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Evolution of Domain Structures and Topological Defects in Hexagonal Manganites FEI XUE, Department of Materials Science and Engineering, The Pennsylvania State University, XUEYUN WANG, SANG-WOOK CHEONG, Rutgers Center for Emergent Materials and Department of Physics and Astronomy, Rutgers University, LONG-QING CHEN, Department of Materials Science and Engineering, The Pennsylvania State University — Multiferroic hexagonal (h-) REMnO3 (RE, rare earths) have attracted significant attentions due to their intriguing physics and potential applications. The h-REMnO3 possess six domain variants, which can cycle around vortex and antivortex cores, so called topological defects. The evolution of the domain structures and topological defects in h-REMnO3 is predicted using phase-field simulations in both two-dimensional (2D) and 3D cases. The temporal evolution of domain and vortex structures allows us to fully explore the mesoscale mechanisms for the vortex-antivortex annihilation, evolution of vortex line loops, and domain wall motion with and without external electric fields. It is demonstrated that the vortex motion and vortex-antivortex annihilation control the scaling dynamics during the domain coarsening process, while vortex line loops show three types of topological changes, i.e., shrinking, coalescence, and splitting. It is also shown that an in-plane external strain can unfold the vortex domains into incommensurate domains.

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