SPIN RESISTIVITY IN MAGNETIC MATERIALS

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We show in this talk recent results on the spin resistivity in magnetically ordered materials obtained by Monte Carlo simulations. We discuss its behavior as a function of temperature in various types of crystal: ferromagnetic, antiferromagnetic and frustrated spin systems. In the model used for simulations, we take into account the interaction between itinerant spins and that between lattice spins and itinerant spins. We also include a chemical potential term, as well as applied magnetic and electric fields.
We study in particular the behavior of the spin resistivity at and near the magnetic phase transition where the effect of the magnetic ordering is strongest. In ferromagnetic crystals, the spin resistivity shows a sharp peak very similar to the magnetic susceptibility. This can be understood if one relates the spin resistivity to the spin-spin correlation as suggested in a number of theories. The dependence of the shape of the peak on physical parameters such as carrier concentration, magnetic field strength, relaxation time etc. is discussed.
In antiferromagnets, the peak is not so pronounced and in some cases it is absent. Its direct relationship to the spin-spin correlation is not obvious. As for frustrated spin systems with strong first-order transition, the spin resistivity shows a discontinuity at the phase transition. Physical mechanisms for itinerant-spin scattering are discussed. For comparison, we show recent experimental results on various magnetic materials.