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BEHAVIOR FEATURES OF THE METASTABLE $Fe_{13}Ga_9$ PHASE DURING HEATING OF NON-EQUILIBRIUM Fe-Ga ALLOYS WITH A HIGH CONTENT OF GALLIUM *

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A surge of interest in Fe-xGa alloys occurred in the early 2000s after discovering increased values of the magnetostriction constant for x ≈ (17-19) and (26-27) at. % [1]. Therefore, the concentration range up to 30 at.% is considered in most works that studied the features of phase transitions between different structural states of Fe-Ga alloys. At the same time, the region of high concentrations of gallium (x > 30 at.%) has not yet been studied in sufficient depth.

Due to the fact that diffusion at low temperatures in alloys of the Fe-Ga system proceeds slowly, it is possible to fix non-equilibrium states during quenching from the high-temperature region. One of the phases that can be fixed in the 32.9-38.4 Ga alloys is $Fe_{13}Ga_9$ [2]. The stability of this phase under heating conditions and the features of phase transitions in alloys with high gallium content were studied by *in situ* real-time neutron diffraction. The high neutron penetration depth allows observation of bulk effects and exclusion of the influence of the surface layer (evaporation of gallium) and local inhomogeneities of the structure.

It was shown that in the studied Fe-Ga alloys with 32.9-38.4 Ga the metastable $Fe_{13}Ga_9$ phase presents in the as-cast state in different amounts. Content of $Fe_{13}Ga_9$ increases during heating and it is stable upon reaching ~550 °C. An example of such typical phase behavior for Fe-34.4Ga is shown in Figure 1. A detailed consideration of the phase transformations under the Fe-38.4Ga alloy heating was presented earlier in our paper [3].

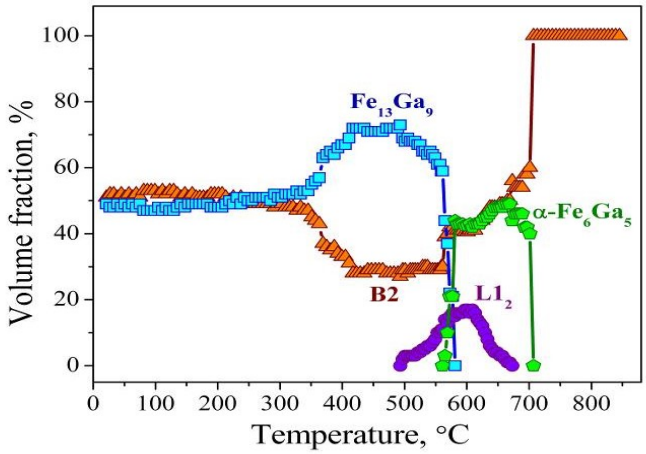

Fig. 1. Evolution of the phase composition of the Fe-34.4Ga alloy in the as-cast state upon heating to 880°C.

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