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Implication of ferroelectric during the growth of superlattices and heterostructures[1] RUI LIU, ALEC SUN, CHARLES PAN, KAIZE CHENG, ELI DOYLE, HSIANG-CHUN HSING, ANNA GURA, GIULIA BERTINO, JIN-WEN LAI, MATTHEW DAWBER, Department of Physics and Astronomy, Stony Brook University — In ferroelectric superlattices the materials are often under considerable epitaxial strain, raising their ferroelectric transition temperature to be comparable to the growth temperature. This has important consequences for the growth of superlattices and their eventual properties. For example, the as-grown polarization domain structure in $PbTiO_3$/$BaTiO_3$ (PTO/BTO) superlattices is markedly different depending on if the overall structure's transition temperature lies below, above, or oscillates around the growth temperature. More surprisingly, we found that the ferroelectric polarization of a growing structure has a strong effect on the characteristics of films grown on it. We have studied this effect by focusing on the properties of BTO thin films grown on very thin layers of PTO using a combination of XRD, vertical and lateral PFM and electrical characterization. It reveals that the ferroelectricity of PTO can induce lateral polarization domain structures in BTO grown on it. Further insight into these effects is obtained by XRD performed in-situ during the growth process at the NSLS-II ISR beamline. The results show the ferroelectricity of PTO layers can effects BTO films' growth mode and help them stay in strained ferroelectric state.

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