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Radiative electronic attachment to a ro-vibrating diatomic molecule: Benchmark study of CN^{-1} NICOLAS DOUGUET, University of California, Davis, VIATCHESLAV KOKOOULINE, University of Central Florida, SAMANTHA FONSECA DOS SANTOS, University of California, Davis, OLIVIER DULIEU, MAURICE RAOULT, Laboratoire Aimé Cotton, ANN OREL, University of California, Davis — We study the process of radiative electronic attachment (REA) to linear molecules of astrophysical interest and consider in detail the reaction $CN+e^- \rightarrow CN^- + \hbar\omega$. The treatment is based on first-principles only and takes into account the rotational and vibrational motion of the diatomic molecule. The energy-dependent transition dipole moment between the continuum and bond electron is obtained for various molecular geometries using the complex Kohn variational method. The benchmark calculation for the formation of CN^- by REA has produced a low rate coefficient of about $10^{-15}cm^3/s$ at 30 K. This confirms the idea that the simplest observed negative ion CN^- can not be formed by the process of radiative electron attachment. Note that the same type of treatment could be equivalently used to study photodetachment of a ro-vibrating linear negative ion.

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