

Kondo effect in point contacts

Alfred Zawadowski

Institute of Physics, Budapest University of Technology and Economics
zawa@phy.bme.hu

The experimental results for metallic point contacts doped by magnetic impurities are reviewed. The zero bias resistivity anomalies shows also a strong dependence on the size of the contacts, namely the smaller the size the lower the Kondo temperature is. Very similar behaviors are shown by many other systems, where no magnetic field dependence was observed and in several cases those disappear or are reduced by annealing. Finally experimental results are reviewed where the applied voltage is time dependent and no or very weak frequency dependence has been observed up to 60 GHz which indicates that the characteristic energy scale is much larger than a typical energy of a slow two level system in amorphous materials. There have been several suggestions that these Kondo effects are due to structural defects, which were not identified. The idea of the two-channel Kondo effect has been strongly criticized by Aleiner and Altshuler showing that the electron assisted tunneling of an atom between two sites of the two level systems are strongly depressed if higher levels are taken into account. Recently that problem is revisited in collaboration with L. Borda and G. Zaránd and an attempt was made where the second level is above a double potential well and many levels are taken into account. Such model clearly shows Kondo behavior but the electron scattering on the structural center must be in the strong interaction limit and that makes the application of the model questionable. Preliminary results in that direction are presented. The final conclusion is that the observed zero-bias anomalies with large characteristic energies like 10 K do not have satisfactory explanation.