Accepted Manuscript

Title: Effect of Multi-Pass Equal Channel Angular Pressing on the Microstructure and Mechanical Properties of a Heterogeneous Mg88Y8Zn4 Alloy

Author: Huan Liu, Zhaojun Cheng, Kai Yan, Jingli Yan, Jing Bai, Jinghua Jiang, Aibin Ma

PII: S1005-0302(16)30163-3
DOI: http://dx.doi.org/doi: 10.1016/j.jmst.2016.05.015
Reference: JMST 800

To appear in: *Journal of Materials Science & Technology*

Received date: 6-3-2016
Revised date: 25-4-2016
Accepted date: 23-5-2016

Please cite this article as: Huan Liu, Zhaojun Cheng, Kai Yan, Jingli Yan, Jing Bai, Jinghua Jiang, Aibin Ma, Effect of Multi-Pass Equal Channel Angular Pressing on the Microstructure and Mechanical Properties of a Heterogeneous Mg88Y8Zn4 Alloy, *Journal of Materials Science & Technology* (2016), http://dx.doi.org/doi: 10.1016/j.jmst.2016.05.015.

Effect of Multi-pass Equal Channel Angular Pressing on the Microstructure and Mechanical Properties of a Heterogeneous $Mg_{88}Y_8Zn_4$ Alloy

Huan Liu [1,2,*], Zhaojun Cheng [1], Kai Yan [3], Jingli Yan [4], Jing Bai [4], Jinghua Jiang [1], Aibin Ma [1]

[1] College of Mechanics and Materials, Hohai University, Nanjing 211100, China

[2] Ocean and Coastal Engineering Research Institute, Hohai University, Nantong 226300, China

[3] College of Mechanical Engineering, Yangzhou University, Yangzhou 225009, China

[4] Jiangsu Key Lab of Advanced Metallic Materials, College of Materials Science and Engineering, Southeast University, Nanjing 211189, China

[Received 6 March 2016; received in revised form 25 April 2016; accepted 23 May 2016]

* Corresponding author. Ph.D.; Tel.: +86 02583782359; Fax: +86 02583786046.

E-mail address: liuhuanseu@hhu.edu.cn (H. Liu).

The microstructure evolutions and mechanical properties of a heterogeneous $Mg_{88}Y_8Zn_4$ (in at.%) alloy during multi-pass equal channel angular pressing (ECAP) were systematically investigated in this work. The results show that four phases, i.e. α-Mg, 18R long period stacking ordered (LPSO) phase, $Mg_{24}Y_5$ and Y-rich phase, are present in cast alloy. During ECAP, dynamic recrystallization (DRX) occurs and the diameter of DRXed α-Mg grains decreases to 0.8 μm. Moreover, precipitation of lamellar 14H LPSO structure is developed within α-Mg phase. Both the refinement of α-Mg grains and precipitation of 14H LPSO contribute to the increasing in micro-hardness from 98 HV to 135 HV for α-Mg. In addition, a simplified model describing the evolution of 18R LPSO phase is established, which illustrates that 18R undergoes a four-step morphological evolution with increasing strains during ECAP, i.e. original lath → bent lath → cracked lath → smaller particles. Compression test results