Study on Stress Corrosion Susceptibility of 17-4PH Martensitic Precipitation Hardening Stainless Steel for Offshore Platforms

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Abstract: Stress corrosion susceptibility of 17-4PH martensitic precipitation hardening stainless steel commonly used on offshore platforms was studied by slow strain rate tensile experiments, through which some data such as fracture time, tensile strength, elongation to fracture, and reduction in area were obtained at room temperature in air, and at room temperature, 40 ℃, and 70 ℃ in 3.5% NaCl aqueous solutions. The fracture surfaces of the samples were observed by scanning electron microscope. Three methods in view of ratio, stress corrosion susceptibility index (ISSRT) and fractured surface analysis were employed in order to analyze and verify stress corrosion susceptibility of experimental material at different temperatures. The results showed that the experimental material has no stress corrosion susceptibility in 3.5% NaCl aqueous solution at room temperature and 40 ℃; the susceptibility of the experimental material to stress corrosion is existent but not significant in 3.5% NaCl aqueous solution at 70 ℃; stress corrosion leads to the deterioration of mechanical properties of the experimental material with selectivity, and the analytic results would provide reference for its engineering application.

Keywords: Stress corrosion susceptibility; 17-4PH martensitic precipitation hardening stainless steel; Ratio method; Stress corrosion susceptibility index ISSRT; Fracture surface analysis