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]:

$$AB^+(N^+,v^+) + e^- \rightarrow AB^*,\ AB^{**} \rightarrow A+B,\ \ AB^+(N^{+\prime},v^{+\prime}) + e^-,\ \ A+B^+ + e^-,$$

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) [2-4] 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], BeD^+, CH^+, N_2^+ [4], He_2^+ and ArH^+.

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