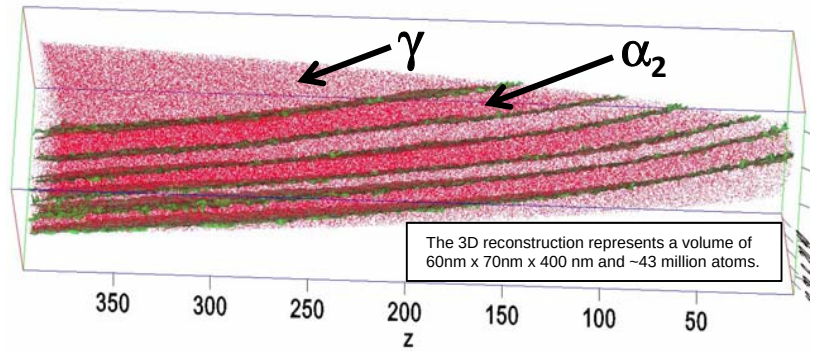
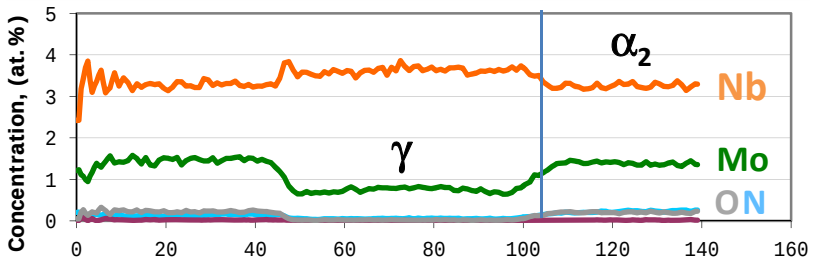
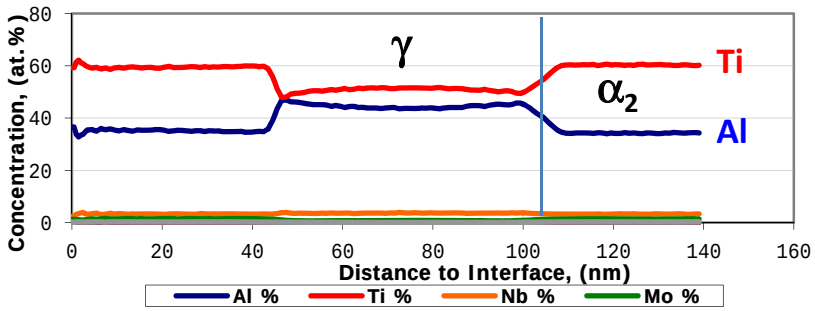
CNMS Industrial Highlight

Investigation of Oxygen in γ-TiAl Phases by Laser-Pulsed Atom Probe Tomography







Work was performed in part as User Project at the Center for Nanophase Materials Sciences.

Significance and Impact

The ability of the ORNL laser-pulsed LEAP to quantify the levels and distributions of oxygen in the different phases of the microstructure in alloys with a variety of oxygen contents, enables alloy design criteria to be established for commercial applications.

Research Details

- Mo atom map showing alternating α_2 and γ phases. Mo is enriched in the α_2 phase and depleted in the γ phase.
- A characteristic M-shaped solute profile was found for Al and Ti across the α_2 /γ interface. Ti and Mo partitioned to the α_2 phase, whereas Al and Nb partitioned to the γ phase.
- The O, N, and C partitioned to the α_2 phase compared to the γ phase. At the α_2/γ lamellar interface, the O concentration gradually increased from a lower value in the γ phase to a higher value in the α_2 phase before leveling off. There was no evidence for any oxide formation at the α_2/γ lamellar interface.