Study on Iron Sulphide Inhibition and Corrosion of 80S and 110SS steels in Acid Solutions Containing H₂S and CO₂

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Corrosion behavior and characteristics of 80S and 110SS steels were investigated in acid solutions containing H₂S and CO₂ at 45°C by the potentiodynamic polarization sweep, EIS and SEM with EDX. The EIS data fitted by ZsimpWin software were theoretically analyzed and discussed. The results indicated that the corrosion potential became more negative and that the corrosion current density decreased as the Na₂S·9H₂O concentration increases from 0 to 2.0wt.%, with the obvious reverse sweep characteristics occurring in anodic polarization branch curve in 2.0wt.% Na₂S·9H₂O case. Warburg impedance characteristics of diffusion process in a low frequency region following a depressed capacitive semi-circle in the intermediate frequency region was observed on 110SS steel with the addition of certain Na₂S·9H₂O concentration. The phase angle peaks for H₂S containing cases in the intermediate frequency region shifted to a low frequency direction and rised toward -90° significantly. The amounts of S element in the “first deposition” corrosion product layer were higher than those in the “second deposition” corrosion product crystals. One corrosion model related to H₂S and CO₂ corrosion was proposed.

Keywords: 80S and 110SS steels; H₂S/CO₂ corrosion; Polarization curve; EIS; Corrosion product layer; Corrosion model

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