AUGER DECAY OF THE $(pp\mu e)^*$ COMPLEX AND MUONIC ATOM FORMATION IN MOLECULAR HYDROGEN

G.Ya. Korenman, G.A. Fesenko †

Institute of Nuclear Physics, Moscow State University, Moscow, 119899, Russia
†Institute of Atomic Power Engineering, Obninsk, 249020, Russia

Mu-molecular complex $(pp\mu e)^*$ is formed in highly-excited states after slowing down and Coulomb capture of negative muons in molecular hydrogen[1, 2], and decay of the complex leads to formation of excited muonic atoms. There are, at least, four different decay channels of the complex: Auger decay, radiative transitions, direct dissociation and muon escape. The analysis of the branching rations of the channels shows that the main competitive channels are direct dissociation into neutral products and Auger ionization with following dissociation of excited mu-molecular ion[3],

$$(pp\mu e)^* \rightarrow \begin{cases} (p\mu)^* & + \ H \\ (pp\mu)^{+*} & + \ e \end{cases} \rightarrow (p\mu)^* + p + e. \qquad (1)$$

In this paper we investigate the competition between Auger decay and dissociation channels. Precision description of the mu-molecular dissociation is rather complicated problem because of a lot number of the states involved. Therefore, we introduce simplified model of the complex which supposes that the wave functions and energies can be replaced by the values of two independent atoms at some distance. The distributions of muonic atoms on quantum states and kinetic energy are obtained taking into account the both channels as well as the initial distribution of the decaying complex on inner states and kinetic energy. The distribution of mu-atoms on the principal quantum number n contains two typical maxima connected with two decay mechanisms. Mean kinetic energy of the formed mu-atoms is of order 1 eV. The results for hydrogen isotopes are also obtained.

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References

1. G.Ya. Korenman and V.P. Popov, in: *Muon Catalyzed Fusion* (Sanibel Island, FL, 1988), AIP Conf. Proc. 181 (AIP, New York, 1989), pp. 145-160.
2. G.Ya. Korenman, V.P. Popov and G.A. Fesenko// Muon Cat. Fusion. 1992. v.7. p.179.
3. G.Ya. Korenman and G.A. Fesenko, in: *Proc. of Third Intern. Symp. on Muon and Pion Interaction with Matter* (Dubna, 1994), to be published.