MICROSTRUCTURE AND MECHANICAL PROPERTIES OF AS-CAST Al-5% Cu/GRAFITE PARTICULATE COMPOSITES PRODUCED BY STIR CASTING METHOD

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ABSTRACT
A method of preparing cast aluminium alloy-graphite particulate composite using uncoated graphite with the addition of 1wt% magnesium (Mg) to aid wettability was studied. The method consists of introducing and dispersing uncoated but pre-treated graphite particles in aluminium alloy melt and casting the resulting composites into suitable moulds. The graphite was pre-treated to 400°C in air for 2 hours just prior to dispersion in the melts. Al-5% Cu and 1%Mg with various additions of graphite particles with 1, 3, 5, 7 and 9% were produced using the stir casting method and then the physical and mechanical properties were tested in the as-cast condition. Properties such as density, porosity, hardness, impact strength, yield and tensile strengths were evaluated. The density results showed a gradual decrease up till 3% graphite addition while the porosity values lie between 2 and 6%. The results for hardness, yield strength and tensile strength showed good properties up to 3% graphite and then a decrease was recorded afterwards. The microstructural analysis was also carried out using a metallurgical microscope which is connected to a computer system. The micrograph of the control sample contains essentially a network of θ phase (CuAl2) and globules and plates of Al-Mg compound in the α-Al matrix. The micrographs of the as-cast samples revealed a network of the CuAl2 compound as well as the Al-Mg compound with the graphite particulates at the grain boundaries. However, micrographs 5 and 6 show pronounced dendritic structures on solidification in addition to the contents of the micrographs which are at interdendritic regions.