THERMAL MODES OF SYNTHESIS IN MECHANICALLY ACTIVATED MIXTURE TI + AL*

A.V. SOBACHKIN[1], *V.Y. FILIMONOV*[1,2], *M.V. LOGINOVA*[1], *A.A. SITNIKOV*[1], *V.I. YAKOVLEV*[1], *A.Z. NEGODYAEV*[1], *A.Y. MYASNIKOV*[1,3], *A.A ROZNYJ*[1]

[1]*Polzunov Altai State Technical University, Barnaul, Russian Federation*
[2]*Institute for Water and Environment Problems, Barnaul, Russian Federation*
[3]*Institute of Solid State Chemistry and Mechanochemistry, Novosibirsk, Russian Federation*

The work established the existence of low-temperature synthesis regimes in a mechanically activated Ti + Al powder mixture. It has been shown that during synthesis in the thermal explosion mode [1–3], the critical temperatures depend on the time of mechanical activation. It was found that the complete conversion of reagents into products can be carried out without the implementation of synthesis in the combustion mode, under conditions of carrying out the reaction in a low-temperature mode (less than 700 °C).

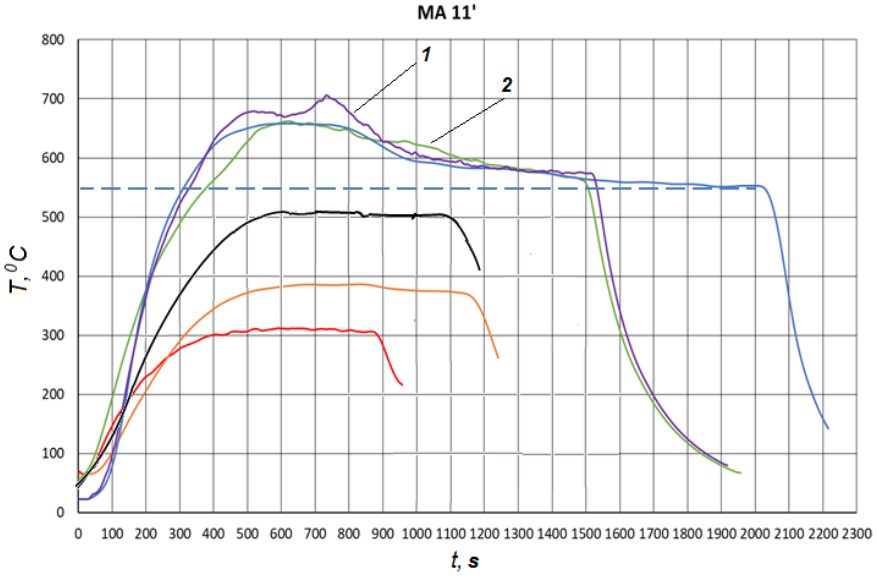

Fig.1. Low-temperature synthesis regimes in a mechanically activated Ti+Al mixture at different values of initiating power. Mechanical activation time is 11 min.

As X-ray phase analysis shows, the composition of the products synthesized in modes 1 and 2 (Fig. 1) is identical to the composition of the products obtained in the thermal explosion mode when reaching maximum temperatures of 1300 °C. It has been established that the content of the synthesized compounds depends on the time of mechanical activation and on the thermal conditions of synthesis. Analysis of the microstructure of the initial components and synthesis products made it possible to establish that the synthesis is realized in the volume of the mechanocomposite through a solid-phase heterogeneous reaction, as a result of which a moving interface is formed between the products and the initial titanium. The results obtained give grounds to assert that in this case it becomes possible in principle to control the processes of structure-phase formation in the activated Ti-Al mixture.

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