Proximity-induced *p*-wave superconductivity in hybrid systems comprising chiral molecules and graphene

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Following our previous scanning tunneling spectroscopy (STS) investigations of spin-polarized proximity effects in superconductor/ferromagnet bilayers [1,2] (which will be briefly reviewed in my talk), we employed the same technique in the study of two types of hybrid superconducting systems, which also showed evidence for emerging spin-polarized triplet-pairing superconductivity. The first comprises chiral molecules (polyalanine alpha-helix) deposited on Nb (a conventional *s*-wave, singlet-pairing superconductor). Surprisingly, the tunnelling spectra measured in molecule-covered regions exhibited zero-bias conductance peaks (ZBCPs), indicating induced order-parameter with non-conventional symmetry in the Nb, conforming to triplet-pairing *p*-wave. The possible origin of this spin-polarized inverse proximity effect will be discussed. A similar phenomenon was found for a proximal superconductor, where the conventional proximity-induced s-wave in Au coupled to NbN turned unconventional upon the deposition of chiral molecules. In the second part of the lecture, I will present STS measurements on graphene deposited on the electron-doped cuprate superconductor $Pr_{1.85}CeCuO_4$ (PCCO). Here too, the proximity induced order parameter in the graphene sheet appears to have non-conventional symmetry, as reflected by ZBCPs and split-ZBCPs in the tunneling spectra. We note that ZBCPs are not observed on the bare PCCO, despite being a *d*-wave superconductor. The tunneling spectra are well accounted for by a model predicting *p*-wave triggered superconducting density of states in single layer graphene proximity-coupled to a *d*-wave superconductor.

[1] Y. Kalcheim, et al., Phys. Rev B (Rapid Comm.), 89, 180506 (2014).
[2] Y. Kalcheim, et al., Phys. Rev. B (Rapid Comm.), 92, 060501 (2015).