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BULK BORON CARBIDE NANOSTRUCTURED CERAMICS BY REACTIVE SPARK PLASMA SINTERING

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Abstract

Bulk boron carbide (B₄C) ceramics was fabricated from a boron and carbon mixture by use of one-step reactive spark plasma sintering (RSPS). It was also demonstrated that preliminary high-energy ball milling (HEBM) of the B+C powder mixture leads to the formation of B/C composite particles with enhanced reactivity. Using these reactive composites in RSPS permits tuning of synthesized B₄C ceramic microstructure. Optimization of HEBM + RSPS conditions allows rapid (less than 30 min of SPS) fabrication of B₄C ceramics with porosity less than 2%, hardness of ~35 GPa and fracture toughness of ~ 4.5 MPa·m^{1/2}

Keywords:

ceramics, boron carbide, high-energy ball milling, mechanical activation, reactive sintering, spark plasma sintering

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