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Tailoring the properties of artificially layered ferroelectric superlattices MATTHEW DAWBER, NICOLAS STUCKI, CELINE LICHTENSTEIGER, STEFANO GARIGLIO, JEAN-MARC TRISCONE, DPMC, University of Geneva, Switzerland — A key attraction of artificial ferroelectric superlattices is the potential to be able to tailor the properties of the material to a particular application. Here we demonstrate that the key ferroelectric parameters, polarization and critical temperature can be tuned over a very large range in $PbTiO_3/SrTiO_3$ superlattices by varying the ratio of the layer thicknesses. It is shown that the polarization can be tuned from 0-60 $\mu C/cm^2$ and the transition temperature from room temperature to 700^oC while maintaining a perfect crystal structure and low leakage currents in these heterostructures. We developed a simple model based on Landau theory that would guide straightforward production of samples with ferroelectric properties designed for particular applications. We also explore the phase transition behaviour with temperature in superlattices with very thin $PbTiO_3$ layers where we find not only unexpected evidence of ferroelectricity but also an unusual relationship between strain and polarization.

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