ELECTRON-IMPACT IONIZATION OF Na-LIKE IONS WITH ACCOUNTING OF AIS

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In Coulomb-Born approximation with exchange ionization cross-sections of Na-like ions Al^{2+}, Si^{3+}, Fe^{15+}, Ar^{7+} Ti^{11+} and Mo^{31+} are calculated. In addition to the direct knock-out of target electron into the continuum (direct ionization - DI), the processes of excitation of inner-shell electrons into low-liying AIS are considered (excitation autoionization - EA)

$$e^- + 1s^2 2s^2 2p^6 3s \rightarrow 1s^2 2s^2 2p^5 3snl + e^-, \quad n = 3,4; \quad l = 0,1,2.$$

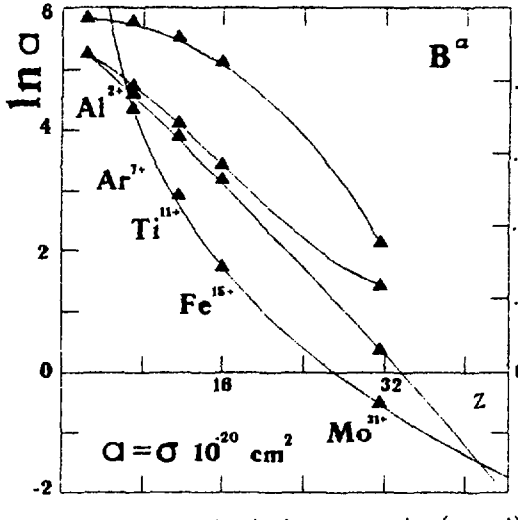
The total ionization cross-section is represented in the form

$$\sigma_i = \sigma_d + \Sigma_i B_i^a \sigma_{ex}^i, \quad B_i^a = \Sigma_j A_{ij}^a / (\Sigma_j A_{ij}^a + \Sigma_n A_{in}^r)$$

where σ_d is the direct cross-section σ_{ex}^i is the cross-section of exchange of electrons to the AIS-level i A_{ij}^a is the probability of autoionization in the channel j A_{in}^r is the probability of radiation decay to the n-level.

The wave-functions of bound-states were calculated in one-configurational HF-approximation with the complete self-consistense for every LS-term separately. The method of calculation is described in [1].

In the fig. the dependence of calculated cross-section versus charge z is shown. The coefficient B^a was defined as a ration of summary cross-sections EA to the summary cross-section of excitation of every ion at a given energy. The values of cross-sections are given at incident electron energies equal to 1.3 of threshold energy of excitatiton of 2p-electron. It is to be noticed that the dependence of EA-cross-section is almost linear (in the chosen logaritmic scale). The probabilities of radiation-decay of AIS



were calculated in the dipole appoximation, while the probabilities of autoionization were calculated with taking into account only electro-static interaction of electron.

It is seen in the fig. that at $7 < z$ the role of DI dominates over the process of EA. At $7 \leq z \leq 42$ the desisive role is played by EA. Further increase of z again leads to domination of DI, since the majority of excited AIS are decaying via radiation channel.

Fig. The dependence of excitation cross-section (curve 1), cross-section of EA (curve 2), cross-section of DI, calculated by Lotz-formula (curve 3), and B^a (right scale, curve 4) versus ion-charge z.

1. V.F.Gedeon et al// Optika i spectroskopia,1989,v.67,p.257