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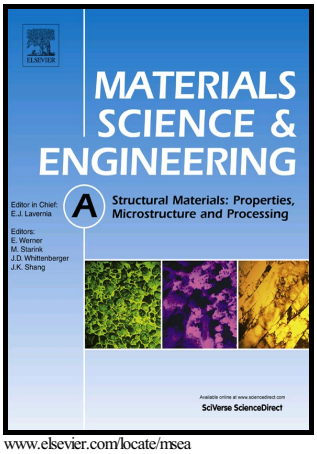

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Dynamic softening mechanism in Ti-13V-11Cr-3Al beta Ti alloy during hot compressive deformation

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Abstract

Dynamic recrystallization (DRX) behavior of Ti-13V-11Cr-3Al beta Ti alloy was investigated by performing hot compression tests at temperatures 930 and 1030 °C and strain rate of 0.1 s^{-1}. EBSD measurements and optical microscopy analyses showed that continuous dynamic recrystallization leads to a considerable grain refinement through the dissociation of coarse deformed grains. It was observed that the well-developed subgrains formed by the extended dynamic recovery are responsible for the grain dissociation. The random orientation of new grains supports the fact that subgrains rotation would be the final step which turns the well-developed subgrains into the recrystallized grains. Some remarks such as grain boundary serrations and nucleations at 930 °C were typical of the propensity for discontinuous DRX at low temperatures. However, the same remarks were absent at 1030 °C. The kinetics of dynamic recrystallization was described by the Avrami kinetics equation. The change of Avrami's exponent (n) from 1.17 to 0.48 by increasing temperature from 930 to 1030 °C was associated with variation in the mechanism of dynamic recrystallization from continuous-partial discontinuous DRX at 930 °C to the fully continuous DRX at 1030 °C.

KeyWords: Dynamic recrystallization; Titanium alloy; Hot Compression; EBSD; Flow curve.

1- Introduction

Beta Ti alloys are desirable for different applications especially in the automotive and aerospace industries [1]. They are characterized by excellent mechanical properties and good