Effect of composition on secondary dendrite arm spacing of Al-Si-Cu-Mg (Fe/Mn) alloys for a given cooling rate

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Abstract

Experiments were carried out to study the variation of secondary dendrite arm spacing (SDAS) of Al-Si-Cu-Mg-(Fe/Mn) alloys with the cooling rate and composition. Sand casting trials were carried out in Al-Si-Cu-Mg-(Fe/Mn) alloys with varying compositions of Si, Cu and Fe using an inverted mould. Alloys were prepared in an induction furnace at about 730ºC and triple-plate castings were cast using chills at the bottom of the plates for promoting directional solidification. Thermal information was acquired using pre-installed thermocouples through the mould wall. Optical microscopy studies were implemented to study the variation of secondary dendrite arm spacing (SDAS) as a function of chemical composition and cooling rate.

The relationships between cooling rate and SDAS were plotted for the alloys and SDAS decreased with an increase in cooling rate and also with the increase in alloy composition.