

Ultrafast Dynamics of the Stripe Phase in Nickelate Via Time-resolved Resonant Soft X-ray Scattering

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In the stripe phase of nickelate $\text{La}_{2-x}\text{Sr}_x\text{NiO}_4$, spin order coexists with charge order, whose periodicity is half of spin order. So far, most of the studies on the stripe phase were performed in the thermal equilibrium state by varying temperatures; the dynamics of the stripe phase in the time domain when the system is driven-out-of-equilibrium has not yet been studied. Using the x-ray free electron laser (XFEL) produced at the Linac Coherent Light Source (LCLS), we performed time resolved optical-pump and resonant soft x-ray diffraction probe experiments to study the dynamics of the charge and spin order. It is found that the photon-induced transient state shows distinct behaviors for the charge and spin orders, which are also different than their thermal evolution in equilibrium.