Life, dislocation evolution, and fracture mechanism of a 41Fe-25.5Ni-23.5Cr alloy during low cycle fatigue at 700 °C

Haizhou Li, Hongyang Jing, Lianyong Xu, Lei Zhao, Yongdian Han, Zhengxin Tang, Bo Xiao, Yu Zhang

PII: S0142-1123(18)30592-9
DOI: https://doi.org/10.1016/j.ijfatigue.2018.09.026
Reference: JIJF 4861

To appear in: *International Journal of Fatigue*

Received Date: 27 July 2018
Revised Date: 21 September 2018
Accepted Date: 26 September 2018

Please cite this article as: Li, H., Jing, H., Xu, L., Zhao, L., Han, Y., Tang, Z., Xiao, B., Zhang, Y., Life, dislocation evolution, and fracture mechanism of a 41Fe-25.5Ni-23.5Cr alloy during low cycle fatigue at 700 °C, *International Journal of Fatigue* (2018), doi: https://doi.org/10.1016/j.ijfatigue.2018.09.026

Life, dislocation evolution, and fracture mechanism of a 41Fe-25.5Ni-23.5Cr alloy during low cycle fatigue at 700 °C

Haizhou Li[1, 2], Hongyang Jing[1, 2], Lianyong Xu[1, 2, 3*], Lei Zhao[1, 2], Yongdian Han[1, 2], Zhengxin Tang[1, 2], Bo Xiao[1, 2], Yu Zhang[1, 2]

[1]School of Materials Science and Engineering, Tianjin University, Tianjin 300350, PR China;

[2]Tianjin Key Laboratory of Advanced Joining Technology, Tianjin 300350, PR China;

[3]State Key Laboratory of engines, Tianjin University, Tianjin 300072, PR China.

*Corresponding author. Tel./fax: +86 22 27402439.

E-mail address: xulianyong@tju.edu.cn.

Abstract

The low-cycle fatigue behavior, dislocation evolution, and fracture mechanism of a 41Fe-25.5Ni-23.5Cr alloy, Sanicro 25, were investigated under various total strain amplitudes of 0.3%, 0.35%, 0.4%, and 0.5% at 700 °C. According to strain-controlled fatigue tests, this alloy exhibited a cyclic hardening behavior. The back stress and friction stress increased with increasing total strain amplitude, which was attributed to the increase in the interactions of the dislocations with precipitates and dislocations. The hysteresis loops showed that the serrated flow was particularly pronounced at the total strain amplitude of 0.5%. Furthermore, the plastic strain amplitude and the hysteresis loop area increased as the total strain amplitude increased. The modified relationship of fatigue life and plastic strain amplitude ($N_f - \Delta\varepsilon_p/2$) was established based on the energy-based prediction model of fatigue life, which was influenced by the parameters cyclic strain hardening exponent n' and cyclic strength coefficient