

# CERAMICS ON THE $\beta$ - $\text{Si}_3\text{N}_4$ BASIS SINTERED UNDER PRESSURE WITH ACTIVATING ADDITIVES OF ALUMINIUM AND SAMARIUM OXIDES

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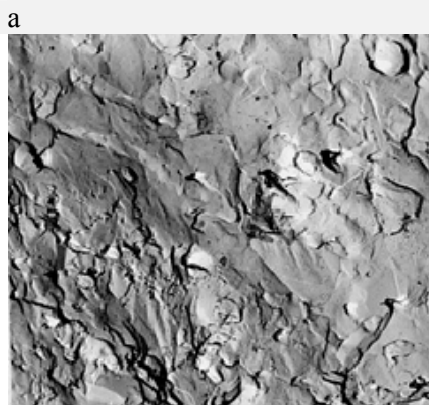
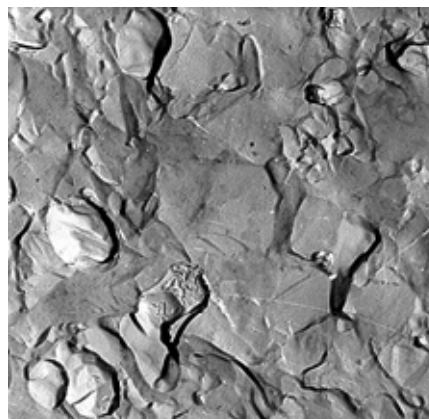
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Hot pressed nitride-silicon materials have high brittleness. Alloying with metallic refractory compounds additives performs to decrease it. In present work the influence of aluminium and samarium oxides additives on consolidation, structure and mechanical properties of hot pressed silicon nitride is studied. Pressing of specimens was carried out on machine with inductive heating at temperatures of 1700-1750 °C and pressure of 30 MPa. Tests of specimens bending strength was carried out on 3-dot loading testing machine.

The received results are presented in the table.

Content, mas. %		Density, g/cm <sup>3</sup>	Strength $\sigma_b$ , MPa
Oxides	Iron		
7 Al <sub>2</sub> O <sub>3</sub>	10,2	3,38	575
18 Al <sub>2</sub> O	10,6	3,32	510
18 Al <sub>2</sub> O	6,2	3,25	430
5 Sm <sub>2</sub> O <sub>3</sub>	10,2	3,24	535

Electron microscopy research of specimens have shown that during hot pressing there is a recrystallization through liquid phase, at that fine fraction (less than 0,5 microns) of the main phase disappears, in other particles morphological changes occur: the majority of grains get a rounded shape, and some crystals get oval shape with two-sided rounded corners. However, dissolution and recrystallization of the finest particles do not lead to significant change of the most presumable and maximum  $\text{Si}_3\text{N}_4$  grains size in a dense material in comparison with grains in burden. Figure shows the fractography of  $\text{Si}_3\text{N}_4$  specimens with different amount of Al<sub>2</sub>O<sub>3</sub>.



a  
b  
Fig. Microstructure of ceramics on  $\beta$ - $\text{Si}_3\text{N}_4$  basis with mas. %: 5 (a) and 18 (b) Al<sub>2</sub>O<sub>3</sub> additives fracture surface x 4700

Change of specimens strength correlates with change of ceramics with different compounds fracture mechanism. For material with maximum bending strength it is specific that fracture extends through binder and crystal as well (fig a).