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Investigation of the microstructure and oxidation properties of NbB_2-SiC-GNP composites

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Niobium diboride (NbB_2), ceramic is characterized by an excellent combination of properties comprising high melting point, hardness, wear resistance, thermal conductivity, good creep resistance, and excellent chemical stability. However, difficulties in densification, low fracture toughness and poor oxidation resistance of NbB_2 limit the use of these materials. A number of studies have shown that addition of SiC improves the oxidation resistance by forming a protective SiO2-rich layer and improve fracture toughness of transition borides. Moreover, recent studies have demonstrated that graphene nano-platelets (GNP) addition can significantly enhance the mechanical properties of ceramic matrices. In this study, GNPs were incorporated into (20-x)SiC-80NbB_2 (vol.%) composite powder with x=0, 0.5, 3, 5, 7 and 10 vol.% contents. The resulting powder mixtures were sintered by spark plasma sintering (SPS) at 1750°C under 50 MPa with a 5 min holding time. The sintered composites were then characterized with respect to their densification, microstructure, oxidation behavior and mechanical properties change with the combination of SiC and graphene nano platelets. Improvement in oxidation resistance as a result of formation of protective layers and fracture mode change with the incorporation of SiC and GNPs will be discussed in this presentation.

Biography

Burak Cagri Ocak has a Bachelor's degree in Metallurgy and Materials Engineering from Istanbul Technical University. He also received his Master's degree in Materials Engineering and did his thesis work on ultra-high temperature ceramics. Currently, he is pursuing his Doctoral education from the Istanbul Technical University.

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