Supplementary Material (ESI) for Journal of Materials Chemistry

Supporting Information for

High-temperature redox chemistry of $La_{1.5+x}Sr_{0.5-x}Co_{0.5}Ni_{0.5}O_{4+\delta}$ (x = 0.0, 0.2) studied *in situ* by neutron diffraction

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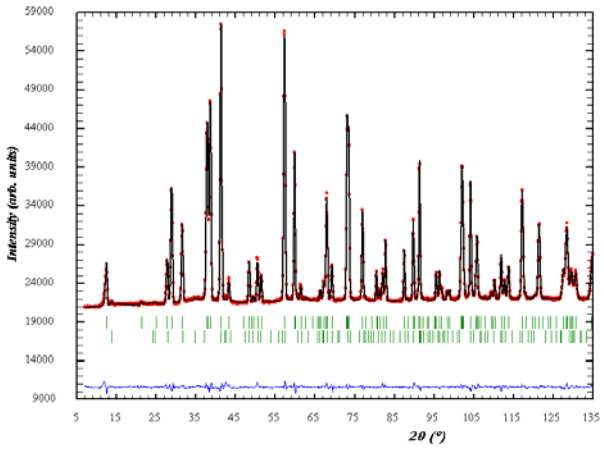
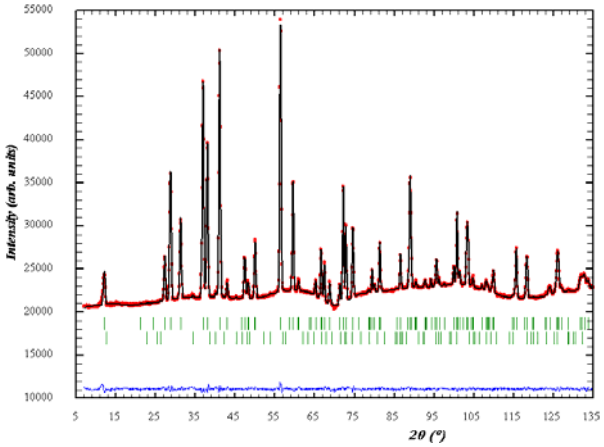
Figure S1. Rietveld refinements of the neutron powder diffraction patterns of $La_{1.7}Sr_{0.3}Co_{0.5}Ni_{0.5}O_{4+\delta}$ (x = 0.2) **(a)** at 43 °C before hydrogen reduction, **(b)** at 600 °C after reduction, **(c)** at 57 °C after reduction. The lower set of tick marks correspond to a $La(OH)_3$ impurity at 43 °C and a La_2O_3 impurity at 600 and 57 °C. The undulating background in (b) and (c) is due to diffuse scattering from the quartz tube.

Figure S2. Difference Fourier map at z = 0.25 showing the presence of an interstitial anion in as-prepared $La_{1.5}Sr_{0.5}Co_{0.5}Ni_{0.5}O_{4+\delta}$.

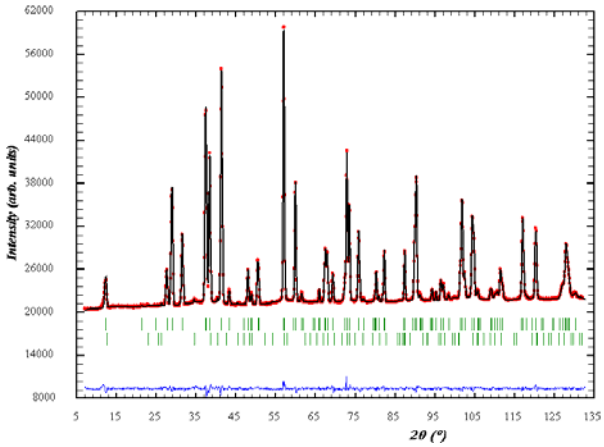
Figure S3. Difference Fourier map at z = 0.25 showing the presence of an interstitial anion at room temperature in H_2-reduced $La_{1.7}Sr_{0.3}Co_{0.5}Ni_{0.5}O_{3.90(1)}$.



(a)



(b)



(c)

Figure S1

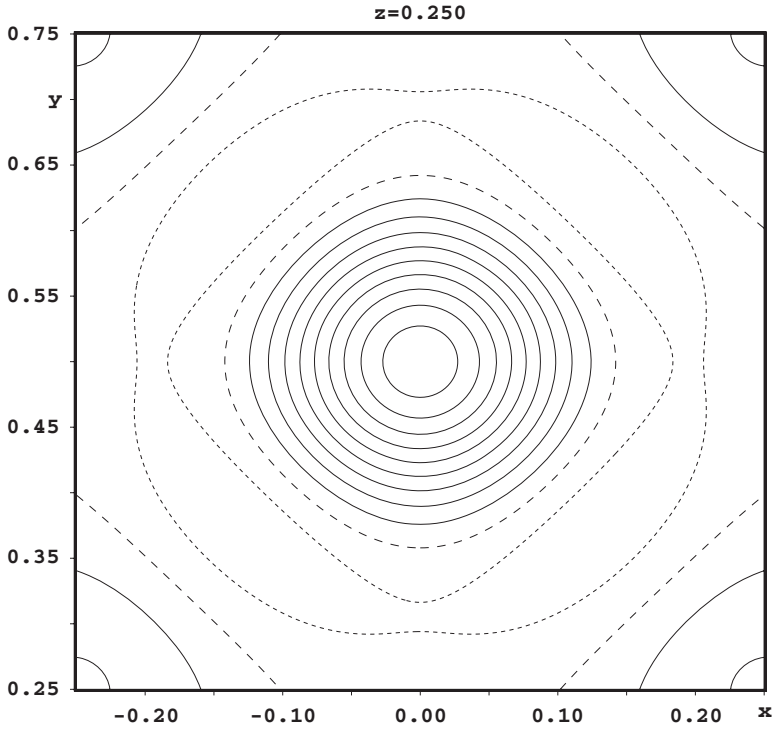


Figure S2

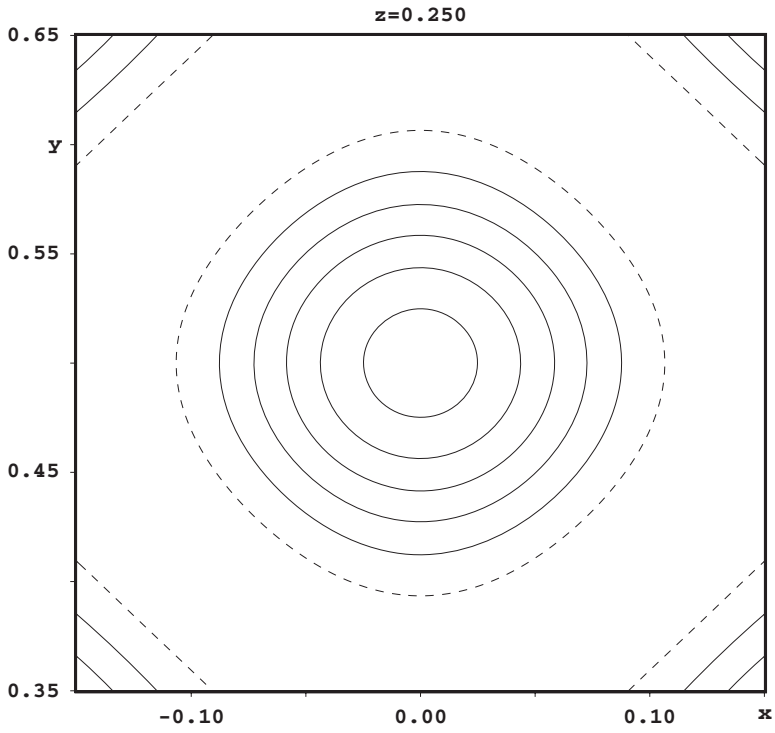


Figure S3