# *Supplementary Material*

# On the magnetic structure and magnetic behaviour of the most distorted member of the series of RNiO₃ perovskites (R= Lu)

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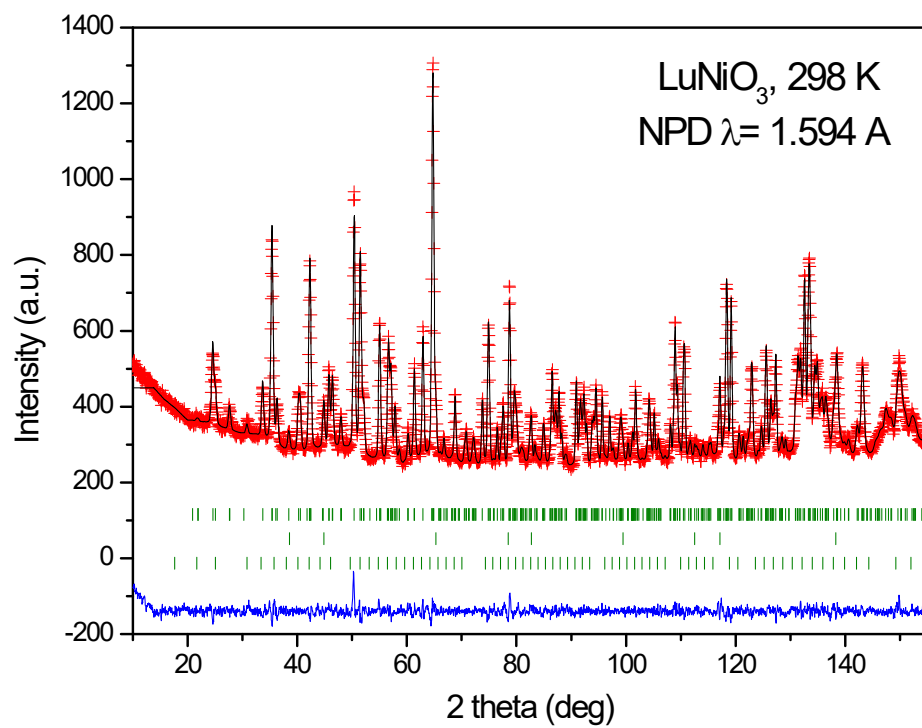
**Figure S1.** Rietveld plot of $LuNiO_3$ at 295 K, within the AFM regime. The second and third series of Bragg peaks correspond to minor NiO and $Lu_2O_3$ impurities, respectively.
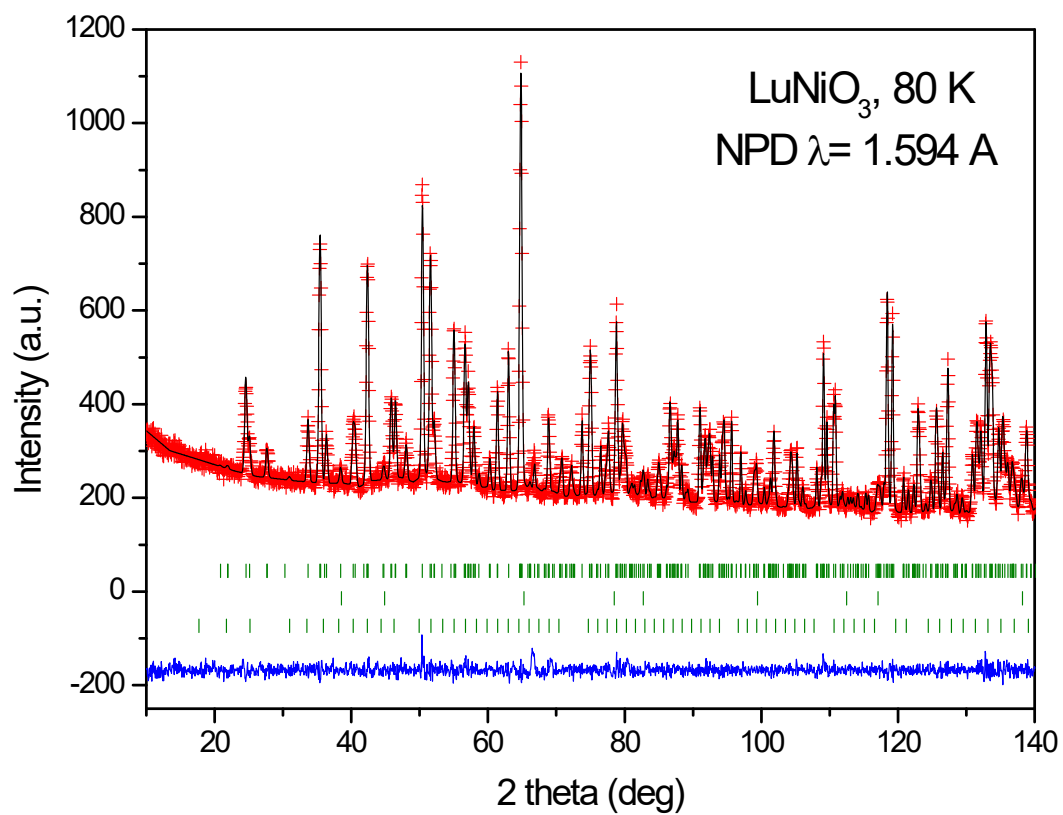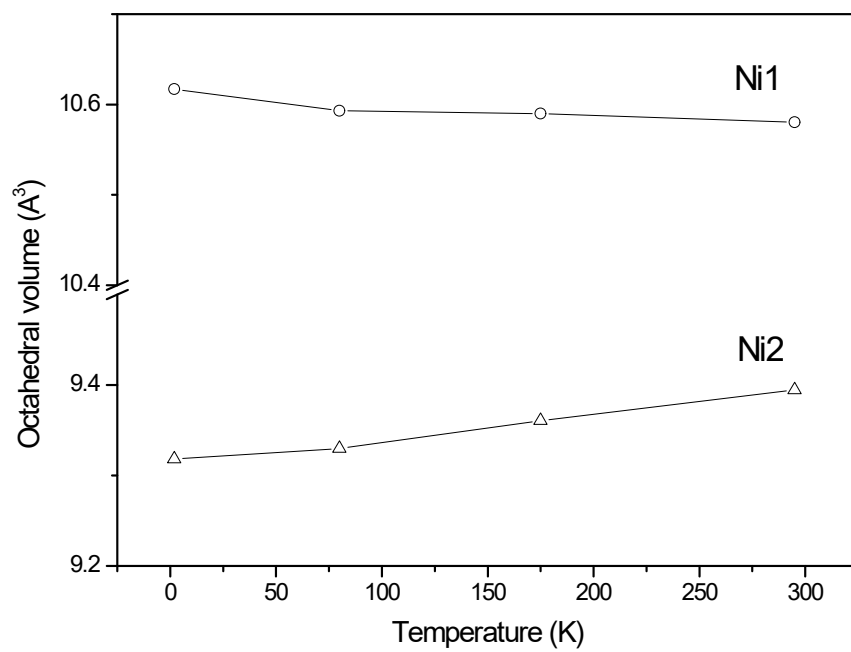
**Figure S2.** Rietveld plot of LuNiO₃ at 80 K, within the AFM regime. The second and third series of Bragg peaks correspond to minor NiO and Lu₂O₃ impurities, respectively.
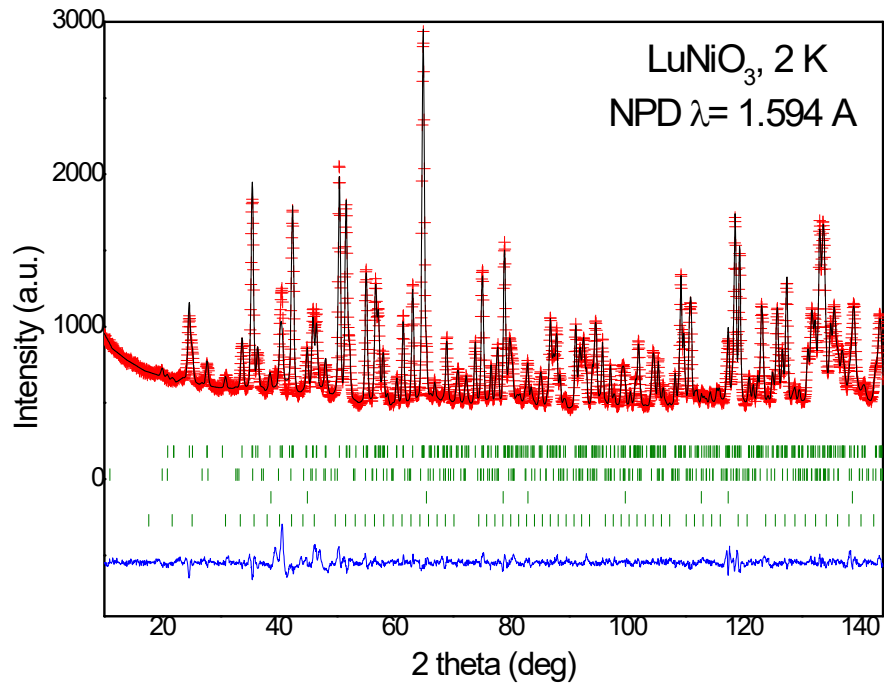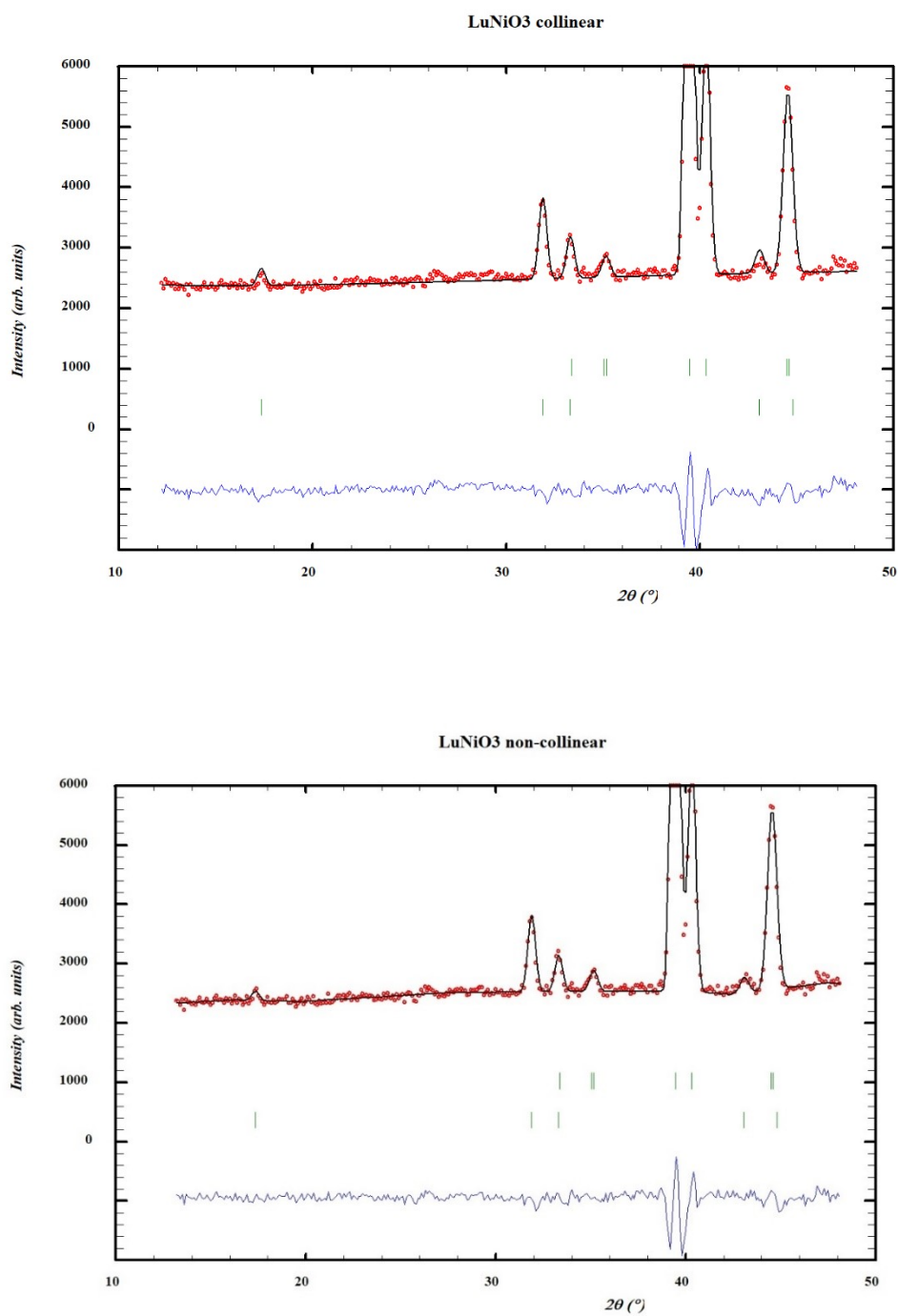
**Figure S3.** Rietveld plot of LuNiO$_3$ at 2 K, within the AFM regime. The second series of Bragg peaks correspond to the magnetic structure. The magnetic peaks are almost unappreciable in this D2B diffractometer. The third and four series of tick marks belong to minor NiO and Lu$_2$O$_3$ impurities, respectively.
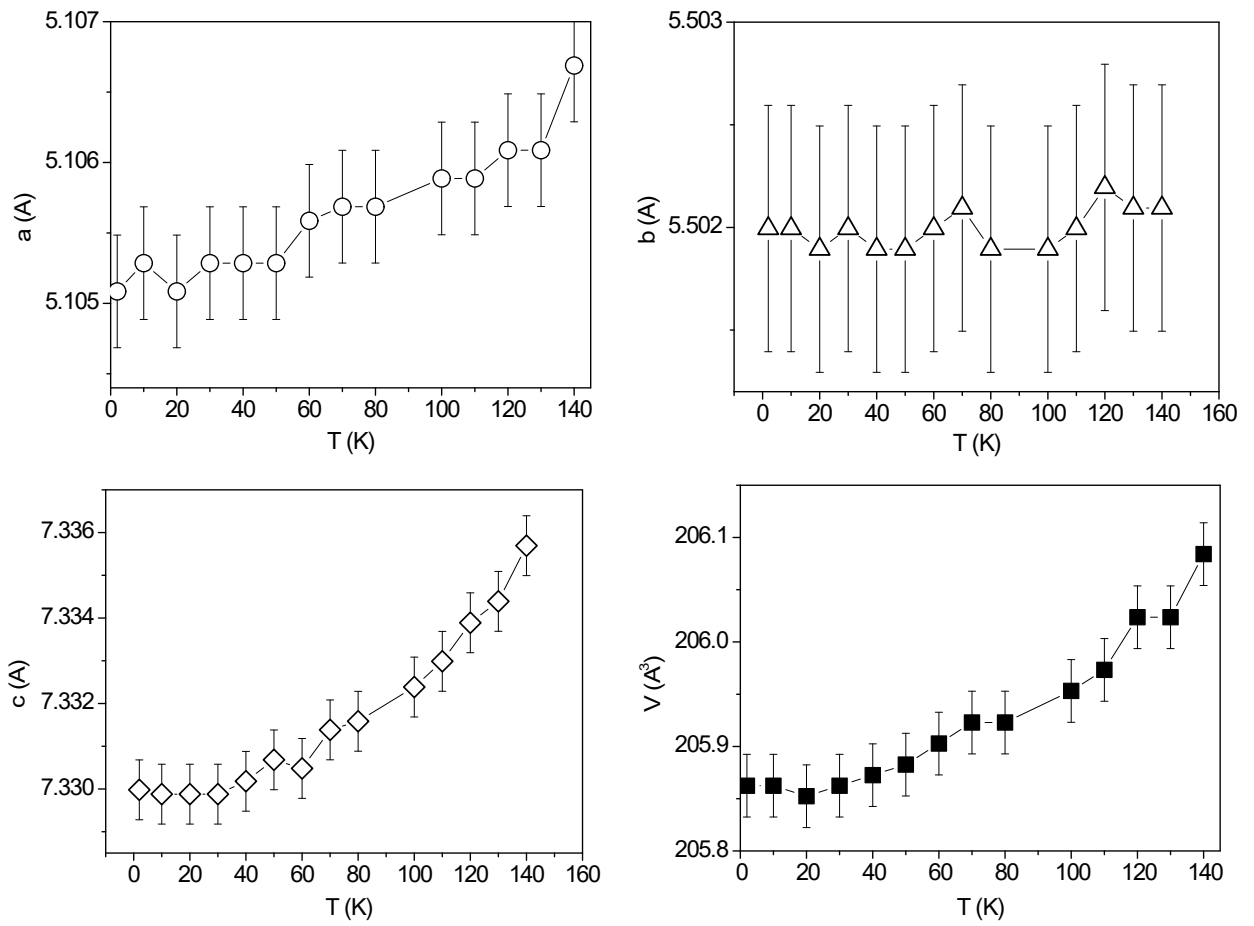
**Figure S4**. Thermal variation of the unit-cell parameters and unit-cell volume of LuNiO$_3$ determined from NPD data collected at the d1B diffractometer. The long wavelength of 2.52 Å implies large standard deviations for the lattice parameters.

**Figure S5**. Thermal variation of the polyhedral volume for Ni1O$_6$ and Ni2O$_6$ octahedra.

**Figure S6.** Close up of the Rietveld plot of $LuNiO_3$ at 2 K, for the collinear (upper Fifure) and non-collinear (lower Figure) models. within the AFM regime. The second series of Bragg peaks correspond to the magnetic structure. There is an apparent better fit from visual inspection of the first (0.5, 0, 0.5) and the forth (0.5, 1, 1.5) magnetic reflections for the non-collinear model.