ABSTRACT

The production quality and age-hardening behaviour of Al 6063/SiC particulate composites developed using borax additive and a two-step stir casting was investigated. This was aimed at establishing optimum processing and thermal ageing conditions required for the development of Al 6063/SiCp composites. Al 6063/SiCp composites containing 6, 9, and 12 volume percent of SiC were produced; and samples representative of each composition were subjected to age-hardening treatment at 180°C, 190°C, and 200°C for holding times ranging from 30 to 180 minutes. Micro-structural characterisation and density measurements were used as a basis of evaluating the porosity and general casting quality of the composites; while hardness measurements were used to study the age hardening behaviour. Experimental results show that Al 6063/SiCp composites having low porosity levels (≤1.6 % porosity) and a good uniform distribution of the SiC particulates in the matrix of the Al 6063 were produced. Compared with the monolithic alloys, the aging response of the 6 and 9 volume percent (vol.%) SiC composites were generally poor, while the 12vol.% SiC composites showed appreciable age-hardening response at temperatures of 180-190°C (at 200°C, the ageing response was poor). Also, the transformation sequence of the composites appeared to be different from that of the monolithic alloy judging from the nature of the hardness profiles.

Keywords: Age-hardening; aluminum alloy 6063; stir casting; SiC; Composite; porosity