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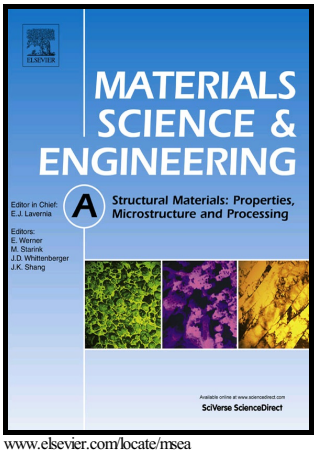

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PII: S0921-5093(17)30798-0
DOI: http://dx.doi.org/10.1016/j.msea.2017.06.034
Reference: MSA35172

To appear in: *Materials Science & Engineering A*

Received date: 25 April 2017
Revised date: 7 June 2017
Accepted date: 9 June 2017

Cite this article as: Huihui Yu, Yunchang Xin, Yao Cheng, Bo Guan, Maoyin Wang and Qing Liu, The different hardening effects of tension twins on basal slip and prismatic slip in Mg alloys, *Materials Science & Engineering A* http://dx.doi.org/10.1016/j.msea.2017.06.034

The different hardening effects of tension twins on basal slip and prismatic slip in Mg alloys

Huihui Yu[1], Yunchang Xin[1,2*], Yao Cheng[1], Bo Guan[1], Maoyin Wang[3], Qing Liu[1,2]

[1]School of Materials Science and Engineering, Chongqing University, Chongqing 400044, China

[2]National Engineering Research Center for Magnesium Alloys, Chongqing University, Chongqing 400044, China

[3]Institute of Materials, China Academy of Engineering Physics, No. 9, Huafeng Xincun, Jiangyou city, Sichuan Province, 621908, P.R. China

[*]Corresponding author: Yunchang Xin, Tel.:+86 023 65106407; fax: +86 023 65106407. ycxin@cqu.edu.cn

Abstract

A study regarding the influence of $\{10\bar{1}2\}$ twins on hardening of prismatic slip and basal slip was performed. To this end, a rolled Mg AZ31 with and without $\{10\bar{1}2\}$ twins was tensioned along the transverse direction and at 45° from the normal direction to activate prismatic slip and basal slip predominant deformations, respectively. The results show that grain refinement by $\{10\bar{1}2\}$ twins is more effective to strengthen basal slip (28 MPa increment in yield strength) than prismatic slip (11 MPa increment). It is shown that a lower geometric compatibility factor (m') for basal slip transfer than prismatic slip transfer across boundaries exists in the pre-twinned samples, indicating a higher boundary obstacle effect. $\{10\bar{1}2\}$ twin boundary with a basal pole inclined by 86° generates a lower m' for basal slip transfer than that for prismatic slip transfer. This together with the high fractions of twin boundaries account for the lower m' for basal slip transfer than that for prismatic slip transfer in the pre-twinned sample.