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Controlling Phase of Brownmillerite – Perovskite $SrCoO_{3-\delta}$ through Ionic Liquid Interfacing[1] ANTHONY WONG, University of Tennessee, ANDREAS HERKLOTZ, YOGESH SHARMA, DONGKYU LEE, Oak Ridge National Lab, PHILIP RACK, University of Tennessee, HO NYUNG LEE, THOMAS Z. WARD, Oak Ridge National Lab — Ionic control in oxide solids is of particular interest due to the phenomenological properties that emerge and can be manipulated specifically through the stoichiometric control of oxygen. Control over oxygen stoichiometry in strontium cobaltite has been shown to allow a reversible crystal transition from a perovskite structure with the stoichiometry of $SrCoO_3$ to a brownmillerite structure with the stoichiometry of $SrCoO_{2.5}$. This crystal transition is accompanied by transitions in the magnetic and resistive properties of the material. While these crystal transitions were previously observed at high temperatures and modulating oxygen partial pressures, we present a new method of inducing oxygen ion migration that is capable of reversible control of crystal phase at room temperature. Here, an ionic liquid is interfaced with the cobaltite surface. Applying biases of <+/- 5V to the ionic liquid gate induces the formation of an electric double layer at the interface which imparts local surface charges sufficient to draw out and reinsert oxygen ions into the underlying oxide film depending on bias direction. Crystal transitions under varying bias conditions are monitored with in-situ 4-circle x-ray diffraction and show reversible transition between the brownmillerite and perovskite structures.

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