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Role of ferroelectric polarization during the growth of $BaTiO_3$ /$PbTiO_3$ ferroelectric superlattices[1] RUI LIU, ALEC SUN, MATTHEW DAWBER, State Univ of NY- Stony Brook — In epitaxially strained ferroelectric thin films and superlattices, the ferroelectric transition temperature can lie above or below the growth temperature. Ferroelectric polarization and domains can evolve during the growth of a sample, and electrostatic boundary conditions may play an important role. Short-period (1/1 to 5/5) $BaTiO_3$ /$PbTiO_3$ (BTO/PTO) ferroelectric superlattices with 50% BTO composition were grown and we see a steady interface driven enhancement of piezoelectricity as the layer thickness is reduced. By contrast, the dielectric constant we measured in experiment has two characteristic regimes. Samples with layer thickness of 3 unit cells or more have higher dielectric constants than those with 2 or 1 unit cell thick layers. The ferroelectric nature was investigated by Piezoforce Microscopy and we found a domain transition from monodomain (1/1 and 2/2) to polydomain (3/3, 4/4 and 5/5) as grown. This appears to be associated with the ferroelectric state of the PTO layer during growth, i.e. if it is ferroelectric during the growth the samples are polydomain, and if not they are monodomain. Associated with this, we also found the BTO layer growth rates are strongly associated with the ferroelectric state of the PTO layers during the growth.

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