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Radiative electron attachment to molecules of astrophysical interest. Benchmark study of CN^{-1} VIATCHESLAV KOKOOULINE, Department of Physics, University of Central Florida, Orlando, FL, NICOLAS DOUGUET, SAMANTHA FONSECA DOS SANTOS, Department of CHMS, University of California at Davis, Davis, CA, OLIVIER DULIEU, MAURICE RAOULT, Laboratoire Aime Cotton, CNRS, Universite Paris 11, Orsay France, ANN OREL, Department of CHMS, University of California at Davis, Davis, CA, ? COLLABORATION —
We have developed a first-principles approach to study the process of radiative electron attachment (REA) to linear molecules of astrophysical interest Mol $+e^- \rightarrow$ $Mol^- + \hbar\omega$. ($Mol^- = C_nH^-$, C_nN-). The approach is based on accurate ab initio calculations of electronic bound and continuum states of the negative ion. The electronic continuum states are obtained with the complex-Kohn variational method. The benchmark calculation for the formation of the simplest observed ion, CN-, by REA has produced a low rate coefficient, $5 \times 10^{-17} cm^3/s$ at 30 K. We will present also a preliminary result for the C_4H^- formation by REA. For this molecule, the REA rate coefficient is expected is larger by about a factor of 10 due to a larger transition dipole moment. This study suggests that the negative molecular ions, recently observed in the interstellar medium, can hardly be formed by the process of radiative electron attachment.

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