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ABSTRACT BOOK

AUTHOR INDEX

Abstract No : 1031

SELF-PROPAGATING HIGH TEMPERATURE SYNTHESIS OF COMPOSITES ON THE BASIS OF ZrB_2 - Al_2O_3

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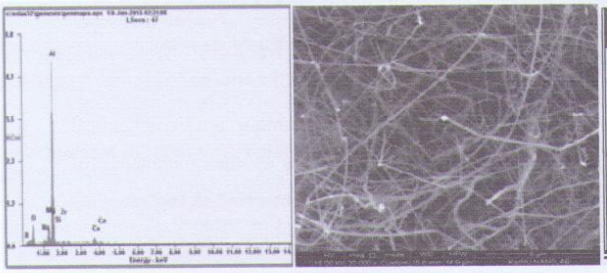
Transition metal borides are of special interest due to their unique physico-chemical properties and are widely used as the most promising materials in many branches of engineering, machine building, electronics, power industry [1]. However, strong covalent bonds inherent to phases of pure diborides of transition metals lead to low plasticity and low strength, thereby limiting the field of their use to a great extent. In this connection, at present great attention is paid to the technology of production of multicomponent composition materials containing metal borides in combination with more plastic materials playing the role of a binder. These can be, for example, aluminium or magnesium oxides which play the role of a high temperature binder and filler decreasing the content of expensive diboride, when producing composition materials [2, 3].

The aim of this investigation is self propagating high temperature synthesis (SHS) of composition materials with a wide range of phase composition using borate ore of Inder deposite of the Republic of Kazakhstan. The ores of Inder deposite are represented mainly by asharite, hydroboracite and ulexite [4]. The average content of B_2O_3 in Inder ores makes up 15-27.5%. In relation to the fact that borate ore of Inder deposite is distinguished by a considerable content of gypsum, the initial raw material was concentrated, the maximum content of boron oxide after concentration of ore made up 40 mass.%.

SH-synthesis was carried out in the system $ZrSiO_4 + Al + B_2O_3$, (where B_2O_3 is in the composition of borate ore). The sample were prepared from the charge containing aluminium (99% purity), borate ore of Inder deposit (the content of boron oxide up to 40%), natural mineral-zirconium ZrSiO4 (98.8%), preliminary mechanical activation was carried out in a high power planetary-centrifugal mill. The prepared samples were burnt at room temperature in air initiating ignition by magnesium.

High temperature phase: zirconium diboride, corundum, zirconium silicide were determined in SHS products by the method of XRD analysis.



Element	Wt%	At%
BK	10.31	20.30
OK	19.74	26.26
NaK	1.00	0.92
MgK	5.81	5.09
AlK	55.65	43.90
SiK	0.55	0.41
ZrL	1.89	0.44
CaK	5.04	2.68
Matrix	Correction	ZAF

Figure 1 – The microstructure and elemental analysis (SEM, EDAX) of SHS products of the system $ZrSiO_4 + Al + B_2O_3$(in borate ore)

Investigation on the microstructure surface of compositions allowed to reveal formation of filamentary crystals from aluminium oxide (Figure 1).

Thus the possibility of using borate ore of Inder deposite and mineral-zirconium for synthesis of refractory composite on the basis of ZrB_2-Al_2O_3 is shown.

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