# MAGNETORESISTANCE IN i-*R*-Cd ICOSAHEDRAL QUASICRYSTALS (*R*=Y, Gd)

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Quasicrystals are ordered but aperiodic lattices. Understanding the relationship between the quasicrystalline structure and magnetism has been a long-standing challenge. Effects of local magnetic moments and intersite spin correlations on transport properties of the quasicrystalline conduction electrons also remain open questions of current interest (see, *e.g.*, Ref. [1]). A class of recently discovered, rare earths and cadmium-based binary quasicrystals, i-R-Cd [2], provide an opportunity to investigate electronic and magnetic properties in quasicrystals with localized moments.

We focus on the transport properties of this family of quasicrystals with and without magnetic moments, i-Gd-Cd and i-Y-Cd, respectively. DC magnetization measurements have revealed a spin-glass behavior for i-Gd-Cd quasicrystals, with spin freezing temperature $T_f = 4.6$ K. [3] We have explored the magnetoresistance (MR) up to a magnetic field ($H$) of 12 T for temperatures ($T$) ranging from 1.6 K to 300 K. The most interesting behavior is observed in i-Gd-Cd, in which the MR exhibits thermo-magnetic history dependence at low $T$. In contrast, the i-Y-Cd MR does not depend on magnetic history. Figure 1 shows a comparison of the resistances of i-Gd-Cd and i-Y-Cd as a function of $H$ at 1.6 K for states prepared by zero-field cooling (ZFC) and field cooling (FC) the samples in 12 T. In the quasicrystal with local magnetic moments, there is a clear difference between the ZFC and FC values of the positive MR. The onset of the positive, history dependent MR at $T \sim 20$ K $> T_f$ may be related to the formation of magnetic clusters above $T_f$, as inferred from the magnetization and specific heat measurements. [3] Possible mechanisms responsible for the striking coupling between charge transport and local magnetic environment observed in the MR will be discussed.

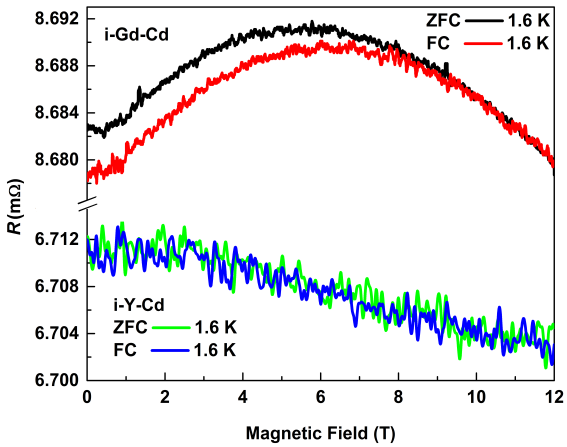


Figure 1: ZFC and FC resistance $R$ of i-Gd-Cd and i-Y-Cd vs. $H$ at 1.6 K. ZFC state is prepared by zero-field cooling from 50 K and FC state is prepared by cooling in $H$=12 T from 50 K.

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