Study of Phase Transformations in the $Al_{60}Fe_{40-x}Si_x$ System

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Abstract. The study of phase transformation in alloys of the Al-Fe-Si system with a high content of silicon and iron is important for understanding the mechanisms that control the microstructure and exhibited properties. In this work, two groups of alloys are considered: $Al_{60}Fe_{39}Si_1$ and $Al_{60}Fe_{30}Si_{10}$. For these alloys, phase diagrams were constructed using modeling methods in ThermoCalc software, the change in phase ratio during cooling from the melting temperature was studied, and the composition of the phases was analyzed depending on the temperature of the alloy. These alloys were obtained by synthesis using additive technologies. Using dilatometric analysis, phase transformation temperatures were identified and good agreement was found with the data obtained in ThermoCalc. Data on the perception of small deformations were obtained. It was discovered that upon transition to a quasi-equiatomic composition, i.e. with an increase in silicon content from 1 to 10 wt.% with a corresponding decrease in the amount of iron, a more favorable phase composition is formed. The $Al_{60}Fe_{30}Si_{10}$ alloy exhibits greater high-temperature ductility compared to the $Al_{60}Fe_{39}Si_1$ alloy.

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