



## New process observed in collisions between highly charged protonated protein and $\text{Xe}^{8+}$ , $\text{Xe}^{5+}$ , $\text{He}^{2+}$ ions

Serge Martin, L. Chen, Richard Bredy, Arnaud Vernier, Philippe Dugourd, Rodolphe Antoine, C. Ortega, Min Ji, Jérôme Bernard, O. G. Maganad, et al.

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## New process observed in collisions between highly charged protonated protein and $\text{Xe}^{8+}$ , $\text{Xe}^{5+}$ , $\text{He}^{2+}$ ions

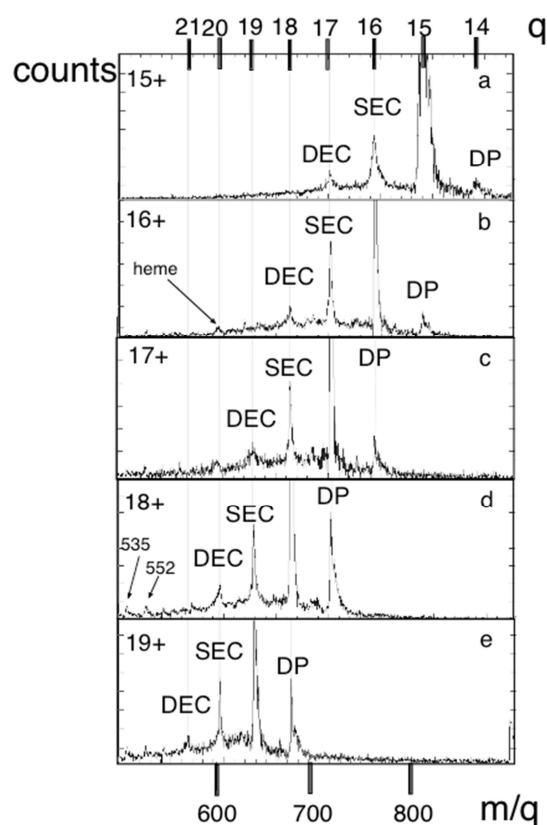
S. Martin <sup>\*</sup> <sup>1</sup>, L. Chen <sup>\*</sup> <sup>2</sup>, R. Brédy <sup>\*</sup>, A. Vernier<sup>\*</sup>, P. Dugourd<sup>\*</sup>, R. Antoine<sup>\*</sup>, C. Ortéga<sup>\*</sup>, M. Ji<sup>\*</sup>, J. Bernard<sup>\*</sup>, O. Gonzalez Maganad <sup>†</sup>, G. Reitsma<sup>†</sup> and T. Schlathölter

<sup>\*</sup> Institut Lumière Matière, UMR5306 Université Lyon 1-CNRS, Université de Lyon, 69622 Villeurbanne cedex, France

<sup>†</sup> KVI Atomic and Molecular Physics, University of Groningen, Zernikelaan 25, NL-9747 AA, The Netherlands

**Synopsis** Electron multicapture processes have been studied in collisions between cytochrome C protein and highly charged Xe and He projectile at keV kinetic energy range. In competition with single and double electron capture, a new and unexpected channel attributed to deprotonation process of the protein has been observed.

Studies of processes in ions-ions collisions are not common in the keV energy range. We have investigated the interaction between highly charged  $\text{Xe}^{8+}$ ,  $\text{Xe}^{5+}$  or  $\text{He}^{2+}$  projectiles and trapped highly protonated cytochrome C (Cyt-C) using a new set-up developed at the KVI laboratory [1]. Single electron capture SEC and double electron capture DEC processes have been studied versus the charge  $q$  of the protein  $\text{Cyt-C}^{q+}$  ( $q=15-19$ ). Typical mass spectra are shown on figure 1 for collisions between  $\text{Xe}^{8+}$  and  $\text{Cyt-C}^{q+}$ . At first sight, collisions between selected charge state of Cyt-C and projectile involve very few processes. As an example for the trapped  $\text{Cyt-C}^{18+}$  parent ion (figure 1d) the expected  $\text{Cyt-C}^{19+}$  and  $\text{Cyt-C}^{20+}$  peaks are mainly attributed to the single (SEC) and double electron capture (DEC) processes. The unexpected  $\text{Cyt-C}^{17+}$  peak is attributed tentatively to a deprotonation (DP) process of the Cyt-C parent ions. This new and unexpected channel has never been observed for other smaller biological molecules. This DP process increases from  $\text{Cyt-C}^{15+}$  to  $\text{Cyt-C}^{19+}$ . A tentative explanation is based on the fast decreasing of proton affinities versus the charge of Cyt-C. During the collision process; the electric field of the projectile is high enough to eject the proton from the Cyt-C. Higher mass resolution spectra and kinetic energy dependence would be necessary to confirm this mechanism.



**Figure 1.** Mass spectra of  $\text{Xe}^{8+} + \text{Cyt-C}^{q+}$  ( $q=15-19$ ). SEC, DEC and DP processes are observed.

### References

- [1] S. Bari, R. Hoekstra and T. Schlathölter  
2010 *Phys. Chem. Chem. Phys.* **12** 3376

<sup>1</sup> E-mail: [smartin@univ-lyon1.fr](mailto:smartin@univ-lyon1.fr)

<sup>2</sup> E-mail: [chen@univ-lyon1.fr](mailto:chen@univ-lyon1.fr)

