

# ELECTRON CORRELATION IN THE FORMATION OF LI-LIKE IONS

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Electron correlation leading to double-K-shell vacancy production in Li-like  $\text{Be}^+$ ,  $\text{B}^{2+}$ ,  $\text{C}^{3+}$  and  $\text{O}^{5+}$  ions to form so-called “*hollow ions*” has been investigated. Using different Li-like ions allows an understanding of the variation of electron correlation when the  $Z$  of the parent ion changes. A range of collision energies was used in order to study the dependence of electron correlation on the velocity of the collision. The present work has been conducted at Western Michigan University. Li-like ions were accelerated to intermediate-to-high velocities before colliding with neutral helium target atoms. Electron emission was measured at zero degrees, i.e., along the beam direction, using a tandem parallel-plate analyzer.

Fig. 1 shows the electron energy range corresponding to double-K-shell vacancies in  $\text{Be}^+$ ,  $\text{B}^{2+}$ ,  $\text{C}^{3+}$  and  $\text{O}^{5+}$  ions at collision energies near 1 MeV/u. The formation of specific hollow excited states and the variation in their intensities exhibit the effect of the charge of the parent ion, which directly influences the relative importance of the electron-electron ( $e-e$ ) interaction in forming these doubly vacant states. The collision velocity dependence of the cross sections for producing the doubly vacant K-shell states is used to infer the contribution of the  $e-e$  interaction in producing these states.

The  $e-e$  interaction is categorized in terms of *shake* and *dielectronic (rescattering)* processes based on the final hollow states formed in each of the different systems. A detailed analysis and comparison of the present results with earlier results for atomic Li bombarded with fast  $\text{Ar}^{18+}$  ions [1,2] will be given.

## References

[1] J.A. Tanis *et al.*, Phys. Rev. Lett. **83**, 1131 (1999).

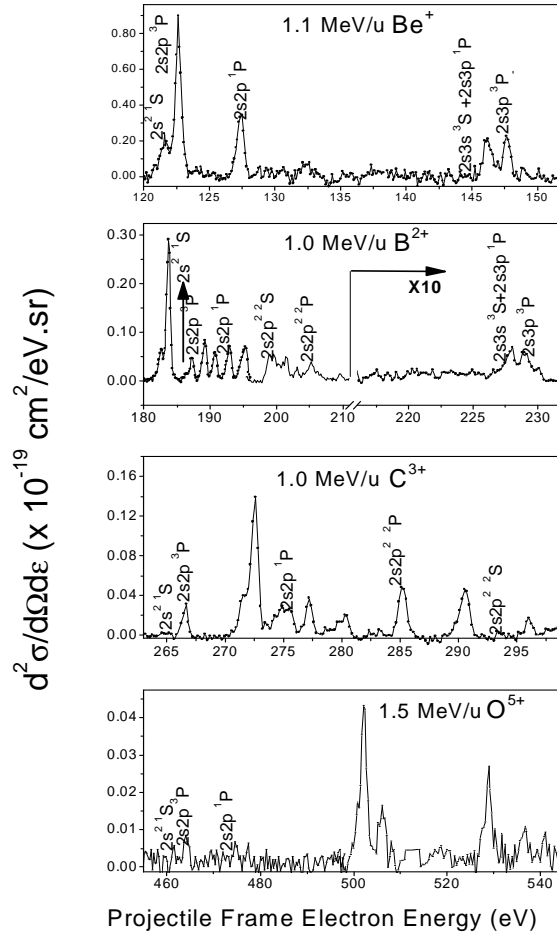


Figure 1: Double differential cross sections for double-K-shell vacancies in  $\text{Be}^+$ ,  $\text{B}^{2+}$ ,  $\text{C}^{3+}$  and  $\text{O}^{5+}$  ions.

[2] J.A. Tanis *et al.*, Phys. Rev. A **62**, 032715 (2000).

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