

ABSTRACT

Aluminium alloy with copper as major alloying element is known for their high strength. Al-Cu alloy exhibit high strength at room as well as high temperature applications. The most common alloying element added to aluminium and copper is silicon, which imparts good casting properties. Adding silicon to Al-Cu alloy improve their castability at the cost of strength at higher temperatures. The current analysis is aimed at assessing different mechanical and microstructural changes for alloys of aluminium with copper when silicon is not added. Different casting processes and their results are also analysed for the Al-Cu alloy system. Aluminium alloys containing 4wt%, 8wt% and 12wt% of copper developed in the laboratory for the study has been tested for their mechanical properties and microstructure changes. Green sand casting and gravity die casting process used to compare the casting qualities and properties of components developed from these alloys. Wear properties of developed alloy also has been studied. The alloy containing 8wt% copper found to be best among all the three alloys developed based on tensile strength and microstructure. All the developed alloys were heat treated and tensile strength improved for all the alloys after heat treatment. From microstructure study it has been established that finer grain sizes and Al_2Cu intermetallics found are suitable to retain strength at higher temperatures for the developed alloys. The present study conducted simulation analysis with validation to improve cast qualities which happened to be poor due to excess copper and in the absence of silicon. Present analysis is a balanced combination of conventional alloy and modern techniques which may help to optimize alloy development and castability.