Effect of Heat Treatment on Stress Corrosion Cracking Behavior and Electrochemical Characteristic of Welded Ti-6Al-4V Alloy during Slow Strain Rate Test

Yan Liu¹, Shawei Tang¹, Guangyi Liu^{1,2}, Yue Sun¹, Jin Hu^{1,*}

¹ School of Materials Science and Engineering, Harbin Institute of Technology, Harbin 150001, China

² State Key Laboratory for Marine Corrosion and Protection, Luoyang Ship Material Research Institute (LSMRI), Qingdao 266101, China

*E-mail: hujin@hit.edu.cn

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Local rapid induction heating is used as a post weld heat treatment for a welded Ti-6Al-4V alloy. The welded sample is heat treated at different temperatures. The microstructure and corrosion behavior of the welded sample before and after the post weld heat treatment are investigated. Electrochemical impedance spectroscopy (EIS) measurements under slow strain rate test (SSRT) are performed in a LiCl-methanol solution. The results demonstrate that the microstructure in fusion zone evolves from acicular α' martensite phase in the as-welded sample to lathy α phase and transformational β phase in the heat treated samples. The lathy α phase decreases and the transformational β phase increases with the increase of the heat treatment temperature in the fusion zone. The mechanical properties and corrosion resistance of the welded samples are significantly improved after the heat treatment and gradually increase with the increase of the heat treatment temperature, which indicate that the post weld heat treatment effectively reduces the susceptibility of the welded Ti-6Al-4V alloy to stress corrosion cracking.

Keywords: Ti-6Al-4V alloy; Welding; Post weld heat treatment; Stress corrosion cracking; Electrochemical impedance spectroscopy; slow strain rate test

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