Excitation processes in collisions of closed-shell atomic particles

M.Gochitashvili[1], R.lomsadze[1], R.Kezerashvili[2]
1. Ivane Javakhisvili Tbilisi State University, Georgia.
2. New York City College of Technology, City University of New York, USA.

In this work, the collision processes of closed-shell particles H_e^+, N_a^+, K^+ with two atomic molecules H_2, N_2 are discussed. Excitation processes are studied in the visible 400 ÷800 nm and the ultraviolet 50÷130 nm radiation region. Correlation diagrams are constructed for colliding pairs in the quasi-diatomic approximation, based on which the excitation mechanism is explained in both ion-atomic and ion-molecular collisions. It is shown that the determining role in the processes of dissociative excitation of molecules is played by the excitation of an intermediate molecular state, which is realized both in the charge transfer $H_e^+ - H_2, N_2 \rightarrow H_2^{+*}, N_2^{+*}$, and in the direct excitation $N_a^+, K^+ - H_2, N_2 \rightarrow H_2^*, N_2^*$ channels, respectively.

The determining factor in the excitation process is the fact that the beam of incident particles is directed perpendicular to the molecular axis (C_{2V} symmetry).

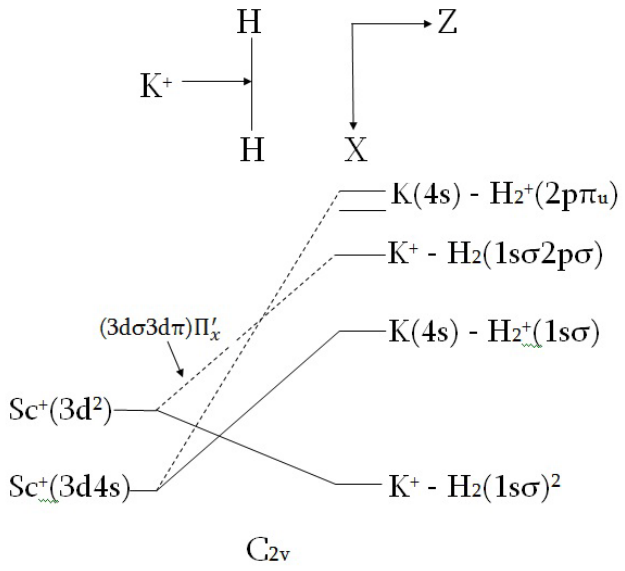

Fig.1 The correlation diagrams of the quasimolecular system of $(KH_2)^+$

In this figure, a correlation diagram of the $(KH_2)^+$ the system is constructed in the quasi-diatomic approximation. It can be seen from the figure that the H(2p) excited dissociation product arises in the process of direct excitation and subsequent decay of the H_2^* molecule, namely, the excitation of the intermediate $(1s\sigma\ 2p\sigma)B^1\Sigma_u^+$ the state occurs through the rotational $\Sigma - \Pi$ interaction between states of different symmetry.