

Characteristics and Mechanical Properties of Bypass-Current MIG Welding-Brazed Dissimilar Al/Ti Joints

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Abstract : Joining of 1 mm thick aluminum 6061 to titanium TC4 was conducted using Bypass-current MIG welding-brazed, and stable welding process and good bead appearance were obtained. The Joint profile and microstructure of Ti/Al joints were observed by optical microscopy and SEM and then the structure of the interfacial reaction layers were analyzed in details. It was found that the intermetallic compound layer at the interfacial top is in the form of columnar crystal, which is in short and dense state. A mount of AlTi were observed at the interfacial layer near the Ti base metal while intermetallic compound like Al₃Ti and TiSi₃ were formed near the Al base metal, and the Al₁₁Ti₅ transition phase was found in the center of the interface layer due to the uneven distribution inside the weld pool during the welding process. Tensile test results show that the average tensile strength of joints is up to 182.6 MPa, which reaches about 97.6% of aluminum base metal. Fracture is prone to occur in the base metal with a certain amount of necking.

Keywords : bypass-current MIG welding-brazed, Al alloy, Ti alloy, joint characteristics, mechanical properties

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