Experimental Study on Alternating Current Corrosion of Pipeline Steel in Alkaline Environment

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The variation of the topsoil pH value in the X70 steel surface was studied under the AC corrosion process. The cyclic voltammetry technique was employed to investigate the AC action mechanism on the X70 pipeline steel in a soil environment. The results show that the alternating current has a great effect on the surface soil pH value. The corrosion mechanism of a metal suffered AC interference in an alkaline environment is that the AC changes the polarization potential and reduces the pH value of the surface soil. The coupling potential of the mixed alternating and direct currents presents a periodic oscillation in the electrode surface, which destroys the passivation of the X70 steel. The electrode surface is covered with a large amount of Fe (OH) ads, when the potential is in the range of the active dissolution potential of the X70 steel. In this condition, the hydroxides and oxides will form preferentially. In a different charge transfer process, the hydroxide, as the inhibitor of the passivation film, has an important impact on the metal corrosion. The increase of the corrosion rates is under the control of the transfer process.

Keywords: AC corrosion; alkaline environment; X70 steel; corrosion mechanism

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