

# Author's Accepted Manuscript

Enhancing the ductility in the age-hardened aluminum alloy using a gradient nanostructured structure

Pingwei Xu, Hongyun Luo, Sijie Li, Yang Lv, Jun Tang, Yue Ma



PII: S0921-5093(16)31455-1  
DOI: <http://dx.doi.org/10.1016/j.msea.2016.11.090>  
Reference: MSA34416

To appear in: *Materials Science & Engineering A*

Received date: 7 October 2016  
Revised date: 24 November 2016  
Accepted date: 25 November 2016

Cite this article as: Pingwei Xu, Hongyun Luo, Sijie Li, Yang Lv, Jun Tang and Yue Ma, Enhancing the ductility in the age-hardened aluminum alloy using a gradient nanostructured structure, *Materials Science & Engineering A* <http://dx.doi.org/10.1016/j.msea.2016.11.090>

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

## Enhancing the ductility in the age-hardened aluminum alloy using a gradient nanostructured structure

Pingwei Xu<sup>a,b,c1</sup>, Hongyun Luo<sup>a,b,c1,2\*</sup>, Sijie Li<sup>a,b,c1</sup>, Yang Lv<sup>a,b,c1</sup>, Jun Tang<sup>a,b,c1</sup>, Yue Ma<sup>a,b,c1</sup>

<sup>a</sup>Key Laboratory of Aerospace Materials and Performance (Ministry of Education), School of Materials Science and Engineering, Beijing University of Aeronautics and Astronautics, Beijing, People's Republic of China

<sup>b</sup>The Collaborative Innovation Center for Advanced Aero-Engine (CICAAE), Beijing University of Aeronautics and Astronautics, Beijing, People's Republic of China

<sup>c</sup>Beijing Key Laboratory of Advanced Nuclear Materials and Physics, Beijing University of Aeronautics and Astronautics, Beijing, People's Republic of China

\**E mail:* luo7128@163.com

### Abstract:

A high ductility and extra strain hardening are achieved in Al alloy but without strength improvement via the introduction of a gradient nanostructured layer. The strain gradient and different residual stress between gradient layer and matrix are mainly responsible for the enhanced ductility, while the appearance of minority flaws (grain boundary precipitations) accounts for strength change. Compressive residual stress suppresses crack nucleation and propagation and cooperatively activates the partial dislocation mechanism in gradient layer. Combined with tensile residual stress from matrix, strain gradient is further increased during tensile testing. Besides, samples with the gradient layer exhibit significant thickness effect on the tensile properties, due to varying compressive residual stress occurring at flaws. Different contributions from

---

<sup>1</sup> **Address:** 8th Lab of the School of Material Science and Engineering, Beijing University of Aeronautics and Astronautics, No.37 Xueyuan Road, Haidian District, Beijing, 100191, People's Republic of China

<sup>2</sup> **Fax:** 0086-010-82317108 **Tel:** 0086-010-82339905

Download English Version:

<https://daneshyari.com/en/article/5456449>

Download Persian Version:

<https://daneshyari.com/article/5456449>

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