Momentum distribution for proton-H collisions at 50 keV projectile energy.

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It is discussed the momentum distribution for the ionization process in proton-H collisions using the two-center close-coupling method (CCM) [1]. It has been possible to predict the total ionization cross sections with good success by describing the continuum electrons in the CCM with positive energy pseudostates. However, it has been extremely difficult to achieve a good momentum distribution representation of the ejected electrons. The set of energy eigenvalues associated to the pseudostates, could be visualized as an energy discretization of the continuum. This makes difficult to envisage a strategy for counting the contribution to an energy range [3].

In this contribution it is explored the capabilities of the CCM to describe the differential cross section of ionized electrons by Fourier transforming the pseudostates. It is considered the two center approach to take into account the influence of both nuclei on the ejected electrons. The same basis function centered on each nucleus is used. The basis is carefully selected to avoid, as far as possible, problems associated with over-representation.

The results of this work for the electron energy differential cross section in the projectile reference frame show a peak that may be related to electrons in the forward direction having velocities similar to that of projectile. This structure when transformed to the target frame appears as a slightly visible contribution at around 27 eV. The phenomenon, occurring in other systems, has been named electron capture to the continuum (ECC).

Although the angular dependence of the ionized electron distribution does not reproduce experimental data [3], the integration over the angle, does it, in the energy range from 10 to 30 eV. However, at higher energies, the obtained distribution is above the experiment, discrepancy that seems to arise from electrons coming from angles below 15 deg, not measured in the mentioned experiment. At energies below 10 eV, the CCM functions oscillate too fast and the method fails in reproducing the experimental results.

For more complex systems, the application of this procedure in CCM seems to be plausible.

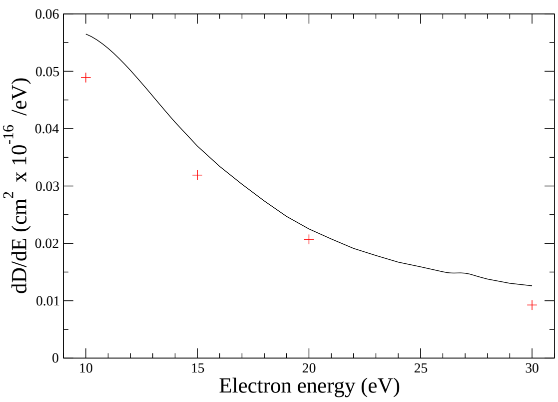

Figure 1. Momentum distribution of ionized electrons at 50 keV. Experimental data [3]: +. Solid line, present results

References

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