

PERCOLATION TRANSITIONS IN $\text{Bi}_2\text{Sr}_2\text{Ca}_2\text{Cu}_3\text{O}_{6+x}/\text{La}_{0.7}\text{Sr}_{0.3}\text{MnO}_3$ RANDOM NANOCOMPOSITE

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Abstract

We have studied transport characteristics of random binary networks composed of d-wave superconductor $\text{Bi}_2\text{Sr}_2\text{Ca}_2\text{Cu}_3\text{O}_{6+x}$ microparticles and half-metallic ferromagnet $\text{La}_{0.7}\text{Sr}_{0.3}\text{MnO}_3$ (LSMO) nanoparticles. Double resistive percolation transition (superconductor–metal–semiconductor) for nanocomposites with the LSMO volume fraction below 30% was observed. We argue that the constituent particle geometrical size and indirect interaction via superconducting proximity effect play a crucial role in realizing necessary conditions enabling the percolation transitions in the nanocomposites under consideration.

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