

MAR15-2014-020163

Abstract for an Invited Paper
for the MAR15 Meeting of
the American Physical Society

Domain walls in improper ferroelectrics as functional oxide interfaces

MANFRED FIEBIG, Department of Materials, ETH Zurich, Vladimir-Prelog-Weg 4, 8093 Zurich, Switzerland

The coexistence of magnetic and electric order in multiferroics and the resulting magnetoelectric coupling have triggered an immense research interest. The most prominent mechanisms promoting magnetic and ferroelectric order, however, tend to be mutually exclusive. As a result, multiferroics are an inherent source of “unusual” ferroelectricity. In many cases the ferroelectric state is improper, i.e., induced by the ordering of a different parameter like magnetism or strain. This secondary nature can lead to properties not normally found in ferroelectrics. In my talk I will discuss consequences for the ferroelectric domain walls of various multiferroics. For example, in magnetically induced ferroelectrics like MnWO_4 or TbMnO_3 the electric polarization within the wall is expected to rotate instead of passing through zero, as in conventional displacive ferroelectrics. This affects the distribution and propagation of the ferroelectric domains. In addition, a magnetic-field-induced rotation can reversibly charge and discharge the domain walls. In strain-induced ferroelectrics like SrMnO_3 the interplay of strain and oxygen vacancies leads to a polar state in which domain walls act as insulating boundaries to the conducting domains which therefore acts as nano-capacitors.