

Cusp electron studies in MeV/u collisions of $O^{6+}(1s2s\ ^3S)$ ions with He targets

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The processes of the capture of a target electron into the projectile continuum (ECC) and the loss of a projectile electron into the projectile continuum (ELC) are investigated both experimentally and theoretically for collisions of 24 MeV $O^{6+}(1s2s\ ^3S)$ ions with He gas targets. Double-differential cross sections (DDCS), $d^2\sigma/d\Omega dE$, of the resulting cusp-shaped electron peak were measured at the emission angle of zero degrees with respect to the projectile velocity. The experiments were performed at the NCSR "Demokritos" 5.5 MV Tandem Accelerator Laboratory utilizing an electrostatic single stage hemispherical deflector spectrograph [1]. The cusp electron spectra from the excited $O^{6+}(1s2s\ ^3S)$ state were obtained after applying our double-measurement technique, which requires the same measurement of the cusp peak with O^{6+} projectiles in the ground state ($1s^2\ ^1S$) and with O^{6+} projectiles in the mixed state ($1s^2\ ^1S, 1s2s\ ^3S$) [2]. Corresponding DDCS calculations, obtained using continuum distorted-wave (CDW) and continuum distorted-wave eikonal initial-state (CDW-EIS) theories [3], are critically compared to the measurements. Our study exposes the role of multi-electron open-shell ions in the dynamics of the ECC and ELC processes providing data that are scarce in the literature.

References

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