## Pressure-Induced Magnetic Phase Transitions in $Pr_{1-x}Sr_xMnO_3$ Manganites (x = 0.48 – 0.85)

<u>D.P.Kozlenko<sup>1</sup></u>, Z.Jirák<sup>2</sup>, V.P.Glazkov<sup>3</sup>, B.N.Savenko<sup>1</sup> and S.E.Kichanov<sup>1</sup> <sup>1</sup> Frank Laboratory of Neutron Physics, JINR, 141980 Dubna Moscow Reg., Russia <sup>2</sup> Institute of Physics, ASCR, Cukrovarnická 10, 162 53 Prague 6, Czech Republic <sup>3</sup> Russian Research Center "Kurchatov Institute", 123182 Moscow, Russia

## E-mail: denk@nf.jinr.ru

The crystal and magnetic structures of manganites  $Pr_{1-x}Sr_xMnO_3$  (x = 0.48 - 0.85) have been studied by means of neutron diffraction at high pressures up to 4.8 GPa in the temperature range 16 – 300 K using sapphire anvil high pressure cells with the DN-12 spectrometer at the IBR-2 high flux pulsed reactor (Dubna, Russia).

At ambient pressure  $Pr_{1-x}Sr_xMnO_3$  compounds (x = 0.48 - 0.85) have a tetragonal crystal structure (sp. gr. *I4/mcm*) and different magnetic properties for particular x values.  $Pr_{0.52}Sr_{0.48}MnO_3$  exhibits a ferromagnetic state below  $T_C$  = 290 K.  $Pr_{0.5}Sr_{0.5}MnO_3$  at 175 K <  $T < T_C$  = 265 K exhibits an intermediate ferromagnetic (FM) state followed by the onset of the A-type antiferromagnetic (AFM) state at  $T_N \approx 175$  K which is accompanied by a phase transformation to the orthorhombic structure (sp. gr. *Fmmm*). In  $Pr_{0.44}Sr_{0.56}MnO_3$  at  $T_N \approx 215$  K the onset of the orthorhombic A-type AFM state occurs.  $Pr_{0.15}Sr_{0.85}MnO_3$  transforms to the C-type AFM state at  $T_N \approx 260$  K.

Under high pressure, in  $Pr_{0.52}Sr_{0.48}MnO_3$  the onset of the A-type AFM state ( $T_N \approx 250$  K) accompanied by the structural transformation from the tetragonal to the orthorhombic structure of *Fmmm* symmetry was observed. In  $Pr_{0.5}Sr_{0.5}MnO_3$  at high pressures the noticeable increase of the FM – A-type AFM transition temperature from  $T_N \approx 175$  up to 230 K and formation of the phase separated state below 150 K, consisting of the mixture of orthorhombic A-type AFM phase and tetragonal phase without long range magnetic order occur. In  $Pr_{0.44}Sr_{0.56}MnO_3$  at high pressures a tetragonal C-type AFM phase ( $T_N \approx 125$  K) appears and the phase separated state is formed, consisting of its mixture with the initial orthorhombic A-type AFM phase ( $T_N \approx 220$  K) [1]. In  $Pr_{0.15}Sr_{0.85}MnO_3$  the initial C-type AFM state remains stable under high pressure. The stability of different magnetic states of  $Pr_{1-x}Sr_xMnO_3$  under high pressure is discussed. The work has been supported by the Russian Foundation for Basic Research, grant 03-02-16879.

[1] D.P.Kozlenko et al., J. Phys.: Condens. Matter 2004, 16, 2381.