World Academy of Science, Engineering and Technology
International Journal of Materials and Metallurgical Engineering
Vol:9, No:06, 2015

# Microstructure and Mechanical Properties of A201 Alloys with Additions of Si

**Authors :** Suzan Abd El Majid, Menachem Bamberger, Alexander Katsman

**Abstract :** Two Al-4 wt. % Cu based alloys, A201 and A201+Si were investigated in the as-cast, solution treated and aged conditions. The addition of Si was used to improve the castability of the basic alloy. The all investigated alloys in the as-cast condition contained a eutectic structure along grain boundaries (GBs) with the composition Al-50at. %Cu that was found by HRSEM EDS. Addition of Si refined the grain structure and changed the amount of the eutectic regions, their size and shape. Additionally, the A201+Si microstructure contained Si rods and small amount of Al6Mn4Cu3Fe2Si-phase. Solution treatment (ST) at 550°C for ~ 20 hours resulted in a slight dissolution of the eutectic structure in the A201 alloy while substantial dissolution and change of the eutectic composition was detected in the A201+Si alloy. After ST, the A201alloy contained θ-Al2Cu, Al5Cu2Mn3 and Al9Cu7Mn3(Fe) phases associated to the GBs, while the ST A201+Si alloy contained θ-Al2Cu, Al6Mn4Cu3(Fe,Si) and Si94Mn3Al2Cu phases. Precipitation hardening during aging at 170°C was investigated for both alloys. The microhardness of the ST A201alloy increased during aging and reached the maximum value ~ 140 HV after 2 h of aging. Initial microhardness of the ST A201+Si alloy was distinctly higher than one of the ST A201 alloy, but it decreased during the first hour of aging, then increased and reached the same maximum value ~ 140 HV after ~ 4 h of aging. It was concluded that the Si addition influenced the precipitation sequence and slowed down the age hardening process. The Si induced grain refining and evolution of the eutectic structure during the heat treatments applied are discussed.

**Keywords :** A201 alloys, castability, microstructure, micro-hardness
**Conference Title :** ICAEM 2015 : International Conference on Advanced Engineering Materials
**Conference Location :** Vienna, Austria
**Conference Dates :** June 21-22, 2015