

Accepted Manuscript

Boron carbide B₄C ceramics with enhanced physico-mechanical properties sintered from multimodal powder of plasma dynamic synthesis

Alexander Sivkov, Iliyas Rakhmatullin, Ivan Shanenkov, Yuliya Shanenkova



PII: S0263-4368(18)30471-2

DOI: [doi:10.1016/j.ijrmhm.2018.09.003](https://doi.org/10.1016/j.ijrmhm.2018.09.003)

Reference: RMHM 4785

To appear in: *International Journal of Refractory Metals and Hard Materials*

Received date: 18 July 2018

Revised date: 24 August 2018

Accepted date: 2 September 2018

Please cite this article as: Alexander Sivkov, Iliyas Rakhmatullin, Ivan Shanenkov, Yuliya Shanenkova , Boron carbide B₄C ceramics with enhanced physico-mechanical properties sintered from multimodal powder of plasma dynamic synthesis. Rmhm (2018), doi:[10.1016/j.ijrmhm.2018.09.003](https://doi.org/10.1016/j.ijrmhm.2018.09.003)

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Boron carbide B₄C ceramics with enhanced physico-mechanical properties sintered from multimodal powder of plasma dynamic synthesis

Alexander Sivkov, Ilyas Rakhmatullin, Ivan Shanenkov, Yuliya Shanenkova*

School of Energy and Power Engineering, National Research Tomsk Polytechnic University, 634050, Tomsk, Russian Federation

* Corresponding author (I. Shanenkov). Email: Swordi@list.ru; Full postal address: 634050, Russian Federation, Tomsk, National research Tomsk polytechnic university; 30 Lenin av.; Tel.: +79069561366

Abstract

Boron carbide B₄C as one of the hardest materials known is of a great scientific interest for years due to a unique combination of different useful properties. The ceramics on its basis has many prospective applications. However, the widespread usage of this ceramics is limited due to the relatively low fracture toughness as well as the poor sinterability. This work shows the possibility to obtain the ceramics with enhanced physico-mechanical properties based on the powdered boron carbide B₄C prepared by a plasma dynamic method. The key features of this powdered material are a single-crystalline particle structure and their multimodal distribution from several nanometers to several micrometers that is confirmed by the results of both scanning and transmission electron microscopy. Sintering the ceramics based on the as-prepared B₄C powder by SPS technology at the temperature of 1950°C, pressure of 60 MPa and time exposure of 5 min allows not only achieving the expected values of ceramics density (~99% relative to the theoretical one) but also the high hardness (~37 GPa) and fracture toughness (6.7±0.3 MPa·m^{1/2}).

Keywords:

Boron carbide B₄C; plasma dynamic synthesis; multimodal powder; ceramics; physico-mechanical properties

Download English Version:

<https://daneshyari.com/en/article/10142075>

Download Persian Version:

<https://daneshyari.com/article/10142075>

[Daneshyari.com](https://daneshyari.com)