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Investigation on a giant magnetoelectric effect compound $Ba_{1-x}Sr_xMg_2Fe_{12}O_{22}$ via neutron scattering techniques YAN WU, HUIBO CAO, Quantum Condensed Matter Division, Oak Ridge National Laboratory, KUN ZHAI, YOUNG SUN, Institute of Physics, Chinese Academy of Science, China, FANGWEI WANG, Institute of Theoretical Physics, Chinese Academy of Science, China — Y-type hexaferrite $Ba_2Mg_2Fe_{12}O_{22}$has a giant magnetoelectric effect (ME). The magnetic structure consists of two groups of L- (large moment) and S- (small moment) blocks stacking along the c-axis. The moments align ferrimagnetically in the same block. At zero field, it displays a proper screw magnetic structure with an incommensurate wavevector $\boldsymbol{k}$ along the c-axis below a ferrimagnetic-antiferromagnetic (FM-AFM) transition (195 K) and then transforms to a longitudinal conical phase below 50 K. Applying a small magnetic field, the material displays polarization in the conical phase. When doped with Sr, the material keeps its sensitivity to field while the ME coefficient is greatly enhanced. The transition temperatures are largely elevated and FM-AFM transition goes above room T. Meanwhile, temperature dependent neutron diffraction investigation shows new commensurate AFM peaks emerging at heavy Sr doped sample. However, size effect is not sufficient to explain the changes upon Sr doping. Comparison study of the crystal and magnetic structure of the doped samples is performed to identify the exquisite atomic position changes and the moment interaction picture differences with doping.

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