Investigation of electronic phase segregation in La0.75Ca0.15Sr0.10MnO3 manganite

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The effect of electronic phase segregation in a broad metal-insulator transition (MIT) observed in La0.75Ca0.25-xSr_xMnO3 (x=0.1) composition is investigated using heat capacity, magnetization, electrical resistivity and magnetoresistance measurements. The negative magnetoresistance of 65% in an applied magnetic field of 12T and 15% in 1T with a broad working range of 18K around 300K which is beneficial for room temperature colossal magnetoresistance (CMR) applications. The broad transition in temperature dependent zero field resistivity measurement is analyzed in the light of percolation model indicates the abundance of insulating/metallic clusters in metallic/insulating region. A significant difference between the metallic fraction around the MIT and the ferromagnetic phases observed around the Curie temperature demonstrates the interplay between volume of itinerant and polaronic electronic phases.

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