

# Microstructure and microindentation of $\text{Ti}_3\text{SiC}_2$ -Titaniumfiller brazed joints by tungsten inert gas (TIG) process.

Y. Hadji, A. Tricoteaux, M.G. Ben Ghorbal, M. Yahi, R. Badji, T. Sahraoui, M. Hadji, M.W. Barsoum

**Abstract:** Herein we study the joining of  $\text{Ti}_3\text{SiC}_2$ - a MAX phase - with a Tifiller ( $\text{Ti}_3\text{SiC}_2/\text{Ti}$ -filler) using a TIG-brazing process. The microstructures of the interfaces were investigated by scanning electron microscopy and energy dispersive spectrometry. When  $\text{Ti}_3\text{SiC}_2$  comes into contact with the molten Ti -filler during the TIG-brazing operation, it starts decomposing into  $\text{TiC}_x$  and a Si-rich liquid. Simultaneously, the molten Ti infiltrates into the  $\text{Ti}_3\text{SiC}_2$  resulting in a 200  $\mu\text{m}$  thick duplex region, comprised of  $\text{TiC}_x$  and a Ti-rich phase with some dissolved Si. Both Si and C are found in the solidified Ti; the Si source is from the Si-rich liquid, while the presence of C indicates that some of the C diffused into the Ti. Upon cooling, C- containing Ti- rich lamellae form the solidified Ti. Microindentation results of the decomposed  $\text{Ti}_3\text{SiC}_2$  layer show an increase in hardness and a decrease in elastic modulus relative to  $\text{Ti}_3\text{SiC}_2$ . Notably, no cracks were observed.

**Keywords :** MAX Phases, Microstructures, Joining, hardness, Micro-indentation