

Terahertz displacive excitation of a coherent Raman-active phonon in V_2O_3

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Nonlinear processes involving frequency-mixing of light fields set the basis for ultrafast coherent spectroscopy of collective modes in solids [1,2]. In certain semimetals and semiconductors, generation of coherent phonon modes can occur by a displacive force on the lattice at the difference-frequency mixing of a laser pulse excitation on the electronic system [3,4]. Here, as a low-frequency counterpart of this process, we demonstrate that coherent phonon excitations can be induced by the sum-frequency components of an intense terahertz light field, coupled to intraband electronic transitions [5]. This nonlinear process leads to charge coupled coherent dynamics of Raman-active phonon modes in the strongly correlated metal V_2O_3 . Our results show an alternative up-conversion pathway for the optical control of Raman-active modes in solids mediated by terahertz-driven electronic excitation.

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