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Landau theory of composite domain walls and vortices in multiferroic hexagonal manganites SERGEY ARTYUKHIN, U Groningen, KRIS DELANEY, NICOLA SPALDIN, UC Santa Barbara, MAXIM MOSTOVOY, U Groningen — Multiferroic materials with their coexisting magnetic and ferroelectric orders may find applications in memory devices. In hexagonal manganites, where electric polarization is induced by a periodic lattice distortion, ferroelectric and magnetic domain walls are firmly locked[1] even though electric polarization and spin ordering are decoupled in the bulk. Recent measurements showed that electric polarization changes sign at the boundaries of structural domains and revealed the existence of unusual vortices where six structural domains merge and the electric polarization changes sign six times around the defect.[2,3] We present a phenomenological theory of coupled lattice, charge and spin degrees of freedom in hexagonal manganites, which we use to calculate how electric polarization, structural distortions and magnetic ordering vary at the domain walls and vortices, and how the shape of these defects changes in an applied electric field.

[1]M. Fiebig et al., Nature 419, 818 (2002).
[2]T. Choi et al., Nature Materials 9, 253 (2010).
[3]M. Mostovoy, Nature Materials 9,188 (2010).

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