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Structure and switching of in-plane ferroelectric nano-domains in strained Pb(x)Sr(1-x)TiO(3) thin films SYLVIA MATZEN, OLEKSIY NESTEROV, GIJSBERT RISPENS, JEROEN HEUVER, BEATRIZ NOHEDA, Zernike Institute for Advanced Materials, University of Groningen, The Netherlands, MICHAEL BIEGALSKI, HANS CHRISTEN, Center for Nanophase Materials Science, Oak Ridge National Laboratory, Oak ridge, Tennesee, US — Understanding and controlling domain formation in nanoscale ferroelectrics is interesting from a fundamental point of view and of great technological importance. Increasing miniaturization allows creating complex domain structures, offering novel functionalities that could be particularly useful for the development of nanoelectronic devices. While most studies in thin films focus on domain patterns with up/down polarization for ferroelectric memories, domain structures with purely in-plane polarization have not been much investigated. However, such structures are potentially useful in optical devices or to avoid depolarization fields in ultra-thin films, as long as the domains can be addressed and switched. We use a combination of compositional substitutions and epitaxial growth on a substrate in order to tune the domain configuration. The substitution of Pb by Sr in $Pb_xSr_{1-x}TiO_3$ thin films grown epitaxially on (110)-$DyScO_3$, stabilizes a domain structure with purely in-plane polarization. In this work, we show that it is possible to stabilize and control a complex domain architecture at two different length scales, yielding periodic ferroelectric nano-domains with purely in-plane polarization. Most importantly, these in-plane domains can be switched by a scanning probe.

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