Dissociative electron attachment

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The dissociative attachment processes is the simplest chemical reaction induced by electrons and therefore a subject of rather theoretical and experimental research works [1-5]. However, it is only recently that papers have appeared investigating The dissociative attachment processes to molecules in preliminary prescribed excited rotational-vibrational states [1], threshold singularities [3] and resonances [2,3] of these reactions have been examined.

The cross sections dissociative attachment reactions of electron to diatomic molecules H_2, HD, D_2, HCl, DCl, F_2, HF, DF, Cl_2, Br_2, HBr, DBr, I_2, DI, HI, N_2, Li_2, Na_2 have been calculated.

The main approximation in this approach consists in the fact that the interaction of an incident electron with electrons and nuclei a target molecule is replaced by interaction of an incident electron with each atoms as a whole and atom is considered to be the field center. So, the complicated many particle problem of calculation of the cross sections of electron scattering by diatomic molecules is reduced to a three-particle problem which is solved by method of quantum few-body theory of scattering proposed L.D.Faddeev and O.Y.Yakubovski [4]

This method is applicable for the description of both the direct processes and the processes proceeding without the formation of intermediate long-lived states. Therefore, this approach is applied here to calculate the cross sections of an electron collision with diatomic molecules in the ground state and preliminarily prescribed arbitrary rotational-vibrational states.

The results of calculations are presented and compared with the available experimental data and with the results of calculation using other approximation. Comparison of the performed calculations with experimental data shows that simulation of the interaction, in the framework of present above gives satisfactory agreement with experiment [1], coincidence of the orders of magnitude of cross sections, including the izotopic effects [5], and confirms the existence of the Efimov [3] effect in dissociative attachment processes.

References

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