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Unconventional magnetic domains in helical and ferrimagnetic phases of multiferroic $Sr_3Co_2Fe_{24}O_{41}$ HIROSHI NAKAJIMA, Osaka Prefecture University, HIROMASA KAWASE, Osaka University, ATSUHIRO KOTANI, Osaka Prefecture University, TSUYOSHI KIMURA, Osaka University, SHIGEO MORI, Osaka Prefecture University — Multiferroics, in which ferroelectricity and ferromagnetism coexist, is of great current interest in condensed matter physics. In a multiferroic hexaferrite, $Sr_3Co_2Fe_{24}O_{41}$, ferroelectricity is induced by applying a magnetic field at room temperature, which is due to a transverse helical spin structure. The temperature evolution of magnetic domain structures in the hexaferrite was investigated by means of in-situ Lorentz microscopy. We found that stripy domains ($\sim$ 20 nm in width) elongating perpendicular to the c axis were formed in the transverse helical phase. On heating from the helical to ferrimagnetic phases, the stripy domains started to disappear. As a result, the 180 magnetic domains were formed although macroscopic magnetic domains of the helical phase remained intact. These results suggest that the stripy magnetic domains originate from the helical spin structure and have no long-ranged coherence along the c axis. Furthermore, magnetic vortex structures were revealed to appear in a magnetic field of 100 mT above 480 K, which originates from the high magnetic anisotropy in the ferrimagnetic phase. Our observation suggests that the magnetic anisotropy in each phase plays an important role in the formation of the magnetic domain structures.

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