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Electron dissociative attachement to ArH^+, HD^+, N_2^+ and CO_2

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Synopsis We will present our recent results in the study of electron-induced reactivity of ionized and neutral molecules. The Configuration Interaction method and the Multichannel Quantum Defect Theory have been employed in order to obtain cross sections for collisions of electrons with ArH^+, HD^+, N_2 and CO_2.

Using the Multichannel Quantum Defect Theory (MQDT) [1-6], we computed the cross sections and the rate coefficients for the dissociative recombination (DR) (1.1) and the related competitive processes - vibrational excitation or desexcitation (VE or VdE) (1.2) ($v_f^+ > v_i^+$ or $v_f^+ < v_i^+$) and dissociative excitation (DE) (1.3):

$$AB^+(v_i^+) + e^- \longrightarrow A + B \quad (1.1)$$
$$\longrightarrow AB^+(v_f^+) + e^- \quad (1.2)$$
$$\longrightarrow A^+ + B + e^- \quad (1.3)$$

AB standing for ArH[7], HD and N_2[6]. Here v_i^+ and v_f^+ stand for the initial and final vibrational quantum number of the target ion.

These processes occur in the interstellar media, in (re)entry, fusion edge and laboratory plasmas.

The configuration interaction method [8] has been alternatively used for exploring the dissociative electron attachement (1.4) and dissociative excitation (1.5) of CO_2 whose removal is crucial for depollution:

$$CO_2(X) + e^- \longrightarrow CO(X) + O^-(^2P), \quad (1.4)$$
$$\longrightarrow CO(X) + O(^3P) + e^- \quad (1.5)$$

The study of the reactional dynamics relies on the calculation of the relevant potential energy curves and of the corresponding mutual interactions. In these calculations one bond of the target (OC-O) has been stretched only, in order to obtain CO in its electronic ground state.

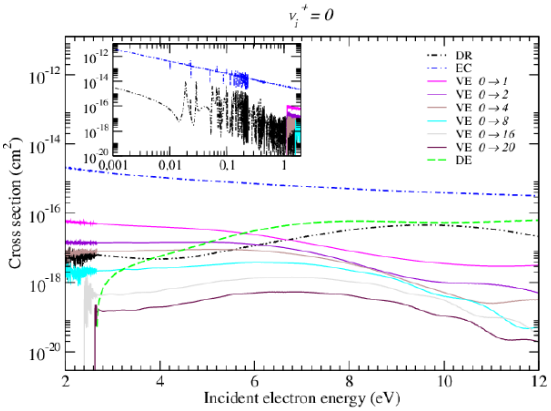

Figure 1. Reactive collisions of HD^+ in its ground vibrational state with electrons.

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