

Ultrafast Mid-infrared Spectroscopy of the Charge- and Spin-Ordered Nickelate $\text{La}_{1.75}\text{Sr}_{0.25}\text{NiO}_4$

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Here we report the first ultrafast mid-infrared study of charge and spin-ordered nickelates. A strong photo-induced modulation of the optical conductivity is observed on sub-picosecond timescales, indicating the filling and subsequent re-establishment of the pseudogap in the time-domain. The fast timescale of this process (about 600 fs) suggests a major role of short-range correlations of polaronic carriers. Spectral analysis at energies resonant to the Ni-O stretching mode allows decoupling the phonon dynamics from the large pseudogap modulation. This approach reveals the interplay between specific lattice modes and the electronic degrees of freedom in nickelates.

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