

EVALUATION OF $1s2l2l'$ $^4P/{}^2P$, ${}^2P_+/{}^2P_-$, ${}^2D/{}^2P$ RATIOS FROM COLLISIONS OF MIXED STATE ($1s^2\ ^1S$, $1s2s\ ^3S$) He-LIKE ION BEAMS WITH H_2 AND He TARGETS

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New results are presented on the ratio R of ${}^4P/{}^2P$ populations of Li-like $1s2s2p$ quartet and doublet P states formed in energetic ion-atom collisions by single $2p$ electron transfer to the metastable $1s2s\ ^3S$ component of the He-like ion beam. Spin statistics predict a value of $R=2$ mostly in disagreement with reported measurements of $R=3-10$ [1-2]. A new technique is used in the evaluation of R which avoids the need for the normalization of the measured cross sections and allows for the determination of the separate contributions of ground- and metastable-state beam components to the measured spectra. Applying our technique to older zero-degree Auger projectile spectra from 4.5 MeV B^{3+} [3] and 25.3 MeV F^{7+} [4] mixed state ($1s^2\ ^1S$, $1s2s\ ^3S$) ion collisions with H_2 targets, we report values of $R=3.5\pm 0.4$ for boron and $R=1.8\pm 0.3$ for fluorine. In addition, also reported for the first time are the ratios of ${}^2D/{}^2P$ and ${}^2P_+/{}^2P_-$ populations from either the metastable and/or ground state beam component, which provide a sensitive indicator of the importance of other active processes that can affect the overall intensities of the measured Auger spectra. They are evaluated in the same technique and compared to previously reported results for carbon collisions on helium [1].

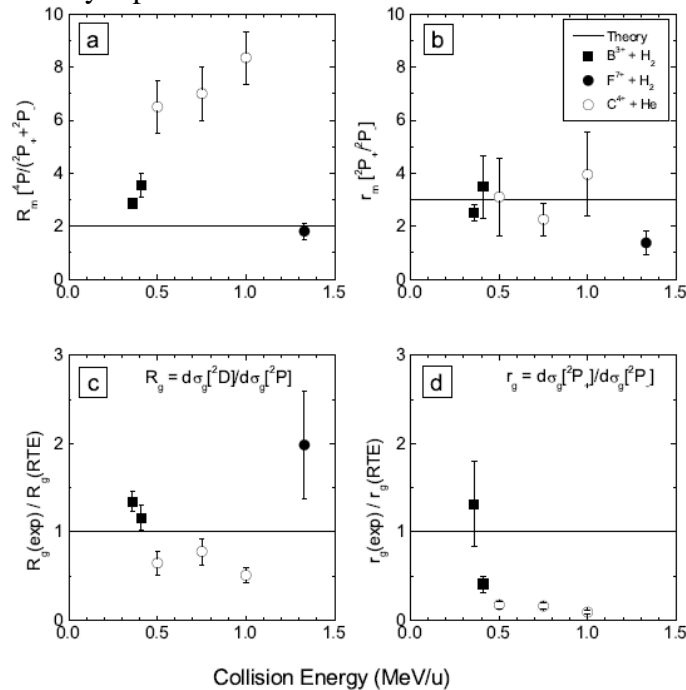


Figure 1: Theoretical and experimental ratios. The carbon on helium results are from [1].

References

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