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Strong-field nonadiabatic alignment of Hubbard molecules[1]
DMITRI ROMANOV, ROBERT LEWIS, ANOJ ARYAL, Temple University — We investigate many-body effects in strong-field impulsive alignment of linear molecules by a linearly polarized laser pulse in the essentially non-perturbative regime of transient nonadiabatic charge redistribution (TNCR). The electron-electron interaction in model diatomic and polyatomic molecules is considered within the framework of the Hubbard Hamiltonian and expressed by the effective on-site repulsion parameter. During the ultrashort laser pulse, the nonadiabatic electron localization competes with the inter-electron repulsion, and this interplay determines the patterns of angular dependence of the resulting cumulative torque on the molecule. As a result, the semiclassical dynamics of the subsequent field-free alignment in the molecular ensemble in the wake of the laser pulse depend specifically on the intensity and shape of the pulse, as well as on the tunnel matrix element and the repulsion parameter in the model molecules. We discuss applications of these model many-body effects in situations where considerable nonresonant excitation or ionization of molecules occurs during the laser pulse.

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