Recent results on the reactive collisions of electrons with H_2^+, BeH^+, ArH^+ and some of their isotopologues

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Molecular cations of hydrogen and hydrides are important in the kinetics of the fusion plasma, close to the wall and/or the divertor. Their collisions with electrons result in dissociative recombination, ro-vibrational excitation and dissociative excitation [1]:

$$AB^+(N^+,v^+) + e^- \rightarrow AB^*, AB^{**} \rightarrow A + B,\ AB\ (N^{+\prime},v^{+\prime}) + e^-,\ A + B^+ + e^- \qquad (1)$$

Here N^+/v^+ stand for the rotational/vibrational quantum numbers of the cation, whereas AB^* and AB^{**} for a bound excited (mostly Rydberg) state and for a dissociative (mostly doubly- or multiply-excited) state respectively of the neutral.

We will show our recently-computed cross sections for the collisions of H_2^+, HD^+, D_2^+, ArH^+, ArD^+, BeH^+, BeD^+ and BeT^+ with electrons of energy up to 12 eV, computed with our method based on the Multichannel Quantum Defect Theory (MQDT) [2-4]. The major physical features characterizing the extreme energies – rotational effects at very low energy, infinite series of dissociative channels and vibrational continua at high energy – will be illustrated.

References

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