EFFECT OF MULTIFERROIC $BiFeO_3$ DOPING ON ELECTRICAL, MAGNETIC AND MAGNETORESISTANCE PROPERTIES OF $La_{0.8}Ag_{0.2}MnO_3$

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ABSTRACT

Composites with composition (1-x) $La_{0.8}Ag_{0.2}MnO_3$ (LaAgMnO) / (x) $BiFeO_3$ (BFO) ceramics were prepared using the conventional solid-state synthesis method to investigate the effect of BFO on electrical, magnetoresistance and magnetic properties. The structure and morphology of composites have been studied by X-ray diffraction (XRD) and scanning electronic microscopy (SEM). The XRD results showed a slight decrease in unit cell volume is probably due to some parts of BFO content substituted at the LaAgMnO lattice while the results of SEM showed rounded grains and connectivity between grains are improved as a result of BFO doping. Resistivity and magnetic susceptibility measurements showed both metal-insulator transition temperatures, T_{MI} and paramagnetic to ferromagnetic transition temperature, T_C decreased with increased BFO content indicating suppression of double exchange, DE mechanism. The temperature dependence of MR shows a small peak around T_{MI} for all samples which ascribed to the intrinsic MR effect. Below the MR peak, the MR increase almost linearly with decreasing temperature for all samples and this is ascribed to the phenomena of extrinsic MR. The highest MR% (at 40 K) was observed for the x = 1.5% sample which showed an MR of more than twice that of the undoped (x = 0%) sample. This extrinsic effect is suggested to be related to spin polarized tunneling between grains. Under external field spin polarized tunneling of conduction electrons is enhanced as a result of improved spin alignment. It is suggested that BFO induced some kind of magneto-electric coupling between BFO and LaAgMO which producing enhanced MR effect.

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