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Low-Energy Electronic Structure and Fermi Surface of the itinerant metamagnet Sr₃Ru₂O₇

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Abstract content
   (Max 300 words)

Sr3Ru2O7 is the second member of the Ruddlesdden-Popper series of strongly correlated oxides Srn+1RunO3n+1, where n defines the number of consecutive planes of the ruthenium oxygen (RuO6) octahedra layers in the unit cell. This compound has recently attracted the attention of the scientific community because of its unusual low-temperature physical properties such as metamagnetism and quantum criticality [1] with evidence of nematic fluid behaviour [2,3]. The early work of Binz et al. based on mean field theory showed that the metamagnetic behaviour observed in Sr3Ru2O7 [4] can be understood as a result of the presence of van Hove singularities (vHs) (i.e. sharp peaks observed in the density of states (DOS)) in the proximity of the Fermi energy and associated to Fermi surface (FS) sheets of different symmetry [5]. Therefore, the complete determination of the symmetry and the location of these singularities on the FS are of fundamental importance for the understanding of the quantum critical behaviour of Sr3Ru2O7.
In this study we present our recent results on the low-energy electronic structure of Sr3Ru2O7, including details on the FS sheets. This investigation was performed via synchrotron-based angle resolved photoemission spectroscopy performed at 1K. Together with the reconstruction of the FS, our results show that - in addition to the flat band close to the X point that reveals a complex DOS with vHs near to the Fermi level (as suggested by Tamai and co-workers [6]) - there is another flat band associated to a FS sheet of a different symmetry around the Γ point that also reveals a complex DOS with vHs near the Fermi level. Moreover, evidence of vHs around the X point has been suggested in the FS of Sr3Ru2O7, with the presence of high intensity around this point. Finally, the presence of strong electron-phonon correlations was confirmed by the presence of kinks in band dispersions, which are the evidence of a sensitive coupling between the structural and magnetic properties in Sr3Ru2O7.

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