

# Infiltration behavior of Cu and Ti fillers into $\text{Ti}_2\text{AlC}/\text{Ti}_3\text{AlC}_2$ composites during tungsten inert gas (TIG) brazing

N. Chiker, A. Haddad, Y. Hadji, M.E.A. Benammar, M. Azzaz, M. Yahi, T. Sahraoui, M. Hadj, M.W. Barsoum

**Abstract:** Herein we study the infiltration behavior of Ti and Cu fillers into a  $\text{Ti}_2\text{AlC}/\text{Ti}_3\text{AlC}_2$  MAX phase composites using a TIG-brazing process. The microstructures of the interfaces were investigated by scanning electron microscopy and energy dispersive spectrometry. When  $\text{Ti}_2\text{AlC}/\text{Ti}_3\text{AlC}_2$  comes into contact with molten Ti, it starts decomposing into  $\text{TiC}_x$ , a Ti-rich and  $\text{Ti}_3\text{AlC}$ ; when in contact with molten Cu, the resulting phases are  $\text{Ti}_2\text{Al}(\text{Cu})\text{C}$ ,  $\text{Cu}(\text{Al})$ ,  $\text{AlCu}_2\text{Ti}$  and  $\text{TiC}$ . In the presence of Cu at approximately 1630 °C, a defective  $\text{Ti}_2\text{Al}(\text{Cu})\text{C}$  phase was formed having a  $\text{P6}_3/\text{mmc}$  structure.  $\text{Ti}_3\text{AlC}_2$  MAX phase was completely decomposed in presence of Cu or Ti filler materials. The decomposition of  $\text{Ti}_2\text{AlC}$  to  $\text{Ti}_3\text{AlC}_2$  was observed in the heat-affected zone of the composite. Notably, no cracks were observed during TIG-brazing of  $\text{Ti}_2\text{AlC}/\text{Ti}_3\text{AlC}_2$  composite with Ti or Cu filler materials.

**Keywords :** MAX phase, Joining, microstructure, hardness, Brazing, TIG process