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Laser assisted charge transfer in the realm of cold collisions[1]
ALEXANDER PETROV, CONSTANTINOS MAKRIDES, SVETLANA KOTOCHIGOVA, Temple University — We study two colliding particles, Ca and Yb^+, which can undergo non-radiative charge-exchange transitions from the scattering continuum in the excited $A^2\Sigma^+$ state to the continuum of the ground $X^2\Sigma^+$ state. This reaction can be controlled by linearly-polarized laser radiation of frequency ω, which is in the range of quasi-molecular electronic energy separation. Using the dressed-state picture or the Floquet Ansatz we construct coupled time-independent Schrödinger equations for the interatomic separation R. The mechanism of electromagnetic field control is based on an interplay between intra-molecular couplings and molecule-field interactions. We show that laser field affects the chemical reaction through reversible modification of an effective Hamiltonian via either non-resonant temporal Stark shifts or resonant "dipolar" interactions, leading to both transient- and cw-light-induced non-adiabatic charge transfer. We investigate these processes for various collision energies as well as over a wide range of laser intensities and frequencies.

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