

Relationship between the microstructure and property of Al-0.21wt% Mg-0.41wt% Si alloy

ABSTRACT

In this study, the relationships between microstructure and property have been investigated for Al 0.21wt%Mg-0.41wt%Si alloy. JMatPro calculations was used to predict the phase relationships as a function of temperature. The effects of solution treatment (ST) and artificial ageing (AA) as well as natural ageing at room temperature (NA) were studied. A comparison of the alloy ageing response was made at different ageing temperatures using Vickers hardness test. Tensile test was carried out to evaluate the strength and ductility of the alloy. The microstructures of as received and solution treated alloys were observed by polarized light optical microscopy. The morphology of the precipitates formed was monitored using transmission electron microscopy (TEM). Results indicate that needle-shaped precipitates are responsible for hardening the alloy. The higher density of precipitates in the alloy enhanced the precipitates strengthening. It was found that the tensile strength results for the alloy that aged at room temperature and 185°C followed the hardness graphs trends. The most possible particles observed in the solution treated alloy were suspected to be α or β -Al₃FeSi and α -AlMnSi. The results of TEM-EDX analysis were verified by JMatPro calculations.

Keyword: Al-Mg-Si alloy; Heat treatment; Ageing; Mechanical properties; Microstructure