Impurity and Doping Effect on the Single Layer of C60 Molecules Adsorbed on Ag(100)

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One monolayer of C60 chemisorbed on Ag(100) is an interesting fullerene-based system, showing the reversible opening of a gap at the Fermi level at temperatures 25 $\leq T \leq$ 300K, whose origin is still under debate.

Here we report the influence of magnetic and non-magnetic impurities and alkali metal doping on the electronic structure and morphology of this system. The pristine and doped monolayers were studied by means of high-resolution photoemission spectroscopy and X-ray photoelectron diffraction.

Preliminary results show that the gap persists in the presence of nonmagnetic impurities but it is completely suppressed in the presence of magnetic impurities, giving a support for the possible superconducting scenario of this system. Doping with K induces charge transfer to the molecules and the presence of two inequivalent K atoms. The lineshape of K 2p core levels is reminiscent of that of K3C60.In order to understand the origin of the two inequivalent K atoms in the doped ML system, we performed angle scanned XPD from the K 2p core levels on both K3C60 and the doped ML. While in K3C60 we observed a photoelectron diffraction pattern from both the octahedral and tetrahedral K sites, in the doped ML only one component gives a diffraction pattern. This suggests that in the doped ML one of the two K components may be related to disordered atoms or to atoms atop the C60 molecules.