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# Structural design and energy absorption mechanism of laminated SiC/BN ceramics

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**Abstract**:

The laminated silicon carbide/boron nitride (SiC/BN) ceramics with different structural designs were fabricated by pressureless sintering at 1900 °C for 1 h in argon flow. The alumina ($Al_2O_3$)-and yttrium(III) oxide ($Y_2O_3$)-doped SiC ceramic exhibited a significant intergranular fracture behavior, which could be attributed to the yttrium aluminum garnet (YAG) phase located at the grains boundaries. The bending strength and fracture toughness were used to characterize the crack propagation including the delamination cracking, crack kinking, and crack deflection. The energy absorption in the process of crack propagation was characterized by the work of fracture (WOF) and damping capacity. The mode of crack propagation changed with the change in the structure and variation of BN content in the BN layer. The delamination cracks occurred inside the BN layer or at the interface between SiC and BN layers. The sample with a gradient structure exhibited the combination of delamination cracks occurring at the interface and inside the BN layer, which showed the maximum WOF of 2.43 KJ $m^{-2}$, bending strength of 300 MPa, and fracture toughness of 8.5 MPa·$m^{1/2}$. The damping capacity varied with the change of the structure and the amplitude. The sample with a gradient structure exhibited the damping capacity of 0.088 and the maximum loss modulus of 9.758 GPa.

**Keywords**: Structural design; Laminated; Silicon carbide; Crack propagation; Damping capacity;

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