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Electron-driven reactivity of molecular cations in cold plasmas

Electron impact recombination, (ro-)vibrational, electronic and dissociative excitation of molecular cations:

\begin{equation}
AB^+ + e^- \rightarrow AB^, *AB^{} \rightarrow*
\begin{cases}
*A+B & *
AB^{+} + e^- & \\
A+B^++e^-&
\end{cases},
\end{equation}

are in the heart of the molecular reactivity in the cold ionized media [1], being major charged particles destruction reactions and producing often atomic species in metastable states, inaccessible through optical excitations. They involve super-excited molecular states undergoing predissociation and autoionization, having thus strong resonant character.

The methods based on the Multichannel Quantum Defect Theory (MQDT) [1,2] are the most suitable for modeling these processes, since they account the strong mixing between ionization and dissociative channels, open - direct mechanism - and closed - indirect mechanism, via capture into prominent Rydberg resonances correlating to the ground and excited ionic states - and the rotational effects. These features will be illustrated for several cations of high astrophysical, planetary atmosphere and fusion edge plasma relevance, such as H_2^+ [3], BeH^+ [4], SH^+ [5], N_2^+ [6], NeH^+, NS^+ [7], N_2H^+ [8], C_2H^+, etc.

Comparisons with other existing theoretical and experimental results, as well as the isotopic effects, will be displayed.

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Presenting Author

Zsolt J. Mezei

Presenting Author Affiliation

Institute for Nuclear Research (ATOMKI), Debrecen, Hungary

Presenting Author Gender

Male

Country

Hungary

Presenting Author Email Address

mezei.zsolt@atomki.hu

Primary authors: MEZEI, Zsolt J. (Institute for Nuclear Research (ATOMKI), Debrecen); Mr BOFFELLI, Jeoffrey (Lab. Ondes et Milieux Complexes, CNRS, Université Le Havre Normandie, France); Mr HASSAINE, Riyad (Lab. Ondes et Milieux Complexes, CNRS, Université Le Havre Normandie, France); Mr GAUCHET, Fréderic (Lab. Ondes et Milieux Complexes, CNRS, Université Le Havre Normandie, France); Prof. POP, Nicolina (Dept. of Phys. Foundation of Engineering, Politehnica University Timisoara, Romania); Dr IACOB, Felix (Physics Faculty, West University of Timisoara, Romania); Dr NIYONZIMA, Sebastian (Dépt. de Physique, Université du Burundi, Bujumbura, Burundi); Dr EPÉE EPÉE, Michel Douglas (Dept. of Physics, Faculty of Sciences, University of Douala, Cameroon); Dr CHAKRABARTI, Kalyan (Dept. of Mathematics, Scottish Church College, Calcutta, India); Prof. MOTAPON, Ousmanou (Dept. of Physics, Faculty of Sciences, University of Douala, Cameroon); Prof. TENNYSON, Jonathan (Dept. of Physics and Astronomy, University College London, United Kingdom); Prof. SCHNEIDER, Ioan F. (Lab. Ondes et Milieux Complexes, CNRS, Université Le Havre Normandie, France)

Presenter: MEZEI, Zsolt J. (Institute for Nuclear Research (ATOMKI), Debrecen)

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