Electron-loss and capture cross sections of W ions colliding with H and He atoms

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Electron-loss and charge-exchange cross sections of tungsten ions colliding with H and He atoms are calculated in the energy range of 1 keV/u – 10 MeV/u using DEPOSIT, RICODE and CAPTURE codes based on the classical energy-deposition model and the first Born approximation. The data obtained can be used for plasma modeling and interpretation of future experiments at fusion devices using tungsten as a material for the plasma facing components (PFC). The details of calculations are presented in [1]. The data for charge-exchange cross sections for highly charged W ions are in good agreement with semi-empirical formula [2].

The data for these charge-changing cross sections were evaluated on the basis of their dependencies on collision energy, and atomic structure of colliding particles such as ionization potentials, ion charge, nuclear charge of the target atom and others. It was also very useful and important to obtain some *semi-empirical formulae*, for example, for electron loss cross sections obtained in [3]. This formula was evaluated on the basis of available experimental data and numerical calculations performed for a large number of colliding systems and in a wide energy range. Such formulae are required to get self-consistent data and to predict the charge-changing cross sections for an arbitrary colliding partners.

Figure 1 shows an example of the calculated cross sections for H gas target.

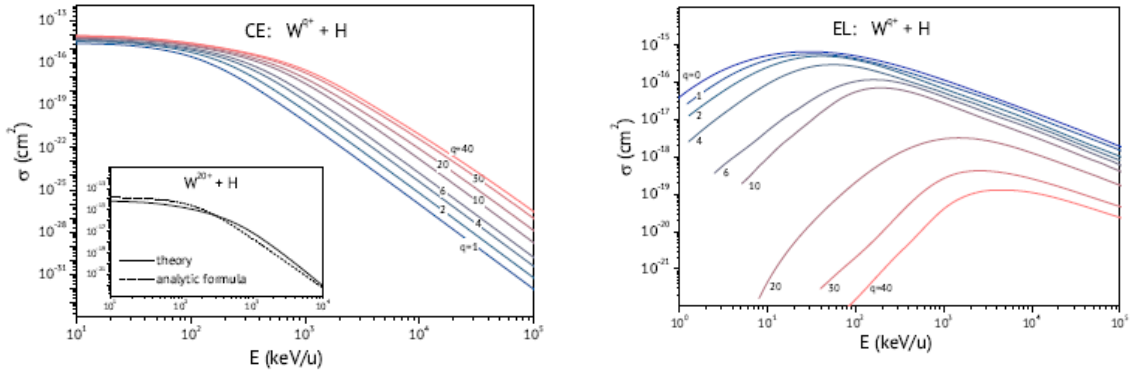

Fig. 1. Calculated charge-exchange (CE) and electron-loss (EL) cross sections of W^{q+} ions colliding with H atoms. In the left figure, calculated CE cross sections for W^{30+} +H collisions are compared with semi-empirical formula [2].

References.

[1] I.Yu. Tolstikhina *et al*. J. Phys. B, 2012 (submitted)
[2] Y. Nakai *et al*. Physica Scripta **T28**, 77 (1989)
[3] V.Shevelko *et al*. NIMB **269**, 1455 (2011) ; *ibid* **278,** 63 (2012)