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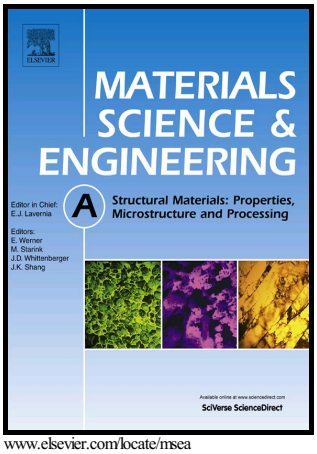

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Effect of Heat Treatment and Deformation Temperature on the Mechanical Properties of ECAP Processed ZK60 Magnesium Alloy

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Abstract:

Equal channel angular pressing(ECAP) as a common severe plastic deformation (SPD) procedure has been extensively explored in Mg alloys to improve their mechanical properties. But due to the hot processing temperature and texture softening, the strength of ECAP processed Mg alloys was found to be relatively low. In this work, high strength and good ductility were achieved in ZK60 magnesium alloy by a combination of grain refinement strengthening and precipitate hardening through the use of heat treatment and equal channel angular pressing (ECAP). Due to the pre-solution heat treatment, fine metastable phase particles ($MgZn_{2)}$ precipitated during the severe plastic deformation, which improved the work hardening of the alloy and increased the strength and ductility simultaneously. When the ECAP processing temperature was reduced gradually, the grains were further refined to ~500 nm and more $MgZn_2$ particles precipitated hierarchically. Therefore, there was a notable increase in the yield strength and ultimate tensile strength, while the ductility was almost retained.

Keywords: Mg alloy; ECAP; solution heat treatment; precipitate; strength

1. Introduction

Magnesium alloys have attracted increasing attention in automotive, aerospace

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