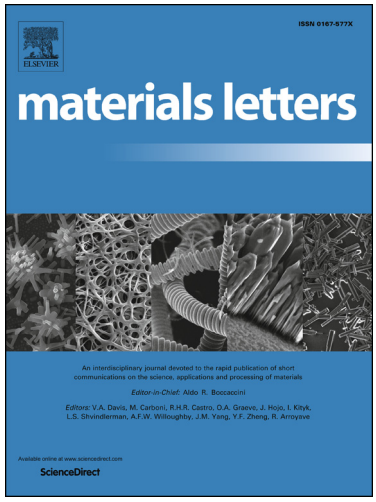

High strain-rate superplasticity of AZ91 alloy achieved by rapidly solidified flaky powder metallurgy

Taekyung Lee, Michiaki Yamasaki, Yoshihito Kawamura, Yongmoon Lee, Chong Soo Lee

PII: S0167-577X(18)31468-X
DOI: https://doi.org/10.1016/j.matlet.2018.09.090
Reference: MLBLUE 24958

To appear in: *Materials Letters*

Received Date: 17 April 2018
Revised Date: 23 July 2018
Accepted Date: 17 September 2018

Please cite this article as: T. Lee, M. Yamasaki, Y. Kawamura, Y. Lee, C.S. Lee, High strain-rate superplasticity of AZ91 alloy achieved by rapidly solidified flaky powder metallurgy, *Materials Letters* (2018), doi: https://doi.org/10.1016/j.matlet.2018.09.090

High strain-rate superplasticity of AZ91 alloy achieved by rapidly solidified flaky powder metallurgy

Taekyung Lee[1,*], Michiaki Yamasaki[2,*], Yoshihito Kawamura[2], Yongmoon Lee[3], Chong Soo Lee[3]

[1]*School of Mechanical Engineering, Pusan National University, Busan 46241, Korea*
[2]*Magnesium Research Center, Kumamoto University, Kumamoto 860-8555, Japan*
[3]*Graduate Institute of Ferrous Technology, Pohang University of Science and Technology (POSTECH), Pohang 37673, Korea*

* Corresponding authors:
Prof. T. Lee, Tel.: +82-51-510-2985, Fax: +82-51-514-7640, E-mail: taeklee@pnu.ac.kr
Prof. M. Yamasaki, Tel: +81-96-342-3710, E-mail: yamasaki@gpo.kumamoto-u.ac.jp

Abstract

In this study, the authors successfully obtained high strain-rate superplasticity (HSRS) for an AZ91 Mg alloy using rapidly solidified flaky powder metallurgy (RS FP/M). The RS FP/M AZ91 shows an elongation to failure of 465% at a temperature and initial strain rate of 623 K and 10^{-2} s^{-1}, respectively. Furthermore, the optimum superplastic strain rate for the maximum elongation was 10^{-2} s^{-1}, which is higher than those attained by other methods. The HSRS obtained in this study is attributed to an effective grain refinement (~1 μm) and high thermal stability. The bimodal grain structure may further contribute to HSRS.

Keywords: Superplasticity; Magnesium; Metals and alloys; Powder technology

1. Introduction

In recent years, lightweight Mg alloys have attracted great attention owing to their potential applications in the automotive, aerospace, and railway industries. Researchers have paid attention to superplastic deformation behavior to overcome their serious drawback of the limited formability at room temperature. Superplasticity indicates