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Stimulated formation of ultracold ground $(NaCa)^+$ molecular ions
PHILIPPE PELLEGRINI, HARVEY MICHELS, WINTHROP SMITH, ROBIN CÔTÉ, University of Connecticut, Physics Department, U-3046 Hillside Road, Storrs CT, 06269-3046 — Ultracold atomic systems in which electric charges play an important role are of particular interest. Futhermore, the recently proposed possibility of sympathetic cooling of ions by cold neutral atoms in the same trap has opened the way to new fundamental collision process studies [1]. We theoretically study the possibility of forming ultracold ground $(NaCa)^+$ molecular ions starting with a Ca^+ ion colliding with a neutral Na atom via the excited $A^1\Sigma^+$ potential. Stimulated radiative association rates to the ground $X^1\Sigma^+$ potential are calculated. We calculated as well, the lifetime for radiative cascade from high (v,J) levels to the first ro-vibrational levels (v=0,J) of the ground electronic state, due to the large permanent dipole moment. We also present new accurate *ab initio* calculations of adiabatic potentials and dipole moments for the $(NaCa)^+$ system. [1] W. W. Smith, E. Babenko, R. Côté, and H. H. Michels in *Coherence and Quantum Optics VIII*, N.P. Bigelow et al., eds., Kluwer Academic/Plenum Publishers, NY 2003, pp. 623-624.

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