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Directional Solidification of Al–Cu–Mg Eutectic Alloy

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Abstract : Aluminum alloys are produced and used at various areas of industry and especially in the aerospace industry. The advantages of these alloys over traditional iron-based alloys are lightweight, corrosion resistance, and very good thermal and electrical conductivity. The aim of this work is to experimentally investigate the effect of growth rates on the eutectic spacings (λ), microhardness, tensile strength and electrical resistivity in Al–30wt.%Cu–6wt.%Mg eutectic alloy. Al–Cu–Mg eutectic alloy was directionally solidified at a constant temperature gradient (G=8.55 K/mm) with different growth rates, 9.43 to 173.3 µm/s by using a Bridgman-type furnace. The dependency of microstructure, microhardness, tensile strength and electrical resistivity for directionally solidified the Al-Cu-Mg eutectic alloy were investigated. Eutectic microstructure is consisting of regular Al2CuMg lamellar and Al2Cu rod phases with in the α (Al) solid solution matrix. The lamellar eutectic spacings were measured from transverse sections of the samples. It was found that the value of microstructures decrease with the increase the value the growth rates. The microhardness, tensile strength and electrical resistivity of the alloy also were measured from sample and relationships between them were experimentally analyzed by using regression analysis. According to present results, values tensile strength and electrical resistivity increase with increasing growth rates.

Keywords : directional solidification, aluminum alloys, microstructure, electrical properties, hardness test
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