MS28-O3

New dedicated neutron scattering instrument for complex magnetic structures POLI

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As one of the most powerful methods for investigating nuclear and magnetic structures, neutron diffraction (especially polarized neutron diffraction) plays a key role in better understanding complex magnetic and domain configuration in multiferroics, heavy fermion superconductors, frustrated systems and other complex magnetic materials. Polarized single-crystal diffractometer POLI at MLZ[1] employs non-polarized double-focusing monochromators in combination with high-efficiency ^{3}He cell polarizers, which lead to a gain in both flux and resolution in comparison with other short-wavelength polarized neutron diffractometers using Heusler-alloy monochromators. With flexible instrument setups, namely: (1) classical single crystal neutron diffraction in extreme environments like high magnetic fields, very low/high temperatures, high voltage, pressure cells etc. and their combinations; (2) polarize neutron diffraction (flipping-ratio measurements) using high magnetic field[2] and (3) zero-field spherical neutron polarimetry (SNP) using the third generation Cryopad[3], and rather high flux of hot polarized neutron, POLI raises to a powerful tool in complex magnetic structure research. In this report, we will show the strength of instrument in study magnetic structures. Several examples of applications in resolving different challenging aspects in crystal, magnetic and domain structure of complex magnetic material will be presented. Examples of (1) basic magnetic structure refinement, (2) magnetic structure studies under very low temperature and high pressure, (3) distinguish magnetic spin density wave, helicoidal or cycloidal chiral structures, (4) separate incommensurate structures with very long period, (5) magnetic domain study with depolarization analysis using SNP setup. Our versatile instrument gives a unique access to understanding complicated magnetic structures and offers a good starting point for further exploring dynamics in novel magnetic physics.

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MS28-O4

Revisiting the magnetic structure of $La_{1/3}Sr_{2/3}FeO_3$ by neutron powder diffraction

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$La_{1/3}Sr_{2/3}FeO_3$ is reported to show a $2Fe^{4+} \rightarrow Fe^{3+} + Fe^{5+}$ charge disproportionation (CD) accompanied by Fe^{3+}/Fe^{5+} charge ordering (CO) and a metal-insulator (MI) transition at 200 K [1]. The MI transition was ascribed to CD and CO. Based on the CO, the magnetic structure was reported to be *P*-3m1 or *P*1 from the neutron diffraction studies performed at 50 K and 15 K, respectively [2]. The former seems not to be a correct solution since the presence of rotoinversion -3 is incompatible with the claimed collinear magnetic structure, with the collinear moments in the ab-plane in R-3c metric; and the latter might be a correct solution, but without any symmetry restrictions in space group *P*1. In this study, the magnetic ordering this compound has been revisited by neutron powder diffraction down to 2 K [3]. From full symmetry analysis, a chiral helical model and a collinear model are proposed. The neutron diffraction pattern is equally well fitted by either model.

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