MAR05-2004-001999

Abstract for an Invited Paper
for the MAR05 Meeting of
the American Physical Society

Electrical and structural investigations, and ferroelectric domains in nanoscale structures

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Generally speaking material properties are expected to change as the characteristic dimension of a system approaches at the nanometer scale. In the case of ferroelectric materials fundamental problems such as the super-paraelectric limit, influence of the free surface and/or of the interface and bulk defects on ferroelectric switching, etc. arise when scaling the systems into the sub-100 nm range. In order to study these size effects, fabrication methods of high quality nanoscale ferroelectric crystals as well as AFM-based investigations methods have been developed in the last few years. The present talk will briefly review self-patterning and self- assembly fabrication methods, including chemical routes, morphological instability of ultrathin films, and self-assembly lift-off, employed up to the date to fabricate ferroelectric nanoscale structures with lateral size in the range of few tens of nanometers. Moreover, in depth structural and electrical investigations of interfaces performed to differentiate between intrinsic and extrinsic size effects will be also presented.