Electronic and magnetic excitation in Ruddlesden-Popper La3Ni2O7 nickelate

(Session 1: Superconductivity and Magnetism, Oral)

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Layered transition metal oxides manifest a plethora of quantum phenomena including the charge, spin, orbital ordering, and unconventional superconductivity. A prototypical example in this class of materials is the Ruddlesden-Popper (RP) series of nickelates. Since 2019, the reduced RP infinite-layer nickelates R(Sr,Ca)NiO_2 (R=rare earth) have been found to be superconducting (T_c up to ~ 20 K) with a remarkably similar structure to high-temperature superconducting cuprates [1]. Despite a different level of involvement of oxygen in its electronic structure in comparison to cuprates, similar magnetic excitations were revealed in infinite-layer nickelates validating the existence of strong electron Coulomb interactions in particular the proximity between the strong antiferromagnetic correlations and superconductivity [2]. Most recently, both bi-layer $La_3Ni_2O_7$ and tri-layer $La_4Ni_3O_{10}$ RP nickelates were reported to be superconducting under high pressure with T_c of ~ 80 K and ~ 25 K, respectively [3-7]. In this talk, I will present our recent resonant inelastic X-ray scattering studies of the electronic and magnetic excitations in bi-layer $La_3Ni_2O_7$ nickelate [8].

Reference:

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