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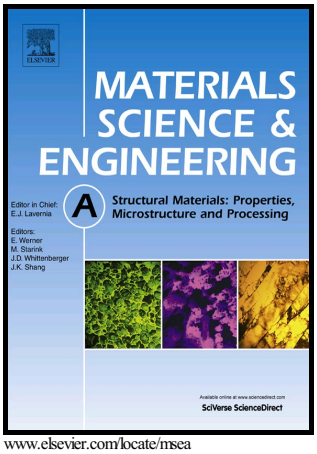

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Deformation behavior and Microstructure evolution during hot working of a coarse-grained Ti-5Al-5Mo-5V-3Cr-1Zr titanium alloy in beta phase field

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Abstract

Isothermal compression of a coarse-grained Ti-55531 titanium alloy was carried out in the β phase region to investigate the hot formability and microstructure evolution of the material. It is found that the initial structure does not affect the flow stress after discontinuous yielding. The coarse structure lowers the extent of discontinuous yielding and increases the corresponding strain interval. The microstructural developments are greatly affected by strain rate during β deformation. The substructures are nearly equiaxed at low strain rate and gradually become discontinuous arranged in band in the vicinity of original grain boundaries with the increase of strain rate. At higher strain rate, conventional continuous dynamic recrystallization (CDRX) and a two-step CDRX occur. The two-step CDRX comprises the formation and separation of ribbon grain structure. The high fraction of deformation band (DB) hinders recrystallization at high strain rate. Deformation mechanism is also summarized according to the power dissipation map.

Keywords: Titanium alloy; β deformation; Recrystallization; Deformation band

1. Introduction

Ti-5Al-5Mo-5V-3Cr-1Zr is a relatively new near-β titanium alloy based on the Russian alloy VT22. It is not sensitive to segregation and has good hardenability, excellent strength and good fracture toughness. So it is suitable for the manufacturing of large-scale integral structural applications in the aerospace industrial field [1].