

Study of the charge and spin modulations using resonant x-ray scattering and polarization analysis on the TLS beamline BL07

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Abstract

It has been known that many unusual physical properties, such as the superconductivity, antiferromagnetism, ferroelectricity, metal-insulator transition, and multiferroics, always accompany with the formation of electronic modulations. The study of the electronic modulations is therefore essential for understanding these physical properties. Many probes, such as x-ray, neutrons, and electron beams, have been widely used to study the modulated structures. Among them, x-ray has the merits of high spatial resolution, selectability of elements, distinguishable polarizations over others. The 3d transition metal oxide, $\text{La}_{1.66}\text{Sr}_{0.33}\text{NiO}_4$ (LSNO) is isostructural to high-Tc superconductor $\text{La}_{1-x}\text{Sr}_x\text{CuO}_4$ and has been known to have charge and spin modulations, so it can therefore serve as a model system for studying the coupling between the different degrees of freedom of charge, spin, and lattice distortion. Using resonant x-ray scattering with the polarization analysis, we observed both charge and spin modulations at low temperature and demonstrate that the beamline BL07 is capable for probing the charge and spin modulations and studying the symmetry of both modulations in reciprocal space.