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Effect of Welding Current on Inconel 718 to Ti-6Al-4V Dissimilar Gas Tungsten Arc Welding with a Cu Filler Metal

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Dissimilar metal welding (DMW) has lately gained attention as a compelling process that may result in hybrid structures of reduced weight and improved corrosion resistance for a wide range of applications. The main objective of the current study is to elucidate the role of copper in dissimilar welding between Inconel 718 and Ti-6Al-4V alloys, as well as to investigate the influence of varying welding currents on the microstructure of the resulting joints. Gas Tungsten Arc Welding (GTAW) was performed between the above-mentioned alloys using a pure copper (99 wt.%) filler metal and varying the welding current. An infrared thermography (IRT) camera was employed to obtain the temperature distributions and thermal profiles during the welding process. Microstructural characterization was carried out by means of Scanning Electron Microscopy (SEM), coupled with Energy-Dispersive Spectroscopy (EDS), while X-Ray Diffraction (XRD) was employed to conduct crystal structure analysis of welded samples. Vickers microhardness testing was performed to assess the mechanical behavior of the joints and establish correlations with the presence of specific phases or intermetallic compounds within the microstructure.