HIGH MAGNETORESISTANCE IN A DOPED NEARLY MAGNETIC SEMICONDUCTOR

C. Petrovic (Brookhaven National Laboratory, Condensed Matter Physics); Rongwei Hu (Brookhaven National Laboratory, Condensed Matter Physics and Brown University, Physics Department); E. S. Choi (NHMFL) and V. F. Mitrovic (Brown University, Physics Department)

Introduction

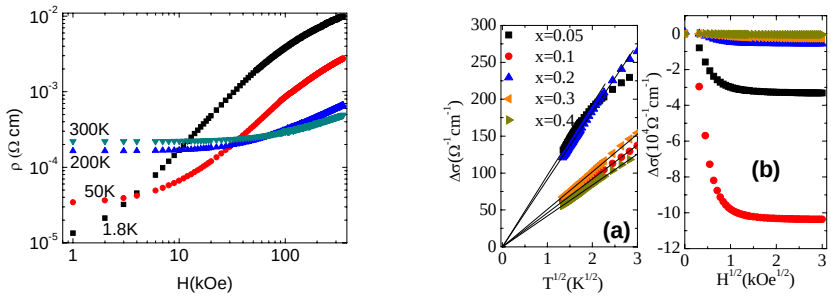
In this work we show colossal positive magnetoresistance (CMR) in doped nearly magnetic semiconductor $FeSb_2$ [1].

Experimental

Electrical transport measurements were carried out using QD PPMS and in 33T magnetic field at NHMFL Tallahassee.

Results and Discussion

Resistivity isotherms of $Fe_{0.9}Co_{0.1}Sb_2$ up to 350 kOe are shown in Fig. 1. At 1.8 K resistivity increases by four orders of magnitude compared to its value at room temperature and shows no signs of saturation at all investigated temperatures. It has been suggested that the transition between a narrow gap, nearly magnetic or a "Kondo", semiconductor and a ferromagnetic metal represents the itinerant or "inverse" analog of a metal-insulator transition in the manganites [2]. In this picture, a large magnetoresistance is expected near high magnetic field induced metamagnetic transition from a singlet semiconductor state and a ferromagnetic metallic state.



Figures 1 and 2: (1) CMR in $Fe_{0.9}Co_{0.1}Sb_2$. (2) Magnetoconductivity and localization effects

We show that low temperature conductivity (T,H) is proportional to $\sqrt{T}$, $\sqrt{H}$ (Fig. 2). This results implies the existence of a square root singularity in the electronic density of states at the Fermi energy [3].

Conclusions

Our results suggest contribution of Coulomb interactions in disordered metal to exceptionally high MR effect.

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