THE ROLE OF MUONS IN PROBING LOCAL MAGNETISM IN HIGH T_C OXIDE SYSTEMS

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Muons are extremely sensitive probes of local magnetism in solids. Since the discovery of the high T_C superconductors, there has been a significant increase in muon studies of solids. Muons have played an important role in studies of superconducting penetration depth and of local magnetic correlations.
In this talk, an introduction to the use of muons to probe magnetism will be presented, along with results from a number of experiments on doped High T_C Systems.
9.7 cm
Using zero field muon spin rotation, we studied the antiferromagnetic correlations in the single layer system $La_{2-x}Sr_xCu0_4$ and in the bilayer compound $Y_{1-x}Ca_xBa_2Cu_30_6$. We observe a common phase diagram for these two sestems as a function of a single parameter. namely the hole doping per plane and we also note two distant transitions of the magnetic ground state. The first transition occurs at the border between the 3D antiferromagnetic state and a low temperature disordered state with short range correlations. A second transition coincides with the onset of superconductivity and indicates a distinct change in the behavior of the magnetic correlations that coexists with superconductivity. These data are discussed on the basis of a model of microscopic phase segregation of the doped holes into hole rich and hole poor regions which are in an atomic scale. The contrast of these results to a system showing macroscopic phase separation will be presented. The results of the muon spin rotation experiments will be considered in the perspective of other studies of local magnetism.
Results presented here are the result of a cooperative program with Ch. Niedermayer, A. Golnik, T. Blasius, Ch. Bernhard and A. Moodenbaugh.

13.4 cm

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