

### Supplementary information

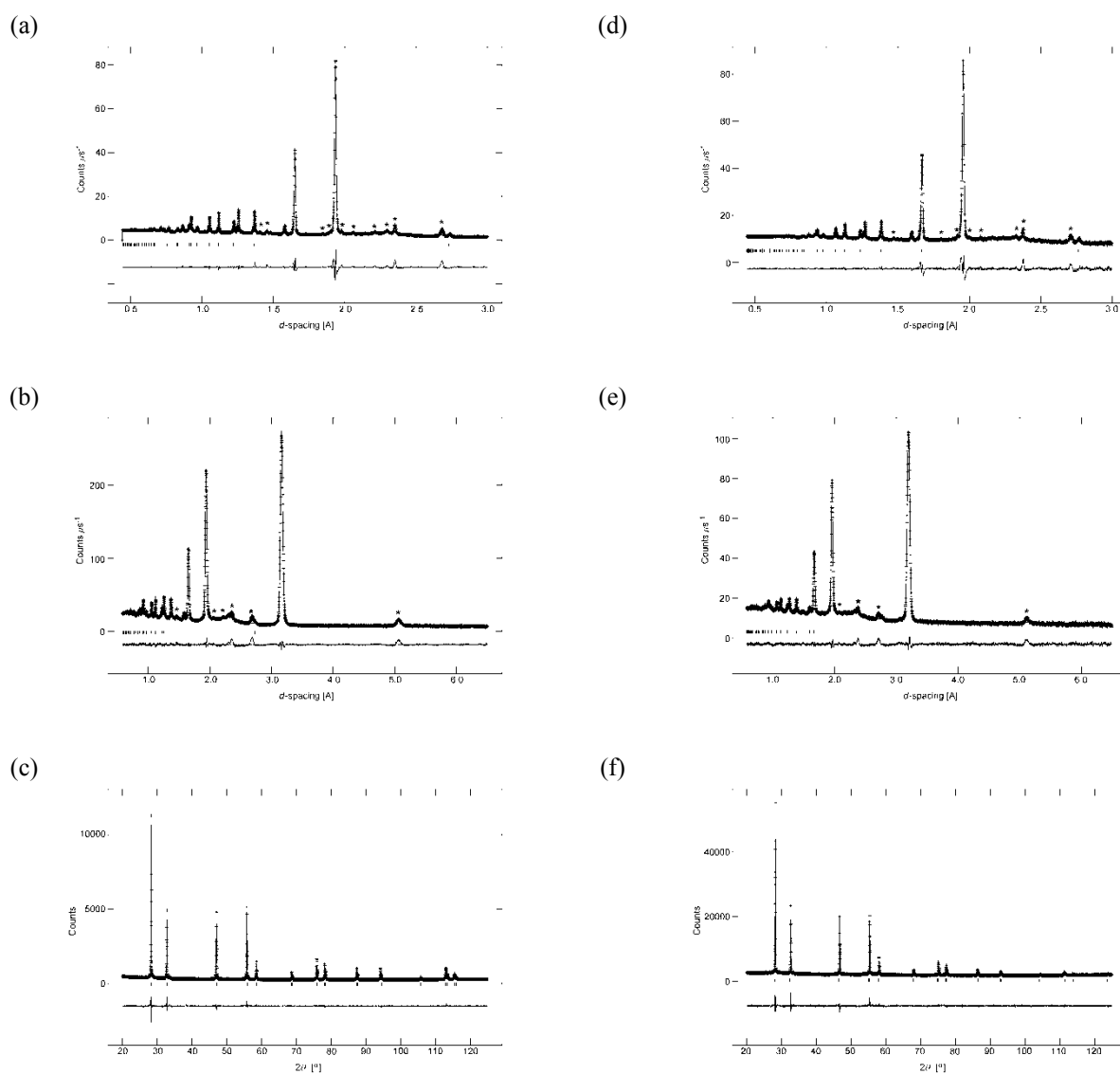


Fig. S1. Diffraction profiles for  $\text{Bi}_3\text{Nb}_{0.8}\text{Yb}_{0.2}\text{O}_{6.8}$  at room temperature (a) to (c) and 800°C (d) to (f), fitted by Rietveld analysis, showing neutron back scattering (a) and (d), neutron low angle (b) and (e) and X-ray (c) and (f) data. Observed (+ symbols), calculated (line) and difference (lower) profiles are shown, with reflection positions indicated by markers. Significant superlattice peaks are indicated by an asterisk.

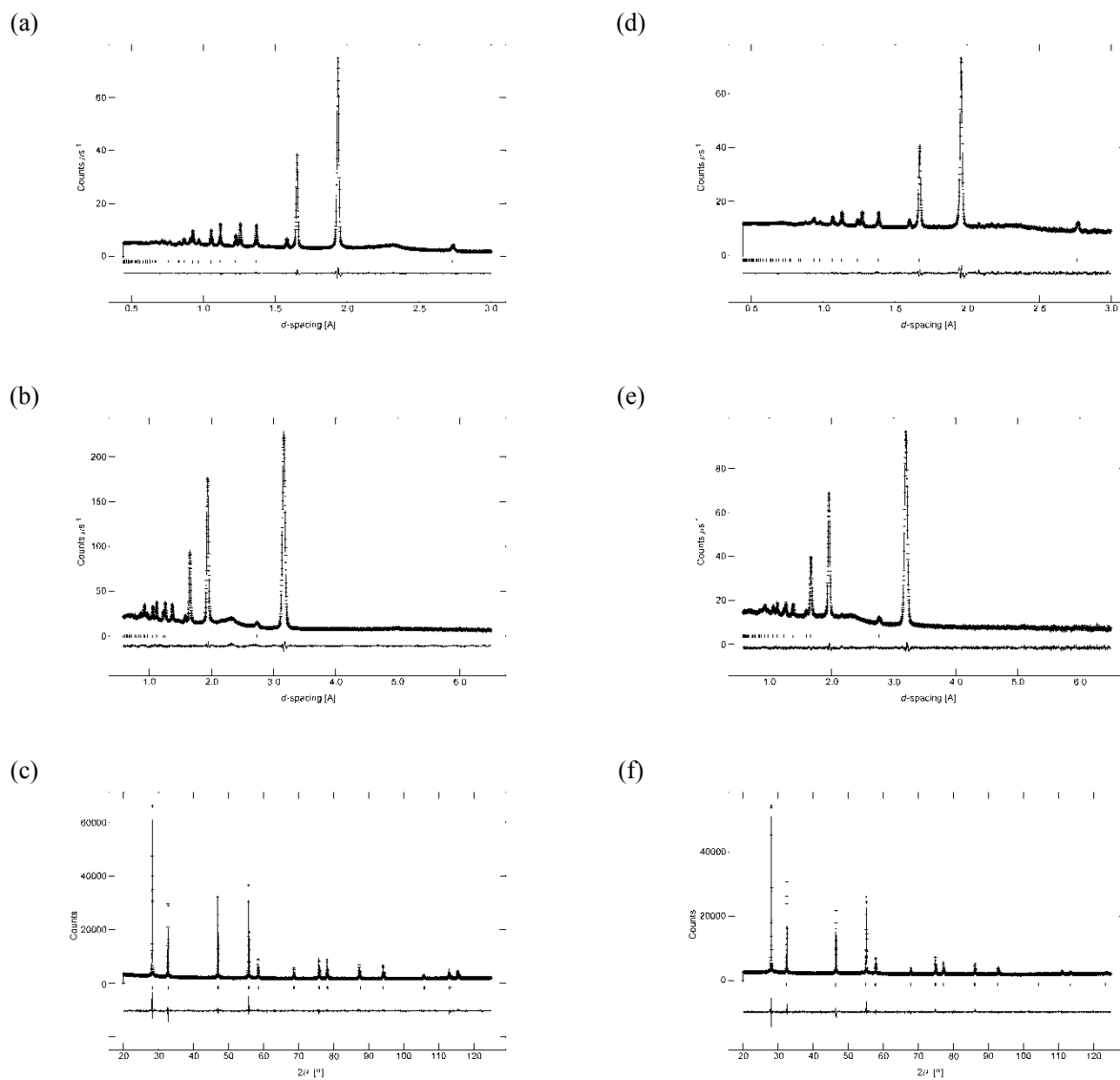


Fig. S2. Diffraction profiles for  $\text{Bi}_3\text{Nb}_{0.6}\text{Yb}_{0.4}\text{O}_{6.6}$  at room temperature (a) to (c) and  $800^\circ\text{C}$  (d) to (f), fitted by Rietveld analysis, showing neutron back scattering (a) and (d), neutron low angle (b) and (e) and X-ray (c) and (f) data. Observed (+ symbols), calculated (line) and difference (lower) profiles are shown, with reflection positions indicated by markers.

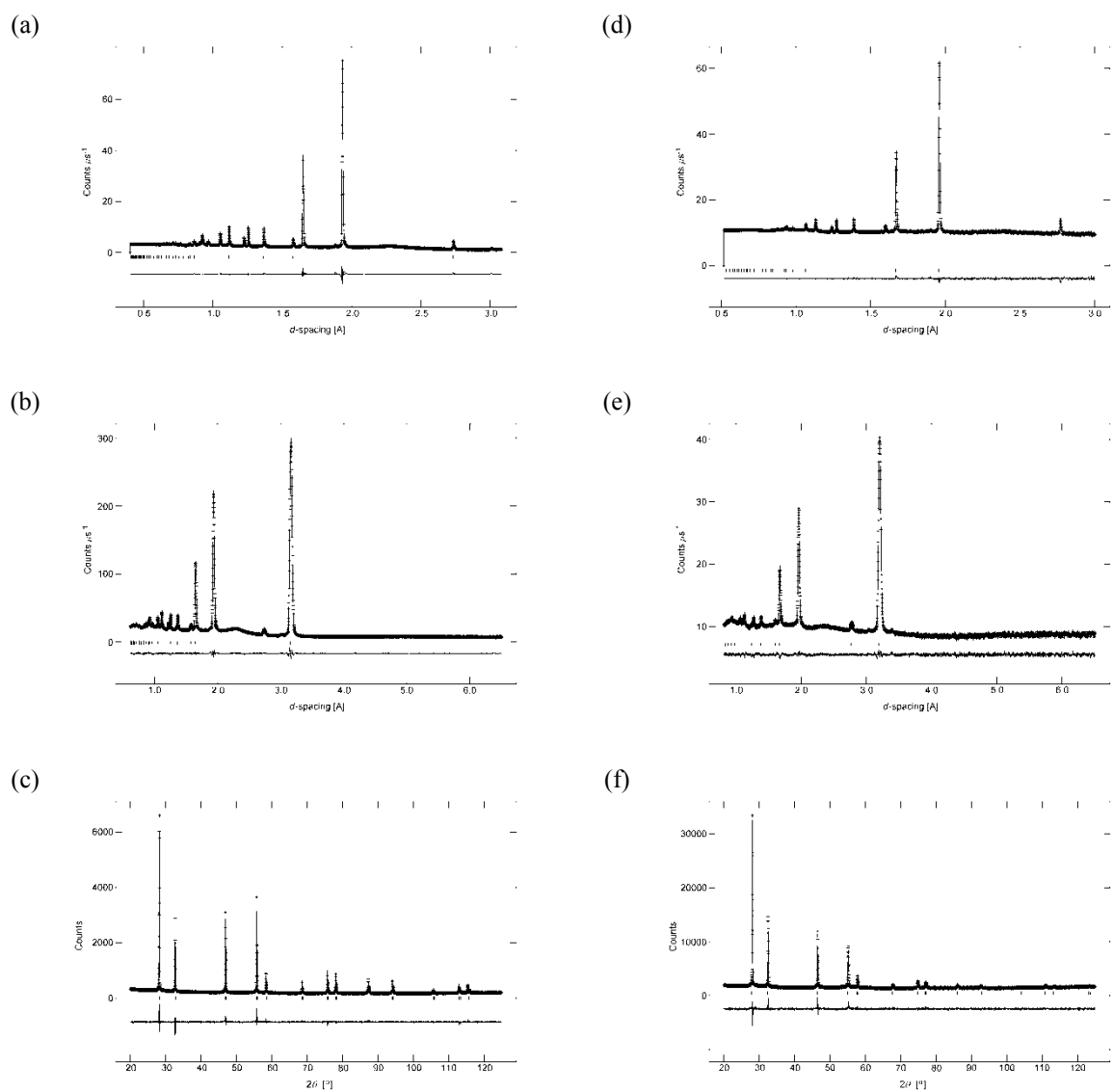


Fig. S3. Diffraction profiles for  $\text{Bi}_3\text{Nb}_{0.4}\text{Yb}_{0.6}\text{O}_{6.4}$  at room temperature (a) to (c) and 800°C (d) to (f), fitted by Rietveld analysis, showing neutron back scattering (a) and (d), neutron low angle (b) and (e) and X-ray (c) and (f) data. Observed (+ symbols), calculated (line) and difference (lower) profiles are shown, with reflection positions indicated by markers.