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Synthesis of Epitaxially Strained Brownmillerite Strontium Cobaltate ($\text{SrCoO}_{2.5}$) ERIC JIN, MATTHEW MARSHALL, JOSEPH NGAI, CHARLES AHN, FRED WALKER, Yale University — Strontium cobaltate (SrCoO_3) is a perovskite oxide predicted to have metal-insulator transitions and magnetic phases induced by epitaxial strain. The related brownmillerite phase $\text{SrCoO}_{2.5}$ has a similar structure, but contains alternating planes of oxygen vacancies in the octahedral oxygen cages of the perovskite structure. We demonstrate epitaxial growth of $\text{SrCoO}_{2.5}$ on both SrTiO_3 and LaAlO_3 substrates by molecular beam epitaxy using RF oxygen plasma. X-ray diffraction measurements show finite thickness oscillations that are characteristic of smooth films, and half-order diffraction peaks that are representative of the brownmillerite phase. We observe a single tetragonal domain when the film is deposited on SrTiO_3 with the planes of oxygen vacancies parallel to the interface. When grown on LaAlO_3 , the film contains multiple orthorhombic domains. We conclude that the observed domain structures for SrCoO_3 grown on SrTiO_3 and LaAlO_3 are due to ordering of the oxygen vacancies to reduce strain. We will also present strategies to increase the oxygen content to that of SrCoO_3 .

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