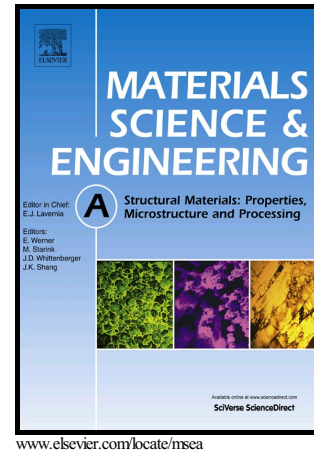


Author's Accepted Manuscript

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PII: S0921-5093(15)30768-1
DOI: <http://dx.doi.org/10.1016/j.msea.2015.12.078>
Reference: MSA33161

To appear in: *Materials Science & Engineering A*

Received date: 22 November 2015
Revised date: 22 December 2015
Accepted date: 23 December 2015

Cite this article as: Shima Sabbaghianrad and Terence G. Langdon, Developing superplasticity in an aluminum matrix composite processed by high-pressure torsion, *Materials Science & Engineering A* <http://dx.doi.org/10.1016/j.msea.2015.12.078>

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Submitted to Materials Science and Engineering A (November 2015): revised December 2015

Developing superplasticity in an aluminum matrix composite processed by high-pressure torsion

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Abstract

An Al-7075 alloy reinforced with 10 vol.% Al₂O₃ particulates was processed by high-pressure torsion (HPT) at room temperature under a pressure of 6.0 GPa through up to 20 turns. The metal matrix composite (MMC) showed significant grain refinement from an initial average grain size of ~8 μm to ~300 nm after processing by HPT through 20 turns. The Vickers microhardness also increased from an initial value of Hv ≈ 167 to a saturation value after HPT processing of Hv ≈ 260. Tensile testing at 623 K demonstrated the potential for achieving true superplasticity in the HPT-processed MMC with a maximum elongation of ~670% when testing at a strain rate of $1.0 \times 10^{-2} \text{ s}^{-1}$.

Keywords: Al-7075 alloy; hardness; high-pressure torsion; metal matrix composite; superplasticity

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