Quenching of excited Na due to He collisions

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Abstract
The quenching and elastic scattering of excited Sodium by collisions with Helium have been investigated for energies between 0.01 meV and 10 eV. With the \textit{ab initio} adiabatic potentials and nonadiabatic radial and rotational couplings obtained from multireference single- and double-excitation configuration interaction approach, we carried out scattering calculations by the quantum-mechanical molecular-orbital close-coupling method. Cross sections for quenching reactions and elastic collisions are presented and compared with other available theoretical predictions and experimental data. Quenching and elastic collisional rate coefficients as a function of temperature between 1 K and 10,000 K are also obtained. The results are relevant to modeling non-LTE effects on Na D absorption lines in extrasolar planets and brown dwarfs.

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