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Abrupt changes in electronic relaxation and lattice dynamics across the structural phase transition in lightly doped Ca_2RuO_4 observed via time-resolved optical reflectivity HAO CHU, DARIUS TORCHINSKY, LIUYAN ZHAO, PATRICK RALL, Institute for Quantum Information and Matter, California Institute of Technology, JASMINKA TERRACE, GANG CAO, Department of Physics and Astronomy, University of Kentucky, DAVID HSIEH, Institute for Quantum Information and Matter, California Institute of Technology, INSTITUTE FOR QUANTUM INFORMATION AND MATTER, CALIFORNIA INSTITUTE OF TECHNOLOGY COLLABORATION, DEPARTMENT OF PHYSICS AND ASTRONOMY, UNIVERSITY OF KENTUCKY COLLABORATION — Ca_2RuO_4 is a multiband strongly correlated electron system that undergoes a structural phase transition at Ts 360K that is concomitant with an insulator-to-metal transition and a rearrangement of orbital occupancy. Understanding its structural and electronic response to ultrafast optical excitation can provide insight about the microscopic mechanism of this phase transition.We report temperature and fluence dependent time resolved optical reflectivity measurements from lightly doped Ca_2RuO_4 single crystals. Abrupt changes in both the electronic relaxation dynamics and multiple lattice vibrational modes are observed, including the softening of two optical phonon modes as Ts is approached. We will discuss the relevance of our results to existing theories of the mechanism underlying the structural phase transition in Ca_2RuO_4 as well as the possibility of photo-inducing this phase transition on ultrafast time scales.

Hao Chu
Institute for Quantum Information and Matter,
California Institute of Technology

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