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THE ROLE OF THE EFFECTIVE SOLID ANGLE IN THE DETERMINATION OF THE ELECTRON YIELD OF METASTABLE PROJECTILE AUGER STATES

Content :

The 1s2s2p 4P metastable state life time formed by single electron capture (EC)in MeV/u He-like-ion - atom collisions is long (10-6-10-9s). In electron measurements, where the spectrometer lies in the direct path of the ion, electrons are measured at 0o to the beam and metastable projectile states Auger decay all along its path towards the spectrometer. Thus, the overall detection solid angle varies with the electron emission position and the determination of the Auger yields is not straightforward. Here, the SIMION electron optics software is used to treat the problem in an effective Monte Carlo simulation that includes τ obtained using the MCDF method. The experimental setup involving a hemispherical deflector analyzer with injection lens and PSD was accurately modeled. Random electron distributions in electron energy and emission angles were used to simulate the metastable Auger decay along the beam path, while the number of electrons was recorded. A systematic study based on the above procedure allowed for the accurate determination of the solid angle correction factor for the 4P decay in excellent agreement with measured electron line shapes of both metastable and prompt Auger projectile states formed by EC in collisions of 25 MeV F7+ with H2 [1] and 12 MeV C4+ with Ne. These results are important in the accurate evaluation of the 4P/2P ratio of Auger yields [2], whose observed non-statistical production by electron capture into He-like ions awaits further resolution [3].

References

[1] M. Zamkov et al., Phys.Rev.A65, 062706 (2002)
[2] http://apapes.physics.uoc.gr
[3] T.J.M. Zouros et al., Phys. Rev. A77, 050701R (2008)

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