Transfer ionization study in He^{++} + Ar collisions at 30 keV/amu

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Synopsis A semiclassical study of ionization and transfer ionization processes is presented in the He^{++} + Ar collision at 30 keV/amu.

Studies of differential cross sections in energy between light ions and heavy atoms are scarce, despite their importance in fundamental physics and in applications in various fields.

In this work we study different channels that determine the transfer ionization probability in the collision of doubly ionized helium ions and argon atoms. The development of the collision is analyzed considering two ways: the simultaneous process of two electrons ejected from Ar (He^{++} + Ar → He^{+} + Ar^{++} + e) and a two-steps process (He^{++} + Ar → He^{+} + Ar^{+} → He^{+} + Ar^{++} + e) in which an electron leaves the Ar, followed by a rearrangement of the electronic clouds before the second electron is ejected.

The probabilities of the different channels involved in the calculation are obtained from the Fourier transform of the wave functions, calculated in the impact parameter approximation with the atomic-orbital close-coupling method [1]. In a previous study [2], the method used here was successfully applied to two systems that have been extensively studied for comparison purposes: p + H and p + He. The calculation of the simple ionization or capture probabilities of an electron from the *d* layer of Ar is carried out using a potential model, whose parameters are adjusted to reproduce the energy of the levels *s*, *p*, *d* and *f* of the atomic basis in each one of the two centers. The dynamics of the 8 electrons in the *d* layer of Ar are taken into account by using binomial statistics.

The figure shows the processes probabilities that contribute to the transfer ionization differential cross section in energy: simple capture and ionization, and both transfer ionization in simultaneous as well as sequential processes.

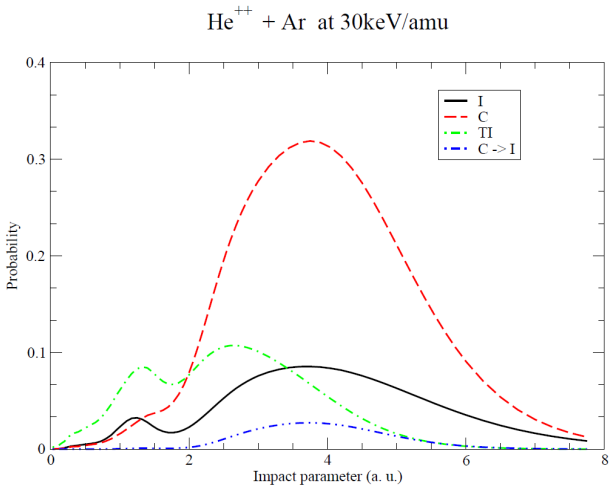

Figure 1. It is shown the probability of different processes that contribute to the transfer ionization distribution in energy. The red curve represents simple capture, black is the simple ionization, green and blue are the transfer ionization in simultaneous and sequential processes respectively.

In the poster presentation, the obtained results on the differential cross section in energy will be discussed and compared with relevant data appearing in the literature.

References

[1] W. Fritsch and C. D. Lin, 1991, Phys. Rep. 202, 1-97.

[2] A. Amaya-Tapia *et al. ArXiv: 1601.05848 [physics-chem.ph]*

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