SUPPLEMENTARY INFORMATION

Growth of High Quality Single Crystals of Strontium doped (Nd,Pr) nickelates, $Nd_{2-x}Sr_xNiO_{4+\delta}$ and $Pr_{2-x}Sr_xNiO_{4+\delta}$

O. Wahyudi[a,b,c,d,‡], M. Ceretti[a*], I. Weill[b,c], A. Cousson[e], F. Weill[b,c], M. Meven[f], M. Guerre[a], A. Villesuzanne[b,c,g], J.-M. Bassat[b,c], W. Paulus[a]

[a] *Institut Charles Gerhardt Montpellier, UMR 5253 CNRS-Université de Montpellier, Chimie et Cristallochimie des Matériaux, Place Eugene Bataillon, 34095 Montpellier, France*
[b] *CNRS, ICMCB, UPR 9048, F-33600 Pessac, France*
[c] *Univ. Bordeaux, ICMCB, UPR 9048, F-33600 Pessac, France*
[d] *Sciences Chimiques de Rennes, Université de Rennes 1, France.*
[e] *Laboratoire Léon Brillouin, UMR 12 CEA-CNRS, Gif sur Yvette, 91191 France*
[f] *Heinz Maier-Leibnitz Zentrum (MLZ), Technische Universität München and RWTH Aachen University, Institut für Kristallographie, Outstation at MLZ, 85747 Garching, Germany*
[g] *IREET, University of Bolton, Bolton, BL3 5AB (UK)*
[h] ** Corresponding author: monica.ceretti@univ-montp2.fr*
[‡] *Present address: Shanghai Institute of Ceramics, Chinese Academy of Sciences, 1295 Dingxi Road, Shanghai, P.R.China 200050*

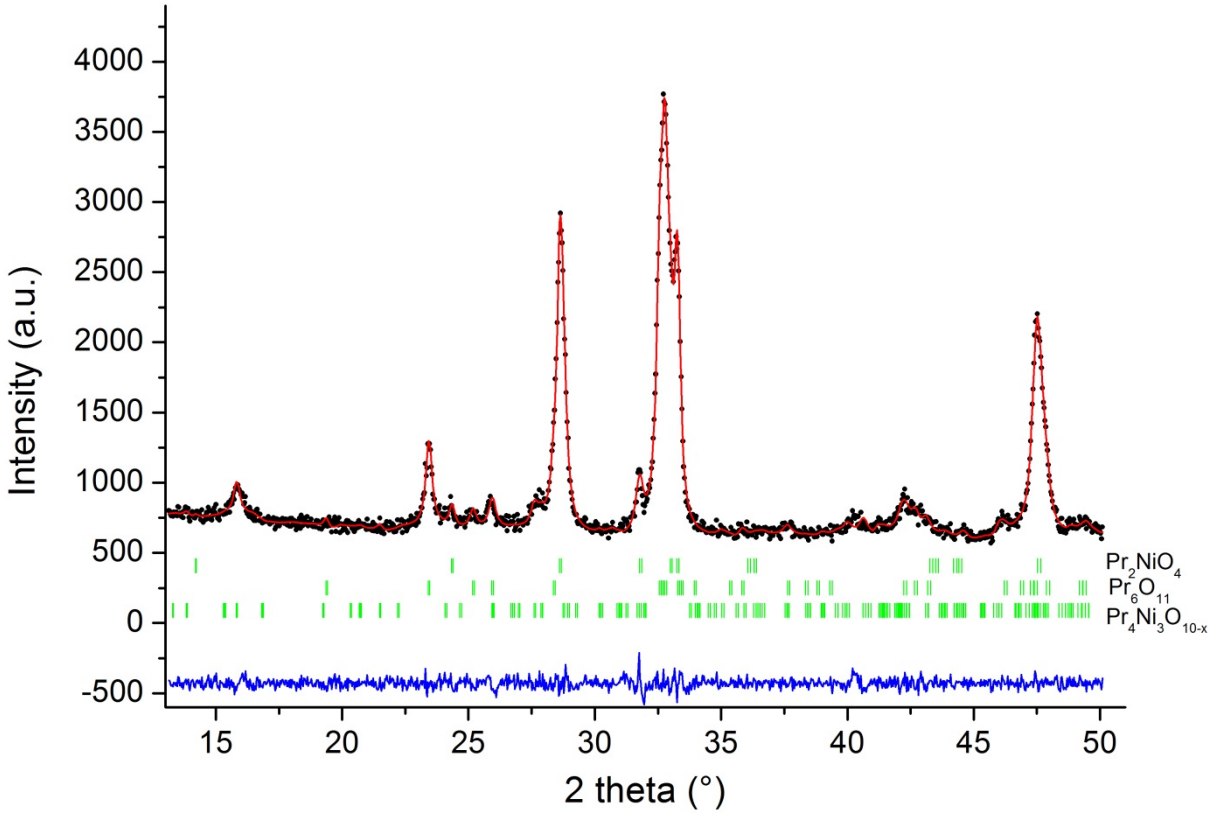

Figure S1: Characteristic XRD pattern of $Pr_2NiO_{4+\delta}$ after air heating at 1000°C evidencing the partially decomposition into Pr_6O_{11} and $Pr_4Ni_3O_{10-x}$ (*PANalytical* X'Pert powder diffractometer (Cu $K_{\alpha 1, \alpha 2}$))

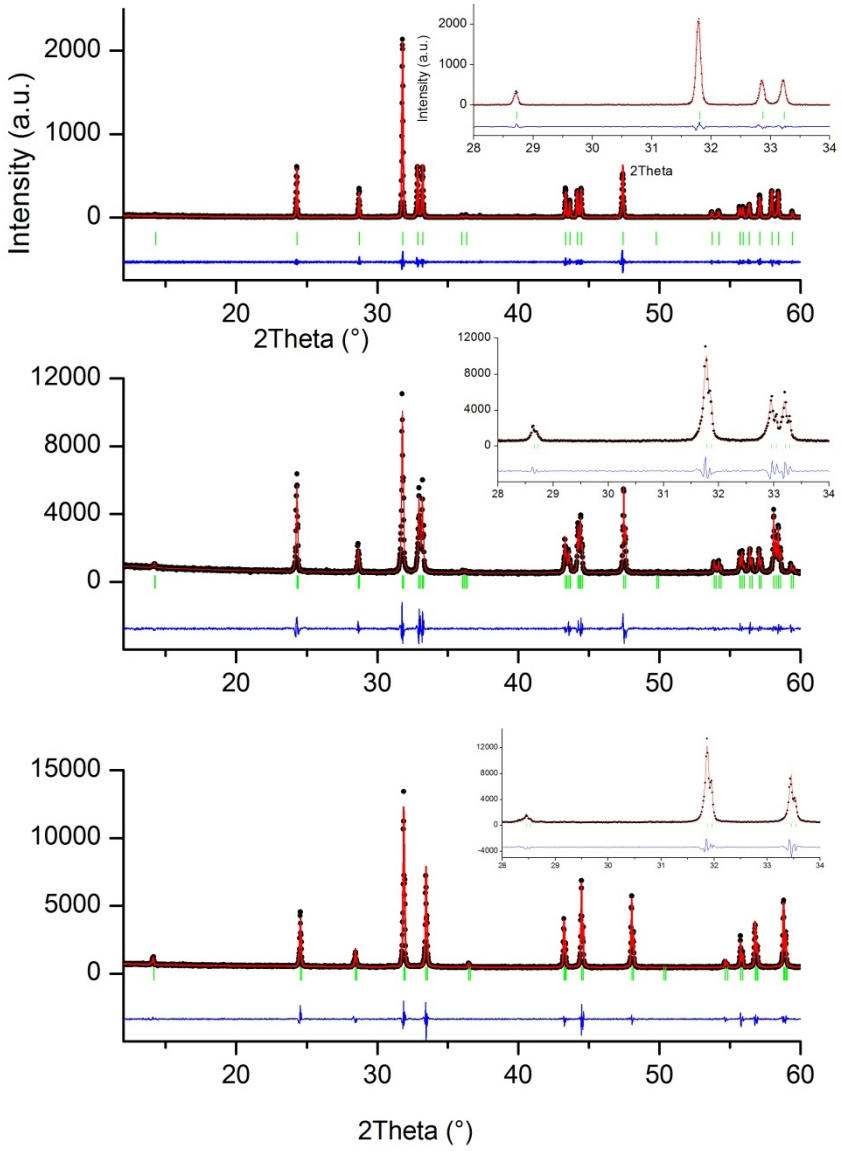

Figure S2: X-ray diffraction patterns of crushed as grown $Pr_{2-x}Sr_xNiO_{4+\delta}$ single crystals. The upper diagram was obtained for x=0.00 (orthorhombic), the middle corresponds to x=0.1 while the bottom is for x=0.5 (tetrahedral). XRD measurements have been performed with a *PANalytical* X'Pert powder diffractometer (Cu $K_{\alpha 1,\, \alpha 2}$)

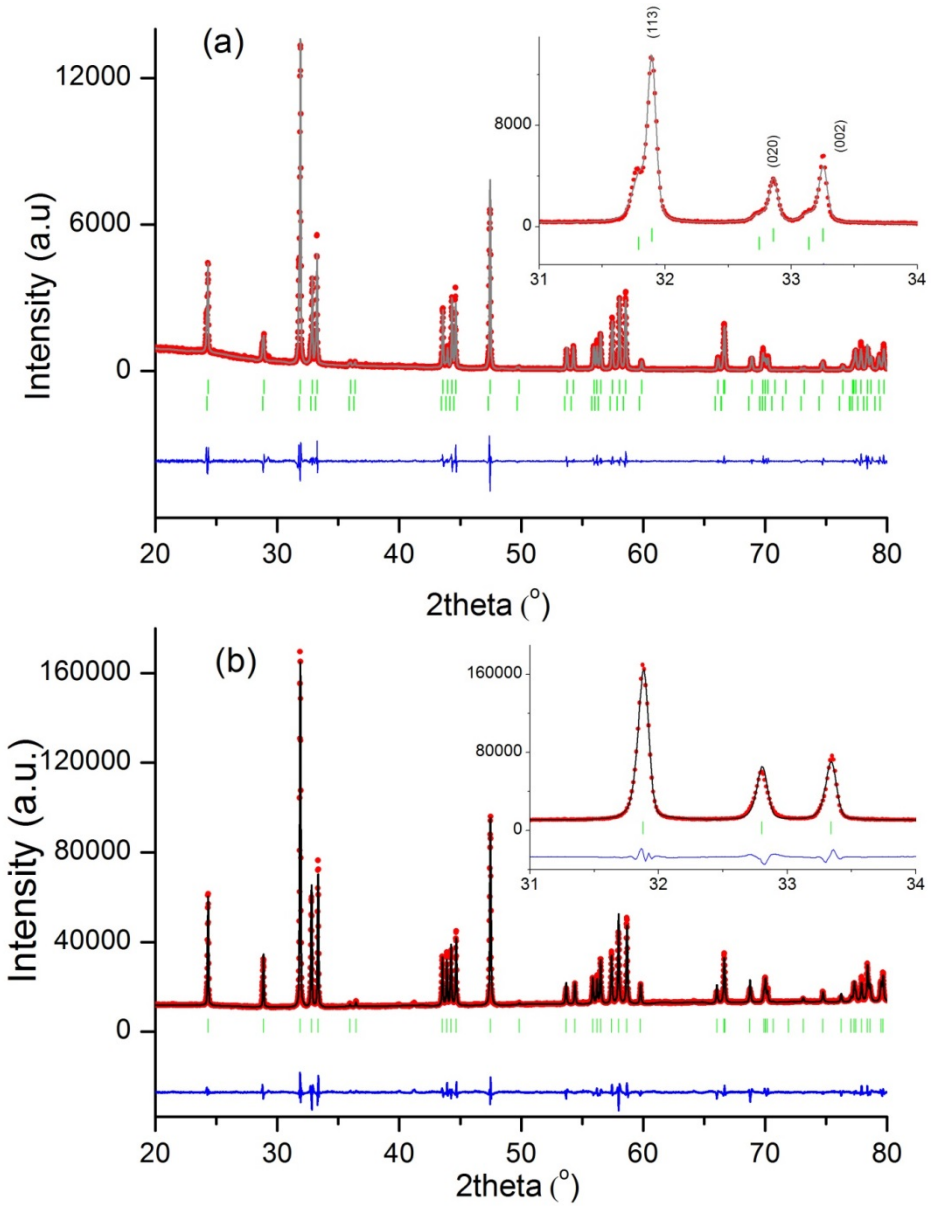

Figure S3 : XRD of the as grown undoped $Nd_2NiO_{4+\delta}$ single crystal, before (a) and after (b) annealing at 430°C. (Diffractometer BRUKER D8, Cu $K_{\alpha 1}$). The same behaviour has been observed for the doped $Nd_{2-x}Sr_xNiO_{4+\delta}$ (with x=0.1 and x=0.5) single crystals. The XRD diffraction pattern in the upper part clearly shows the presence of two phases with the same symmetry but different lattice parameters, due to the presence of a shoulder at lower two-theta angles of the (200) and (020) reflections, but also for the (113). This means that the two phases are different in the oxygen content, which has a direct consequence on the lattice parameters

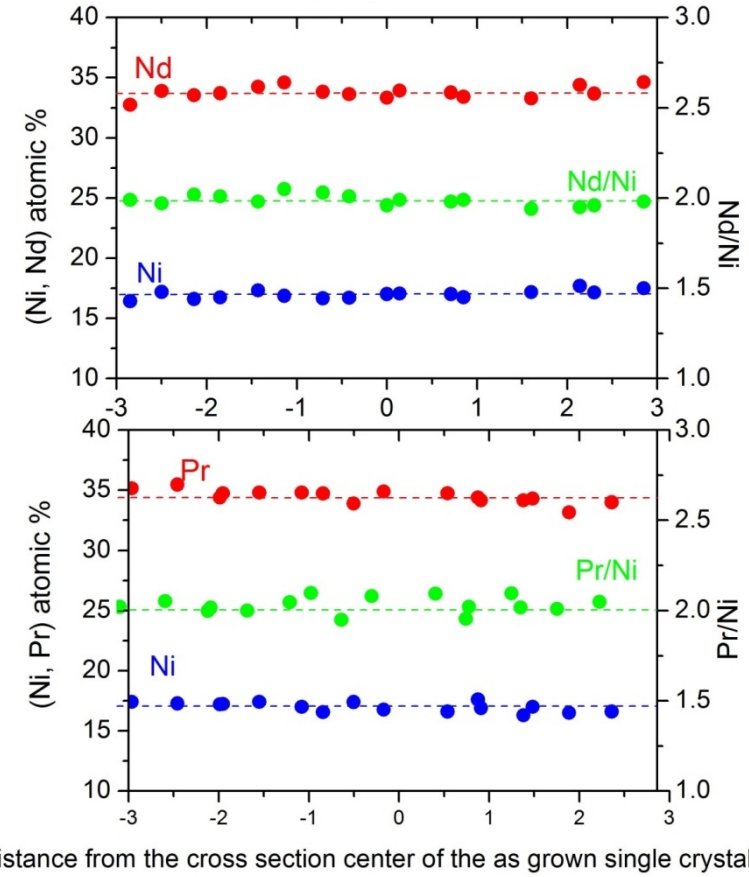

Figure S4 : Upper part: atomic percentage of neodymium and nickel, as well as the Nd/Ni ratio (around 2), distribution over a cross section of the as grown NNO single crystal. The bottom part shows the results obtained on PNO single crystal.