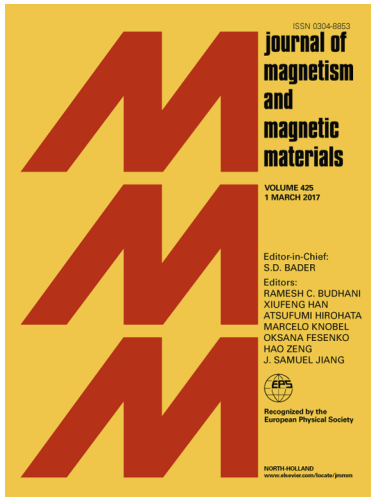

Comparison of structural, magnetic and electrical transport behavior in bulk and nanocrystalline Nd-lacunar $Nd_{0.67}Sr_{0.33}MnO_3$ manganites

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Comparison of structural, magnetic and electrical transport behavior in bulk and nanocrystalline Nd-lacunar $Nd_{0.67}Sr_{0.33}MnO_3$ manganites

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Abstract

Bulk and nanocrystalline Nd-lacunar $Nd_{0.67}Sr_{0.33}MnO_3$ manganites were synthesized, and the structural, magnetic and electrical properties have been systematically studied. The Rietveld refinement confirms perovskite structure with orthorhombic crystal symmetry (Pbnm space group). The bulk compound shows a sharp second order transition at 275 K while the nanocrystalline compound exhibit a broadened transition with a T_C of 242 K. Temperature dependence of electrical resistivity of both the compounds witness double peaks; a sharp peak near T_C and a broad peak below T_C, which is more prominent in the nanocrystalline compound whereas former peak is more prominent in the bulk compound. The combined effect of Kondo-like spin-dependent scattering and electron-electron interactions dominates the transport properties at low temperature in the nanocrystalline compound and results in upturn enhancement in resistivity, while the high-temperature insulating behavior of both compounds can be explained by the adiabatic small polaron hopping mechanism. The effective Mn ion valence of bulk and nanocrystalline compounds are found to be 3.56 and 3.25 and the observed crystal field splitting energy is slightly higher for the nanocrystalline compound. X-ray

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