Magnetism and multiorbital models in the iron-based superconductors

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Magnetism and multiorbits play important role in the iron-based superconductors. We study the orbital-weight redistribution triggered by spin order in the iron pnictides by using the three-orbital model and five-orbital model with the Hund coupling. It is observed that the magnetization in the xz and yz orbitals are markedly different and the Fermi surface presents mostly xz character with are consistent with photoemission experiments. By comparing with the neutron-scattering and angle-resolved photoemission experiments, we find the phase diagrams for the intraorbital Hubbard repulsion U and Hund coupling J. In addition, the pairing tendencies in these realistic coupling regions are investigated using the random phase approximation. We further use a Hartree Fock multiorbital Hamiltonian to study the striped phase in the iron pnictides. Upon electron doping, charge stripes are stablized to run perpendicular to the direction of the spin stripes of the undoped magnetic ground state. These patterns give implications for recent experiments that reported electronic nematic states and spin incommensurability. We will also show some recent work on the iron selenide $(K, Tl)Fe_{1.6}Se_2$. Collaborators are M. Daghofer, E. Dagotto, A. Moreo, P. Dai, Q. Luo, J. P. Hu, E. W. Carlson, J. Zhao, et al. Refercences: Nat. Phys. 5, 555 (2009); Phys. Rev. B **81**, 180504(R)(2010); Phys. Rev. B **82**, 104508 (2010); ArXiv:1103.3743.