Single electron capture in fast collisions of He-like ions with gas targets*

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The fundamental atomic process of single electron capture (SEC) for fast ion-atom collisions of He-like ion projectiles with gas targets is reviewed. Recently, a long-standing problem of how open shell ion cores behave while undergoing SEC in fast ion-atom collisions was resolved [1]. Our work invalidated the generally adopted frozen core approximation, exposing a new screening effect due to the Pauli Exclusion Principle (Pauli shielding). The reported work was based on measurements of state-selective Auger electron spectra using the APAPES installation [2] at the tandem accelerator laboratory of the NCSR "Demokritos" [3], critically compared to ab initio calculations based on a three-electron close-coupling semiclassical approach. The study involved He-like carbon projectile ions pre-excited in the $C^{4+}(1s2s\ ^3S)$ state in MeV/u collisions with He targets [4]. Here, we report new results on the SEC process for He-like oxygen projectiles in the $O^{6+}(1s2s\ ^3S)$ state in collisions with He. Thus, we extend our measurements towards an iso-electronic study of the SEC process, to help clarify the role of the observed electronic correlation effects. The forthcoming upgrade of the NCSR "Demokritos" tandem accelerator will greatly facilitate these future studies.

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