CEA – Saclay, 91191 Gif-sur-Yvette Cedex
Service de Physique de l'Etat Condensé - UMR 3680

SÉMINAIRE

Mercredi 21 novembre 2018 à 11h15

Orme des Merisiers SPEC, Salle Itzykson, Bât.774

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From single magnetic adatoms on superconductors to coupled spin chains

Magnetic adsorbates on conventional s-wave superconductors lead to exchange interactions that can induce bound states inside the superconducting energy gap. These states are known as Yu-Shiba-Rusinov (YSR) states and can be resolved by scanning tunneling spectroscopy as a pair of resonances at positive and negative bias voltages in the superconducting gap.

Here, we employ tunneling spectroscopy at 1.1 K to investigate magnetic atoms and chains on superconducting Pb surfaces. We show that individual Manganese (Mn) atoms give rise to a distinct number of YSR-states, depending on the crystal field imposed by the adsorption site. The spatial extension of these states directly reflects their origin as the singly occupied d-states [1].

When the atoms are brought into sufficiently close distance, the Shiba states hybridize, thus giving rise to states with symmetric and anti-symmetric character [2]. It has been shown that the Pb(110) surface supports the self-assembly of Fe chains, which exhibit fingerprints of Majorana bound states [3]. Here, we show that Co chains on Pb(110) exhibit similar characteristics of ferromagnetic coupling. Despite of this similarity they do not exhibit zero-energy states. In a simple model of tight-binding calculations, we ascribe the absence of Majorana end states to an even number of d-bands crossing the Fermi level [4].

References
[1]   M. Ruby et al., Phys. Rev. Lett. 117, 186801 (2016).
[2]   M. Ruby et al., Phys. Rev. Lett. 120, 156803 (2018).
[3]   S. Nadj-Perge et al., Science 346, 602 (2014).
[4]   M. Ruby et al., Nano Lett. 17, 4473 (2017).

A coffee break will be served at 11h00. The seminar will be given in English.

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