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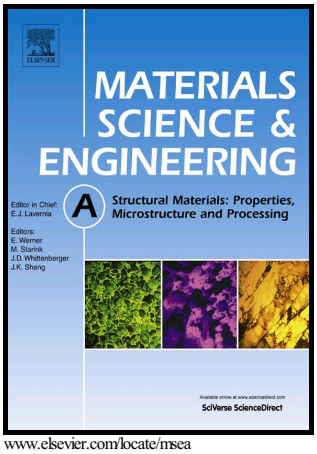

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Twinning-induced dynamic recrystallization and micro-plastic mechanism during hot-rolling process of a magnesium alloy

Jinhua Peng [a], Zhen Zhang [a,b,*], Yaozu Li [a], Wei Zhou [a], Yucheng Wu [a,b]

[a] School of Materials Science and Engineering, Hefei University of Technology, Hefei 230009, China
[b] National–Local Joint Research Center of Non-ferrous Metal Materials and Processing Technology, Hefei 230009, China

Abstract:

$\{10\bar{1}1\}$ twinning played an important role during hot-rolling process of AZ31 alloy. In the present work, TEM was employed to investigate such twinning related plastic mechanism. The dislocations were usually lying on the basal plane in matrix, while $\vec{a}+\vec{c}$ slip was usually activated near grain boundary as well as in twinned area even when the orientation was quite soft for basal slip. The combination of $\vec{a}$ and $\vec{a}+\vec{c}$ slip created the characteristic misorientation relationship along $\langle 11\bar{2}0\rangle$ in twin region. The activation of non-basal slip met the requirement to accommodate adequate localized stain in twinned area, which made twinning induced DRX kinetically possible. The twin lamella with the highest SF, which was supposed to be the most effective in accommodating imposed strain, showed the highest tendency for localized strain and led to complete DRX inside twinned region.

Keywords: Magnesium alloy; Rolling; Twinning; Dynamic recrystallization

1. Introduction

Magnesium alloys attained increasing interest during the past few decades due to their prominent performance in weight saving and other outstanding properties such as high specific strength and good castability, etc. In this way they have great potential in many fields especially in automotive and astronomy application. However, magnesium alloys show limited ductility especially when compressed along c-axis. This is also of the greatest industrial interest because of the inevitable development of a characteristic basal texture during wrought processing of magnesium alloys [1-6]. It is widely accepted that, based on the work on magnesium single crystals as early as from 1960s [7-12], with c-axis in compression contraction twinning is always involved even when the temperature is as high as 300℃ [13]. This kind of twinning

Corresponding author: Zhen Zhang
Tel: +86 18756015986
E-mail: turkeyzz1984@gmail.com