Transport and magnetic properties of $Nd_{1-x}A_xMnO_3/YBa_2Cu_3O_7$ heterostructures

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9.7 cm

Ferromagnetic (F) and superconducting (S) phase are antogonistic to each other. However, a coexistence ferromagnetic and superconducting phase was observed in $Nd_{1-x}A_xMnO_3/YBa_2Cu_3O_7$ (NSMO/YBCO) superlatices, with modulation length less then 10 nm. In the present study we report on the growth, structure and magnetic characterization of (NSMO/YBCO) superlattices. The comporative studies for two series of NSMO/YBCO superlattices have been performed i.e. for NSMO with x=0.19 and 0.33 respectiviely. For the doping level x=0.19 the bulk NSMO is a ferromagnetic insulator (FMI) with Curie temperature of about 100 K. Whereas for x=0.33 NSMO is a ferromagnetic metal, (FMM), with Curie temperature of about 200 K.
Two seris of NSMO/YBCO superlattices for both doping level were were deposited with fixed NSMO layer equal to 4.8 nm thickness and varying YBCO thickness from 3.6 nm up to 8.4 nm. X ray diffraction spectrum show the presence of superstructure reflected satelittes indicating a good quality of the S/F interfaces in multilayered heterostructures. Neverthless, trasport measurements show transition to superconducting state for multilayers with the YBCO layer thickness above 3.6 nm. The multilayers show in-plane magnetic anisotropy above and below superconducting transition. Discussion of the experimental results for the two ferromagnetic subsystem in NSMO/YBCO heterostructure on their superconducting properties will be presented.
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