# CRYSTAL AND MAGNETIC STRUCTURES OF $Sr_2FeMoO_{6-\delta}$ AT HIGH PRESSURE

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The method of solid-phase reactions using ultrasonic dispersion was used to optimize the conditions for obtaining powders of the $Sr_2FeMoO_{6-\delta}$ compound with a high degree of superstructural ordering of iron and molybdenum cations, as well as with an average particle diameter of 200 nm. To investigate the crystal and magnetic structure of the compound under study, neutron diffraction studies were carried out in the temperature range 5–300 K using a high-resolution Fourier diffractometer (FDHR) installed at the IBR-2 pulsed reactor (JINR Dubna, Russia). High-resolution neutron diffraction patterns were obtained using detectors located at average neutron scattering angles of ±152° in the d-space range of 0.6-4.5Å. The neutron diffraction patterns were analyzed using the FullProf software package [1].

According to the data of X-ray phase analysis, single-phase powders of strontium ferromolybdate were obtained with the value of superstructural ordering of Fe/Mo cations (86%). It has been established that the magnetic state of the samples correlates with their porosity, heterogeneity in size and shape of the $Sr_2FeMoO_{6-\delta}$ grains. The presence of antiferromagnetic chains in the compound reduces the probability of the formation of long-range ferrimagnetic ordering [2]. This leads to the splitting of large ferrimagnetic domains into smaller ones due to the tendency of the system to a minimum of the free energy, which consists of several components, such as magnetostatic, magnetoelastic, exchange interaction and magnetic anisotropy, which contributes to an increase in the coercive force.

The effect of pressure in a wide range of values (0.01 - 6 GPa) on the behavior of the crystalline and magnetic structures of the $Sr_2FeMoO_{6-\delta}$ double perovskite was studied by the neutron diffraction. It has been established that the $Sr_2FeMoO_{6-\delta}$ ceramic sample has a tetragonal structure with space group I4/mmm and at $T_C \sim 420$ K it passes from the paramagnetic to the magnetically ordered state. It was found that an increase in the pressure does not lead to a change in the type of crystalline and magnetic structures, and with its increase, the average value of the magnetic moment of the iron sublattice increases monotonically. In this case, the average interionic distance between the metal and the ligand in the $FeO_6$ and $MoO_6$ octahedra does not change uniformly with increasing external pressure. The <Fe-O> bond lengths decrease, while the <Mo-O> bond lengths increase.

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