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Spin Correlation and Magnetically Induced Ferroelectricity in YMn_2O_5 J. OKAMOTO, D. J. HUANG, W. B. WU, S. L. CHENG, C. T. CHEN, National Synchrotron Radiation Research Center, Taiwan, C. Y. MOU, National Center for Theoretical Sciences, Taiwan, K. S. CHAO, S. W. HUANG, National Chiao-Tung University, Taiwan, S. PARK, S-W. CHEONG, Rutgers University, USA — There is great interest in understanding the microscopic nature of the coupling between ferroelectricity and magnetic ordering in several multiferroic frustrated manganites $R\mathrm{MnO_3}$ and $R\mathrm{Mn_2O_5}$ (R= rare earth and Y). For $R\mathrm{MnO_3}$, the multiferroicity can be understood in terms of the anti- symmetric spin interaction, whereas the underlying mechanism of multiferroicity in $R\mathrm{Mn_2O_5}$ remains controversial, because of its structural complexity. We unraveled the temperature-dependent spin ordering of multiferroic $\mathrm{YMn_2O_5}$ by using resonant soft x-ray magnetic scattering at Mn L_3 edge. For temperatures below the onset temperature T_C of ferroelectricity, the handedness of cycloidal spin spirals exists, but vanishes above T_C. The spin handedness perpendicular to the induced polarization reverses at the temperature where the polarization changes its sign. The temperature dependence of spin correlation along the propagating direction of spin spirals resembles the temperature behavior of polarization. These data imply that both symmetric and antisymmetric spin interactions involve in the magnetoelectric coupling in $\mathrm{YMn_2O_5}$.

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