Poster

Coupling between spin and lattice in an XY-like spin-glass (Ni0.40Mn0.60)TiO3

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Synchrotron-based resonant inelastic X-ray scattering (RIXS) and X-ray absorption spectroscopy (XAS) experiments were performed to probe the nature of XY-like spin-glass (SG) focusing on the spin-flip (magnon) excitation and lattice distortion in single-crystal Ni0.4Mn0.6TiO3 (NMTO) close to the spin-glass temperature (TSG). RIXS provides clear evidence of crystal field (d-d) excitations at the Ni and Mn L3-edge, but the magnon is observed mainly at the Ni L3-edge RIXS at the scattering of NMTO close to TSG. Temperature-dependent extended X-ray absorption fine structure (EXAFS) measurement further reveals a large increase of the Ni-O bond length along the c-axis and phonon softening that is caused by the large static disorder of Ni sites near TSG, suggesting that the spin-lattice coupling that is associated with the anti-symmetric Dzyaloshinskii–Moriya (DM) interaction involved magnetic exchange interaction in NMTO. Ni L3,2-edge X-ray magnetic circular dichroism (XMCD) measurement revealed the ferromagnetic/ferrimagnetic ordering of Ni+2 ions in NMTO near TSG. This phenomenon is consistent with the measured magnetic hysteresis (H-M) curve, which exhibits the ferromagnetism/ferrimagnetism that is probably caused by a non-collinear or canted-type spin orientation of Ni^{2+} ions in the ab-plane of NMTO.