The Influence of Silicon Content and Matrix Structure on the Mechanical Properties of Al-Si Alloys

A. Oyetunji and K.K. Alaneme

Abstract

This work focuses on improving the mechanical properties of locally-produced Al-Si alloys by small- and medium-scale, foundry industries, by considering the influence of percentage silicon content and matrix structure, and their correlation on the mechanical properties of Al-Si alloys. Al-Si alloys of different compositions were cast through sand-casting technique; with some modified with NaCl while others were left unmodified. Micro-structural examination was carried out on the cast samples. Thereafter, they were subjected to the following mechanical tests: tensile, hardness and impact-testing. Also, the experimental data were analysed a using routine for multiple regression analysis. The results obtained show that as percentage silicon and percentage β-phase increases, the tensile and hardness strength increases, while the impact energy decreases, and vice versa. Also, the modified samples had better mechanical properties than the unmodified Al-Si cast alloy. Statistical analysis of the experimental data using multiple regression analysis showed that a high degree of correlation exists among the mechanical properties, the percentage silicon content and the matrix structure (α-phase).

Keywords: β-phase, α-phase, % silicon, Al-Si alloy and matrix structure