

# Electron-Induced Recombination, Excitation and Dissociation of Molecular Cations in Edge Plasmas

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The mechanisms driving the dynamics of the dissociative recombination of molecular cations is discussed, in the frame of a stepwise version of the Multichannel Quantum Defect Theory. It is shown that they strongly depend on the energy of the incident electron: at very low energy, very often (with notable exceptions), prominent narrow resonances are superposed on a  $1/\text{energy}$  dependence. They are due to the resonant capture into ro-vibrationally excited Rydberg states (indirect process via closed channels). At intermediate energy, rotational effects loose relevance, and the resonances are important but less numerous, except in the case of capture into core-excited Rydberg states. And finally, above the dissociation threshold of the target cation, the narrow resonances disappear, but the autoionization of the dissociative states (more and more numerous) results not only in vibrational (de-)excitation, but also in dissociative excitation. Examples are given for electron collisions with  $\text{H}_2^+$ ,  $\text{BeH}^+$ ,  $\text{ArH}^+$  and their isotopologues, as well as for  $\text{N}_2^+$ .

An alternative MQDT approach, based on the use of the R-matrix theory via the package Quantemol, has been employed for the study of diatomic and triatomic systems - in collaboration with University of Central Florida and CentralSupélec Paris Saclay, and we illustrate this for  $\text{CF}^+$ ,  $\text{N}_2\text{H}^+$ ,  $\text{C}_2\text{H}^+$ ,  $\text{CH}_2^+$ .

The perspectives of advancement are finally given.