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Effect of Ti content on microstructure and strength of the self-joining of ZrB_2 -SiC with Pd-Co-Ti filler metals

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ABSTRACT

Ti element has been introduced into Pd-Co brazing alloy for the joining of SiC reinforced ZrB_2 ceramic. Effects of Ti content on the microstructure and mechanical properties of the joint were investigated. The results showed that, compared with single Pd-Co brazing alloy, by adding Ti element into the brazing alloy, the wettability of brazing alloy on ZrB_2 -SiC was greatly improved. The thickness of the diffusion zone in the ceramic occurred a reduction significantly. The active Ti atoms reacted with ZrB_2 to form a TiB_2 layer on the surface of the ceramic. The TiB_2 layer acted as a barrier, the diffusion of the Si from the ceramic to the brazing foil was inhibited. A certain degree of control over the reaction between the solder and SiC was obtained, which was beneficial for the joint strength. The four-point bending strength was 35% higher than the joint brazed with single Pd-Co foil when 10 at.% Ti was added.

KEYWORDS: ZrB_2 -SiC, Pd-Co-Ti, brazing, microstructure, mechanical properties