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## On possible reactions between boron carbide and silicon at elevated temperatures

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### Abstract

Ternary compounds like  $B_5SiC_2$  and  $B_3Si_2C_2$  as products of reaction between  $B_4C$  and silicon were proposed to exist in early investigations. According to the recent publications the products of high temperature reaction are SiC and the ternary phase(s)  $B_xC_yC_z$ . The crystals of the newly appearing ternary phase(s) have relatively big dimensions (10-20  $\mu m$ ), rather strict crystal facets. Twinning may be frequent for these phases. According to energy dispersive and wavelength dispersive spectroscopy the composition of these crystals tends to  $B_3Si_2C_2$ , their diffraction lines are similar to those of  $B_xSi_yC_z$  phase, described earlier.

**Key words:** boron carbide, silicon, ternary phase(s)

### 1. Introduction

In the early investigations of the system “Boron-Carbon-Silicon” Samsonov [1] proposed the existence of ternary compounds like  $B_5SiC_2$  and  $B_3Si_2C_2$ , as products of reaction between  $B_4C$  and silicon. Later [2] the existence of silicon borides as products of reaction between  $B_4C$  and silicon was shown. Two reactions (1, 2), that follow the process of reaction sintering of  $B_4C$ , were suggested



The information on “B – Si - C” system is rather limited. Telle [3] found the limit of solid solubility of boron in SiC on the level up to 3,5%, but didn't find any ternary compounds.

In the last publications [4-8] on processing of  $B_4C$  with silicon the information on reactions between  $B_4C$  and silicon at high temperatures is confirmed. Yet there is no definition of the products of reaction. The products of reaction between  $B_4C$  and silicon are considered [4-8] to be SiC and ternary phase  $B_xSi_yC_z$ . The ternary phase  $B_xSi_yC_z$  is proposed to be the solid solution of silicon in the crystal lattice of  $B_4C$ . The existence of ternary phase has academic interest; the practical view is if it weakens or strengthens the material.

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