

Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Imaging and characterization of conducting ferroelectric domain walls by photoemission electron microscopy JAKOB SCHAAB, ETH Zurich, INGO KRUG, TU Berlin, ZEWU YAN, EDITH BOURRET, Lawrence Berkeley National Laboratory, CLAUS SCHNEIDER, FZ Juelich, RAMAMOORTHY RAMESH, UC Berkeley, DENNIS MEIER, ETH Zurich — Unusual electronic properties arise at ferroelectric domain walls due to the low local symmetry and hypersensitivity of these natural oxide interfaces to electrostatics and strain. A major challenge is to expand the experimentally accessible parameter space in order to better understand these interfacial phenomena and ultimately exploit them to design domain-wall-based next-generation devices. Here, we show that ferroelectric domain walls can be visualized based on photo-induced charging effects using high-resolution X-ray photoemission electron microscopy (X-PEEM). We probe local variations in the electronic conductance in the ferroelectric semiconductor ErMnO_3 contact-free and with nanometer resolution by mapping the kinetic energy distribution of photoelectrons. We find a pronounced domain-wall contrast which we assign to the local conductivity by a direct comparison with scanning probe microscopy data. Our experiments reveal a new and non-destructive pathway for element-specific studies of electronic and chemical domain-wall structures in ferroelectric and multiferroic bulk systems.

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Date submitted: 12 Nov 2014

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