Stress corrosion behavior of Cr-containing low-alloy steels in SO_2- marine atmosphere

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Abstract Four different levels of Cr-series low-alloy high-strength steels (0 wt%, 1 wt%, 2 wt%, 3 wt%) were prepared by vacuum melting and hot rolling, and the stress corrosion (SCC) behavior of four steels was investigated by slow rate tensile (SSRT) and U-bend immersion tests. The results show that in the simulated marine atmospheric environment, The addition of 3 wt% Cr inhibits the anodic dissolution（AD）of the matrix and Improves SCC resistance by about 5%. However, in the SO_2-simulated marine atmosphere environment, The addition of 3% Cr increases the SCC sensitivity of the steel by about 60% . The reason for this result is that the hydrogen embrittlement (HE) is gradually dominating due to the high concentration of H ions in this environment, while the addition of Cr significantly increases the strength of the steel and the sensitivity of large angle grain boundaries (HAGB). As the sensitivity of steel to H increases, the sensitivity to SCC increases.

Keywords Low alloy steel ,SO_2- simulated marine atmospheric environment ,Stress corrosion cracking, Hydrogen embrittlement

Reference

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