Unconventional Superconductor Proximity Effects in Systems Comprising Ferromagnets, Graphene and Chiral-Molecules

Oded Millo

Motivated by our previous scanning tunneling spectroscopy (STS) works that provide evidence for the emergence of triplet superconductivity at superconductor-ferromagnet interfaces, which will be briefly reviewed, and the observations of chiral-molecule induced magnetization and spin-selective transport, we turned to study the effect of chiral molecules on conventional BCS superconductors. By applying STS, we demonstrate that the singlet-pairing s-wave order parameter of Nb is significantly altered upon the adsorption of chiral polyalanine alpha-helix molecules on its surface. The tunneling spectra exhibit zero-bias conductance peaks embedded inside gaps or gap-like features, suggesting the emergence of a triplet-pairing component with either d-wave or p-wave symmetry, as corroborated by simulations. Such an effect was demonstrated (vis STS) also for a proximal superconductor - a thin Au film deposited on NbN, as well as for NbSe2 flakes (by transport measurements). In the last part of the talk I will present STS data manifesting unconventional superconducting order parameter proximity-induced in single layer graphene deposited on the electron-doped cuprate superconductor Pr1.85CeCuO4.