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Infiltration behavior of Cu and Ti fillers into Ti2AlC/Ti3AlC2 compositesduring tungsten inert gas (TIG)brazing

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Abstract: Herein we study the infiltration behavior of Ti and Cu fillers into a Ti2AlC/Ti3AlC2MAX phase composites using aTIG-brazing process. The microstructures of the interfaces were investigated by scanning electron microscopyand energy dispersive spectrometry. When Ti2AlC/Ti3AlC2 comes into contact with molten Ti, it starts decomposinginto TiCx, a Ti-richandTi3AlC; when in contact with molten Cu, the resulting phases are Ti2Al(Cu)C, Cu(Al), AlCu2Ti and TiC. In the presence of Cu at approximately 1630 °C, a defective Ti2Al(Cu)C phase was formedhaving a P63/mmc structure. Ti3AlC2 MAX phase was completely decomposed in presence of Cu or Ti fillermaterials.The decomposition of Ti2AlC to Ti3AlC2 was observed in the heat-affected zone of the composite.Notably, no cracks were observed during TIG-brazing of Ti2AlC/Ti3AlC2 composite with Ti or Cu filler materials.

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