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Phase transformation and microstructural control of the α-solidifying γ -Ti-45Al-2Nb-0.7Cr-0.3Si intermetallic alloy

M.N. Mathabathe

S. Govender

A.S. Bolokang

R.J. Mostert

C.W. Siyasiya

ABSTRACT:

The γ-Ti-45Al-2Nb-0.7Cr-0.3Si based intermetallic alloy was developed. Microstructure evolution of the as-cast and heat-treated alloy yielded the spheriodised and Widmanstätten laths. High temperature differential thermal analysis (HTDTA) was performed on the as-cast Ti-45Al-2Nb-0.7Cr-0.3Si alloy in order to determine critical temperatures and provide insight into phase transformations prior heat treatment. The morphology of the alloy was analysed by the optical microscopy, scanning and transmission electron microscopy (SEM/TEM). The SEM was equipped with energy dispersion spectroscopy (EDS) for chemical composition. The EBSD mapping was employed to determine microstructural evolution. The results show that after heat-treatment the homogeneous microstructures were obtained, compared to the dendritic as-cast structure. The spheriodised laths were seen embedded inside the lamellar structure; whereas the Widmanstätten laths were observed as crossed/needle like (α_2+ γ) laths of small spacing, with a spatial orientation with respect to the lamellar structure. The structural development was determined by the X-ray diffraction (XRD).