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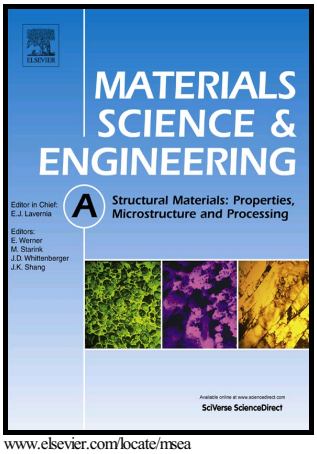

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Characterization of precipitates in an Al-Zn-Mg alloy processed by ECAP and subsequent annealing

Mohamed A. Afifi[a], Ying Chun Wang[a,b], Pedro Henrique R. Pereira[c], Yangwei Wang[a,b], Shukui Li[a,b], Yi Huang[c], Terence G. Langdon[c]

[a] School of Materials Science and Engineering, Beijing Institute of Technology, Beijing 100081, China
[b] National Key Laboratory of Science and Technology on Materials under Shock and Impact, Beijing 100081, China
[c] Materials Research Group, Faculty of Engineering and the Environment, University of Southampton, Southampton SO17 1BJ, UK

Abstract

Experiments were conducted to examine the influence of equal-channel angular pressing (ECAP) and post-ECAP annealing on the microstructures of an Al-Zn-Mg alloy. The results show that precipitates, mainly of the η', η ($MgZn_2$), T ($Al_{20}Cu_2Mn_3$) and E ($Al_{18}Mg_3Cr_2$) phases, are fragmented to fine spherical precipitates during ECAP processing for 4 and 8 passes. After post-ECAP annealing at 393 and 473 K for 20 h, precipitates with larger sizes lie primarily along the grain boundaries and finer particles are evenly distributed within the grains. Increasing the numbers of ECAP passes from 4 to 8 leads to an increase in the volume fraction of the finer precipitates in the ECAP-processed and annealed alloy. After 4 passes and heat treatment at 473 K, the precipitates are slightly larger compared with the alloy processed under identical conditions and annealed at 393 K. Nevertheless, significant coarsening is evident after processing for 8 passes and increasing the annealing temperature from 393 to 473 K. Different types of precipitates are effective in impeding grain growth during the post-ECAP annealing even at 473 K for 20 h. In addition, η precipitates form within the T and E phases after both ECAP and post-ECAP annealing.

Keywords: Al-Zn-Mg alloy; Equal-channel angular pressing (ECAP); Grain stability; Heat treatment; Precipitates.
Corresponding author: Ying Chun Wang, e-mail: wangyc@bit.edu.cn