

Competition of magnetic excitations at the nanoscale

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On normal metal surfaces the magnetic moment of an atom or molecule can be screened by the itinerant electrons as described by the Kondo effect. On a superconductor, the opening of an energy gap at the Fermi level may lead to a significant reduction of the screening, leaving a net magnetic moment to interact with the Cooper pairs. As a result the pairing energy of the Cooper pairs is reduced and spin-polarized bound states appear in the vicinity of a magnetic impurity.

Using scanning tunneling spectroscopy we explore the different magnetic excitations of Manganese-phthalocyanine molecules on a superconducting Pb(111) surface. The delicate balance between Kondo screening and superconducting pairing leads to quantum ground states with different magnetic properties.