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Evolution of Oxygen Vacancy Ordered Phases in $SrCoO_x$ Under Varying Molecular Beam Epitaxy Growth Conditions[1] TASSIE ANDERSEN, SAY YOUNG COOK, Northwestern University, HAWOONG HONG, DILLON FONG, Argonne National Laboratory, LAURENCE MARKS, Northwestern University — Strontium cobaltite, $SrCoO_x$ (SCO), is interesting for applications as a functional oxide, as its oxygen vacancy concentration tunes properties from an antiferromagnetic insulator (x=2.5) to a ferromagnetic metal (x=3.0). This work focuses on growth and control of vacancy content in brownmillerite (BM-SCO) and $SrCoO_{2.5+z}$ phases via molecular beam epitaxy (MBE) necessary for device and heterostructure fabrication where vacancy-induced functionalities must be controlled. In-situ x-ray oxide MBE at Sector 33ID-E of the Advanced Photon Source was used for synthesis. Films of $SrCoO_{2.5+z}$ were grown epitaxially on $SrTiO_3$ (001) via shuttered deposition of SrO/CoO_{1-2} unit-cells with different schemes. During and after growth scattered intensity in the out-of-plane direction (00L) was measured with 8 keV x-rays. X-ray Absorption Near-Edge Spectroscopy spectra at the Co K-edge (7.71 keV) were measured. Films exhibited BM-SCO and a second vacancy ordered phase, similar to the $SrCoO_{2.875}$ phase, dependent on the shutter scheme and overall deposition time. Direct growth of this phase rather than oxidation of BM-SCO to obtain $SCO_{2.5+z}$ phases suggests that this is a metastable phase that could allow for further customization of cobaltite-containing materials.

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