Electronic structure: High resolution and angle resolve photoemission Spectroscopy

In my talk I will focus on the electronic structure of three different systems 1) a superconducting boride (ZrB_{12}), 2) topological crystalline insulator (PbSnInTe, SnInTe) 3) graphene doped with Nitrogen (N), Boron (B) and co-doped with BN. In case of ZrB_{12}, hard *x*-ray photoemission and Al $K\alpha$ photoemission reveal significantly different surface and bulk electronic structure [1]. Bulk electronic structure appears to be correlated. High resolution studies in conjunction with ab initio band structure (FLAPW) results indicate signature of pseudogap formation above the superconducting transition temperature revealing complexity in the electronic structure even in conventional superconductors [2]. "M" shaped band dispersion obtained from ARPES measurements for $Pb_{0.6}Sn_{0.36}In_{0.04}Te$ sample can be regarded as a finger print of Dirac-cone surface state of TCI. From ARPES measurements we can conclude that $Pb_{0.6}Sn_{0.36}In_{0.04}Te$ is a potential materials to study topological superconductivity. STM and photoemission results indicates that N, B and BN ions implanted at ion energy (25 eV) dope into the graphene lattice [3-4]. Low concentration (≈1%) of N and B ions shows usual behavior as n-type and p-type respectively. At higher concentration N (2.5 %) doping shows p-type behavior while B doping shows n-type behavior. B/N co-doping follow the trend as observed from B and N doping.

[1] Sangeeta Thakur et al *J. Applied Physics* 114, 053904 (2013).

[2] Sangeeta Thakur et al *Nature Scientific report* 3, 3342 (2013).

[3] Philip Wilke et al *Appl. Phys. Lett. 105*, 111605 (2014).

[4] Philip Wilke et al *Nano letters* 15, 5110-5115 (2015).