Elemental inclusion of silicon within boron carbide to increase toughness for armor applications

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Abstract: Boron carbide (B₄C) is a ceramic with a structure composed of B₁₂ or B₁₁C icosahedra bonded to each other and to three(C and/or B)-atom chains. Despite its excellent hardness, B₄C fails catastrophically under shock loading due to an amorphous shear band failure above the Hugoniot elastic limit. Through elemental inclusion of selected elements (Be, Mg and Al, and Si) within B₄C lattice sites, the current amorphous shear band failure may be prevented.

Short Bio: Dr. Raymond Gamache received his Ph.D. from Rensselaer Polytechnic Institute in physics and his B.S. from the University of Vermont in math and physics. Dr. Gamache served in the Marine Corps and worked both at the Naval Research Laboratory in Washington D.C. and the Naval Surface Warfare Center. Dr. Gamache has developed and fielded Dragonshield armor and has over 30 patents related to new armor systems including applications to both personal and vehicle.