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【714】Nonlinear electron-phonon coupling in doped manganites

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We report a new route to manipulate the electronic properties of a material via vibrational excitation. Using the LCLS free electron laser we investigate the dynamics of the charge order in a manganite film following resonant excitation of a phonon mode to large amplitude. Combining our experimental results with *ab initio* calculation, we find that the direct nonlinear coupling between the excited mode and the electronic degrees of freedom is sufficiently strong to drive the insulator-metal transition in this material. The generalization of our approach leads to new ways of manipulating materials e.g. shaping their properties on ultrashort timescales.

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