

# ELECTRON EMISSION IN $H^-$ - He, $H_2$ COLLISIONS

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Collisions of  $H^-$  ions with gas atoms and molecules are of permanent interest for studying energy dissipation in laboratory and astrophysical plasmas [1]. Of particular interest are they for solving the problem of  $H^-$  beam transportation, e.g. for plasma heating. On the other hand, information on the total and differential cross sections for electron detachment is important for physics of few electron systems to study transition from deterministic to stochastic dynamics of inelastic processes in collisions of weakly bound systems planned to be performed in the future.

The present work is aimed at measuring doubly differential cross sections for electron ejection in collisions of  $H^-$  ions with relatively simple targets, like He and  $H_2$ , and at searching for an adequate model for description of electron detachment at keV energies.

The experimental set-up [2] consisted of an ion source, ion monochromator and collision chamber with cylindrical electrostatic mirror as an electron spectrometer. The energy resolution of spectrometer was 0.6%. The measurements were performed at an electron ejection angle  $54.5^\circ$  in the ion energy range 2 – 10 keV and in the electron energy range 3 – 30 eV.

As an example, the measured doubly differential cross sections for electron ejection in  $H^- - H_2$  collisions are shown in Fig.1 as a function of electron energy. One can discern continuous part of the spectra and a structure connected with decay of the autodetaching states  $2s^2$ ,  $2s2p$  and  $2p^2$ , which experience a Doppler shift in changing ion energy.

Two different approaches have been used for description of dynamics of electron detachment in collisions of  $H^-$  ions. One of them considers the detachment as a result of slow electron scattering on an incident atomic particle. Such mechanism is accomplished when the collision velocity exceeds the orbital velocity of the loosely bound electron. In this case, the energy

spectra of electrons can be related to the differential cross sections for electron elastic scattering. The other approach considers the detachment as a result of the initial quasimolecular term promotion to the continuum, that is acceptable when the collision velocity is less than the electron orbital velocity. In that case, the electron energy spectra can be expressed in terms of the quasimolecular term properties [3]. In the cases under study the velocities mentioned above do not differ very much and description of the electron detachment depends on the electron and ion energy. This work is supported by INTAS under Grant No 01-0155.

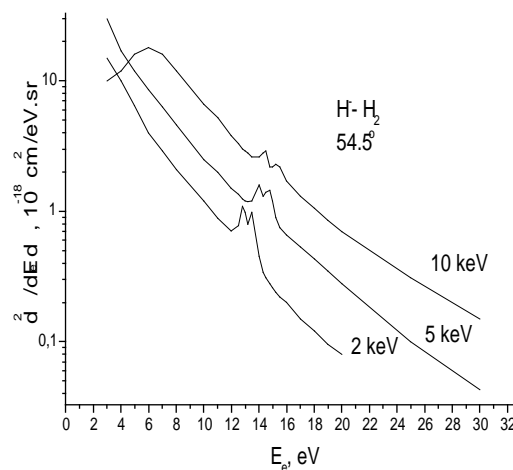


Fig.1. Energy spectra of electrons ejected in  $H^- - H_2$  collisions.

## References

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