



Tuesday, April 26th 2016 – 15:00
CFEL Seminar room I, EG.076 (Bldg. 99)

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Exotic s-wave superconductivity in alkali-doped fullerides: equilibrium point of view

The alkali-doped fullerides (A_3C_{60} , $A = K, Rb, Cs$) show a highest superconducting transition temperature (T_c) among molecular solids.

In the phase diagram, s-wave superconductivity (SC) lies next to Mott insulating phase. This adjacency is similar to the cuprates (d-wave SC) but is more surprising because s-wave SC is believed to be severely suppressed by strong correlations.

In the first part of the talk, I will talk about first principles study on the equilibrium phase diagram [1,2].

A fully ab initio calculation shows that the fullerides are unique multi-orbital systems with an effectively negative exchange interaction (negative J) and a strongly repulsive Hubbard U . We show that this unusual form of intramolecular interaction leads to a surprising cooperation between the strong correlations and phonons in the s-wave pairing, in stark contrast to the conventional phonon mechanism.

In the second part of the talk, I will present recent results which study the effect of several perturbations on SC in three-orbital negative- J Hubbard model.

The study is motivated by a recent remarkable report on the SC-like nonequilibrium optical property in K_3C_{60} at a temperature much higher than the equilibrium transition temperature [3]. I will show that an asymmetric form of Coulomb interaction can enhance superconductivity and that this asymmetric interaction can be realized by the pumping of T_{1u} phonons [4].

[1] Y. Nomura et al., Science Advances 1, e1500568 (2015)

[2] Y. Nomura et al., J. Phys.: Condens. Matter 28, 153001 (2016)

[3] M. Mitrano et al., Nature 530, 461 (2016)

[4] M. Kim et al., in preparation

Host: Angel Rubio

