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ABSTRACTS

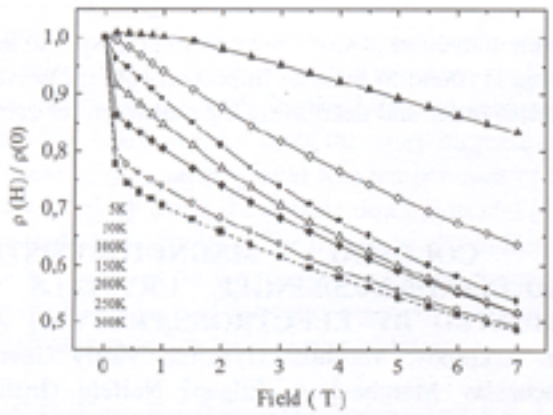

FIG. 1. Magnetic field dependence of MR of sample with x=0.

4T-34. MAGNETIC AND STRUCTURAL PROPERTIES OF $Pr_{1-x}A_xCoO_3$ (A=Sr and Ba). Kenji Yoshii, Akio Nakamura (Japan Atomic Energh Research Institute, Dept of Synchrotron Radiation Research, Hyogo, Kouto, Mikazuki, 679-5148, Japan)

Perovskite cobaltates $Ln_{1-x}A_xCoO_3$ (Ln=lanthanides, A=alkarine earth metals) exhibit ferromagnetic order with Curie temperatures around 150-250 K due to the double exchange interactions between Co3d moments. Detail investigations have been made mainly on $La_{1-x}Sr_xCoO_3$ so far [1]. In this study, magnetic and structural properties were investigated for perovskite cobaltates $Pr_{1-x}A_xCoO_3$ (A=Sr and Ba) with x between 0 and 0.5. The samples were prepared by the ceramic method in air. The reaction products were analyzed by powder X-ray diffraction (XRD) measurements, and their crystal structures were refined by the Rietveld method. Magnetization measurements were performed by a SQUID magnetometer between 4.5 and 300 K. The crystal structures for both A=Sr and Ba were found to be the orthorhombic perovskite type (space group Pnma; $GdFeO_3$ type) in the whole x region. All the lattice parameters (a, b, c) of $Pr_{1-x}Sr_xCoO_3$ increased with increasing x, as found for other $Ln_{1-x}A_xCoO_3$ systems so far. On the other hand, the b-length for $Pr_{1-x}Ba_xCoO_3$ exhibited a maximum at x=0.3-0.4, whereas the a- and c-lengths for this system showed similar behavior as in $Pr_{1-x}Sr_xCoO_3$. The unit cell volumes monotonously increased with increasing x in both systems. While the end compound $PrCoO_3$ exhibits no magnetic order down to 4.5K, the Sr and Ba substitution led to ferromagnetic order of Co moments below 250 K. The Curie temperature (Tc) of $Pr_{1-x}Sr_xCoO_3$ monotonously increased up to 250 K as x was increased. On the other hand, Tc of $Pr_{1-x}Ba_xCoO_3$ exhibited a maximum (200 K) at x=0.3-0.4. Based on the above result from the XRD measurements, this is qualitatively explained in terms of the enhancement of exchange interactions, owing to the relaxation of orthorhombic distortion caused by the elongation of the b-length at x=0.3-0.4 in $Pr_{1-x}Ba_xCoO_3$. Magnetization at low temperatures changed in proportion with logarithm of time, which indicates extremely slow magnetic relaxation such as spin-glass and/or cluster-glass states coexisting with the ferromagnetic order.

[1] P. A. Joy and S. K. Date, J. Phys.: Condens. Matter., **11**, L217 (1999), and references therein.

4T-35. STRUCTURE AND MAGNETISM IN $(LaPb)(Mn_{0.9}TM_{0.1})O_3$ (TM=Fe, Co, Ni) GMR PEROVSKITES. A. Pena, J. Gutierrez, J. M. Barandiarán, J. L. Pizarro, T. Rojo, M. Insausti, L. Lezama (Univ. del Pais Vasco/EHU, Facultad de Ciencias, Apartado 644, Bilbao, 48080, Spain)

It is already well stablished that the substitution of the Mn ions by other elements considerably modifies the magnetic and transport properties in perovskite-like compounds. In this work the structural, magnetic and magnetotransport study of $La_{0.7}Pb_{0.3}(Mn_{0.9}TM_{0.1})O_3$ (TM=Fe, Co, Ni) manganites are presented. All compositions were synthesised using the sol-gel technique, and show a crystalline structure that corresponds to the trigonal (R-3c)space group. Both the Curie temperature and the saturation magnetic moment drop with the TM ion substitution. This effect is attributed to the disturbance of the double exchange interaction between Mn^{3+} and Mn^{4+} resonant valence ions, upon substitution by defined valence ones. However, Ni has lower influence than Co and Fe in the magnetic properties. The magnetoresistance between 0 and 6 Tesla applied field has been also determined, with maximum values ranging between 45% and 65% for Ni and Fe substitution, respectively.

4T-36. THE MAGNETIC SPECTRA OF POLYCRYSTALLINE PEROVSKITE LSMO. Jinhui Wang, Wenli Gao, Gang Ni, Youwei Du (Department of physics, Nanjing University, Nanjing, Jiangsu, 210093, China)

Dynamics of domains in the polycrystalline perovskite $La_{1-x}Sr_xMnO_3$ with x=0.1, 0.15, 0.2, 0.3 and 0.45, was investigated by magnetic spectrum measurements in frequency from 10Hz to 100MHz at 77K. The samples were prepared by sol-gel method, and the average grain size about 1.2μm after sintering at 1773K for 5h. A striking feature is found that the spectra consist of two dispersions as x larger than 0.175 the composition of crystal structure transition from rhombohedral to orthorhombic, one is relaxation and the other is resonance, occurs at 57-155K and 49-59MHz, respectively. In contrast, only single resonance type dispersions are observed in the spectra with x=0.1 and 0.15. The relaxation and resonance as x>0.175 are attributed to domain wall displacements and spin rotations, and the damping of wall motions is mainly caused by eddy current in alternating field. However, the single resonance spectra with x<0.175 are supposed to be caused by spin rotations rather than coalesce of two dispersions relate to wall displacements and spin rotations, respectively, for the reason that the spins canted in the region x=0.1-0.15 so that the magnetic domain can not form.

4T-37. MAGNETIC AND MAGNETORESISTANCE STUDIES OF THE MANGANITES $Sm_{0.35}Nd_{0.35}Pb_{0.3}Mn_{1-x}Co_xO_3$ (x = 0, 0.1, 0.2). N. O. Moreno, J. C. P. Campoy, G. E. Barberis (UNICAMP, Instituto de Física "Gleb Wataghin", Campinas, SP, 13083-970, Brazil) and J. J. Blanco, M. Insausti, T. Rojo (UPV/EHU, Departamento de Química Inorgánica, Apdo. 644, Bilbao, 48080, Spain)

The magnetic behavior in polycrystalline samples of the $Sm_{0.35}Nd_{0.35}M_{0.3}Pb_{1-x}Co_xO_3$ (x = 0, 0.1, 0.2) at low magnetic fields has been studied by ac susceptibility, and field cooled (FC) and zero field cooled (ZFC) magnetization measurements. We conclude that a small amount of Co substitution tends to destroy the double exchange and broadens the coexistence region of the cluster-glass and ferromagnetic states. Also, the Co doping suppresses the large negative magnetoresistance and it becomes small for x = 0.2.

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4T-39. MAGNETIC PROPERTIES FOR $La_{0.81}Ca_{0.11}MnO_3$ FILMS AS A FUNCTION OF THICKNESS. Seung-Iel Park, Guun Young Ahn, Young Suk Cho, Chul Sung Kim (Kookmin University, Department of Physics, Chongnung-dong, SongBuk-gu, Seoul, 136-702, South Korea) and In Bo Shim (Korea Institute of Science and Technology, Thin Film Technology Research Center, Chongnung-dong, SongBuk-gu, Seoul, Korea, 136-791, South Korea)

La-Ca-Mn-O films were deposited to various thickness(500, 750, 1000 and 1500 Å) by rf-magnetron sputtering at 700 °C on $LaAlO_3$(100) single crystal substrates. Deposited thin films were annealed for 1 hour in O_2 atmosphere at 800 °C. Microstructure, magnetic and low-field magnetoresistance properties and surface state of the deposited La-Ca-Mn-O films on single crystal substrates have been investigated with x-ray diffraction, Rutherford back-scattering spectroscopy, atomic force microscope, scanning electron microscopy, magnetoresistance measurement. The rocking curve of the La-Ca-Mn-O films as a function of deposited thickness was indicated that La-Ca-Mn-O films were grown to planes parallel direction of $LaAlO_3$(100) substrate. The full width at half-maximum(FWHM) of the (200) peak was about 1.3° in all films on $LaAlO_3$(100), which indicates that some in-plane mosaic spread occurred in these epitaxial films. The crystal structure and chemical composition of La-Ca-Mn-O films were determined to be perovskite orthorhombic structure with $La_{0.89}Ca_{0.11}MnO_3$. For film of 1000 Å, the lattice constant were $a_0 = 5.468$Å, $b_0 = 5.442$Å and $c_0 = 7.739$Å. The temperature dependence of the resistance for 1500 Å films shows that a semiconductor-metal transition, T_{SC-M}, occurs at 170 K. The relative maximum magnetoresistance, MR, defined as : [R(0 Oe)-R(15 kOe)]/ R(15 kOe), is about 583 % at 150 K.