

Influence of Oxygen Content of Silicon Nitride upon Its Sinterability in HIPing without Additives

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Two kinds of Si_3N_4 powders, of which characteristics were similar to each other in morphology, crystallographic phases and chemical contents except for oxygen content, were sintered by HIP using a glass capsule without additives. The amount of oxygen content in Si_3N_4 powder had influence upon its sinterability without additives. After HIPing, the increase in oxygen content in samples was detected though no penetration of glass through a BN inner capsule into Si_3N_4 was observed. But the oxygen content in well densified bodies was relatively small.

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Sintering of Si_3N_4 -SiC Whisker Composite

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Si_3N_4 -SiC whisker composites with whisker content up to 30 wt% were prepared by heating 1700° to 2000°C for 60 min in 1 MPa N_2 . Fully dense composites were obtained at 2000°C. The optimum content of sintering aids, Y_2O_3 plus La_2O_3 , was 20 and 30 mol% for the whisker content of 10 and 20 wt% respectively. The room temperature bending strength were 596 and 560 MPa for 10 and 20 wt% additions of whisker, respectively. Moreover, these composites had strengths more than 80% of the room temperature value at 1300°C. Improvement in the strength was achieved by using sieved whisker.

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Electric Discharge Welding of Ceramics

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An electric discharge method for welding ceramics has been developed. A joining material electrically conductive at high temperature is inserted between two pieces of ceramics to be joined, and the joint region is preheated by a pair of burners of spouting combustion gas. When the joint region is heated to high temperature, a high voltage is applied between a pair of electrodes combined with the burners. The ceramics are joined by electric discharge through gas flame and the joint region. Pressureless-sintered Si_3N_4 ceramics were joined using a mixture of kaolin and CaF_2 as a joining material. Ceramics can be joined easily, in a short time, and economically by this method.

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