Theoretical Study of Resonant Inelastic X-ray Scattering Spectrum in Nickelates

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The two-dimensional nickelate La\textsubscript{2-x}Sr\textsubscript{x}NiO\textsubscript{4} has received special attention as a reference system of high-$T_c$ cuprates. The undoped nickelate ($x = 0$) has the charge-transfer gap in the optical conductivity. Upon doping of holes, a broad spectrum appears in the gap. We have shown theoretically that the broad spectrum comes from excitations to the low spin states.\textsuperscript{1} In the Ni K-edge resonant inelastic X-ray scattering (RIXS) measurement, the momentum-resolved charge excitations are obtained.\textsuperscript{2} In this study, we examine theoretically the RIXS spectra on nickelates by using numerically exact diagonalization techniques on the two-band Hubbard model. We also calculate other spectra such as the dynamical charge density function and discuss what excitations appear in the RIXS spectrum.