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Electrical Conductivity Percolation Effects in CrO_2-MgB_2 Nanocomposites XIANGDONG LIU, RAGHAVA PANGULURI, HUANG ZHIFENG, BORIS NADGORNY, Department of Physics and Astronomy, Wayne State University, Detroit, MI 48201 — Cold-pressed half-metals/insulators are known to show an enhanced extrinsic powder magnetoresistance (MR) due to intergranular and intergrain spin-dependent tunneling. In this work we use a mixture of metal/superconductor $(CrO_2)_x(MgB_2)_{1-x}$ nanocomposites to study conduction percolation effects. The samples were cold pressed in the form of pellets from the mixture of pure CrO_2 and MgB_2 powders. Transport and magneto-transport properties of various composition compacts measured as a function of temperature. Magneto-transport measurements performed over a temperature range of 2-100K show a hysteretic behavior with the peak values of MR coinciding with the CrO_2 coercive fields, with a maximum MR value for the composition near the percolation threshold of $\sim$ 42% at 2 K. The electrical resistivity displayed a sharp maximum near the percolation threshold, a feature that is likely to be unique for such type of systems. We will discuss the implications of our results for the analysis of conduction percolation within the framework of a simple percolation model and a possible connection to Andreev reflection effect in this system at low temperatures.

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