A RESEARCH ON THE FLUIDITY OF AL/SICP COMPOSITE BY CO2 SAND CASTING

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ABSTRACT

The aims of this study were to investigate the influence of process parameters, e.g., SiCp content(0~30wt%), pouring temperature (different superheat degree), with and without modification treatment and grain refinement treatment on the fluidity of three types of Al-matrix SiCp composites (A356/SiCp, A413/SiCp and A390/SiCp). The experimental results indicate that the fluidity of three types of Al-matrix SiCp composites tend to decrease with the increase of SiCp content and tend to increase with the increase of superheat degree(also for the pouring temperature). But when the SiCp content was increased more than 10wt% and the superheat exceeded 160℃ for the A356/SiCp composite, the fluidity would decrease. Similar results would also occur for the A413/SiCp and A390/SiCp composites containing more than 20wt% SiCp and with superheat beyond 90℃. In addition, compared with the untreated composites, the introduction of Ti and Sr into three types of Al-matrix composites would increase the fluidity. However, the addition of Sb for A356/SiCp or A413/SiCp composites and the addition of P for A390/SiCp composite would decrease the fluidity as compared with those untreated composites. In this study, the solidification cooling curve of three types of Al-matrix SiCp composites with different SiCp content measured by thermal analysis method and calculated by CA-CCA method to reveal that the latent heat of three types of Al-matrix SiCp composites decrease with the increase of SiCp content. Composites treated with Ti and Sr would increase the latent heat, but, for A356/SiCp or A413/SiCp treated with Ti and Sb and for A390/SiCp treated with Ti and P would decrease the latent heat. Furthermore, the microstructure observation and the critical solid fraction at different positions of the spiral casting were performed to correlate the solidification modes with the fluidity of three types of Al-matrix SiCp composites. Compared with the original aluminum matrix alloys, the solidification modes of A356/SiCp, A413/SiCp and A390/SiCp alloys are changed for any content of SiCp added. The fluidity of those composites will be therefore affected significantly.

Keywords : Al-matrix SiCp composites ; Fluidity ; Modification treatment ; Grain refinement treatment ; CA-CCA

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