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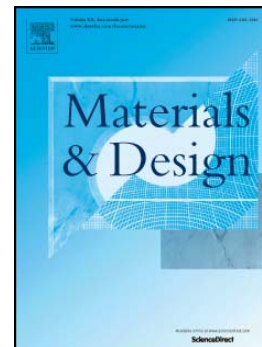
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**Low-temperature diffusion brazing of active metallized Al₂O₃ ceramic tube and
5A05 aluminum alloy**

Y. Wang^a, Z.W. Yang^{a,*}, L.X. Zhang^b, D.P. Wang^a, J.C. Feng^b

^a Tianjin Key Lab of Advanced Joining Technology, School of Materials Science and
Engineering, Tianjin University, Tianjin 300072, China

^b State Key Lab of Advanced Welding and Joining, Harbin Institute of Technology,
Harbin 150001, China

Abstract

A low-temperature ceramic-metal joining technique was successfully developed to produce vacuum-tight Al₂O₃ ceramic and 5A05 aluminum alloy joints, with leak rates of less than $1.0 \times 10^{-9} \text{Pa} \cdot \text{m}^3/\text{s}$. This involved two steps: active metallization of the Al₂O₃ ceramic surface using Ag-Cu-TiH₂-B composite filler, followed by diffusion brazing of metallized Al₂O₃ ceramic and 5A05 alloy at 530°C. The microstructure, interfacial reactions and mechanical properties of the active metallized Al₂O₃ ceramic and diffusion-brazed Al₂O₃/5A05 joint were investigated. The joint properties were determined by the formation of a continuous Ti₃Cu₃O reaction layer adjacent to Al₂O₃ ceramic, *in situ* synthesized TiB whiskers in the brazing seam, and dissolution thickness of 5A05 alloy. The maximum shear strength of the bonded joints reached 70MPa, while fracture propagated in the Al₂O₃ substrate, with a bowed crack path. A model for quantitatively evaluating the dissolution thickness of 5A05 aluminum alloy during diffusion brazing process was established.

Keywords: Active metallization; diffusion brazing; aluminum alloy; Al₂O₃ ceramic; interfacial microstructure

* Corresponding author. Tel.: +86 022 27405889; Fax: +86 022 27405889
E-mail: tjuyangzhenwen@163.com; yangzw@tju.edu.cn (Zhenwen Yang)

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