Corrosion behaviour of X80 pipeline steel welded joint in H₂O-saturated supercritical-CO₂ environment

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In this work, the corrosion behaviour of an X80 carbon steel welded joint in a H₂O-saturated supercritical-CO₂ (SC-CO₂) environment (40°C, 10 MPa) was studied with SEM, XRD and electrochemical techniques. The results showed that different zones (base metal (BM), fine grain heat affected zone (FHAZ), coarse grain heat affected zone (CHAZ) and weld metal (WM)) of the X80 welded joint were corroded in the SC-CO₂ environment, and FeCO₃ corrosion product film is formed on the surface. However, different zones exhibited different corrosion behaviours, as related to its different microstructures. The most serious zones of corrosion appeared at coarse grain heat affected zone (CGHAZ) and fine grain heat affected zone (FGHAZ), which exhibited higher proportion of pearlite. Whereas, BM and WM with higher content of ferritic were slightly corroded.

Keywords: supercritical CO₂, X80 carbon steel, welded joint, corrosion behaviour, CCS

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