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Mapping growth windows in strongly-correlated quaternary perovskite oxide systems by hybrid molecular beam epitaxy MATTHEW BRAHLEK, LEI ZHANG, JASON LAPANO, HAITIAN ZHANG, ROMAN ENGEL-HERBERT, Penn State University — Metal-insulator transitions, high-temperature superconductivity and colossal magnetoresistance represent a few of the many phenomena that emerge in the solid solution $A'_{1-x}A_xBO_3$. Growing these in thin film form is, however, a challenge due to the precise control required for the composition, x, as well as the stoichiometry $(A + A')$:B. The hybrid metal-organic molecular beam epitaxy (hMBE) technique has been shown to exactly control stoichiometry, but requires understanding how to interpolate the growth conditions between the end members $A'BO_3$ and ABO_3. Using the example of $La_{1-x}Sr_xVO_3$, the two-dimensional growth parameter space spanned by the flux of the metal-organic precursor vanadium oxytriisopropoxide and composition, x, can be mapped quickly with a single calibration sample using *in situ* reflection high-energy electron (RHEED), which is corroborated by X-ray diffraction and atomic force microscopy.[1] This strategy enables the identification of growth conditions that allow the deposition of stoichiometric perovskite oxide films with random A-site cation mixing. In particular, at the quantum critical point that separates the Mott-insulator ($LaVO_3$) from a strongly-correlated Fermi-liquid ($SrVO_3$) this ability to produce ultrahigh quality films allows the novel competition between disorder-effects and electron-electron interactions to be revealed. This work was supported by the Dept. of Energy (DE-SC0012375). [1] M. Brahlek, *et al* Appl. Phys. Lett. 109, 101903 (2016)

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