)