Recent Results of EPR Studies of $La_{2-x}Sr_xCuO_4$

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Electron Paramagnetic Resonance (EPR) is a powerful tool in solid state physics, which allows to study electronic and magnetic properties on a microscopic level. However, the application of EPR to high-T_c cuprates was restricted owing to the absence of intrinsic EPR signals in these compounds. We present the new model of Cu spin relaxation which leads to the extremely large linewidth and provides an explanation for the long-standing problem of EPR silence in high-T_c cuprates.

Another approach in the application of EPR to high-T_c superconductors is to dope these compounds with small amounts of some paramagnetic ions which are used to probe the intrinsic behavior. One of the best candidates is Mn, which in the 2+ valent state gives a well defined EPR signal and substitutes for the Cu^{2+} in the CuO_2 plane. It was found that the Mn ions are strongly coupled to the collective motion of the Cu spins (the so called bottleneck regime). The bottleneck regime allows to obtain substantial information on the dynamics of the copper electron spins in the CuO_2 plane. We present a survey of recent results obtained by EPR of Mn^{2+}-doped $La_{2-x}Sr_xCuO_4$ concerning the microscopic electronic phase separation, charge-spin dynamics and unusual oxygen isotope effects.