1. Record Nr. UNINA9910300395803321

Autore	Guyonnet Jill
Titolo	Ferroelectric Domain Walls : Statics, Dynamics, and Functionalities Revealed by Atomic Force Microscopy / / by Jill Guyonnet
Pubbl/distr/stampa	Cham : , : Springer International Publishing : , : Imprint : Springer, , 2014
ISBN	3-319-05750-2
Edizione	[1st ed. 2014.]
Descrizione fisica	1 online resource (167 p.)
Collana	Springer Theses, Recognizing Outstanding Ph.D. Research, , 2190-5053
Disciplina	538.3
Soggetti	Surfaces (Physics) Interfaces (Physical sciences) Thin films Optical materials Electronic materials Spectroscopy Microscopy Nanotechnology Nanoscale science Nanoscience Nanostructures Surface and Interface Science, Thin Films Optical and Electronic Materials Spectroscopy and Microscopy Nanoscale Science and Technology
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	"Doctoral Thesis accepted by the University of Geneva, Switzerland."
Nota di bibliografia	Includes bibliographical references at the end of each chapters and index.
Nota di contenuto	Introduction -- Domain Walls in Ferroelectric Materials -- Experimental Setup -- Lateral Piezoelectric Response Across Ferroelectric Domain Walls -- Electrical Conduction at 180° Ferroelectric Domain Walls -- A Statistical Approach to Domain Wall Roughening and Dynamics: Disordered Elastic Systems -- Measuring the Roughness Exponent of

Sommario/riassunto

Using the nanometric resolution of atomic force microscopy techniques, this work explores the rich fundamental physics and novel functionalities of domain walls in ferroelectric materials, the nanoscale interfaces separating regions of differently oriented spontaneous polarization. Due to the local symmetry-breaking caused by the change in polarization, domain walls are found to possess an unexpected lateral piezoelectric response, even when this is symmetry-forbidden in the parent material. This has interesting potential applications in electromechanical devices based on ferroelectric domain patterning. Moreover, electrical conduction is shown to arise at domain walls in otherwise insulating lead zirconate titanate, the first such observation outside of multiferroic bismuth ferrite, due to the tendency of the walls to localize defects. The role of defects is then explored in the theoretical framework of disordered elastic interfaces possessing a characteristic roughness scaling and complex dynamic response. It is shown that the heterogeneous disorder landscape in ferroelectric thin films leads to a breakdown of the usual self-affine roughness, possibly related to strong pinning at individual defects. Finally, the roles of varying environmental conditions and defect densities in domain switching are explored, and shown to be adequately modelled as a competition between screening effects and pinning.