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PII: S0921-5093(17)30925-5
DOI: <http://dx.doi.org/10.1016/j.msea.2017.07.030>
Reference: MSA35278

To appear in: *Materials Science & Engineering A*

Received date: 23 December 2016
Revised date: 11 July 2017
Accepted date: 13 July 2017

Cite this article as: Hailong Zhao, Jinyan Tong, Carlos C. Engler-Pinto, Larry A. Godlewski, Jacob W. Zindel, Mei Li, Longfei Li and Qiang Feng, Mechanical Response and Dislocation Substructure of A Cast Austenitic Steel under Low Cycle Fatigue at Elevated Temperatures, *Materials Science & Engineering A* <http://dx.doi.org/10.1016/j.msea.2017.07.030>

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Mechanical Response and Dislocation Substructure of A Cast Austenitic Steel under Low Cycle Fatigue at Elevated Temperatures

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Abstract:

With the increase of exhaust temperature in automobiles resulting from the stricter environmental and fuel consumption regulations, high temperature fatigue failure of exhaust manifolds is being a significant issue for safety concern. In this research, low cycle fatigue behavior of a Nb-bearing cast austenitic steel with the "Chinese-script" type primary Nb(C,N), was investigated in the temperature range of 600°C to 950°C. It is indicated that the fatigue lifetime was predominantly dependent on the inelastic strain amplitude, in spite of fatigue temperature. However, the change of deformation substructure from dislocation cells, slip bands to subgrains was observed from 600°C to 950°C, which was induced by the increased thermal recovery. Correspondingly, the cyclic stress amplitude changed from cyclic hardening at 600°C to cyclic softening and cyclic stress saturation at 800°C and 950°C, respectively. Besides, strain

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