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Microstructure Evolution and Mechanical Properties of Titanium Matrix Composites and Ni-based Superalloy Joints with Cu interlayer

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Abstract: This study investigated the joining of TiBw/Ti6Al4V composites and Inconel 718 alloy with Cu interlayer using gas tungsten arc welding (GTAW) equipment in order to modify the joints strength. Microstructure analysis indicated that Ti-Cu intermetallic compounds (IMCs) and a small number of Ti-Ni-Cu compounds were generated in the reaction layer with low heat input. While the main products changed into Ti-Ni-Cu compounds, also combined with Ti-Ni compounds and a few ternary compounds with the increase of heat input. Accordingly, the shear strength of dissimilar joints firstly increased and then decreased with the increase of welding current or the decrease of welding speed. The maximum shear strength (370 MPa) was obtained with the current of 100 A and the speed of 110 mm·min⁻¹. Moreover, the hardness of reaction layer was much higher than that of parent materials due to the formation of IMCs, and medium heat input can reduce the hardness mismatch in joints.

Keywords: TiBw/Ti6Al4V Composites; Inconel 718 alloy; Dissimilar Joints;

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