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Effect of Ni content and brazing temperature on the self joining of ZrB_2 -SiC

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ABSTRACT

Pd-Co-Ni filler alloy was adopted to braze ZrB_2 -SiC to itself. The reliable ZrB_2 -SiC was obtained. The effects of Ni content and brazing temperature were investigated on the microstructure and properties of the ZrB_2 -SiC joints using SEM and four-point bending method. All the joints consist of diffusion zone in ZrB_2 -SiC ceramic, Pd-Si phase, Co-Si phase, and Ni-Co solid solution. During the brazing, Ni and Co soluted into each other; a certain control over the reaction between SiC from the ceramic and Co from the brazing alloy was obtained, which is beneficial for the joint strength. Low brazing temperature leads to undesirable wettability of the brazing alloy on the ceramic. However, high brazing temperature causes the excessive reaction between SiC and Co, which caused the diffusion zone grow wider. With the increasing of brazing temperature, the bonding strength first increased and then decreased. When the brazing temperature reached 1543 K and Ni content was 26 at.%, the bending strength reached the maximum value of 120 MPa.

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