BORON NITRIDE FIBER REINFORCED SIBON MATRIX COMPOSITES

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ABSTRACT: Boron nitride (BN) fiber has attracted increasing attentions in the aerospace and other engineering fields due to its outstanding thermal, mechanical and electromagnetic properties. In this paper, BNf/SiBON composites were prepared by adding short boron nitride fibers and in-situ inorganic solid state reaction. The relationships among hot-pressing sintering temperature, boron nitride fiber content, density and flexural strength of the composites were studied.

FABRICATION: The raw materials are short BN fibers, H3BO3 powder (analytical purity), Si3N4 powder and n-hexane (analytical purity). B2O3 is dehydrated from H3BO3. B2O3 powder, Si3N4 powder, short BN fibers and grinding balls were grinded with n-hexane as solvent for 16-20 hours at a mass ratio of 2:1:0.6-1.2:1.5, and then dried. The dried powder was packed into the graphite mould coated with boron nitride on the inner wall, sintered at 1600°C and 1700°C for 2hours under argon protection and then hot pressed with 10MPa for 15minutes.

CHARACTERIZATION: The bending strength of composites prepared by hot pressing sintering at 1600°C and 1700°C with 20%, 40% and 60% BN fibers are shown in Figure 2. With the increase of sintering temperature, the bending strength of samples increases gradually, C. When the sintering temperature is°C is better than that at 1600°and the bending strength at 1700 constant, the bending strength decreases with the increase of boron nitride fiber content, so the content of fibers should not be too much, and had better to be controlled in the scope of 20 to 40 percents

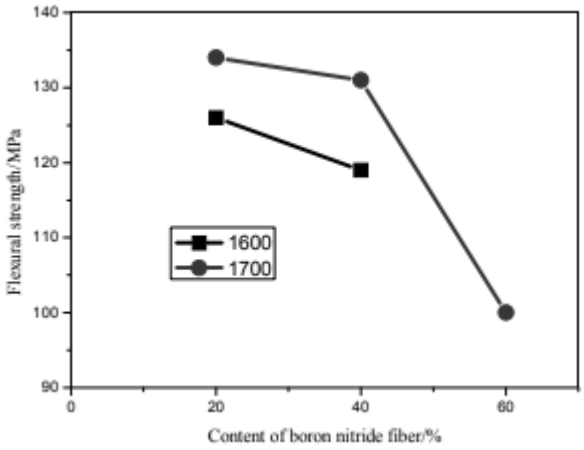

Figure 2. Bending strength at different temperatures and fiber contents.

When brittle fracture occurs, no fibers are pulled out from the surface as shown in figures 3. The bonding between fibers and matrix is closer, and better than that of 40% BN sintered at 1600°C (figure 2).

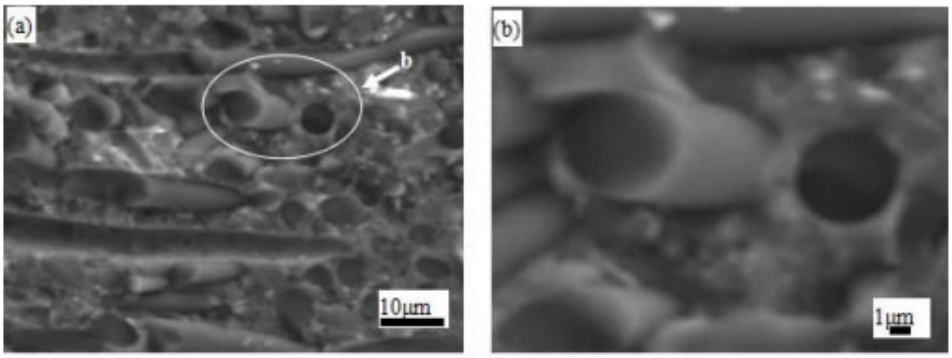

Figure 2: SEM photographs of 40% BN fibers at 1600°C: (a) Mmorphology of fibermatrix; (b) Fracture surface of fiber pulled out.

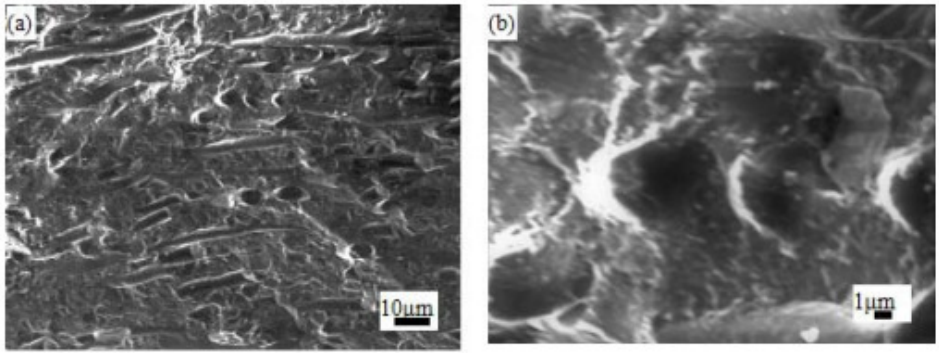

Figure 3: SEM photographs of 40% BN fibers at 1700°C: (a) Morphology of fibermatrix; (b) Fracture surface of fiber pulled out.

CONCLUSION: The bending strength of BNf/SiBON increases with the increase of sintering temperature when the fiber content is constant, and decreases with the increase of fiber content when the sintering temperature is constant. It goes for a maximum (134MPa) at 20% BN fiber and 1700°C. When the sintering temperature is 1700°C, the matrix is more closely bound to the BN fibers.

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