QA11

Characteristics of W-C-N thin films on Si as a role of Diffusion Barrier for $La_{0.67}Sr_{0.33}MnO_3$ manganese oxide layer

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Perovskite manganese oxide thin films have been extensively studied for colossal magnetoresistance (CMR) and tunnelling magnetoresistance (TMR) due to their half-metallic nature and that offers potential for various devices such as magnetic field sensors and hard disk heads[1]. Though the CMR and TMR films have been successfully deposited on several single crystal substrates, these technology must be deposited by viable substrate such as Si substrate is essential for future semiconductor applications[2]. Therefore, we suggest the W-C-N thin film for diffusion barrier to prevent the interdiffusion between La0.67 $Sr_{0.33}MnO_3$ (La-Sr-MnO) and Si substrate. To deposit the La-Sr-MnO layers, we have used acetic acid, ethanol and distilled water as a solvent to synthesize La-Sr-MnO precursor. La-Sr-MnO layers have grown on W-C-N/Si multi layer by a sol-gel spinning process. After the deposition of La-Sr-MnO on W-C-N thin films, the films were annealed for 3 hours at 800°C in oxygen ambient. We have studied the thermal stability of W-C-N ternary component thin films on Si for various nitrogen concentration from as deposition state to 1000°C. After then, we studied the interface effects between La-Sr-MnO layer and W-C-N diffusion barrier. So we have got some results such as polycrystalline La-Sr-MnO thin films were possibly deposited on W-C-N / Si substrate, and we also have studied the relation between MR ratio and grain size.

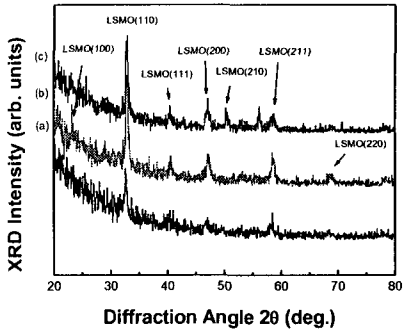

Fig.1. XRD patterns of W-C-N/Si thin films produced at a N_2 p.p.r. of (a) 0%, (b) 1.25 %, and (c) 5 %.

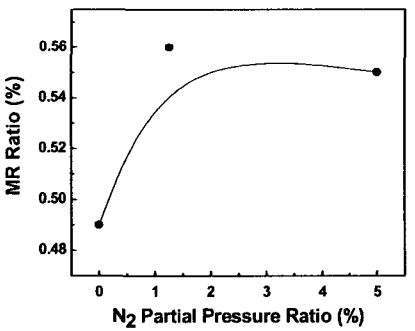

Fig. 2. MR Ratio of LSMO/W-C-N thin films produced at a N_2 p.p.r. of 0% to 5%.

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QA12

Magnetic and Structural Phase Transitions In $Pr_{1-X}Sr_xCoo_3$ Cobaltites

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A fast growing interest to perovskite cobaltites is caused by their peculiar magnetic and transport properties. Like manganites, cobaltites with general chemical formula $Ln_{1-x}M_xCoO_{3-d}$ (where Ln-lanthanide, M-alkali-earth element) clearly show a strong correlation between lattice, charge, spin and orbital degrees of freedom. Phase transitions peculiarities of cobaltites are caused by subtle balance between Hund intra-atomic energy and crystal field energy of CoO_6 octahedrons. Because of such a competition Co^{3+} ions can be in low spin (LS, $t_{2g}^6e_g^0$), intermediate (IS, $t_{2g}^5e_g^1$) or high spin configurations (HS, $t_{2g}^4e_g^2$). Among the $Ln_{0.5}Sr_{0.5}CoO_3$ series the $Pr_{0.5}Sr_{0.5}CoO_3$ composition is an individual case. Magnetic investigation of $Ln_{0.5}Sr_{0.5}CoO_3$ compounds has revealed that only Pr containing compound exhibits two phase transitions at T_A=120and T_C=226. Other compounds show only one magnetic phase transition. A transition at T_C is paramagnet-ferromagnet, whereas origin of transformation at T_A is still unclear.

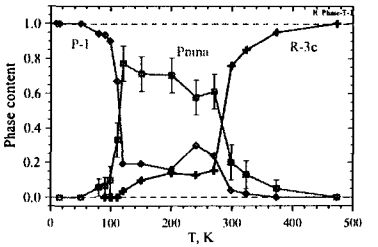

Fig.1. Content of structural phases depending on temperature.

Magnetic and crystal structure phase transitions in compounds on the base of metallic ferromagnet $Pr_{0.5}Sr_{0.5}CoO_3$ have been investigated by the powder neutron and synchrotron X-ray diffractometry methods as well as using magnetic and elastic properties measurements. In $Pr_{0.5}Sr_{0.5}CoO_3$at temperatures near 120, 300, and 800 K the consequence of crystal structure transitions has been observed with a symmetry rise from triclinic (space group P1) to orthorhombic (Pnma), then to rhombohedral (R3c) and cubic (Pm3m). By transition to P1 a sharp increase of the Co-O-Co angle along *c*-axis has been observed as well as spin reorientation from the *c* axis to the *b* one. The Pnma-P1 transition has been revealed only in the Pr-containing compounds and it is the most pronounced in $Pr_{0.5}Sr_{0.5}CoO_3$. Both magnetic and crystal structure phase diagram of $Pr_{1-x}Sr_xCoO_3$system have been constructed. It has been supposed that Pnma-P1 phase transition is caused by active role of Pr^{3+} ions in formation of chemical bond of Pr-O-Co type. The transitions Pnma - R3-c as well as R3-c-Pm3m are associated with a standard size effect due to the mismatch between ionic radii of A and B cations in the perovskite ABO_3 lattice.