Combined Effect of Cathodic Potential and Heat Treatment on Stress Corrosion Cracking Behaviour of Low Alloy Steel in Artificial Seawater

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In this study, the SCC behaviour and mechanism of E690 steels with different heat treatments were investigated in artificial seawater by slow strain rate test, surface analysis technique and potentiodynamic polarization curve test. The results show that the SCC behaviour of E690 steel is mainly controlled by anodic dissolution, and the steels after tempering show the high SCC susceptibilities because of the high corrosion current densities. As the cathodic potential negatively decreases to -850 mV, the SCC susceptibility of base metal decreases; however, the SCC susceptibilities of the steels after tempering increase. At -1050 mV, the SCC susceptibilities of the steels with different heat treatments increase. And the SCC susceptibilities of the steels after tempering are higher than those of base metal at various potentials. The phenomenon is related to the high hydrogen embrittlement susceptibilities of the steels after tempering compared to that of the base metal.

Keywords: Low alloy steel; Heat treatment; Cathodic potential; Stress corrosion cracking

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