Abstract Submitted
for the FWS20 Meeting of
The American Physical Society

X-ray Nanodiffraction Studies of Phase Separation in Cobaltite Heterostructures[1] SCOTT SMITH, GEOFFERY RIPPY, LACEY TRINH, ALEXANDER KANE, ALEKSEY L. IONIN, MICHAEL S. LEE, RAJESH V. CHOPDEKAR, JOYCE M. CHRISTIANSEN-SALAMEH, UC Davis, MSE Dept., DUSTIN A. GILBERT, University of Tennessee, ALEXANDER J. GRUTTER, NIST, PEYTON D. MURRAY, UC Davis, Physics Dept., MARTIN V. HOLT, ZHONGHOU CAI, CNM, Argonne National Laboratory, KAI LIU, Georgetown University, Dept. of Physics, YAYOI TAKAMURA, ROOPALI KUKREJA, UC Davis, MSE Dept. — Perovskite oxides (ABO_3) present a rich and complex landscape of interrelated electronic, magnetic, and structural properties. Recently, there has been growing interest in leveraging anion stoichiometry to significantly alter and tune these functional properties. In addition, the presence of the closely related, oxygen-deficient brownmillerite (BM) phase ($ABO_{2.5}$) provides a rich phase diagram with a wide range of functional properties, which are highly sensitive to the oxygen stoichiometry and thus can be tailored via ionic control. In this talk, I will discuss $La_{0.67}Sr_{0.33}CoO_3$ (LSCO) whose oxygen stoichiometry and nanoscale functional properties can be controlled with the deposition of an oxygen getter layer such as Gd (or Nd). We utilized x-ray nanodiffraction to investigate the role of phase separation and nanoscale defects in LSCO/Gd heterostructures. Our studies show phase separation of the perovskite and oxygen-deficient BM phase for all Gd thickness ranging from 0.5 to 3 nm. A critical oxygen vacancy concentration threshold which leads to formation of extended BM filament was also observed. Our studies provide an unprecedented nanoscale survey of the phase separation in LSCO heterostructures and shed light on the formation of the metastable BM phase.

[1]Funded by UC Davis, UC Multicampus Research Programs and Initiatives, and the NSF. This research used resources of the APS and the CNM at Argonne National Labs.

Scott Smith
UC Davis, MSE Dept.

Date submitted: 24 Sep 2020 Electronic form version 1.4