ARPES study of $NdNiO_3$ heterostructures across the metal-insulator transition

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Abstract

The metal-insulator transitions (MITs) in complex oxides are often precursors to exotic ground states such as high-T C superconductivity, CMR, and different types of charge-, spin- and orbital-ordered states [1] . In this context, rare-earth nickelates ($RNiO_3$, where R = rare-earth elements) can be viewed as model systems, which exhibit temperature-driven MIT and magnetic/charge ordering and these can be tuned by changing R and hydrostatic pressure [2] . In recent years, the novel routes to engineering thin films and heterostructures of $RNiO_3$ further offer the possibility to control the MIT with thickness via strain[3] . In this talk, I will present our recent results, obtained using in-situ PLD+ARPES system, and discuss the mechanism of the MIT in $NdNiO_3$ thin films grown on different substrates as well as magnetic under-layers[4,5] . We observe three dimensional hole and electron Fermi surface (FS) pockets formed from strongly renormalized bands with well-defined quasiparticles. Upon cooling across the MIT, the quasiparticles lose coherence via a spectral weight transfer in NNO/NGO sample[4] . However, in NNO/LAO, the bands are apparently shifted upwards with an additional holelike pocket forming at the corner of the BZ. We observed significant difference in the electronic properties of NNO ultra-thin films when grown in the proximity with localized FM and itinerant AFM under-layers[5] . Our study suggests that substrate-induced strain and magnetism tunes the crystal field splitting, which changes the band structure and control the MIT via the formation of an electronic order[4,5] .

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