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BASIC MODELS OF PHASE FORMATION AT THE MESOLEVEL UNDER REACTIVE SINTERING OF TI-AL-FE2O3 POWDER MIXTURE*

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Titanium-based composites are used in various industries due to their relatively low density, high strength and corrosion resistance. The possibility of using a large number of additional components in the form of both simple elements and compounds that significantly increase its functional and physical-mechanical characteristics is widely used. One of the possible options for the creation of composites based on titanium is the use of reaction sintering, in the course of which the strengthening phase in the form of oxides is directly synthesized. If for relatively simple binary systems like Ti+Al the situation with the limiting physical and chemical stages is relatively clear, then when adding third-grade powders to the mixture, options that are not obvious at first glance are possible. Thus, in the Ti+Al+Fe2O3 system, depending on the percentage of powders, mixing conditions, and heating, different variants of mesovolumes can be distinguished in which the sequence of reactions and accompanying phenomena will lead to different phase composition. To analyze possible variants of events in reaction sintering conditions based on literature data, the following phase-formation models are considered under varying temperature conditions:

Ti+Al (reactions in the melt).

Ti+Al (diffusion couple, constant temperature, solid-phase process).

Ti (melt)+Fe2O3 (solid).

Al (melt)+Fe2O3 (solid).

(Ti+Al) (melt)+Fe2O3 (solid).

The main stages which can be expected under the experimental conditions are established. Particular models with moving interfaces are analyzed and the regularities for different temperatures and different rates of their change are analyzed.

Variants of models of interaction of iron oxide particles with the melt, taking into account the role of wettability of the solid surface, are proposed.

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