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Fine tuning strain through composition: $Pb_xSr_{1-x}TiO_3$ on $DyScO_3$ GIJSBERT RISPENS, JEROEN HEUVER, BEATRIZ NOHEDA, Zernike Institute for Advanced Materials, University of Groningen — Strain tuning, modifying the functional properties by using epitaxial strain as adjustable parameter, has attracted much attention recently. Ferroelectrics are especially suitable for this, thanks to the strong coupling between the polarization and strain. Phase diagrams have been computed for numerous materials, showing low symmetry phases and phase boundaries where interesting properties are expected. From the experimental side, the limited number of suitable substrate materials hampers the application of strain tuning to its full potential. This issue can be circumvented by adjusting the strain state of a ferroelectric material on a particular substrate using cation substitution. We have applied this to the classic ferroelectric $PbTiO_3$ grown on $DyScO_3$. By substitution of Pb with Sr, the polarization direction can be switched from out-of-plane to in-plane. Grazing incidence diffractions (GID) results show a fully strained in-plane a_1/a_2 domain configuration, with domain walls along the <110> directions for films with a Sr content higher than 20%. The Pb rich films show a mainly out-of-plane polarization. In contrast to pure materials, the phase boundary between the in-plane and out-of-plane ferroelectric phases is accessible. This shows the potential of combining strain and composition for engineering of functional properties.

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