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Dissociative recombination and vibrational excitation of molecular cations with electrons: application to H_2^+, BeH^+ and their isotopomers

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Dissociative recombination and vibrational excitation of molecular cations with electrons: application to H_2^+, BeH^+ and their isotopomers

N Pop[1*], F Iacob[2†], J Zs Mezei[3], S Niyonzima[4], O Motapon[5] and I F Schneider[6,7]

[1]Dept. of Fundamental Physics for Engineers, Politehnica University, Timisoara, 300006, Romania
[2]Physics Faculty, West University of Timișoara, Timișoara, 300223, Romania
[3]Inst. of Nuclear Research of the Hungarian Academy of Sciences, Debrecen, H-4001, Hungary
[4]Department of Physics, Faculty of Sciences, University of Burundi, Bujumbura,1550, Burundi
[5]Department of Physics, Faculty of Sciences, University of Douala, 24157, Cameroon
[6]Laboratoire Ondes et Milieux Complexes, CNRS, Univ. du Havre, Le Havre, 76058, France
[7]Laboratoire Aimé Cotton, CNRS, ENS Cachan and Univ. Paris-Sud, Orsay, 91405, France

Synopsis Cross sections and Maxwell rate coefficients for the low-energy reactive collisions of electrons with Hydrogen and Beryllium hydride cations will be presented, as well as a discussion on the major relevant mechanisms and features – direct/indirect process, ro-vibronic couplings, ro-vibrational dependence.

Using a stepwise method based on the Multichannel Quantum Defect Theory (MQDT) [1], cross sections and Maxwell rate coefficients have been obtained for dissociative recombination (DR), elastic collisions (EC), vibrational excitation (VE, inelastic collisions), vibrational de-excitation (VdE, super-elastic collisions) of $\mathbf{H_2^+}$ and $\mathbf{HD^+}$ for numerous ro-vibrational states of the ion [2, 3].

A very good agreement is found between our results and other computations, as well as with experiment. These results will complete the existing data-bases for electron-impact collision processes.

We have expanded our studies on $\mathbf{BeH^+}$ [4] to $\mathbf{BeD^+}$ [5] and $\mathbf{BeT^+}$[6] cations. A complete set of vibrationally resolved rate coefficients for BeT^+ cation reactive collisions with electrons below the ion dissociation threshold will be provided.

The resulting data are useful for the modeling of the kinetics of the Early Universe and of the magnetic-confinement-fusion-edge plasma in JET and, later, in ITER.

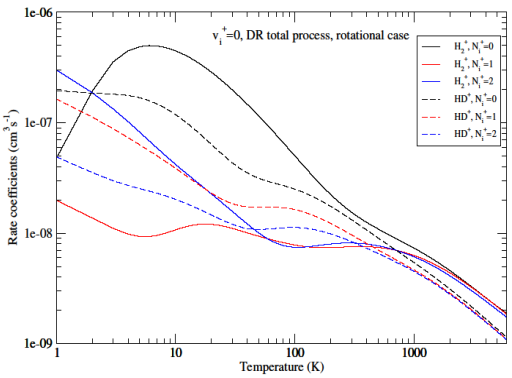

Figure 1. Dissociative recombination Maxwell rate coefficients of H_2^+ and HD^+ in ro-vibrational states N_i^+=0-2, v_i^+= 0.

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* E-mail: nicolina.pop@upt.ro
† E-mail: felix.iacob@e-uvt.ro