Internship offered in M2
2018-2019

Responsible for internship

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Internship topic: Investigating the Fermi surface of a strongly correlated transition metal sulphide

The non-conventional superconductivity in high-T_C cuprates, for example $La_{2-x}Sr_xCuO_4$, is derived from the chemical doping of a parent Mott insulting phase. In the iron-based pnictides, a superconducting state occurs close to a long-range-ordered antiferromagnetic phase [1] and a non-negligible renormalization of the effective mass of quasiparticles has been evidenced [2]. This suggests an important role of electronic correlations in these two-dimensional systems for the mechanism controlling the superconductivity. It is therefore interesting to study other doped two-dimensional electronic systems near the Mott instability.

We propose to investigate the Fermi surface of $(Cu_{1-x}V_x)(VS_2)_2$ single-crystals [3] by Angle Resolved PhotoEmission Spectroscopy. In this system, the charge of the VS_2 layers, which have a quasi-hexagonal symmetry, can be controlled through the cationic substitution in the intermediate $(Cu_{1-x}V_x)$ chains. As a first objective, we will analyse the consequences of the doping that could control the electronic correlations within the VS_2 layers. As a second objective, we want to understand the relation between the strong distortion of the hexagonal lattice induced by the $(Cu_{1-x}V_x)$ chains and the electronic properties.

[1] C. de la Cruz *et al.*, *Nature* **453**, 899 (2008).
[2] A. I. Coldea *et al.*, *Phys. Rev. Lett.* **101**, 216402 (2008) ; M. M. Qazilbash *et al.*, *Nature Physics* **5**, 647 (2008) ; H. Ding et al., J. Phys. Cond. Matter **23**, 135701 (2011).
[3] Y. Klein *et al., J. Solid State Chem.* **184**, 2333 (2011).

Techniques involved: **Angle Resolved PhotoEmission Spectroscopy (ARPES) at synchrotron**

Paid internship: Yes
Can this internship be continued for a PhD? Yes
If yes, type of PhD funding envisaged is: Bourse du Ministère