

Author's Accepted Manuscript

Superplasticity of ultrafine-grained Al-Mg-Sc-Zr alloy

Diana Yuzbekova, Anna mogucheva, Rustam Kaibyshev



PII: S0921-5093(16)30983-2
DOI: <http://dx.doi.org/10.1016/j.msea.2016.08.074>
Reference: MSA34032

To appear in: *Materials Science & Engineering A*

Received date: 18 May 2016
Revised date: 15 August 2016
Accepted date: 18 August 2016

Cite this article as: Diana Yuzbekova, Anna mogucheva and Rustam Kaibyshev, Superplasticity of ultrafine-grained Al-Mg-Sc-Zr alloy, *Materials Science & Engineering A*, <http://dx.doi.org/10.1016/j.msea.2016.08.074>

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.

Superplasticity of ultrafine-grained Al-Mg-Sc-Zr alloy

Diana Yuzbekova, Anna Mogucheva*, Rustam Kaibyshev

Belgorod State University, Pobedy 85, Belgorod, Russia

*Corresponding author: mogucheva@bsu.edu.ru

Abstract

The superplastic behavior of an Al–Mg–Sc–Zr alloy with a grain size of $\sim 0.7 \mu\text{m}$ produced by equal channel angular pressing (ECAP) was examined in the temperature interval $150 - 500^\circ\text{C}$ at strain rates ranging from 10^{-5} to 10^{-1} s^{-1} . No significant grain coarsening occurs under static annealing up to 450°C because of the strong pinning effect of $\text{Al}_3(\text{Sc,Zr})$ dispersoids. The alloy showed superior ductility of 365 pct at 175°C , 1200 pct at 275°C and ~ 3300 pct at 450°C and strain rates of $1.4 \times 10^{-4} \text{ s}^{-1}$, $5.6 \times 10^{-3} \text{ s}^{-1}$ and 5.6×10^{-1} , with corresponding strain rate sensitivities of 0.3, 0.49 and 0.2, respectively. Analysis of the superplastic behavior in terms of threshold and surface observations showed that grain boundary sliding (GBS) controlled by grain boundary diffusion is the dominant deformation mechanism under all of the conditions. The strong pinning effect of coherent $\text{Al}_3(\text{Sc,Zr})$ particles leads to a high dislocation density within grains after superplastic deformation that leads to initial strain hardening at low temperatures and high threshold stress. Analysis of the superplastic behavior showed that the strong temperature dependence of the threshold stress is most likely attributable to the interaction between dislocations and the coherent dispersoids, and the effect of temperature on the optimal strain rate of superplastic deformation associated with the highest values of elongation-to-failure is attributable to absorption of a lattice

Download English Version:

<https://daneshyari.com/en/article/1573032>

Download Persian Version:

<https://daneshyari.com/article/1573032>

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