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Temperature dependence of transgranular fatigue crack resistance in interstitial-free steel and Fe-C steels with supersaturated carbon: effects of dynamic strain aging and dynamic precipitation

Bochuan Li[a,b*], Motomichi Koyama[a*], Eisaku Sakurada[c], Nobuyuki Yoshimura[d], Kohsaku Ushioda[e], and Hiroshi Noguchi[a]

[a] Faculty of Engineering, Kyushu University, 744 Moto-oka, Nishi-ku, Fukuoka-shi, Fukuoka 819-0395, Japan

[b] State Key Laboratory of Advanced Design and Manufacturing for Vehicle Body, College of Mechanical and Vehicle Engineering, Hunan University, Changsha City 410082, P. R. China

[c] Nippon Steel & Sumitomo Metal Corporation, 5-3 Tokai, Tokai, Aichi 476-8686, Japan

[d] Nippon Steel & Sumitomo Metal Corporation, 20-1 Shintomi, Futtsu, Chiba 293-8511, Japan

e Nippon Steel & Sumikin Research Institute Corporation, Kokusai Bldg., 3-1-1 Marunouchi, Chiyoda, Tokyo 100-0005, Japan

[*]Corresponding author: Bochuan LI, email: lbc2017@hnu.edu.cn

Motomichi Koyama, e-mail: koyama@mech.kyushu-u.ac.jp

Abstract

Tension tests at different temperatures were conducted for two ferritic steels: Fe-0.017C with 0.017% solute carbon content and interstitial-free (IF) steels. It is verified the occurrence of dynamic strain aging (DSA) in Fe-0.017C at high temperatures. Tension tests for the Fe-0.017C, following corresponding heating treatments, demonstrated the transition process of dynamic precipitation from under-aging to over-aging. Moreover, the threshold stress intensity factor ranges (ΔK_{th}) of a small crack for these two steels both decrease with temperature growth. However, the ΔK_{th} of Fe-0.017C was always larger than that of IF steel