N2-O-011002

OBTAINING OF B-SIALON BY SHS FROM ALUMINUM FERROSILICON WITH THE ADDITION OF MARSHALITE

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Sialon is a material with unique physical and chemical properties. This material due to its properties has a wide range of applications [1, 2]. Self-propagating high-temperature synthesis (SHS) is the appropriate method to produce sialon and materials based on it due to the short synthesis time, energy efficiency, environmental friendliness, and simple equipment [3, 4].

Despite the advantages of the SHS method, its application in industry was limited by the high cost of starting materials. The use of ferroalloys in SHS processes reduced the cost of the products obtained and shifted this method from the laboratory to the large-scale industrial level [5].

The goal of this work is to obtain a sialon-based material from a mixture of aluminum ferrosilicon - based powders and marshalite in the combustion mode.

In [1] it was shown that the optimal composition of aluminum ferrosilicon and marshalite is 90:10 wt. %. However, the products obtained by combustion of this composition, according to X-ray diffraction, contained iron silicide phases. The presence of silicidal phases indicates an incomplete nitriding reaction.

In order to increase the yield of sialonic phase in the synthesized products, pre-nitrated product and gasifying additive, ammonium fluoride, were added to the mixture of aluminum ferrosilicon and 10 wt. % marshalite. The addition of a pre-nitrated product up to 30 wt. % reduced the intensity of iron silicide reflexes (Fig. 1a). The addition of a pre-nitrated product more than 30 wt. % makes the combustion reaction impossible. After the addition of 1 wt. % ammonium fluoride, silicide phase reflexes are not observed (Fig. 1c). Figure 2 shows a picture of the nitrated sample.

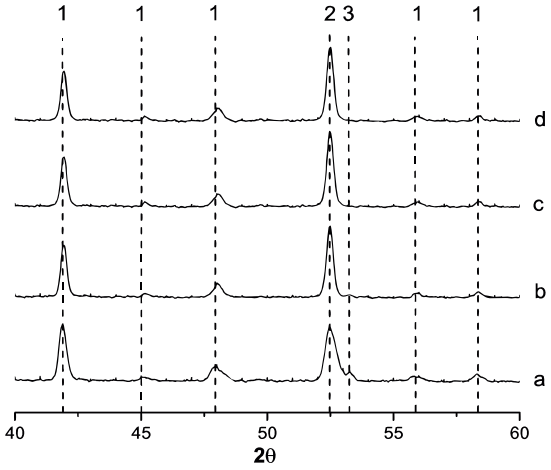

Fig.1. X-ray diffraction patterns of the mixture of aluminum ferrosilicon and marshalite with addition of nitrided product and NH_4F (**a**– 0**, b** – 0.5, **c** – 1, **d** – 1.5 мас. % NH_4F; 1 – β-SiAlON, 2 – α-Fe, 3 – Fe_xSi_y).

Fig.2. Picture of the nitrated mixture of aluminum ferrosilicon, marshalite, nitrated product, and ammonium fluoride.

Thus, the maximum yield of the sialon phase (87 wt%) was obtained from a mixture of powders based on aluminum ferrosilicon and marshalite by the SHS method.

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