

Abstract Submitted
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Self-regulating MBE growth of stoichiometric BaSnO₃ films via reactive radical mechanism¹ ABHINAV PRAKASH, JOHN DEWEY, HWANHUI YUN, JONG SEOK JEONG, K. ANDRE MKHOYAN, BHARAT JALAN, Chemical Engineering and Materials Science, University of Minnesota, Minneapolis, MN 55455 — Growth of thin films comprising of element with low oxidation potential such as Sn often requires reactive oxidants such as ozone or high-pressure oxygen plasma. By utilizing the chemistry of highly reactive radical of Sn, we will present on the growth of phase-pure, epitaxial BaSnO₃ films using a hybrid molecular beam epitaxy (MBE) approach with scalable growth rates. The notable finding was that Sn radicals are very reactive to yield phase-pure BaSnO₃ films even in molecular oxygen [1]. In this approach, we use hexamethylditin (HMDT) as a tin source, a solid effusion cell for Ba and either molecular oxygen or an rf oxygen plasma source. Phase-pure BaSnO₃ films were grown at 900 °C, and oxygen pressure of 5x10⁻⁶ Torr as a function Sn:Ba ratio. *In-situ* time-dependent RHEED intensity oscillations were observed establishing a layer-by-layer growth mode and a critical thickness of ≈1 nm for strain relaxation [1]. Rutherford backscattering spectrometry and lattice constant determined using high-resolution X-ray diffraction was used to optimize cation stoichiometry. “MBE growth window” was identified where films show bulk-like lattice parameter (4.116 Å) over a wide-range of cation flux ratios. A correlation between RHEED patterns, stoichiometry, and surface morphology was established. [1] A. Prakash *et al.*, J. Vac. Sci. & Technol. A **33**, 060608 (2015).

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