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Phonon-induced ultrafast band gap control in LaTiO$_3$ MINGQIANG GU, JAMES M. RONDINELLI, Northwestern University — We propose a route for ultrafast band gap engineering in correlated transition metal oxides by using optically driven phonons. We show that the Γ-point electron band energies can be deterministically tuned in the nonequilibrium state. Taking the Mott insulator $LaTiO_3$ as an example, we show that such phonon-assisted processes dynamically induce an indirect-to-direct band gap transition or even a metal-to-insulator transition, depending on the electron correlation strength. We explain the origin of the dynamical band structure control and also establish its generality by examining related oxides. Lastly, we describe experimental routes to realize the band structure control with impulsive stimulated Raman scattering.

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