

【S-12】 초청강연

Magnetic and Transport Properties of Multilayered $\text{Pr}_{0.65}\text{Ca}_{0.35}\text{MnO}_3/\text{La}_{0.7}\text{Sr}_{0.3}\text{MnO}_3$ Films Controlled by the Microstructures

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The magnetic and the transport properties of $\text{Pr}_{0.65}\text{Ca}_{0.35}\text{MnO}_3/\text{La}_{0.7}\text{Sr}_{0.3}\text{MnO}_3$ multilayered (ML) films prepared by laser ablation method have been investigated in a wide range of temperature and magnetic field. The substrates were $\text{LaAlO}_3(100)$ single crystal and Al_2O_3 polycrystal. The oxygen pressure in the chamber was 200 Torr during deposition and 600 Torr during cooling. Under these conditions were deposited the ML films which contain six $\text{La}_{0.7}\text{Sr}_{0.3}\text{MnO}_3$ layers and five $\text{Pr}_{0.65}\text{Ca}_{0.35}\text{MnO}_3$ layers at different substrate temperature, $T_{\text{sub}} = 560^\circ\text{C}$, 610°C , 660°C , and 710°C . Each layer has thickness of 20 nm. The $\text{La}_{0.7}\text{Sr}_{0.3}\text{MnO}_3$ film was deposited at the top and bottom. X-ray diffraction analysis reveals that all films deposited on LaAlO_3 substrate demonstrate the highly oriented texture and can be treated as epitaxial ones. On the contrary, the deposition on the Al_2O_3 substrate leads to a formation of polycrystalline ML films. It was shown that polycrystalline ML films demonstrate ferromagnetic coupling between layers at all T_{sub} and exhibit non-monotonic (with maximum and minimum) behavior of resistance versus temperature. Meanwhile, in the epitaxial ML films the ferromagnetic coupling is observed only at high T_{sub} (660°C). In these ML films a record value of negative magneto-resistance (60% at 5 T) was observed at room temperature, making it a potential candidate for electronic applications. The experimental results are discussed on the basis of modern theoretical approaches.