

Pairing mechanism of a high- T_c nickelate superconductor $\text{La}_3\text{Ni}_2\text{O}_7$: bilayer Hubbard model embedded in a multiorbital system

Kazuhiko Kuroki

Department of Physics, The University of Osaka

Discovery of high temperature superconductivity in a bilayer nickelate $\text{La}_3\text{Ni}_2\text{O}_7$ [1] and related materials has attracted significant attention. A number of studies on the two-orbital model of $\text{La}_3\text{Ni}_2\text{O}_7$ shows that its superconducting gap function basically exhibits a so-called $s\pm$ wave symmetry, but has a complicated structure if presented in the band representation [2,3,4]. However, the orbital representation of the superconducting gap function for various pairing channels, obtained by fluctuation exchange (FLEX) approximation, shows that the interlayer dz^2 pairing exhibits by far the largest values, and it is nearly momentum independent, indicating intra-unit-cell pairing [4], which is consistent with a recent dynamical cluster approximation study [5]. The origin of the nearly momentum independent gap function can be traced back to the small momentum dependence of the finite energy spin fluctuations arising from the dz^2 orbitals, which acts as a glue for $s\pm$ pairing [4]. This is essentially the same as what was found for the (single orbital) bilayer Hubbard model back in 2002 [6,7]. Although $\text{La}_3\text{Ni}_2\text{O}_7$ is complicated in that there exist hybridization and Hund's coupling between the dz^2 and dx^2-y^2 orbitals, our results show that the essence of its pairing is described by the bilayer Hubbard model comprising the dz^2 orbitals [2,5,7] embedded in a multiorbital system. We have also strengthened our view through a variational Monte Carlo (VMC) study for the two-orbital model of $\text{La}_3\text{Ni}_2\text{O}_7$ [8], whose details will be given in the presentation.

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