

## Superdomain structures in (101)-oriented $\text{Pb}(\text{Zr}_{0.2},\text{Ti}_{0.8})\text{O}_3$ thin films

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Ferroelectrics are well-known for coupled spontaneous polarization and intrinsic piezoelectric effect. Their large piezoelectric response and switchable polarizations (writable and erasable characteristics) are utilized in a wide spectrum of functional electronics, such as sensors, energy converters, non-volatile memories and so on.

The performance of abovementioned properties and functionalities is directly related to the multi-domain structures and dynamics of ferroelastic domain transition in ferroelectrics.  $\text{Pb}(\text{Zr}_{0.2},\text{Ti}_{0.8})\text{O}_3$  (PZT) thin films, the well known ferroelectric material, exhibit two-domain structures called *a/c* domains. These ferroelastic domains endue the systems with enhanced piezoelectricity, resulting from the high mobility of domain wall movement and correlation between *a/c* domains under the application of external electric field.

In this study, we utilized the growth of PZT thin films grown on (110)-oriented  $\text{SrTiO}_3$  (STO) substrates to reveal the relationship between macroscopic domain arrangement and microscopic lattice distortion. Upon the (110)-oriented PZT thin films, we reveal the existence of the superdomains in regular *c*-domain patterns. These superdomains are also switchable under external electric field. This study offers a new perspective, suggesting that not only the typical *a/c* domain transition but also the elastic deformation of these tiny twin domains can serve as key tunabilities of complex domain engineering.