REACTIVE COLLISIONS OF ELECTRONS WITH MOLECULAR CATIONS: EFFECTS AND APPLICATION TO H$_2^+$, BeD$^+$

N. Pop$^1$, F. Iacob$^2$, J. Zs Mezei$^{3,4,5,6}$, O. Motapon$^{3,7}$, and I. F. Schneider$^{3,4}$

$^1$Department of Fundamental of Physics for Engineers, Politehnica University Timisoara, Romania
$^2$Physics Faculty, West University of Timisoara, Timisoara, Romania
$^3$Laboratoire Ondes et Milieux Complexes, CNRS, Univ. du Havre, France
$^4$Laboratoire Aimé Cotton, CNRS, ENS Cachan and Univ. Paris-Sud, Orsay, France
$^5$Laboratoire des Sciences des Procédés et des Matériaux, CNRS, Univ. Paris 13, France
$^6$Inst. of Nuclear Research of the Hungarian Academy of Sciences, Debrecen, Hungary
$^7$Department of Physics, Faculty of Sciences, University of Douala, Cameroon

Dominant elementary processes in numerous cold ionized gases are dissociative recombination (DR), elastic collisions (EC), vibrational excitation (VE) (inelastic collisions), vibrational de-excitation (VdE) (superelastic collisions), and dissociative excitation [1, 2]:

$$\text{AB}^+(\text{N}^+,\nu^+)+e^-\rightarrow\text{A}+\text{B},\text{AB}^+(\text{N}''^+,\nu'^+)+e^-,\text{A}+\text{B}^+e^-$$  (1)

where N$^+$/ v$^+$ stand for the rotational/vibrational quantum numbers of the cation.

In this work, using a stepwise method based on Multichannel Quantum Defect Theory (MQDT) [3], cross sections and rate coefficients have been obtained for reactions induced on H$_2^+$ and BeD$^+$[4]. The different mechanisms taken into account for H$_2^+$, i.e. direct vs indirect and rotational vs non-rotational processes are presented in this work. An analytic three-channel model was developed for the description of simultaneous direct and indirect DR cross sections of H$_3^+$ [5]. For these analyzed systems the results is in good agreement with the CRYRING (Stockholm) and TSR (Heidelberg) magnetic storage ring results.

**Keywords:** Dissociative recombination, Multichannel Quantum Defect Theory, rate coefficients.

**References:**