# Kondo-resonance splitting in a single-atom contact

**D.-J. Choi[1], S. Guissart[2], P. Simon[2], and L. Limot[1]**

[1] *Institut de Physique et Chimie des Matérieaux de Strasbourg,*
[2] *Laboratoire de Physique des Solides.*
*guissart@lps.u-psud.fr*

The downscaling of spintronic devices requires developing new strategies to sense spin-related phenomena at the smallest possible length scale. Progress towards this goal has been achieved by experimental advances in probing the spin-flip of an electron colliding with a magnetic impurity (atom or a molecule) hybridized with a non-magnetic electrode. The sharp increase in the zero-bias differential conductance observed in the Kondo effect also known as Kondo resonance is in fact a powerful spin-sensitive spectroscopic probe. Information can be gathered on the magnetic interactions, between the impurity and its environment [1], or even on the spin-polarization of electrons tunneling into the impurity [2, 3]. In the case of ferromagnetic electrodes, the density of states for spin-up and spin-down states are unbalanced on the electrodes. The impurity-electrode hybridization becomes then spin dependent and the Kondo resonance is expected to split apart [4-6].

Here, we use scanning tunneling microscopy (STM) to study how the Kondo resonance of a single-atom contact changes in the presence of a spin-dependent hybridization. To introduce a spin-dependent hybridization, we use a bulk ferromagnetic nickel tip, either pristine or covered by copper, to contact individual Co atoms adsorbed on a Cu(100) surface (inset of Fig. 1). We show that the strong coupling between the tip and the atom inherent to our contact measurement promotes a spin-split Kondo state.

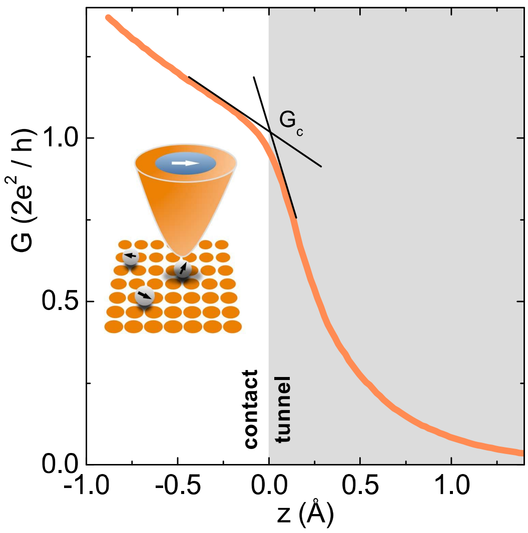


Figure 1 : Experimental setup and typical conductance-versus-tip-displacement recorded above a Co atoms on Cu(100) (The tunneling regim is indicated by a gray background).

The tip excursion provide a tune of couplings parameters, varying the Kondo temperature, and Fano effect. A quantitative line shape analysis of the Kondo resonance based on the numerical renormalization group (NRG) technique shows that the spin-dependent hybridization changes with the tip-apex material, the spin polarization varying between 18% (copper-covered nickel) and 10% (pristine nickel).

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