taining B_4C and C was sintered at 2000° to 2150°C for 60 minutes by pressureless sintering. The thermal conductivity of dense SiC with a relative density of 98% reached 160 to 180 W/m·K by 1.5 wt% C and 2.0 wt% B_4C addition. Moreover, it was found that the additives in compact SiC were localized at grain boundaries and within grains. The non-uniform distribution of additives enhanced the thermal conductivity effectively. [Received August 21, 1985]
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Sintering and Mechanical Properties of Silicon Nitride Crystallized from Amorphous Powder

——Effect of Yttria Addition——

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Sintering and mechanical properties of hot-pressed silicon nitride which was crystallized from amorphous powder with the addition of Y_2O_3 have been studied. The crystallization was performed by calcination at 1200°-1500°C in a nitrogen atmosphere with and without Y_2O_3 addition. The calcined powder was hot-pressed at 1750°C for 1h under a pressure of 49 MPa. Addition of Y_2O_3 promoted the crystallization of amorphous Si_3N_4 to α-phase and increased the rate of α/β transformation. The crystallized powder by calcining after Y_2O_3 addition consisted of fairly fine particles with uniform size distribution, while the calcination without additives resulted in powder of large particle size with various morphologies. The bulk density and the flexural strength tested at room temperature and at 1200°C increased with increasing initial α-phase content for the powders incorporated with Y_2O_3 before calcination, but decreased with decreasing α-phase content for the powder added with Y_2O_3 after calcination. The initial α-phase content had no significant effect on either the bulk density or the flexural strength of the hot-pressed bodies when the starting powder was prepared by crystallization of amorphous powder with the addition of Y_2O_3. It was found that the factors which control sinterability, mechanical properties and microstructure of the hot-pressed silicon nitride ceramics are morphology of the powder particles and the reaction products between Y_2O_3 and Si_3N_4 rather than the α-phase content. [Received August 8, 1985]
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Preferred Orientation and Mechanical Properties of Pressureless Sintered Silicon Nitride

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Mixtures of granular α-and needle-like β-silicon nitride particles could be obtained by adequate heat treatment of α-silicon nitride. By cold-pressing and pressureless sintering, the c-axis of the

β-Si_3N_4 has a preferred orientation perpendicular to the cold-press direction. This orientation varied sharply in the vicinity of the specimen surface because of the β-Si_3N_4 grain growth along the surface. The degree of preferred orientation was related to the content of β-Si_3N_4 in the starting powder and to the molding pressure. Vickers microhardness and 3-point bending strength showed anisotropy due to the crystal orientation. [Received August 27, 1985]

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Crystallinity of SiC Coated on Carbon Fiber

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The structure, crystallinity and preferred orientation of the SiC coated on carbon fiber at 1200°C from mixtures of monomethyltrichlorosilane, hydrogen, methane and argon were studied by X-ray and selected area electron diffractometries. The SiC was identified to be 3C type, in which the stacking sequence of the closest packed layers is highly disordered along one of the [111] directions. Moreover, it was found that a decrease in hydrogen concentration or an increase in methane concentration enhances the orientation of these layers parallel to the fiber surface, and increases the crystallite size. Such changes in the orientation and the crystallite size are considered to be due to the increase in methane concentration in the reaction zone.

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Room Temperature Strength of β-Sialon Fabricated from Aluminum-iso-propoxide and α-Si_3N_4

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β-sialon with $z = 0.5$ was fabricated from Al(Oi-Pr)$_3$/n-C_6H_{14} solution containing α-Si_3N_4 particles. The solution was ball-milled and spray-dried. The powder mixture of α-Si_3N_4 and Al(Oi-Pr)$_3$ was calcined and then hot-pressed. Three-point bending strength of the materials was measured at room temperature. The fracture origin was investigated by an optical microscope. Sintered β-sialon with $z = 0.5$ was consisted of β-sialon and a small amount of O'-sialon. The bending strength was 81 kg/mm^2 for the specimens ground with # 270 diamond wheel, 85 kg/mm^2 for those ground with # 600 diamond wheel and 97 kg/mm^2 for those polished with # 1500 SiC abrasive paper. The annealing at 1200°C for 1h in air increasing the strength remarkably up to 140kg/mm^2 (160kg/mm^2 in maximum). Most specimens fractured at surface flaw caused by machining. [Received July 29, 1985]

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