

Evolution of Microstructure and Properties in Fe, Si-Rich Al-Fe-Si Alloy

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Abstract. The study of the evolution of the microstructure of the Al-Fe-Si system alloys, enriched with iron and silicon, is an important issue in modern materials science. This paper examines the evolution of the microstructure and hardness of an alloy synthesized by the additive method as a result of heat treatment with different cooling rates: in water, in air, in a dilatometer environment. Using simulation in ThermoCalc software, a cooling curve was constructed under equilibrium conditions. It was revealed that the microstructure of the alloy consists of alternating layers of the β phase and FCC aluminum solid solution. When cooling rates change from heating temperature, the thickness of the layers changes, which affects the manifested microhardness. In addition, at high cooling rates, the separation of intermetallic dispersed inclusions of various morphologies and compositions is observed. The minimum amount of intermetallic inclusions is observed during cooling in air; slow cooling in the dilatometer environment leads to the formation of fine needle-shaped inclusions. Intermetallic inclusions are located randomly and are not directly associated with the FCC or β phase.

ACKNOWLEDGMENTS

This research has been funded by the Science Committee of the Ministry of Science and Higher Education of the Republic of Kazakhstan (Grant No. AP19675471).