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Microstructure and properties of Cu/Ti laser welded joints

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Abstract

Microstructure and properties of Cu/Ti laser welded joints. The optical microscopy, SEM, EDS, XRD and TEM were applied to assess the microstructure and bonding mechanism of Cu/Ti joints. When the laser beam was used to irradiate the copper side with an offset value of 0.45 mm, the welded metal and fusion line of Cu side were mainly consisted of the Cu solid solution. The intermetallic layer was formed at the titanium-welded metal interface. The thickness of IMCs was about 25 μ m and consisted of the Cu solid solution, intermetallic compounds such as TiCu, TiCu₂, Ti₂Cu and Ti₃Cu₄. The tensile strength of butt joints could reach 151 MPa, i.e. 61 % of the tensile strength of the copper base metal. The quasi-cleavage fracture occurred at the IMCs.

Keywords: Copper; Titanium; Dissimilar metal welding; Intermetallic compounds; Mechanical properties

1. Introduction

Titanium and copper welding is mainly focused on brazing and solid phase welding. For the solid phase welding, (Xin et al., 2017) obtained a brazing joint of Ti and Cu, but with a maximal tensile strength of only 72.6 MPa. (Aydın et al., 2012) bonded Ti6Al4V and copper through diffusion at 890°C for 60 min. (Kahraman and Gülenç, 2005) bonded Ti6Al4V and commercial

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