

## Microstructure Evaluation of Doped Al-Ti and Al-Cr Alloys

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In this paper are presented the results of experimental research on the influence of calcium addition on the microstructure and mechanical properties of the aluminium-titanium and chromium alloy. Al-Ti and Al-Cr alloy systems is a of a group of Al-based peritectic systems with potential for development, and application especially in transport industry.

As alloying additive and refiner of the investigated aluminium alloy there is used the basis alloy in form of Al-Ca. After casting of this material the solution heat treatment was applied in order to investigate the applied solution heat treatment parameters time and temperature, which were changed in a defined range. These alloys contain also intermetallic phases, which act as crystallisation basis in the process of coagulation of aluminium. The chosen alloy contains especially the Al<sub>3</sub>Ti and Al<sub>4</sub>Cr intermetallic phases particles, in relatively huge amount, which act as active media of heterogenic crystallisation and dissolves rapidly in the investigated liquid Al alloy as well as reveals a modifier effect even after a few minutes of introduction into the molten metal [1-6].

The precipitation process was studied after solution heat treatment and ageing. It was shown that the investigated alloys with ternary additions typically have microstructures with dispersed intermetallic phases, distributed uniformly in an Al matrix. The TiAl<sub>3</sub> intermetallic phase is intrinsically stable with a melting point of 1623 K, in a higher temperature compared to the aluminium chromium alloy. Due to the low equilibrium solid solubility and diffusivity, the potential exist for generating a refined microstructure with fine dispersion of intermetallic phases by additions or by controlled solidification during the heat treatment process. Furthermore, the presence of Ca can lead to the occurrence of new unknown phases as well as can enhance the thermal stability of ternary Al-Ti-Ca and A-Cr-Ca systems because of its higher melting point then the base alloys. For investigation the X-ray diffraction (XRD) was used to identify the phases present in the as-cast alloy directly after casting, the microstructure of the samples was characterized using transmission electron microscopy (TEM) together with energy dispersive spectroscopy (EDS). Vickers microhardness tester with a load of 0.05 kg was also performed for mechanical properties investigations.

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