

## Autoionization of $N^{q+}$ ( $q=1-3$ ) Rydberg states produced in high energy collisions with He

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In the present, we have measured Coster-Kronig (C-K) electrons from high-Rydberg states produced in 21 MeV  $N^{3+} + He$  collisions with high resolution to compare with double electron capture (DEC) and dielectronic recombination (DR) processes. We have extended our measurements from  $N^{3+}$  to  $N^{2+}$  and  $N^+$  ions. The measured spectra have been compared to our results obtained from 1-2 MeV/u  $O^{q+}$  ( $q = 2-4$ ) + He [1,2].

For Be-like  $N^{3+}$  projectiles, a series of  $1s^2 2pnl - 1s^2 2s\ell'$  ( $n = 5-10$ ) C-K transitions is assigned. The high resolution spectrum in the low-energy region, where the  $1s^2 2p5l$  state contributes, shows that the line intensity due to the low angular momentum  $l = 1$  is the most intense peak, which obeys dipole selection rules. This result for the  $l$  distributions is very similar to that for high-energy  $O^{4+}$  projectiles, but different from those of the DEC spectrum and also of the DR spectrum where the radiative stabilization is necessary [3].

For B-like  $N^{2+}$  projectiles, a series of  $1s^2 2s2p(^3P)nl - 1s^2 2s^2\ell'$  ( $n = 4-8$ ) C-K transitions is assigned. In this case, C-K transitions from  $1s^2 2s2p(^3P)4l$  ( $l = 0,1$ ) states are energetically forbidden, but those from the states of  $l = 2,3$  are clearly observed. For the higher  $n$ , the angular momenta of  $l = 0-3$  states are populated.

For C-like  $N^+$  projectiles, the C-K electron spectra are more complicated than those from B- $N^{2+}$  and Be-like  $N^{3+}$  projectiles. A detailed analysis for this collision system is underway.

[1] K. Kawatsura *et al.*, *Nucl. Instr. and Meth.* **B205** (2003) 528.

[2] K. Kawatsura *et al.*, *Nucl. Instr. and Meth.* **B245** (2006) 44.

[3] P. Glans *et al.*, *Phys. Rev.* **A44** (2001) 043609.