Some features of realization of three-stage mechanism of ionic recombination

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One of the basic considered in the kinetic literature mechanisms of recombination of ionic pair A^+ and B^- with participation of atom-acceptor of energy C can be represented by the following scheme including three consecutive two-body collisions:

$$A^+(B^-) + C \leftrightarrow CA^+*(CB^-*) \quad (1)$$
$$CA^+*(CB^-*) + C \rightarrow CA^+(CB^-) + C \quad (2)$$
$$CA^+(CB^-) + B^-(A^+) \rightarrow AB + C \quad (3)$$

In this scheme at a stage (1) there is a formation of intermediate weakly bounded complex of one of ions with atom C. At the second stage this complex is stabilized by collision with the second atom-acceptor of energy and further at a stage (3) as a result of interaction of an ionic complex with the second ion participating in recombination the molecule AB as a final product of recombination is formed. However, formed at a stage (2) stabilized ionic complex can collide not with the second ion, but with possessing sufficient energy another atom C that owing to low bond energy inside the complex can lead to its dissociation on constituent components:

$$CA^+(CB^-) + C \rightarrow C + A^+(B^-) + C \quad (4)$$

The competition of channels (3) and (4) is investigated by a method of classical trajectories on a example of process of recombination in system $Cs^+ + Br^- + Xe$ for a case when at a stage (1) ionic complex $XeCs^+$ is formed in a range of collision energies from 0 to 10,0 eV. Excitation functions of processes (3) and (4) are shown on figure 1 from which it follows that at collision energies above 1,0 eV the probability of decomposition of ionic complex $XeCs^+$ on constituent components considerably exceeds probability of formation of molecule CsBr in channel (3).

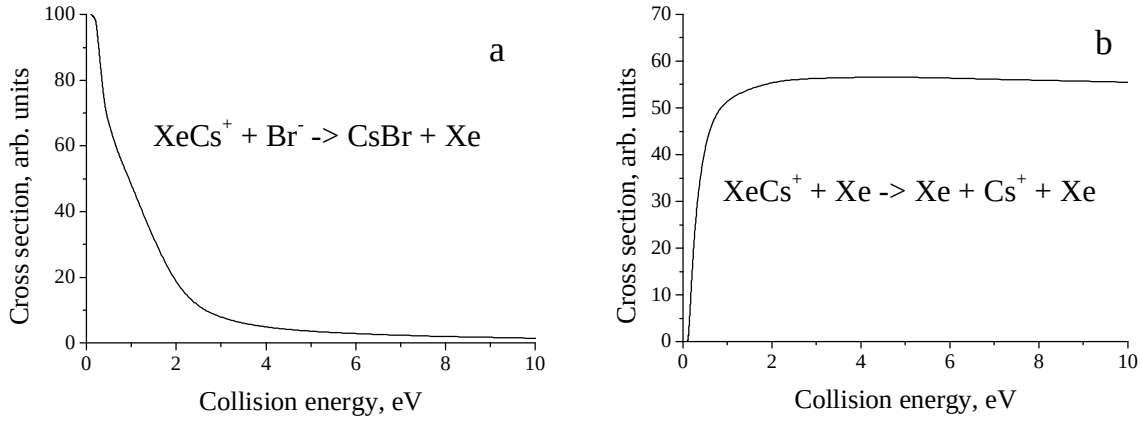

Fig.1. Excitation functions of the channels of formation of molecules CsBr (a) and decomposition of an ionic complex (b) in a range of collision energies from 0 to 10,0 eV.