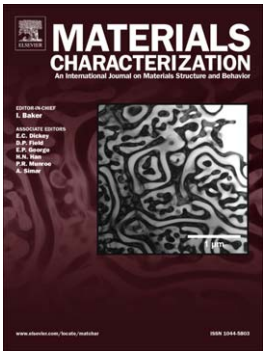

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Microstructure and mechanical properties of AM20 Magnesium alloy processed by Accumulative Roll-Bonding

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Abstract

This work investigates the influence of up to three cycles of accumulative roll-bonding (ARB) on the microstructure and the mechanical behavior of the magnesium alloy AM20. Two initial material states are studied: an initial twin roll cast (TRC) state and an initial TRC and subsequently heat treated (HT) state (400 °C/ 24 h). The ARB process leads to a reduction of grain size in both material states. Both TRC and TRC+HT material exhibit a stabilized basal texture after ARB, which causes the formation of $\{10\bar{1}2\}\langle\bar{1}011\rangle$ extension twins under compressive loading in the direction of rolling at quasi-static and dynamic strain rates at room temperature. An increase of 0.2 % yield strength and compression strength is the result of texture evolution and microstructure refinement through the ARB process. Strain at failure remains constant in the TRC material states and decreases in the TRC + HT states after roll-bonding. Yield strength and strain at failure show marginal dependencies on strain rate, whereas the compression strength exhibits a greater dependency on strain rate.

Keywords: ARB, AM-Magnesium alloy, EBSD, TRC, strain rate

1. Introduction

In recent years, increasing environmental awareness in society has forced industry to reduce the emission of greenhouse gases. To facilitate reductions,

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