Strength of Hot Pressed TiB_2-5% TaB_2-1% CoB Bodies Using Fine Powders

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The transverse rupture strength σ (MPa) of TiB_2-5% TaB_2-1% CoB bodies was expressed by $\sigma = 1500\, d^{-0.56}$, where d (μm) is the average grain size of TiB_2. Hence, the higher transverse rupture strength is expected from the raw materials with smaller particle size of TiB_2. However, fine raw powders did not give a high strength and gave more pores. Examination of compositions and oxygen content suggests that the fine raw powders were more oxidized during mixing.

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Mechanochemical Effect on the Sintering Behavior of Silicon Carbide Powder

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Aluminium-doped beta silicon carbide powders were activated mechano-chemically by fine grinding in a vibration ball mill. The resultant powders doped with metallic boron (0.2%) and carbon (2%) was normally sintered under Argon flow, and the effect of mechanochemical activation on the densification of β-SiC was investigated. The results obtained are as follows :

(1) The moldability of the ground powders decreased remarkably. The mechanochemical activation made very little contribution to the densification of β-SiC and accelerated only the surface diffusion at lower temperatures.

(2) Fine powders with the average particle size of 0.29 μm and maximum size of ca. 1.0 μm is recommended as a starting powder.

(3) The ground powders showed a large weight loss during sintering, and stimulated the growth of plate-like crystals at elevated sintering temperatures. The plate-like crystals tend to retard the extensive consolidification of β-SiC.

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Electrical Discharge Machining of Si_3N_4-SiC Whisker Composite Ceramics

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Silicon nitride ceramics containing more than 10 wt% silicon carbide whisker can be machined electro discharge because of the low electrical resistivity of less than $10^3\ \Omega \cdot cm$. Machining properties of Si_3N_4-SiC whisker composite ceramics by the ram-type electrical discharge machining have been studied. Pure copper is used as a tool electrode. Cutting rate of this composite ceramics increases with an increase in machining current. The cutting rate in reverse polarity machining for positive tool electrode is two or three times larger than that in normal polarity machining. The machined surface in the normal polarity machining is rather smooth, while large craters develop on the surface in the reverse polarity machining. Surface roughness after machining is more than 10 μm. The wear rate of the copper tool electrode is less than 10%. Silicon carbide formed probably by the decomposition of the ingredients in this composite ceramics and kerosene used as machining oil adheres to the tool electrode, which improves the wear resistance of the tool electrode.

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