

Non-Korringa nuclear relaxation in the ferromagnetic phase of the bilayered manganite $\text{La}_{1.2}\text{Sr}_{1.8}\text{Mn}_2\text{O}_7$

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M.J.R. Hoch¹, P.L. Kuhns¹, W.G. Moulton¹, Jun Lu¹, A.P. Reyes¹, and J.F. Mitchell²

¹ National High magnetic Field Laboratory, Florida State University, 1800 E. Paul Dirac Drive, Tallahassee, Florida 32310, USA

² Materials Science Division, Argonne National Laboratory, Argonne, Illinois 60439, USA

⁵⁵Mn NMR spectra for the FM phase of the colossal magnetoresistance bilayer manganite $\text{La}_{1.2}\text{Sr}_{1.8}\text{Mn}_2\text{O}_7$ show a broad distribution of hyperfine fields at Mn sites. The hyperfine distribution reflects variations in the electronic structure at the local level.

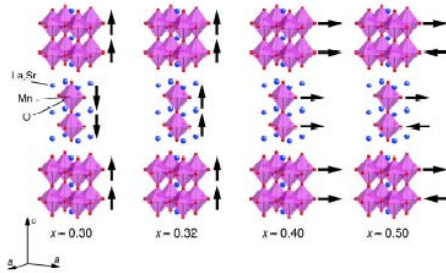


Fig. 1. Magnetic structure of $\text{La}_{1-x}\text{Sr}_x\text{Mn}_2\text{O}_7$

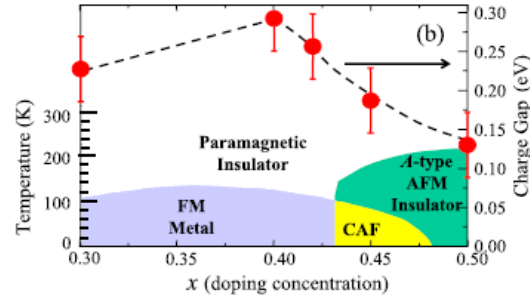


Fig. 2. Phase diagram

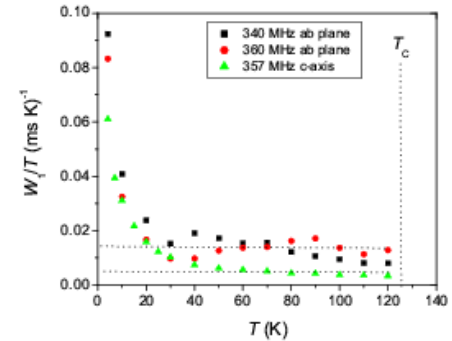


Fig. 3. W_1/T versus T showing non-Korringa behavior at low T

⁵⁵Mn spin – lattice relaxation rates W_1 have a surprisingly weak dependence both on temperature and applied magnetic field. Significant departures of the relaxation rate from Korringa temperature dependence $W_1 \propto T$ below 40 K provide evidence for non-Fermi liquid behavior in this quasi-2D metal.

At temperatures approaching T_C from below, in the range where colossal magnetoresistance appears, further anomalous and field-dependent behavior is found in the relaxation rate temperature dependence.

The results provide evidence for changes in the electronic structure with temperature in this poorly metallic system. At low temperatures the changes are possibly linked to orbital ordering effects. In addition, statistical fluctuations in dopant concentration may play some role in inducing local variations in electronic structure. Above 90 K the emergence of polarons is likely to be responsible for the observed decrease in the relaxation rate.

Acknowledgments

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