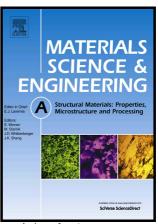
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Effect of Heat Treatment and Deformation Temperature on the Mechanical Properties of ECAP Processed ZK60 Magnesium Alloy

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ACCEPTED MANUSCRIPT

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 (MgZn₂) 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 MgZn₂ 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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