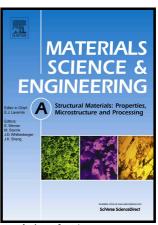
### Author's Accepted Manuscript

Effects of Ni content on low cycle fatigue and Al-12Si-0.9Cumechanical properties of 0.8Mg-*x*Ni at 350°C

Jian Feng, Bing Ye, Lijie Zuo, Ruijuan Qi, Qudong Wang, Haiyan Jiang, Rong Huang, Wenjiang Ding



www.elsevier.com/locate/msea

PII: S0921-5093(17)31142-5

http://dx.doi.org/10.1016/j.msea.2017.08.114 DOI:

Reference: MSA35462

To appear in: Materials Science & Engineering A

Received date: 29 April 2017 Revised date: 29 August 2017 Accepted date: 30 August 2017

Cite this article as: Jian Feng, Bing Ye, Lijie Zuo, Ruijuan Qi, Qudong Wang, Haiyan Jiang, Rong Huang and Wenjiang Ding, Effects of Ni content on low cycle fatigue and mechanical properties of Al-12Si-0.9Cu-0.8Mg-xNi at 350°C. Materials Science Engineering Ahttp://dx.doi.org/10.1016/j.msea.2017.08.114

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.

#### **ACCEPTED MANUSCRIPT**

# Effects of Ni content on low cycle fatigue and mechanical properties of Al-12Si-0.9Cu-0.8Mg-xNi at 350 °C

Jian Feng<sup>1</sup>, Bing Ye<sup>1</sup>\*, Lijie Zuo<sup>1</sup>, Ruijuan Qi<sup>2</sup>, Qudong Wang<sup>1</sup>, Haiyan Jiang<sup>1</sup>,

Rong Huang<sup>2</sup>\*, Wenjiang Ding<sup>1</sup>

<sup>1</sup>National Engineering Research Center of Light Alloy Net Forming and State Key Laboratory of Metal Matrix Composites, Shanghai Jiao Tong University, 200240 Shanghai, China

<sup>2</sup>Key Laboratory of Polar Materials and Devices, Ministry of Education, East China Normal University, 200241 Shanghai, China

#### **Abstract**

In order to study the effects of  $\varepsilon$ -Al<sub>3</sub>Ni phase on elevated temperature properties, Al-12Si-0.9Cu-0.8Mg-xNi alloys with Ni contents of 1.0%, 2.5% and 4.0%, respectively, were prepared by gravity casting and their microstructure, tensile and low cycle fatigue properties at 350 °C were investigated. The results show that the microstrucure mainly consists of α-Al, eutectic Si, ε-Al<sub>3</sub>Ni, δ-Al<sub>3</sub>CuNi, and Q-Al<sub>5</sub>Cu<sub>2</sub>Mg<sub>8</sub>Si<sub>6</sub> phase. Thermodynamic calculation indicates that the ε-Al<sub>3</sub>Ni weight fraction increases with Ni contents while other phase contents are kept constant, and this result is consistent with the microstructure and XRD analysis. With the increase of ε-Al<sub>3</sub>Ni content, the tensile strength at 350 °C increases from 94 MPa to 116 MPa, while the elongation decreases from 2.8% to 2.0%. The Al-Si alloy with 2.5% Ni exhibits the optimal low cycle fatigue property with a fatigue strength coefficient of 198.29 MPa and fatigue strength exponent of -0.1295. The coarsening of ε-Al<sub>3</sub>Ni phase is obvious with a higher Ni content of 4.0%, and the debonding of coarse \(\epsilon - Al\_3Ni\) phase accelerates the propagation of micro-cracks and degrades the fatigue properties The ε-Al<sub>3</sub>Ni phase is beneficial to the mechanical properties of the alloys and thermally stable during fatigue test at 350 °C.

Keywords: Al-Si alloys, Heat resistant, Low cycle fatigue, Microstructure,

<sup>&</sup>lt;sup>1</sup>\*Corresponding author at: National Engineering Research Center of Light Alloy Net Forming and State Key Laboratory of Metal Matrix Composites, Shanghai Jiao Tong University, Shanghai 200240, China. Tel.: +86 21 54742715, Fax: +86 21 34202794. E-mail address: bingye@sjtu.edu.cn.

<sup>&</sup>lt;sup>2</sup>\*Corresponding author at: Key Laboratory of Polar Materials and Devices, Ministry of Education, East China Normal University, Shanghai 200241, China. Tel: +86 21 54345398, Fax: +86 54345119. E-mail address: rhuang@ee.ecnu.edu.cn.

#### Download English Version:

## https://daneshyari.com/en/article/5455162

Download Persian Version:

https://daneshyari.com/article/5455162

Daneshyari.com