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AF Le Padellec, A., Lievin, J., Staicu-Casagrande, E. M., Nzeyimana, T., Naji, E. A., Urbain, X.
TI Competitive processes in the associative ionization of C⁻ with C⁺, N⁺, and O⁺
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DT Article

DE ab initio calculations; associative ionisation; atom-ion reactions; carbon; negative ions; nitrogen; oxygen; positive ions; potential energy surfaces; reaction rate constants

ID ELECTRON-IMPACT; TRANSITION-PROBABILITIES; EXCITED-STATES; MERGED BEAM; BASIS-SETS; AB-INITIO; ION; C-2; SPECTROSCOPY; SPECTRUM

AB Absolute integral cross sections have been measured for associative ionization reactions involving the C⁻ and C⁺, N⁺, and O⁺ reactants. These measurements, obtained using a merged-beam setup in the keV range, provide us with useful experimental information on the efficiency and mechanisms of molecular ion formation from ionic reactants. The relative magnitudes of the different cross sections are rationalized by considering the spin multiplicities of initial and final states, and the exothermicities of the detachment and transfer ionization channels. The very different production efficiencies of CO⁺ ions via the O⁻+C⁺ and C⁻+O⁺ channels are explained by statistical and energetic considerations. The potential energy curves of CO and CO⁺ have been calculated by quantum ab initio methods in order to characterize the reactive pathways leading to autoionization. Thermal rate coefficients are derived to serve the plasma physics community.

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