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Strong-field molecular alignment driven by nonadiabatic charge localization: rotational wavepacket modifications[1] DMITRI ROMANOV, ROBERT LEVIS, Temple Univ — Strong electric field of an intense, nonresonant ultrashort laser pulse can effect a substantial drop of electron potential energy across a molecule, which is comparable with the distances between field-free potential energy surfaces. This can result in a transient radical redistribution of electron density and thus can alter the mechanism of rotational wavepacket formation and subsequent alignment in the molecular ensemble. We consider model diatomic molecules in a tight-binding approximation, in a situation when the laser-induced potential energy shifts across the molecule are comparable with the original level splitting. Averaging over the carrier-frequency oscillations of the laser field produces an effective rotational Hamiltonian, which allows for studying systematically the dependence of the nonadiabatic alignment kick on the molecular parameters and the laser pulse characteristics. We trace the transition from the usual alignment mechanism, which relies on anisotropic molecular polarizability, to a new mode of the effective-torque interaction, which is related to the fledging nonadiabatic electron localization.

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