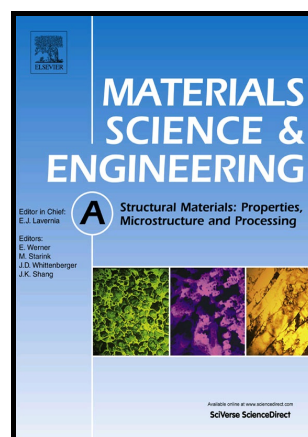


Author's Accepted Manuscript

Superplasticity in high temperature magnesium alloy WE43

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www.elsevier.com/locate/msea

PII: S0921-5093(16)31631-8
DOI: <http://dx.doi.org/10.1016/j.msea.2016.12.129>
Reference: MSA34560

To appear in: *Materials Science & Engineering A*

Received date: 9 February 2016
Revised date: 27 December 2016
Accepted date: 30 December 2016

Cite this article as: Sahithya Kandalam, R.K. Sabat, N. Bibhanshu, G.S. Avadhani, S. Kumar and Satyam Suwas, Superplasticity in high temperature magnesium alloy WE43, *Materials Science & Engineering A* <http://dx.doi.org/10.1016/j.msea.2016.12.129>

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Superplasticity in high temperature magnesium alloy WE43

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Abstract

Severe plastic deformation of the magnesium alloy WE43 (Mg-4%Y-2.3%Nd-0.5%Zr) has been carried out by multi-axial forging (MAF) in order to refine the grain size from 25 μm to 6 μm . Deformation behaviour of the as-processed material has been investigated. Compression tests were carried out in the temperature range 250 - 450 $^{\circ}\text{C}$ and in the strain rate range 10^{-3} - 10 s^{-1} . Strain-rate sensitivity values were calculated from the stress-strain curves. A high value of strain rate sensitivity was noticed in the temperature range 350 - 400 $^{\circ}\text{C}$ and the strain rate range 10^{-4} - 10^{-2} s^{-1} , which indicated the possibility of superplastic forming after multi-axial forging. The superplastic behaviour of MAF processed samples was further investigated by carrying out tensile tests. An excellent superplastic elongation of 470% was obtained at the temperature 375 $^{\circ}\text{C}$ and strain rate 3×10^{-4} s^{-1} . The material also exhibited superplasticity at higher strain rates at this temperature.

Keywords: Magnesium alloy; severe plastic deformation; multi axial forging; strain rate sensitivity; superplasticity; grain boundary sliding.

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