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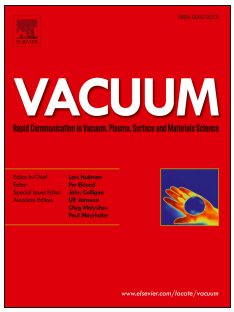

Brazing ZTA ceramic to TC4 alloy using the Cu foam as interlayer

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Brazing ZTA ceramic to TC4 alloy using the Cu foam as interlayer

Xiaoyang Wang, Chun Li, Xiaoqing Si, Junlei Qi*, Jicai Feng, Jian Cao*

State Key Laboratory of Advanced Welding and Joining, Harbin Institute of Technology, Harbin 150001, China

Abstract

In this study, a Cu foam was used as the interlayer to enhance the brazing strength of ZTA /TC4 joints. Scanning electron microscopy (SEM), energy disperse spectroscopy (EDS), X-ray diffraction (XRD) and transmission electron microscopy (TEM) were used to characterize the interfacial microstructure of the joints, which is determined to be ZTA ceramic/Ag(s,s)+Cu(s,s)/TiO+$Ti_3(Cu,Al)_3O$/Ti_2Cu_3/TiCu/ Ti_2Cu/α+β-Ti/TC4 alloy. The effects of brazing temperature and holding time on the microstructure and mechanical properties of the joints are investigated. With the increase of brazing temperature and the holding time, Ti-Cu intermetallic compound layers thickens and the brazing seam narrows. When the joints are brazed at 850 °C for 10 min, the shear strength of the joints reaches the maximum value of 84.5 MPa, displaying a 95% increase compared to the joints without the Cu foam interlayer.

Key words: Brazing; ZTA ceramic; TC4 alloy; Cu foam; Interfacial microstructure; Mechanical properties

1. Introduction

Zirconia toughened alumina (ZTA) has become one of the widely used structural ceramics due to the good toughness and crack resistance [1]. However, due to their poor machinability, ZTA ceramics are difficult to be processed into complex components [2, 3]. In addition, many applications require a metallic part in combination with the ceramic [4]. Therefore, ZTA ceramics need to be reliably joined

*Corresponding author. Tel./fax: +86-045186418146.

E-mail address: *cao_jian@hit.edu.cn (Jian Cao)；jlqi@hit.edu.cn (Junlei Qi)*