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Multiferroic vortices SANG-WOOK CHEONG, SEUNG CHUL CHAE, XUEYUN WANG, FEI-TING HUANG, YOICHI HORIBE, Department of Physics and Astronomy, Rutgers University — Hexagonal $REMnO_3$ (RE=Ho, Er, Tm, Yb, Lu) is an improper ferroelectric where the size mismatch between RE layers and Mn-O layers induces a simultaneous ferroelectric-trimerization structural phase transition [1]. The six types of ferroelectric-trimerization domains merge one point, and form a vortex or antivortices, depending on vorticity. A zoo of vortices and antivortices form into a topologically-nontrivial network, and intriguing collective magnetism develops at the domain walls of the vortex-antivortex network. In addition, we found that bound states of vortices and antivortices can also develop. We will discuss the formation of the vortex-antivortex network and the vortex-antivortex bound states in terms of the interaction between two neighboring domain walls and that between a vortex and an antivortex.

[1] T. Choi et al., Nature Mater. **9**, 253 (2010).
[2] S. C. Chae et al., PRL **108**, 167603 (2012).

Sang-Wook Cheong
Department of Physics and Astronomy, Rutgers University

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