

Quenching of excited Na due to He collisions

C. Y. Lin* P. C. Stancil* H. P. Liebermann† P. Funke†
R. J. Buenker†

27 December 2005

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 *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.

This work is funded by NASA grant NNG04GM59G.

*Physics and Astronomy, University of Georgia, Athens, GA

†Mathematik und Naturwissenschaften, Bergische Universität Wuppertal, D-42097 Wuppertal, Germany