Resonant electron-molecular cation collisions in the edge plasmas of fusion devices: new state-to-state cross sections and rate coefficients

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Dissociative recombination, elastic scattering, (ro-)vibrational excitation, vibrational de-excitation and dissociative excitation [1]:

$$AB^+(N^+, v^+) + e^- \rightarrow AB^*, AB^{**} \rightarrow \begin{cases} A + B \\ AB^+(N'^+, v'^+) + e^- \\ A + B^+ + e^- \end{cases} , \qquad (1)$$
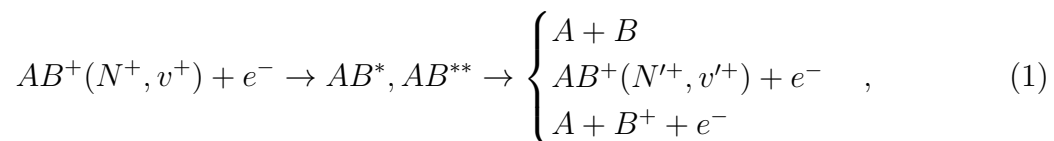
are dominant elementary processes in numerous cold ionized gases. Here N^+/v^+ stand for the rotational/vibrational quantum numbers of the cation, AB^* for a bound excited (mostly Rydberg) state of the neutral, and AB^{**} for a dissociative (mostly doubly- or multiply-excited) state of the neutral.

The quantum interference between the direct mechanism - capture into the doubly-excited states AB^{**} - and the indirect one - temporary capture into a Rydberg state AB^* - induces resonances in the cross section.

The Multichannel Quantum Defect Theory (MQDT) [2, 3, 4, 5, 6] is the most suitable approach for these processes, efficiently handling channels - open for the direct process and closed for the indirect one - and the corresponding channel mixing via electronic and vibronic interactions. We will provide new cross sections and rate coefficients for H_2^+, HD^+ [2], BeH^+ [3, 4], BeD^+ [5], CH^+, N_2^+ [6].

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