Distinction in Corrosion Behaviors of Duplex Stainless Steel 2205 Induced by Alternating Voltages Interference with Different Waveforms

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Abstract Based on the $FeCl_3$ immersion tests at different temperatures, the pitting corrosion of DSS 2205 samples in the presence of AV interference with different waveforms was investigated. The results show that the 50Hz sinusoidal AV signals with high amplitudes obviously etch the DSS 2205 samples in 30 °C solution. In 40 °C solution, the sinusoidal signal with higher amplitude induces the formation of big pits on samples. However, big pits form with interference of AV signal with lower and higher amplitude in high-temperature (50 °C) solution. At lower temperature, increase in frequency evidently weakens the etching and pitting behaviors on DSS 2205 samples, however, the sinusoidal AV with higher frequency still triggers the big pits in the high-temperature solution. This suggests that the effects of frequency of sinusoidal AV interference on pitting behavior are also influenced by system temperature. As for the different waveform AV signals with 50 Hz, when the AV RMS on DSS 2205 samples maintains the equal values, the sinusoidal and triangular wave AV signals cause the stronger etching on samples than square-wave one. When in 50 °C solution, the sinusoidal and triangular wave AV signals induce much more severe pitting corrosion on DSS 2205samples compared with square-wave one. Based on the analyses of cross sectional morphologies, the AV-induced pits show a strong trend of lateral growth under AV interference. Although, the RMS values of three waveform AV signals applied on DSS 2205 samples are equal, the caused pitting and etching behaviors are different, which has a close relation with AV waveforms, peak potentials and enduring time of the peak potential.

Keywords DSS 2205, Pitting corrosion, AV interference, Waveform

Reference

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