PAUL SCHERRER INSTITUT

Invitation

LMU-Seminar

Title: **Spectroscopic studies of Rh-doped Sr_2IrO_4**
Speaker: **Dr. Alex Louat**
Laboratoire de physique des solides, Orsay, France

Time: **Wednesday, March 20th 2019, 10:00**

Place: **WBGB/019**

Abstract:

Some compounds with 5d orbitals, like Sr_2IrO_4, have been found to be insulating, while they were expected metallic in a one electron picture. This was a surprise as, unlike 3d orbitals, which are well known to form easily insulating Mott states due to strong electronic correlations, 4d and even more 5d orbitals were expected to be less correlated. With heavy atoms, a new energy becomes relevant, the spin-orbit coupling (SOC). Sr_2IrO_4 is the archetype of Mott insulator induced by a strong SOC. The SOC creates a non-degenerate half-filled J_{eff}=1/2 band split by moderate Coulomb repulsion to form a Mott insulator.

We investigated by ARPES the electronic structure of Rh doped Sr_2IrO_4 [1]. Our measurements confirm that the Ir/Rh substitution leads to a metallic state despite the isovalence of Ir and Rh. The Mott gap does not seem to close, but there is a rigid band shift towards the Fermi level, highlighting that Rh induces hole doping. The metallic phase that is reached is not a Fermi liquid. The bands are not renormalized despite strong correlation, there is no quasiparticle peaks and a pseudogap appears all along the Fermi surface. To properly analyse the physics of the pseudogap, a good understanding of the intensity modulations induced by matrix element effects is necessary [2].

We have also studied the magnetic phases diagram by ^{17}O NMR and µSR for the first time. Our results show an inhomogeneous destabilization of the antiferromagnetic phase upon Rh doping despite the absence of structural disorder. Both techniques reveal features that can be interpreted as the development of a magnetic moment on an oxygen site that seems to be stabilized by doping.

These studies make it possible to attribute to Sr_2IrO_4 doped with rhodium the rather rare character of strongly correlated 2D material with controlled disorder. These observations allow us to discuss the role of oxygen in the correlated oxides and how a correlated system responds to defects.

[1] A. Louat, F. Bert, L. Serrier-Garcia, F. Bertran, P. Le Fèvre, J. Rault, V. Brouet, Phys. Rev. B 97, 161109(R) (2017)

[2] A. Louat, B. Lenz, S. Biermann, C. Martins, F. Bertran, P. Le Fèvre, J. Rault, F. Bert and V. Brouet, in preparation