

Microstructure and microindentation of Ti_3SiC_2 -Titaniumfiller brazed joints by tungsten inert gas (TIG) process.

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Abstract: Herein we study the joining of Ti_3SiC_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 Ti_3SiC_2 comes into contact with the molten Ti -filler during the TIG-brazing operation, it starts decomposing into TiC_x and a Si-rich liquid. Simultaneously, the molten Ti infiltrates into the Ti_3SiC_2 resulting in a 200 μm thick duplex region, comprised of 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 Ti_3SiC_2 layer show an increase in hardness and a decrease in elastic modulus relative to Ti_3SiC_2 . Notably, no cracks were observed.

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