MS14-P29 | EVIDENCE OF ANATASE INTERGROWTHS FORMED DURING SLOW COOLING OF REDUCED ILMENITE

D'Angelo, Anita (Australian Synchrotron (ANSTO), Clayton, AUS); Webster, Nathan (CSIRO, Clayton, AUS)

Worldwide, ilmenite ($FeTiO_3$) is industrially important as it is the main source of titanium dioxide, TiO_2, which has applications in sunscreens, as pigments and in photocatalysis. Controlling the parameters during synthetic rutile production is essential to minimise production costs and ensure final product quality. To improve the properties of the final product and economics upgrading, the synthetic rutile industry simulates reactions that occur in the rotary kiln within pots. In this work, unusual and distinct changes were observed between the powder X-ray diffraction (PXRD) patterns of RIs produced after rapid and slow cooling from small and large pots, respectively. The PXRD pattern of the slow-cooled RI showed the M_3O_5 peak at 20.6° (002) 2θ was not apparent, and the peaks at 37.9° ($2\bar{0}3$) and 38.3° (203), and 47.9° (204) and 48.4° (402) 2θ had significantly decreased in intensity. Using transmission electron microscopy (TEM), selected area electron diffraction (SAED) and pair distribution function (PDF) analysis, we attribute these features to M_3O_5–anatase intergrowth formation, which causes a loss in long-range order along the M_3O_5 *c*-axis. Overall, these results demonstrate the importance of cooling rate during the formation of these materials, and may be used to guide process developments within the industry.