

# **Production and Age-Hardening Behaviour of Borax Premixed SiC reinforced Al-Mg-Si alloy Composites developed by Double Stir-Casting Technique**

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## **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 ( $\leq 1.6$  % 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