Physical properties of oxygen-annealed $SrFe_{0.8}Co_{0.2}O_{2.5}$ thin films

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Transition metal oxides are interesting materials due to diverse physical properties such as superconductivity, ferromagnetism and metal-insulator transition. These properties are often induced by the number of electrons in the transition metal ions. Cation doping and control of oxygen contents are used to change physical properties of the materials. In this work, we studied changes of physical properties of $SrFe_{0.8}Co_{0.2}O_{2.5}$(SFCO) epitaxial thin films. SFCO epitaxial thin films have been grown on (001) $(LaAlO_3)_{0.3}$-$(SrAl_{0.5}Ta_{0.5}O_3)_{0.7}$ substrates by pulsed laser deposition. To find the optimal growth condition, we changed substrate temperature and oxygen partial pressure. We used θ-2θ scans to determine the structure of the films. From full width half maximum (FWHM) values of rocking curves, we could find the film with best crystallinity. The film, grown in 600°C and 100 mTorr, showed the narrowest FWHM. We found the reduction of *c*-axis lattice constant from each films annealed in oxidative condition (PO_2 = 600 Torr) at different temperature. Transport measurements confirmed reduction of electrical resistivity after annealing. Also, SQUID data showed clear ferromagnetism. In short, we clearly demonstrated annealing in oxidative condition significantly changed materials' properties via oxidation. This work was supported by the National Research Foundation of Korea (NRF) and grant funded by the Korea government (MSIP) through GCRC-SOP (No. 2011-0030013). Also, this research was supported by the Basic Science Research Program through the NRF funded by the Ministry of Education (NRF-2015R1D1A1A02062175).