Microstructure and Mechanical Behavior of Functionally Graded Al-Si-Cu-Zn Alloy

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ABSTRACT

The microstructure and mechanical behavior including hardness and wear properties of functionally graded Al-Si-Cu-Zn alloy produced by centrifugal casting at varying speeds (0,600,1000 & 1500 rpm) have been investigated in the present investigation the Silicon has been varied up to 12% by weight. The copper and zinc has been varied up to 6% by weight. The crystallized silicon particle with a lower density (2330 Kg/m^3) distributes in a gradient fashion as density on the inner side and thinly on the outer surface of the wall of the cylindrical casting. The crystallized copper and zinc particles with a higher density (Cu-8900Kg/m^3 & Zn 7130Kg/m^3) distribute thinly on the inner side and densely on the outer surface of the wall of the cylindrical casting. At zero speed primary silicon, copper and zinc particles distribute throughout the casting uniformly as the speed increases fine silicon particles dispersed to the inner surface of cylindrical casting, copper and zinc are dispersed to the outer surface. The tensile strength, hardness and wear resistance for the alloy were found to depend mainly on the distribution of the primary silicon, copper and zinc particles along the radial directions. The inner layer of the alloy showed the highest tensile strength, hardness and wear resistance compared to the outer surface.

Keywords: Centrifugal casting, functional graded material, mechanical properties, microstructure and Al-Si-Cu-Zn alloy.

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