Growth of High Quality Single Crystals of Strontium doped (Nd,Pr) nickelates, Nd$_{2-x}$Sr$_x$NiO$_{4+\delta}$ and Pr$_{2-x}$Sr$_x$NiO$_{4+\delta}$

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**Figure S1**: Characteristic XRD pattern of Pr$_3$NiO$_{4+\delta}$ after air heating at 1000°C evidencing the partially decomposition into Pr$_6$O$_{11}$ and Pr$_5$Ni$_3$O$_{10-x}$ (PANalytical X’Pert powder diffractometer (Cu K$_{\alpha1,\alpha2}$))
Figure S2: X-ray diffraction patterns of crushed as grown Pr$_{2.5}$Sr$_x$NiO$_{4+δ}$ 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 $K_{α1,2}$)
Figure S3: XRD of the as grown undoped Nd$_2$NiO$_{4+\delta}$ single crystal, before (a) and after (b) annealing at 430°C. (Diffractometer BRUKER D8, Cu K$_{\alpha1}$). The same behaviour has been observed for the doped Nd$_{2-x}$Sr$_x$NiO$_{4+\delta}$ (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.