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Ultrafast pump-probe reflectance study of multiferroic $Eu_{0.75}Y_{0.25}MnO_3$ D. TALBAYEV, Tulane University, J. LEE, S.A. TRUGMAN, R.P. PRASANKUMAR, A.J. TAYLOR, Los Alamos National Laboratory, R.D. AVERITT, Boston University, C.L. ZHANG, S.-W. CHEONG, Rutgers University — Time resolved dynamical studies of multiferroic materials help unravel the fundamental interactions between various degrees of freedom. We report an ultrafast pump-probe reflectance study of multiferroic $Eu_{0.75}Y_{0.25}MnO_3$. The material undergoes antiferromagnetic ordering and, upon further cooling, ferroelectric ordering that strongly couples to the material's magnetic state. We measured the pump-probe reflectance in this compound using 400- and 800-nm pump and probe pulses. We found that the amplitude of the photoinduced reflectance increases dramatically with the development of local and long-range spin-spin correlations as the temperature is lowered toward the magnetic ordering transition. We also observe a dramatic increase in the rise time, up to 10s of picoseconds, of the photoinduced reflectance. This time scale is consistent with the long response times of the spin system in manganites. We suggest that the modification of the local exchange coupling around the photoinduced electrons and holes is responsible for the observed reflectance behavior, as the optical properties of manganites are known to couple strongly to the local and long-range spin correlations [1].

[1] N.N. Kovaleva et al., Phys. Rev. Lett. **93**, 147204 (2004)

Diyar Talbayev
Tulane University

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