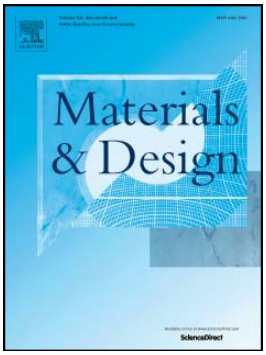

Low-temperature diffusion brazing of active metallized Al_2O_3 ceramic tube and 5A05 aluminum alloy

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Low-temperature diffusion brazing of active metallized Al_2O_3 ceramic tube and 5A05 aluminum alloy

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Abstract

A low-temperature ceramic-metal joining technique was successfully developed to produce vacuum-tight Al_2O_3 ceramic and 5A05 aluminum alloy joints, with leak rates of less than 1.0×10^{-9}Pa•m^3/s. This involved two steps: active metallization of the Al_2O_3 ceramic surface using Ag-Cu-TiH_2-B composite filler, followed by diffusion brazing of metallized Al_2O_3 ceramic and 5A05 alloy at 530°C. The microstructure, interfacial reactions and mechanical properties of the active metallized Al_2O_3 ceramic and diffusion-brazed Al_2O_3/5A05 joint were investigated. The joint properties were determined by the formation of a continuous Ti_3Cu_3O reaction layer adjacent to Al_2O_3 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 Al_2O_3 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; Al_2O_3 ceramic; interfacial microstructure

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