

Article

Unusual Lattice Parameters Behavior for $\text{La}_{1.9}\text{Ca}_{0.1}\text{NiO}_{4+\delta}$ at the Temperatures Below Oxygen Loss

Denis Mishchenko¹, Zakhar Vinokurov^{1,*}, Evgeny Gerasimov², Elena Filonova³, Alexander Shmakov¹ and Elena Pikalova^{4,5}

¹ Synchrotron Radiation Facility SKIF, Boreskov Institute of Catalysis, SB RAS, 630559 Kol'tsovo, Russia; q14999@yandex.ru (D.M.); highres@mail.ru (A.S.)

² Federal Research Center Boreskov Institute of Catalysis, SB RAS, 630090 Novosibirsk, Russia; gerasimov@catalysis.ru

³ Department of Physical and Inorganic Chemistry, Institute of Natural Sciences and Mathematics, Ural Federal University, 620002 Yekaterinburg, Russia; elena.filonova@urfu.ru

⁴ Laboratory of Solid Oxide Fuel Cells, Institute of High Temperature Electrochemistry, UB RAS, 620002 Yekaterinburg, Russia; e.pikalova@list.ru

⁵ Department of Environmental Economics, Institute of Economics and Management, Ural Federal University, 620002 Yekaterinburg, Russia

* Correspondence: vinokurovzs@catalysis.ru

Supplementary Materials

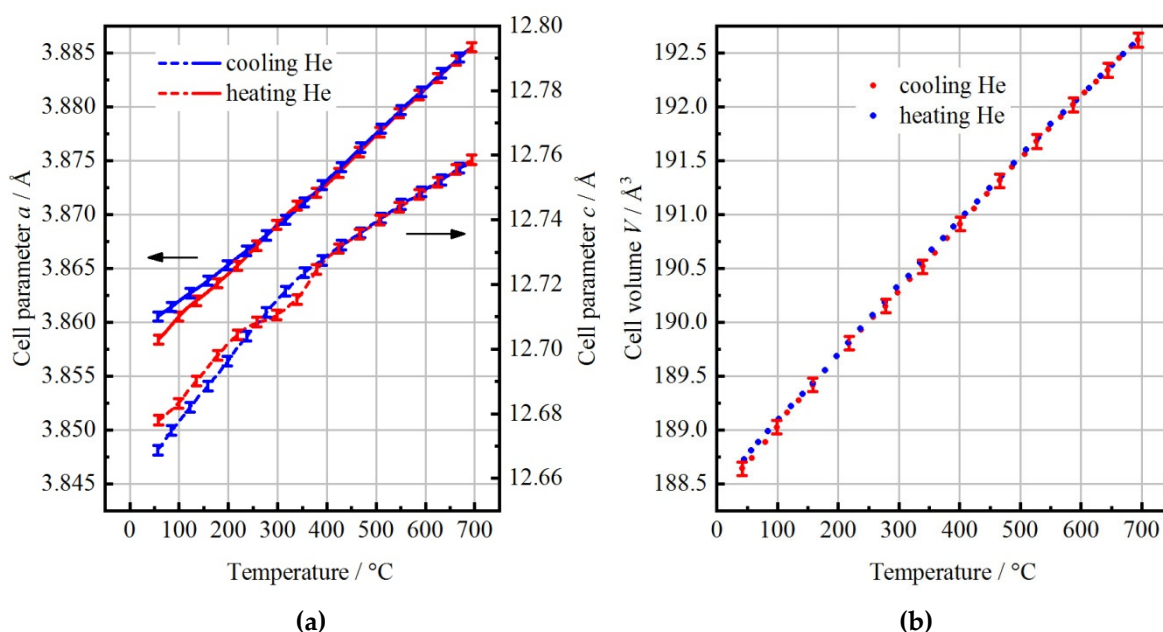


Figure S1. Lattice parameters a , c (a) and volume (b) as a function of temperature, obtained from XRD patterns for $\text{La}_{2}\text{NiO}_{4.17}$ collected in He flow.

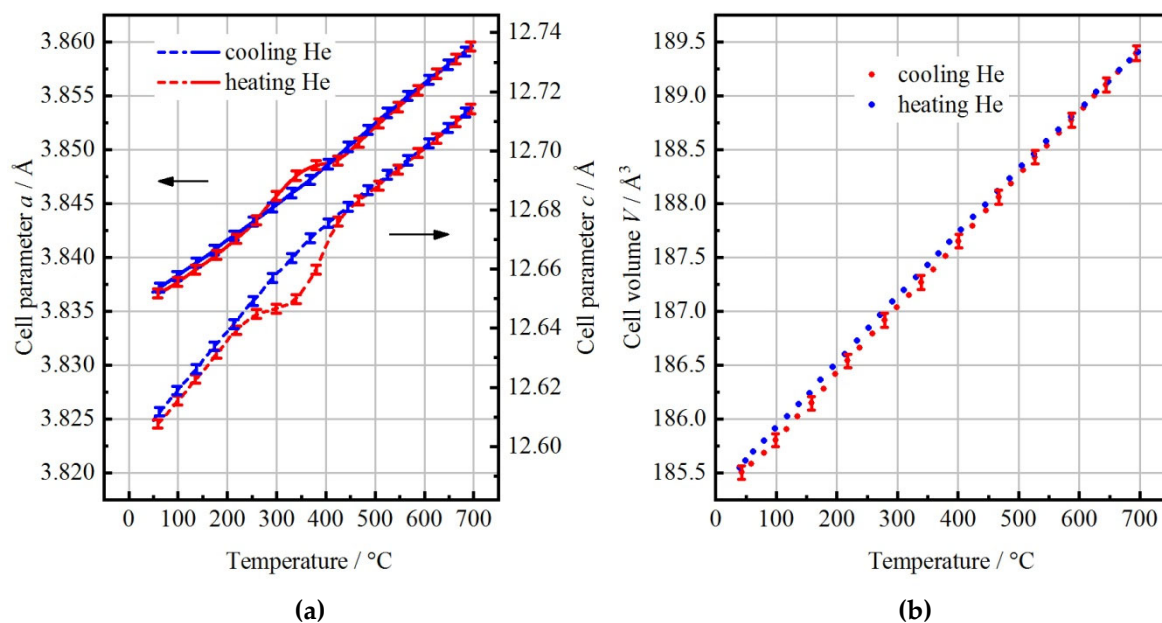


Figure S2. Lattice parameters a , c (a) and volume (b) as a function of temperature, obtained from XRD patterns for $\text{La}_{1.8}\text{Ca}_{0.2}\text{NiO}_{4.09}$ collected in He flow.

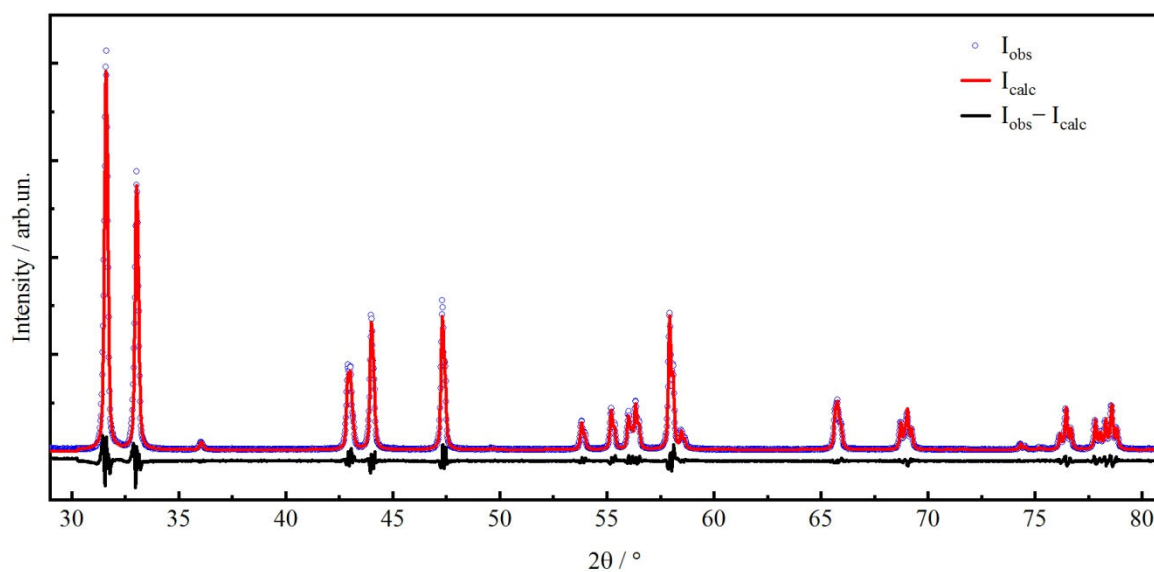


Figure S3. Rietveld refinement results of as-prepared LCNO_01 sample.

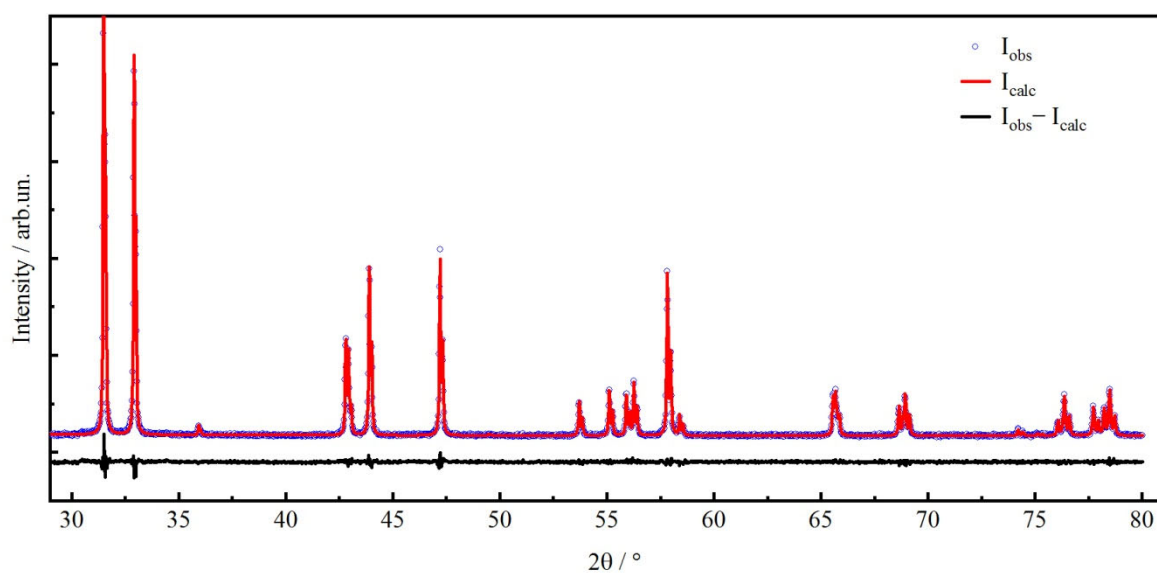


Figure S4. Rietveld refinement results of quenched LCNO_{01_q} sample.

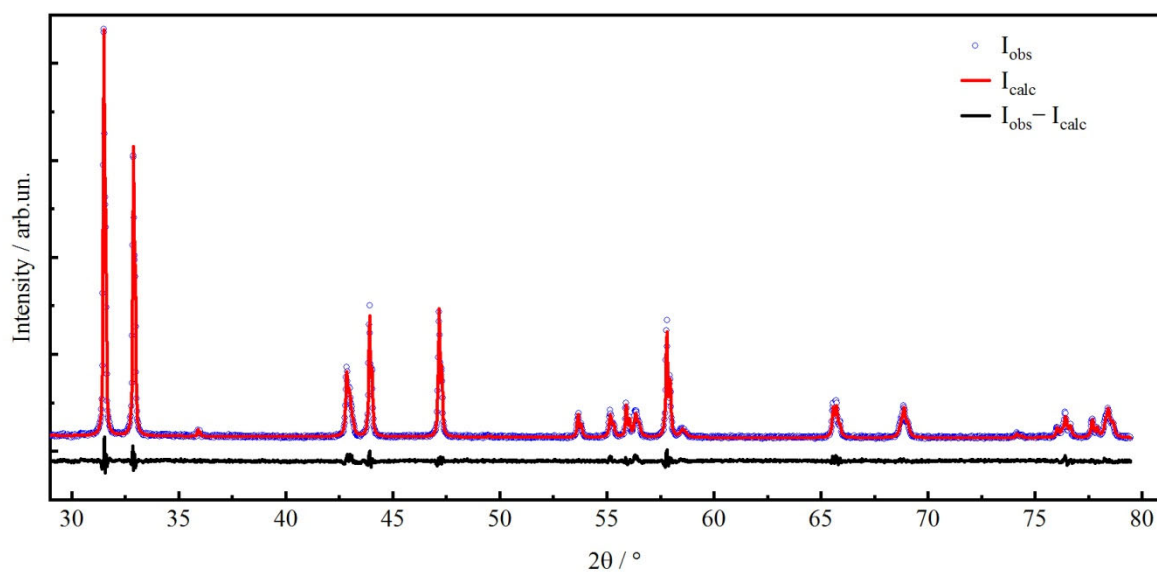


Figure S5. Rietveld refinement results of tempered LCNO_{01_t} sample.

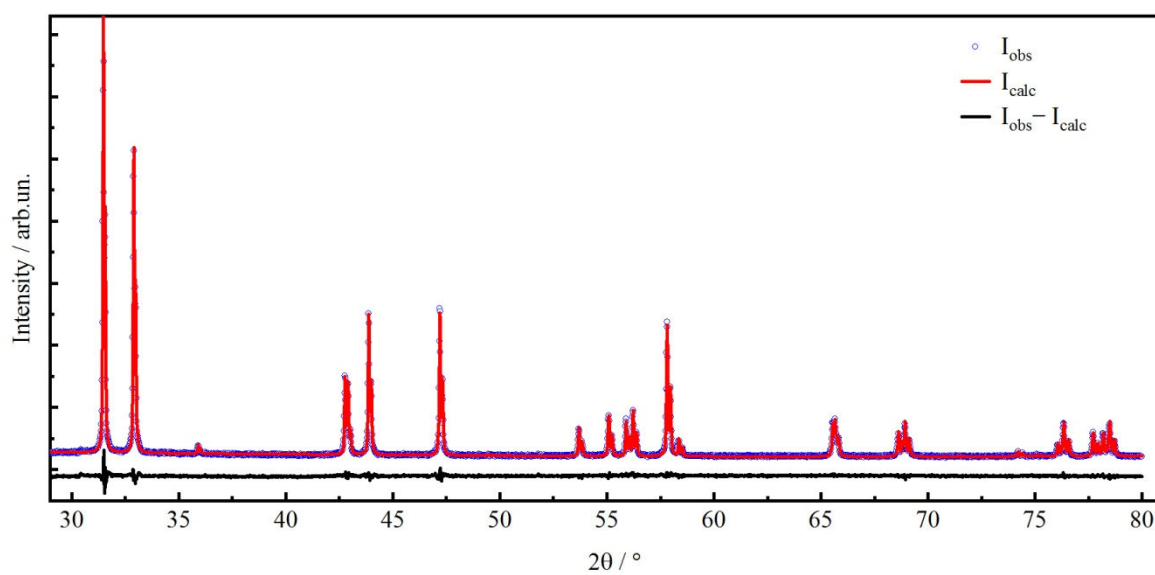


Figure S6. Rietveld refinement results of calcined at 700 °C in air LCNO_01_700 sample.

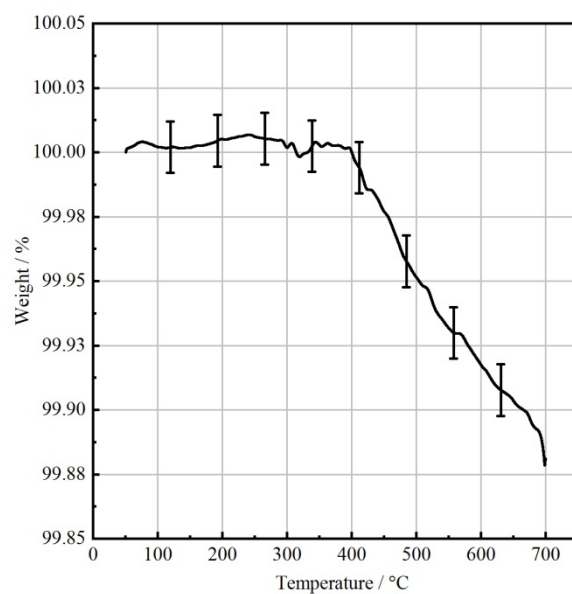


Figure S7. Weight loss curve obtained by TGA for LCNO_01_q sample.

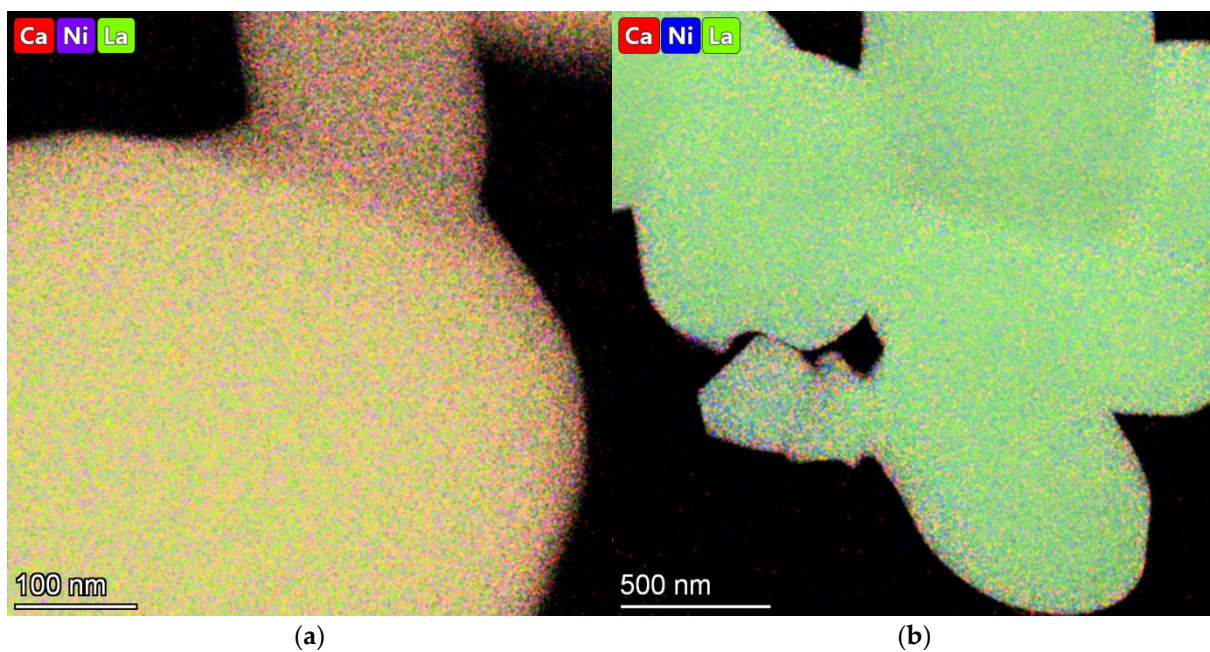


Figure S8. EDS mapping patterns of Ca, Ni and La for LCNO_01_q sample – (a,b).

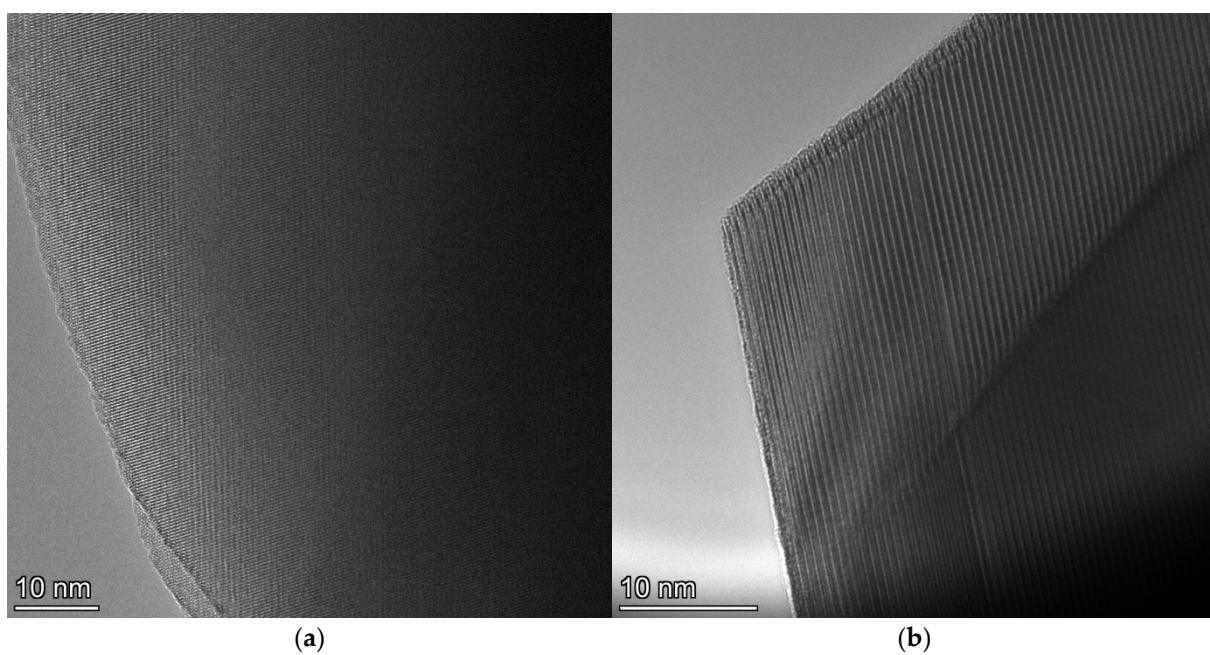


Figure S9. HRTEM image of LCNO_01_q sample – (a); occasional stacking faults in the lattice of LCNO_01_q sample – (b).

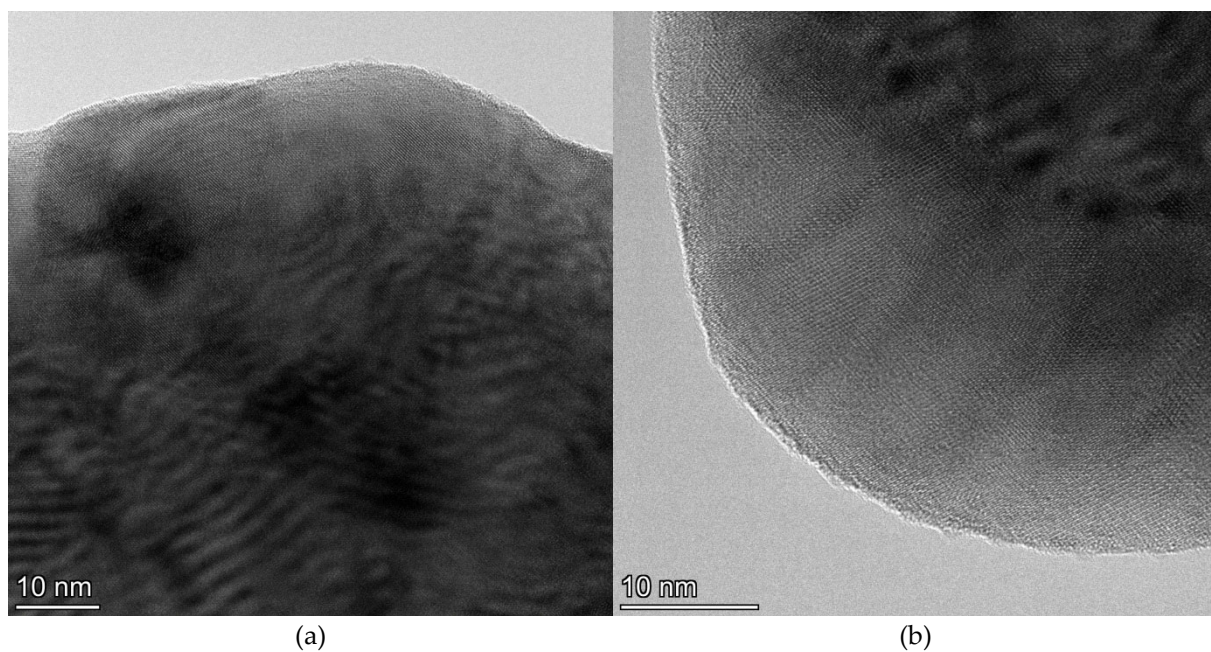


Figure S10. HRTEM images of LCNO_01_t sample showing amorphization and nano-sized particles on the surface as well as disorientated planar defects – (a), (b).

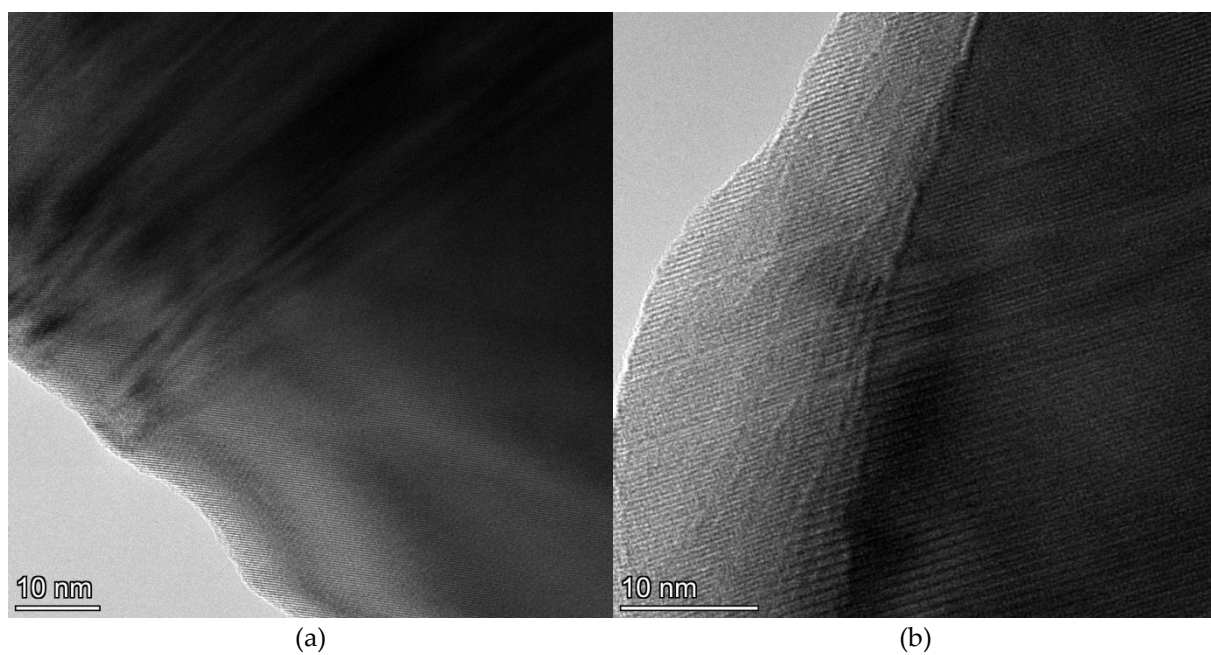


Figure S11. HRTEM images LCNO_01 sample showing ordered planar defects – (a), (b).