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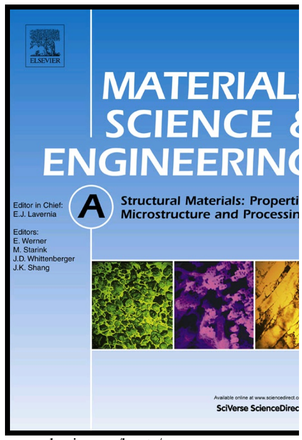

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Influence of deformation on the Burgers orientation relationship between the α and β phases in Ti–5Al–5Mo–5V–1Cr–1Fe

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Abstract

The evolution of microstructure in Ti–5Al–5Mo–5V–1Cr–1Fe with an initial lamellar microstructure during compression to a true strain 1.2 at 800°C was established via EBSD analysis. The principal features comprised recrystallization of the β matrix and fragmentation/spheroidization of α lamellae. Angular deviations from the Burgers orientation relation (OR) and the kinetics of the spheroidization of lamellar microstructure as a function of strain were quantified. The influence of the deviation from the OR on spheroidization kinetics of the lamellar structure was interpreted.

Keywords: titanium alloys; orientation relationships; interfaces; EBSD

1. Introduction

Two-phase α/β titanium alloys exhibit a variety of microstructures. These include lamellar hcp α colonies within the bcc β matrix, which provides a good blend of fracture toughness and creep resistance. However a globular-α morphology is usually more desirable for applications requiring a balance of strength and ductility [1]; such a structure is produced via large, hot deformation in the (α+β) phase field to bring about spheroidization of lamellar colonies [2]. Spheroidization is associated with a series of microscopic processes consisting of the development of transverse low-angle boundaries within the α phase; the formation and growth of grooves at the α/β interphase boundary; fragmentation of the lamellar platelets by the grooves; and final spheroidization and coarsening of the resulting small-aspect ratio α particles by diffusional processes [e.g., 3-5]. As shown in [6, 7], the nature of interphase α/β boundaries can have a major influence on the kinetics of spheroidization.

Prior to deformation, the α and β phases in the lamellar microstructure obey a classical Burgers orientation relationship (OR), i.e., $\{0001\}_\alpha \| \{110\}_\beta$ and $<11\bar{2}0>_\alpha \| <111>_\beta$ [8, 9], and

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