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Effect of boundary on the alpha phase precipitation in a near-alpha titanium alloy

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Abstract:

Effect of boundary (β/β and α/β boundary) on the α phase precipitation in a near- α titanium alloy had been statistically investigated. The result shows that most grain boundary α (GB α) precipitates maintain a Burgers orientation relationship (BOR) with one of adjacent prior β grains. However, in some unique cases, the GB α did not maintain a BOR with either prior β grains due to preferential growth of equiaxed primary α (α_p). It was also observed that the low-angle β/β boundaries can be passed through by secondary α (α_s). Additionally, when an α_p grain and an adjacent β grain have a near BOR, the preferred α_s may form at α_p/β boundary with the similar orientation to the α_p due to low interfacial energy of low-angle α_p/α_s boundary.

Keywords: Titanium alloy; Microstructure; Phase transformation; Crystallographic orientation

1 Introduction

Near- α titanium alloys are widely used in turbo-fan engine components due to excellent mechanical properties [1]. A good balance of creep and fatigue strength in near- α titanium alloys can be achieved with a bimodal microstructure consisting of equiaxed primary α (α_p) grains in a transformed β matrix [2]. This type of microstructure can be obtained by heating equiaxed microstructure to the temperature corresponding to the

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