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Epitaxial Growth of $BaSnO_3$ using Hybrid Molecular Beam Epitaxy[1] ABHINAV PRAKASH, TIANQI WANG, Chemical Engineering and Materials Science, University of Minnesota, Minneapolis, MN 55455, CHRISTIAN M. SCHLEPÜTZ, X-Ray Science Division, Advanced Photon Source, Argonne National Laboratory, Argonne, IL 60439, BHARAT JALAN, Chemical Engineering and Materials Science, University of Minnesota, Minneapolis, MN 55455 — Using co-deposition of a chemical precursor for Sn, a solid source for Ba and an RF plasma source for oxygen, we have extended the hybrid MBE approach for the growth of stoichiometric $BaSnO_3$. First, we present a detailed growth study of SnO_2 on r-plane sapphire as a function of Sn flux, oxygen pressure and substrate temperature. High-resolution x-ray diffraction (HRXRD) and AFM showed single phase, epitaxial SnO_2 films and smooth surfaces, respectively. Three growth regimes were identified: reaction-, flux- and desorption-limited with increasing substrate temperature. Further study at constant substrate temperature revealed growth rate increases first and then becomes constant with increasing tin flux. We will then present a comprehensive study of the growth of phase-pure, smooth epitaxial $BaSnO_3$ films on $SrTiO_3$. HRXRD of 5nm $BaSnO_3$ on $SrTiO_3$ using synchrotron radiation suggest that films grow mostly coherent with out-of-plane lattice parameters of 4.20-4.25Å for different cation flux ratios, remarkably similar to the calculated value of 4.26Å using elastic tensors assuming $BaSnO_3$ grows coherent on $SrTiO_3$. Strain relaxation, stoichiometry control and their roles on the electronic transport will be discussed.

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