

Effect of hydrogen on passive film and corrosion behaviour of 2507 super duplex stainless steel in H₂S environment based on ToF-SIMS characterization

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Abstract The effect of hydrogen on passive film and corrosion behaviour of 2507 super duplex stainless steel (SDSS) in H₂S environment was studied by electrochemical experiments and ToF-SIMS characterization. The results showed that sulfides were present in the passive film in the forms of FeS_x and NiS_x, and they were enriched in local passive film of the austenite phase since austenite was rich in Fe and Ni elements. In H₂S-containing environments, the passive films had a bilayer structure. The inner layer was composed of oxides of Cr and Ni, while the outer layer was enriched in oxides of Fe and Mo, hydroxides and sulfides. Moreover, hydrogen thickened the passive film, and induced the formation of hydroxides and sulfides in the passive film, which resulting in the decrease in pitting resistance. Due to the better corrosion resistance of the austenite phase, pitting occurred at the ferrite phase and phase boundary.

Keywords 2507 SDSS; Passive film; H₂S; Hydrogen; ToF-SIMS

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