Electronic Supplementary Material (ESI) for Materials Horizons.
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Supporting Information

Unusual Electrical Conductivity Driven by Localized Stoichiometry Modification at Vertical Epitaxial Interfaces

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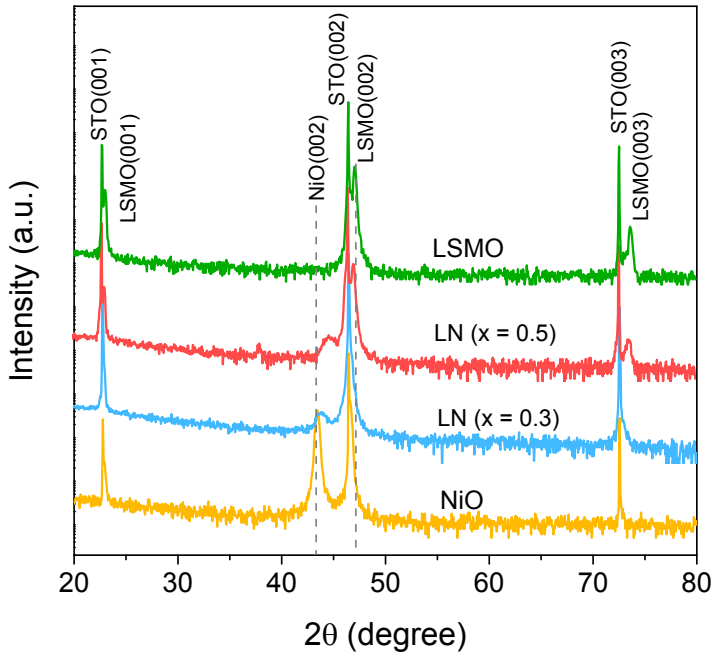

Figure S1. θ–2θ local XRD scans of LSMO, NiO, LSMO-NiO (LN) VAN films with x = 0.3 and x=0.5.

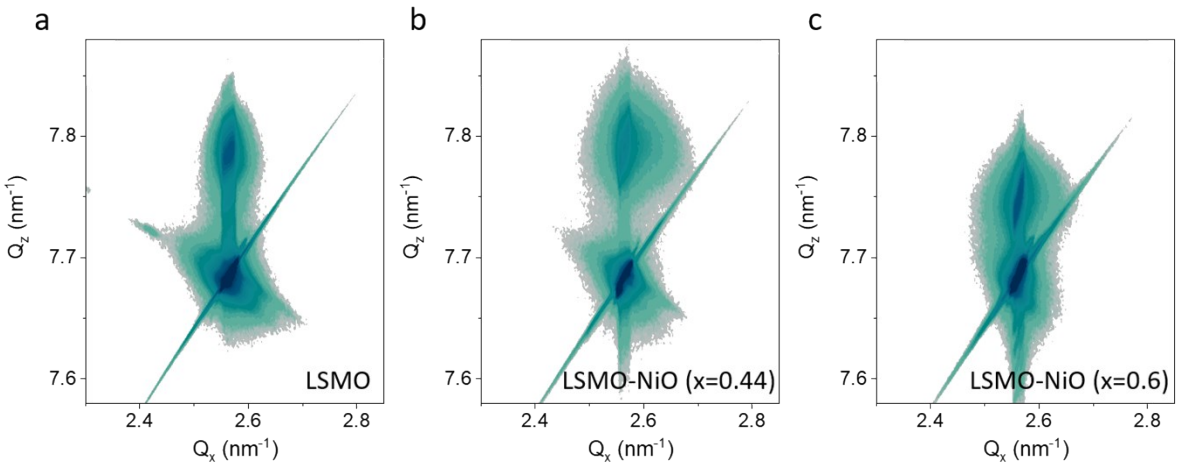

Figure S2. Reciprocal space maps near the STO(103) diffraction peak for (a) single-phase LSMO (x = 0.3), (b) LSMO-NiO (x = 0.44) and (c) LSMO-NiO (x = 0.6) VAN films.

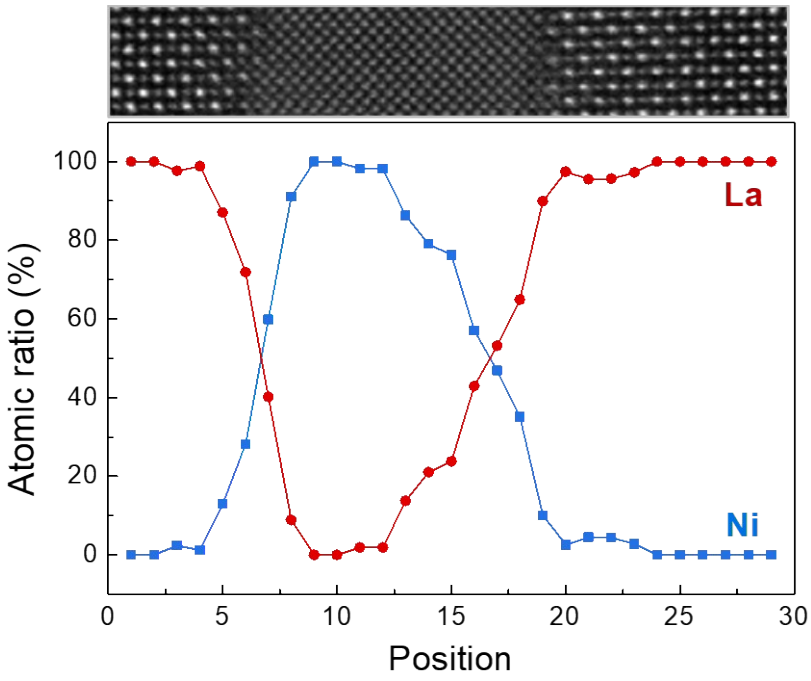

Figure S3. Atomic ratio variation for La and Ni across an entire NiO pillar with the corresponding HADDF-STEM image. The element variation was determined based on the multiple linear least square (MLLS) fitting analysis of La-*M* edge and Ni-*L* edge EESL data presented in Figure 2 of the main text.

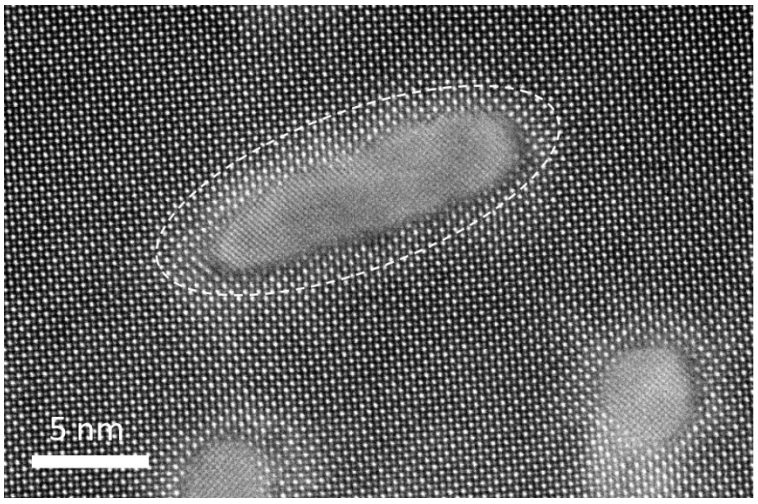

Figure S4. Plan-view HAADF-STEM image of a LSMO-NiO (x = 0.5) VAN film highlighting an elliptical NiO nanopillar with a brighter contrast region near the interface.

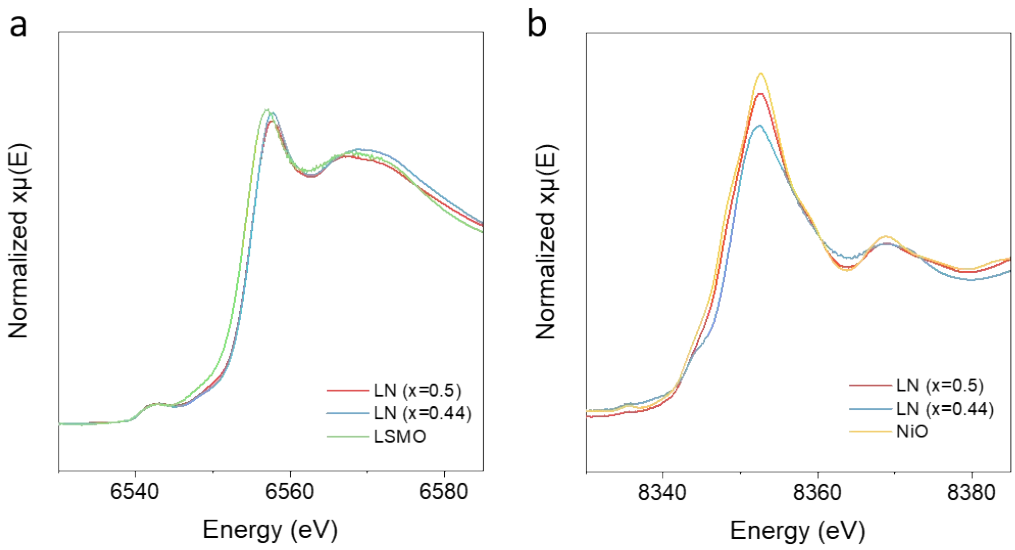

Figure S5. (a) Mn-*K* edge and (b) Ni-*K* edge XANES spectra of LSMO-NiO (x =0.44 and x = 0.5) VAN and single-phase films.

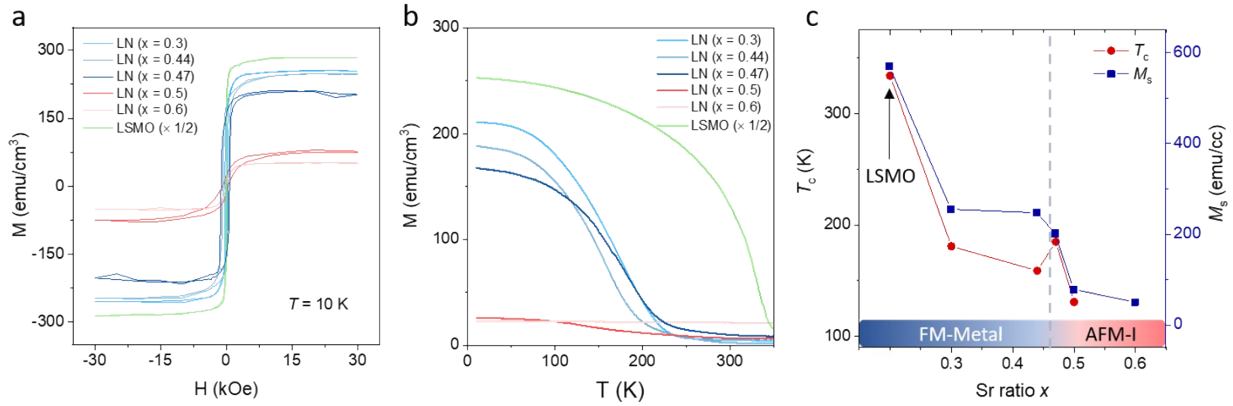

Figure S6. (a) Magnetic hysteresis curves, (b) Temperature dependent field-cooled magnetization with an in-plane magnetic field of 1000 Oe, (c) Curie temperature (T_c) and saturated magnetization (M_s) for LSMO (x = 0.3) compared to LSMO:NiO VAN films as a function of composition x.