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Electron emission from dressed projectiles in collision with atoms and molecules at intermediate energies

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Synopsis Angular and energy distributions of electron emitted from dressed ions and neutral atoms in collisions with atoms and molecules were measured for intermediate incident energies. Effects of the initial state of the projectile electron were studied using distorted wave and CTMC calculations. Experiments carried out on collisions with He, Li, H_2, Ne, and Ar show that the electron loss distributions depend very strongly on the target.

In a collision between dressed projectiles and atoms or molecules, total electron emission distributions show a structure known as electron loss peak (ELP) superimposed to the target electron emission [1]. The ELP, located at an electronic velocity equal to the projectile velocity, is produced by electrons resulting from direct projectile ionization but also from simultaneous projectile and target ionizations. To model the electron loss peak (ELP), theories must calculate the contribution of each of these processes and consider all the electronic states involved.

In this work we present electronic distributions measured in the ELP energy region, which result from the interaction of dressed and neutral projectiles with different targets. Projectiles of B^{2+}, C^{2+} and Li^0 with incident energies between 100 keV/u and 450 keV/u were used. H_2, He, Ne and Ar gases were selected as targets. Doubly Differential Cross Sections (DDCS) for several emission angles from 0° to 150° were then obtained and compared with theoretical calculations based on Classical Trajectory Monte Carlo, Continuum Distorted Wave and Continuum-Distorted-Wave – Eikonal-Initial-State models (CDW-EIS) [2].

In figure 1 we present DDCS for electron emission in collisions of 300 keV/u neutral Li with He target. CDW-EIS calculations are shown with the different contributions from target (TI), projectile (PI) and from simultaneous ionization (SI). The structure associated with the ELP is wider in the experimental data than the theoretical result. While the distributions peak at the expected energy, they extend toward the low energy range forming a double structure. No evidence of such effect was observed with ions. The dependence of this effect with the target species was also studied.

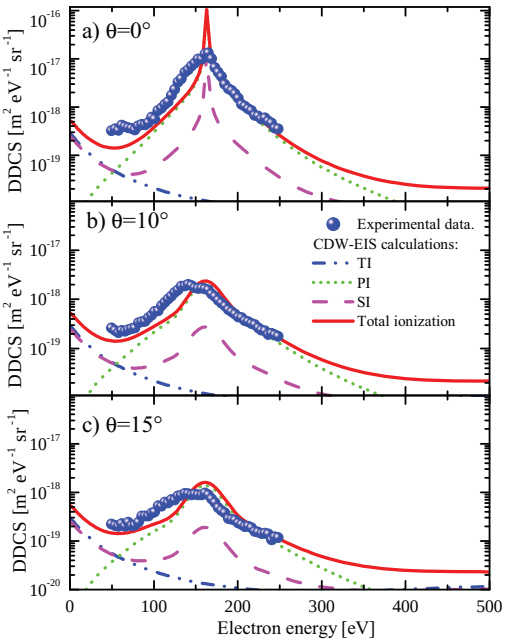

Figure 1. Doubly differential cross section for electron emission in collisions of 300 keV/u Li^0 with He for different emission angles.

References

[1] D. Schneider *at al* 1983 *Phys. Rev. A* **28** 649. O. Heil *at al* 1992. *Phys. Rev. A* **45** 2850.

[2] J.M. Monti *at al* 2013. Accepted for publication in *Phys. Scr. T.*

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