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Infrared spectroscopy of rare-earth-doped $CaFe_2As_2$ ZHEN XING, T.J. HUFFMAN, PENG XU, M.M. QAZILBASH, Department of Physics, College of William and Mary, S.R. SAHA, TYLER DRYE, J. PAGLIONE, Center for Nanophysics and Advanced Materials, Department of Physics, University of Maryland, College Park — Recently, rare-earth doping in $CaFe_2As_2$ has been used to tune its electronic, magnetic, and structural properties. The substitution of rare-earth ions at the alkaline-earth sites leads to the suppression of the spin-density wave (SDW) phase transition in $CaFe_2As_2$. For example, Pr substitution results in a paramagnetic metal in the tetragonal phase that is susceptible to a low temperature structural transition to a collapsed tetragonal phase. However, La-doped $CaFe_2As_2$ remains in the uncollapsed tetragonal structure down to the lowest measured temperatures. Both the uncollapsed and collapsed tetragonal structures exhibit superconductivity with maximum Tc reaching 47 K, the highest observed in inter-metallics albeit with a small superconducting volume fraction. In this work, we perform ab-plane infrared spectroscopy of rare-earth-doped $CaFe_2As_2$ at different cryogenic temperatures. Our aim is to ascertain the contributions of electron doping and chemical pressure to the charge and lattice dynamics of this iron-arsenide system.

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