Anomalous Magnetoresistance Effects in \((\text{CrO}_2)_{1-x} : (\text{MgB}_2)_x\) powders

RAGHAVA PANGULURI, B. NADGORNY, Department of Physics, Wayne State University, Detroit, MI 48201 — It is known that the electrical conduction mechanism in compressed powders and polycrystalline \(\text{CrO}_2\) films is due to the intergranular tunneling. Here, we focus on the percolation effects in the \(\text{CrO}_2\) powders intermixed with a superconductor, \(\text{MgB}_2\). A mixture of \((\text{CrO}_2)_{1-x} : (\text{MgB}_2)_x\) powders with \(0 \leq x \leq 1\) were cold-pressed to form circular disks. The electrical resistance measured by a four probe technique, as expected showed a lower resistance for the mixture when compared to the pure pressed \(\text{CrO}_2\). The observed hysteresis extrinsic magnetoresistance (MR) showed peaks corresponding to the coercive fields of \(\text{CrO}_2\) which can be associated with the alignment of magnetization of adjacent \(\text{CrO}_2\) particles. Interestingly, the MR changed signs at around the superconducting transition temperature of \(\text{MgB}_2\) (~40K) and also the slope of MR at high magnetic fields changed from positive to negative. We will discuss a possible origin of the observed effects, which we believe are related to the ferromagnet/superconductor interaction.