Comparison of Corrosion Resistance and Corroded Surfaces of Welding Metal in Overlay-Welded Inconel 600 and Inconel 625 by Gas Metal Arc Welding

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Inconel is a Ni-based alloy with high strength and high corrosion resistance at high temperature. In this study, the corrosion resistance of overlay-welded Inconel 600 and Inconel 625 in carbon steel pipes was compared in various corrosion tests. The pitting resistance, intergranular corrosion resistance, and intergranular sensitization level of samples overlay-welded with gas metal arc welding (GMAW) under the same welding condition, through potentiodynamic polarization, potentiostatic polarization, and double-loop electrochemical potentiokinetic reactivation (DL-EPR) tests, and the corroded surfaces were observed through scanning electron microscopy coupled with energy-dispersive X-ray spectroscopy (SEM-EDS). Results of the potentiodynamic polarization test showed that Inconel 625 had slightly higher corrosion potential, pitting potential, and passive region than Inconel 600. The potentiostatic polarization test also showed that both the pitting resistance and intergranular corrosion resistance were higher in Inconel 625 than in Inconel 600 because Inconel 625 had a lower current. In the DL-EPR test, since sensitization occurred at the grain boundary in Inconel 600, its degree of sensitization (DOS) could be obtained; however, sensitization did not occur in Inconel 625, leaving its DOS undetermined.

Keywords: Inconel 625, Inconel 600, Overlay welding, Gas metal arc welding, Corroded surfaces

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