

# Magnetoelectricity in Hexagonal Lattice

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The focus of this talk will be the hexagonal oxides that exhibit simultaneous order in their electric and magnetic ground states and the proposed non-trivial microscopic mechanisms that govern the electric field control over magnetism within these systems. I will discuss the remarkable origin of the magnetoelectric (ME) coupling in the hexagonal manganite and ferrite systems, as revealed in the course of our research<sup>1,2</sup>. Our researches showed how the geometric ferroelectricity not only induced a net magnetization but also a strong bulk ME coupling. We were led to propose the existence of a bulk linear ME vortex domain structure or a bulk ME coupling such that if the direction of the polarization was reversed so did the direction of magnetization. Our recent findings showed how these geometric ferroelectrics could be used to construct near room temperature multiferroic superlattices with strong magnetization and ME coupling<sup>3</sup>, which I will discuss as well.

[1] **Hena Das** *et al.*, **Nature Communications** **5**, 2998 (2014).

[2] YananGeng, **Hena Das** *et al.*, **Nature Materials** **13**, 163-167 (2014).

[3] Julia A. Mundy, ....., **Hena Das** *et al.*, **Nature** **537**, 523 (2016)