

NONISOTHERMAL SYNTHESIS AND STUDY OF THE STRUCTURE AND PHASE COMPOSITION OF TITANIUM-CONTAINING NANOLAMINATE COMPOUNDS

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Nichrome powder (PX20N80) was added to a 3Ti + 1,2Si + 2C green mixture in the amount of 1, 5, 10 wt.% to study the microstructure and phase composition of samples and increase the operating temperature of Ti_3SiC_2 -based polymer coatings.

Figure 1 shows the diffraction patterns of SHS products for the 3Ti-1,2Si-2C system for the initial powder X20N80 (a) and for the case when X20N80 is added to the initial mixture in the amount of 1, 5, 10 wt.% (b, c, d, i). An increase in the amount of titanium carbide is observed in the products with the additive of X20N80.

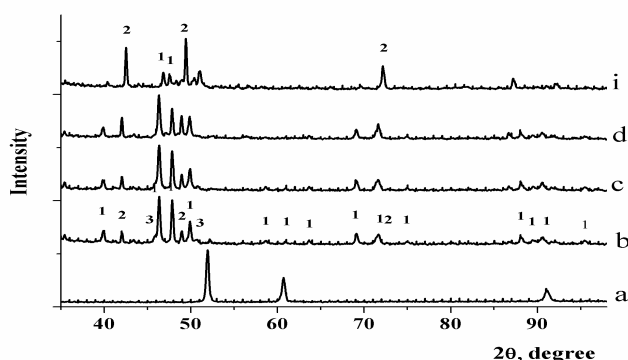


Fig.1. Diffraction patterns of SHS products for the Ti-Si-C system: X20N80 (a), 3Ti + 1,2Si+2C (b), (3Ti + 1,2Si+2C) + 1% of X20N80 (c), (3Ti + 1,2Si+2C) + 5% of X20N80 (d), (3Ti + 1,2Si+2C) + 10% of X20N80 (i). Ti_3SiC_2 (1), TiC (2), TiSi_2 (3).

Titanium carbide is the main phase for the samples with an additive of 10wt.% of X20N80. The diffractogram records the images of Ti_3SiC_2 , as well as the images which can not be determined. There were no the images of X20N80.

The maximum combustion temperature of the 3Ti-1,2Si-2C (Ti_3SiC_2) composition is (2373+25) K, and the maximum combustion temperature of the initial mixture with the additive of 10wt.% of X20N80 is (2273+25) K.

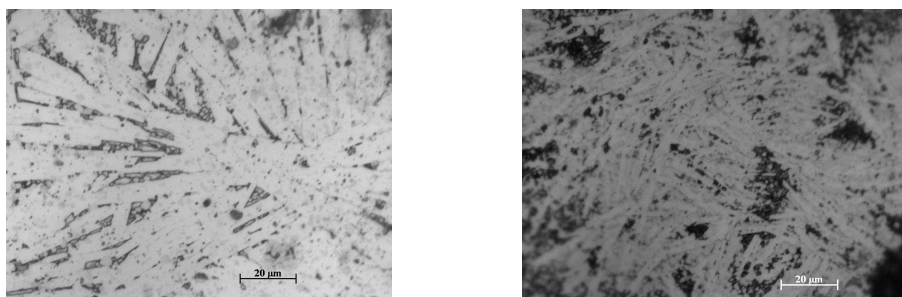


Fig.2. Microstructures of SHS products for the 3Ti – 1,2Si – 2C system with the additives: 1wt.% (a), 10wt.% (b). PX20N80.

Adding PX20N80 to the green mixture leads to the decrease in the grain size of the Ti_3SiC_2 phase. Adding 1% of PX20N80 to the green mixture did not demonstrate a noticeable difference in the phase composition and the microstructure as compared to the products synthesized without additives.

The state diagram of the Ni-Cr system show that PX20N80 is melted, and Ni and Cr interact with the components of the initial mixture with the participation of liquid phase at the indicated temperatures.

The use of composite nanolaminates, doped with nichrome, allows the operating temperature of thin-film heaters to be increased.