State-selective charge exchange processes between Ar and Ne ions with H (1s) and H*(n = 2)

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In this talk we will describe our advances in the proposed research program, namely the calculation of state-selective charge exchange cross sections following the collision of Ne^{10+} and Ar^{18+} ions with H(1s) and H*(n = 2) targets. The methodology employed by our group is based on the classical trajectory Monte Carlo (CTMC) method. Following up our former studies for projectile charges +6, +7 and +8, for H(1s) we have compared and analyzed the cross sections predicted by three methodologies: the standard CTMC [1], the E-CTMC [2,3] and the Z-CTMC [4,5] methods. While the CTMC method initializes the target by means of the microcanonical distribution, the E-CTMC and Z-CTMC methods employ nuclear charge and binding energy distributions to extend the radial electron distribution beyond the classical turning point. The impact energy range considered in our study was 100 eV/u – 300 keV/u. For H(1s), we have benchmarked our results with data reported with the AOCC, TC-AOCC and WP-CCC methods [6-9]. Present Z-CTMC results show good agreement with reported experimental total electron capture cross sections and are in excellent concordance at the state-selective level with available semiclassical and quantum theories. For H*(n = 2), currently under way, we compared our CTMC and Z-CTMC results to those provided by the AOCC [6,7]. Preliminary results will be presented.
As a complementary critical analysis of the classical trajectory Monte Carlo methods hereby employed, we will also show state-selective charge exchange cross sections for collisions between highly charged projectiles and H_2 [10], for which COLTRIMS experimental data have recently turned available. Our results show that from the three methods considered, the Z-CTMC is the one that better reproduces the experimental trends.

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