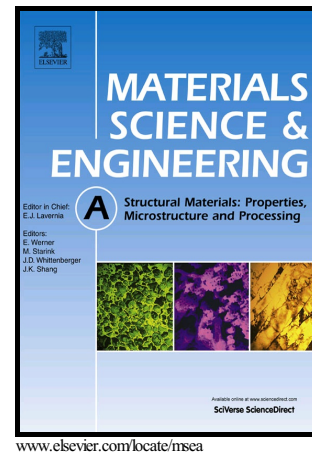


Author's Accepted Manuscript

High-temperature Tensile Properties and Deformation Mechanism of Polycrystalline Magnesium Alloys with Specifically Oriented Columnar Grain Structures

Sheng-shi Zhao, Xiao-ping Lin, Yun Dong, Yi Niu, Dan Xu, Heng Sun



PII: S0921-5093(18)30719-6
DOI: <https://doi.org/10.1016/j.msea.2018.05.061>
Reference: MSA36499

To appear in: *Materials Science & Engineering A*

Received date: 24 November 2017
Revised date: 15 May 2018
Accepted date: 18 May 2018

Cite this article as: Sheng-shi Zhao, Xiao-ping Lin, Yun Dong, Yi Niu, Dan Xu and Heng Sun, High-temperature Tensile Properties and Deformation Mechanism of Polycrystalline Magnesium Alloys with Specifically Oriented Columnar Grain Structures, *Materials Science & Engineering A*, <https://doi.org/10.1016/j.msea.2018.05.061>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting galley proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

High-temperature Tensile Properties and Deformation Mechanism of Polycrystalline Magnesium Alloys with Specifically Oriented Columnar Grain Structures

Sheng-Shi Zhao¹, Xiao-Ping Lin^{1,2*}, Yun DONG^{1,2}, Yi NIU¹, Dan XU¹, Heng SUN¹

¹Northeastern University, Shenyang 110819, China

²Northeastern University at Qinhuangdao, Qinhuangdao 066004, China

*Corresponding author. Xiao-ping LIN; lxp3588@163.com

ABSTRACT

A Mg–4.78Zn–0.45Y–0.10Zr (wt.%) alloy with specifically oriented columnar grain structures (crystal growth direction $\langle 01\bar{1}0 \rangle$) was prepared using directional solidification. The columnar grain structures possessed parallel-growing primary arms and straight longitudinal grain boundaries. The results from an electron backscatter diffraction analysis demonstrated that the angle between the c-axis and the growth direction was 74–87°. As the tensile tests were performed along the $\langle 01\bar{1}0 \rangle$ growth direction, the Schmid factors for the $\langle a \rangle$ cylindrical and $\langle c+a \rangle$ conical plane slips were as high as 0.45. When the tensile test temperature was 300 °C, dynamic recovery was observed and the $\langle a \rangle$ cylindrical, $\langle a \rangle$ conical, and $\langle c+a \rangle$ conical slip systems were all activated. This phenomenon, together with the high orientation consistency between the adjoining grains, resulted in an elongation increase up to 42%. Fractography of the Mg alloy revealed extended or parabola-shaped dimples with specifically oriented columnar grain structures, suggesting good ductility for this material.

Keywords: cellular dendrite; growth orientation; Schmid factor; $\langle c+a \rangle$ plane slip; high-temperature recovery

In order to exploit the benefits of magnesium alloys (higher specific strength, higher specific rigidity and better damping capacity), two major ways are considered

Download English Version:

<https://daneshyari.com/en/article/7971934>

Download Persian Version:

<https://daneshyari.com/article/7971934>

[Daneshyari.com](https://daneshyari.com)