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Vortex interactions and formation of vortex networks in hexagonal $YMnO_3$ SERGEY ARTYUKHIN, KARIN M. RABE, DAVID VANDERBILT, Rutgers University, MAXIM MOSTOVOY, University of Groningen — Multiferroic materials with their coexisting magnetic and ferroelectric orders are of pressing interest for spintronics and information storage technology. In hexagonal manganites there is an additional order, structural trimerization, which strongly interacts with both charge and spin degrees of freedom [1,2]. This results in the clamping of structural, ferroelectric and antiferromagnetic domain walls and gives rise to the appearance of multiferroic vortices [3,4,2]. Motivated by the recent experiments of the group of S-W. Cheong visualizing vortex networks formed in $YMnO_3$ at different cooling rates, we use Landau-type theory and electronic structure calculations to study vortex network formation and interpret experimental observations. Our results emphasize the importance of strains for the understanding of vortex interactions in this material.

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