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Abstracts of papers

THE DETACHMENT OF ELECTRON IN THE SLOW COLLISIONS OF ATOMS AND IONS

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The detachment of an electron under slow collisions of atoms and ions can be considered using the model developed in [1]. In this model the coupling between one special («zeroth») bound state of the system and the continuum of the unbound states is taken into account. The basic assumptions made are the following: a) the motion of nuclei is treated classically; b) the potential curves of the system in the continuum region as well as the Rydberg potential curves (if any) do not interact and are parallel; c) the function characterizing the «zeroth» state changes only slightly in the region of interaction; d) we assume that the energy of the «zeroth» state changes linearly with the time.

Then the problem can be solved exactly using Laplace method. Here we consider further applications and generalizations of this model.

It is shown how the results change if Π-, Δ-, . . . states (instead of Σ) of the quasimolecule decay. The spectrum of electrons is usually displaced to the high energy region.

We have also considered the case, when the motion of nuclei has to be treated quantum-mechanically, i. e. when the energy of relative motion is comparable with the energy of outgoing electrons. In this case it is necessary to assume that the interaction between atomic particles after detachment of the electron is weak. Only in this case the problem can be exactly solved using the Laplace method.

The examples of decay considered in [1] correspond to the case when the bound state is transformed into a virtual state and almost immediately gets «merged» in the continuous spectrum. Here we consider a more realistic case, when after intersection of the boundary of the continuous spectrum, the state becomes quasistationary and the level-width $\Gamma(t)$ does not increase with time or even tends to zero. In this case the system can be «captured» in the quasistationary state and then the energy of detached electrons is displaced to the high energy region.

The trajectory of the poles of the Green function of the quasimolecule for various cases and the possibility of using the adiabatic method in the case of continuous spectrum are considered. In this case the potential functions have to be considered for complex values of the internuclear distance R. Then all the potential functions of the same symmetry are the different sheets of the same multivalued function, and the edge of the continuous spectrum can be considered as the cut along the real axis.

Finally the new experimental data on the energy spectrum of detached electrons are discussed [2].

REFERENCES

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