

Preliminary study on properties of aluminium-silicon (Al-Si) alloys reinforced by in situ titanium diboride (TiB₂)

ABSTRACT

Aluminum-silicon (Al-Si) alloys are an important class of materials, alloys which have great interested in wide industries whether in light or heavy industries, due to their superior properties like high strength to weight ratio, corrosion resistance, and excellent castability. The mechanical strength and the effect of modifying alloys have been studied. To evaluate the strength and revealed the structural of these alloys, the Instron tensile and Shimidzu Vickers hardness tester have been employed while the fracture surfaces have been observed by Scanning electron microscope (SEM). From results obtained, the microstructure of Al-Si with TiB₂ has much finer microstructure compared to unfine Al-Si alloy. It showed that the eutectic silicon microstructure in Al-Si alloy changed from needles-look or acicular to fine grain size or globular when the added of TiB₂. The mechanical studies showed that the ductility of Al-Si alloy was much lower in the absence of grain refiner, TiB₂. The tensile strength of unrefined Al-Si and Al-Si with 6 wt.%TiB₂ as grain refinement were recorded 275 and 312 MPa respectively. The hardness value for the unrefined Al-Si alloy also shows less compared with Al-Si with grain refiner, 6 wt.%TiB₂, which are 74 and 78 MPa. This showed the results were significant improvements in mechanical properties have been obtained with the use of TiB₂ as grain refiner to Al-Si alloy.

Keyword: Aluminium-silicon (Al-Si) alloys; Mechanical properties; Microstructure; Titanium diboride; Grain refinement