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Separation and solid angle correction of the metastable $1s2s2p\ 4P$ Auger yield produced in ion-atom collisions using the biased gas cell technique

Content :

In zero-degree Auger projectile spectroscopy the long lifetimes ($>10^{-9}$ s) of the $1s2s2p\ 4P_{1/2,3/2,5/2}$ metastable states result in their decay along the projectile path towards (and through) the electron spectrometer. Thus, the overall electron detection solid angle varies and correction to the $4P$ electron yields is needed. Previously, this correction was treated either geometrically or by SIMION simulations. A different approach is adopted here. Separation of the $4P$ yields produced inside and outside the target can be achieved by applying a relatively small voltage bias to the target gas cell. The $4P$ component produced inside the cell is thus separated and can be used with corrections to determine the ratio $R=4P/2P$ of the production cross sections, where large departures from the expected value of $R=2$ have been reported, leading to various speculations as to the possible mechanisms involved. Results for 12 MeV C^{4+} collisions with H_2 , He, Ne, Ar are presented.

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