

Study of the symmetry of charge and spin modulations using x-ray scattering

Sheng-Chia Lu (呂晟嘉)¹, Yu-Hui Liang (梁喻惠)¹, Shih-Chang Weng (翁世璋)², and Chao-Hung Du (杜昭宏)¹

¹Department of Physics, Tamkang University, Tamsui Dist, New Taipei City, Taiwan

²National Synchrotron Radiation Research Center, Hsinchu Science Park, Hsinchu, Taiwan

vannanota@gmail.com

Abstract

The 3d transition metal oxide, $\text{La}_{1.66}\text{Sr}_{0.33}\text{NiO}_4$ (LSNO) is isostructural to high-Tc superconductor $\text{La}_{1-x}\text{Sr}_x\text{CuO}_4$, but it does not show the superconducting state with the substitution of Sr up to 75%. Using elastic x-ray scattering, we have demonstrated the existence of charge and spin ordering in a high-quality single crystal $\text{La}_{5/3}\text{Sr}_{1/3}\text{NiO}_4$, which is harmful to the formation of superconducting phase. In order to further understand the physical properties of charge and spin ordering, we study the charge and spin ordering using elastic x-ray scattering with the azimuthal analysis as a function of temperature. We demonstrate that the charge ordering has a two-fold symmetry at well-below the transition temperature, and such a two-fold symmetry is destroyed as approaching to transition temperature. Since the reflections from charge and spin modulations are very weak, the completion of the study still needs more measurements.