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Qeios

Peer Review

Review of: "Projectile Excitation to the 2s2p^{3}P and ^{1}P Autoionizing States in Swift Collisions of He-Like Carbon and Oxygen Mixed-State (1s^2, 1s2s ^{3}S) Ion Beams With Helium"

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The manuscript describes a combined theoretical and experimental investigation of the collision of He-like oxygen and carbon atoms with helium. The theoretical model includes three active electrons (two from O/C and one from He). The yield of Auger electrons ejected from the excited O and C ions is measured and compared with simulations.

Overall, the manuscript presents a careful and thorough investigation, providing a wealth of new data. I think the manuscript is well worth publishing in Qeios; it should provide a good reference for future investigations on the subject.

I have a few comments that the authors might want to consider to make the manuscript clearer:

1. In the experiment, mixed-state ion beams are used. Is it somehow possible to generate pure-state beams isolating only one of the states? It would be particularly interesting if a beam containing only metastable 1s2s states could be produced.

2. In Fig. 3, at a projectile energy of 6 MeV, I think it would be helpful if the peaks visible at Auger electron energy 280 - 290 eV could be labeled (at least approximately). There is a note in the text that there is more information in Tables IX and X, but it would be much better if some identification could be made directly in Fig. 3.

3. In Fig. 6, the cross section for C4+(2s2p) from singlet 1s2s (upper panel, green line) does not go to zero for small projectile energy. Is this an artefact of the calculation, or does it have a physical explanation?

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4. In the theoretical calculations, only one of the He electrons is active. This approximation is speculated to be one possible reason for the discrepancy between theoretical and experimental data. I wonder if it is possible to approximately judge the quality of this approximation by an appropriate parameter (like the projectile energy)? In other words, which parameter should be small (or large) for the approximation to be perfect?

5. Is it possible to compare the theoretical results shown in Figs. 7 and 8 with experimental data?

Declarations

Potential competing interests: No potential competing interests to declare.