EFFECT OF CASTING MODULUS ON THE FLUID OF GRAVITY CAST AL-SI(MG) ALLOYS

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ABSTRACT

The fluidity test of Al-Si(Mg) alloys were conducted at various casting thickness and at different mold temperature using a U-shape permanent mold. The microstructures of the fluidity test castings at different positions were examined to develop the solidification modes of flow cessation for the effects of variables, such as alloy composition (%Si,%Mg) and the minor elements (Ti,Si,P) addition of modification and refinement treatments. It was found that fluidity increases with increasing the mold temperature or the casting thickness. By increasing the Si content or the addition of Ti and Sr into the hypoeutectic alloys can also increase the fluidity. But, the addition of Ti and P into the near-eutectic alloys and the hypereutectic alloys decreases the fluidity. The addition of Mg into the above treated alloys, however, can promote more fluidity. Microscopic examination revealed the position obstructing the melt flow is at the tip zone of thicker casting, but, is at the bottom zone of thinner casting for the hypoeutectic, the eutectic and the hypereutectic alloys. Thus, the fluidity of thicker casting is better than that of thinner casting. In addition, an extremely fine eutectic called cellular structure was found in the casting where possesses faster cooling rate and higher undercooling caused by the appropriate mold temperature or the casting thickness. The correlation of fluidity of Al-Si(Mg) alloys and mold temperature is a exponential function. While, the correlation of fluidity of Al-Si(Mg) alloys and superheat is a power function. But, the fluidity of Al-Si(Mg) alloys is inversely proportional to the average net hydrostatic head and average flow velocity due to the increasing back pressure from gravity effect when using bottom gating. However, the fluidity of Al-Si(Mg) alloys with different casting modulus(thickness) was not highly related to the solidification time.

Keywords : Casting Modulus ; Fluidity ; Gravity Cast

Table of Contents

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