Theory of resonant inelastic x-ray scattering for low-energy excitations from transition metal oxides

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Resonant inelastic x-ray scattering (RIXS) provides us with one of the promising probes to investigate various low energy excitations in materials, including charge, orbital, and spin degrees of freedom[1]. A prominent difficulty in extracting the interpretation of the RIXS data is attributed to the varieties of contributions originated from these degrees of freedom. Recently, we have succeeded in developing an effective formalism to study the RIXS spectra around the transition metal L-edge on the basis of the itinerant electron approach [2], and first, applied it to cuprates [3].

Another transition metal oxides, iridates, which attract much attention due to interplay between strong spin orbit interaction and electron correlation [4], can be a better platform to apply our formalism because the magnetic and excitonic excitations are treated in equal footing in our theory. The results of applications to Sr_2IrO_4 and Na_2IrO_3 show good spectral profile in the wide range of the excitation energy about less than 1eV. Furthermore, our results suggest the number of the magnetic dispersion bands are more than those found experimentally [5,6]. For instance, in Sr_2IrO_4, the number of magnetic excitation bands, which is originally reported as one, turns out to be two [7].

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