EFFECT OF LIQUID METAL PROCESSING PARAMETERS ON MICROSTRUCTURE AND PROPERTIES OF ALUMINA REINFORCED Al BASE MMC

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ABSTRACT

The liquid metal processing technique is considered to be an economic route to obtain particle reinforced aluminium base metal matrix composites. In this paper the influence of Mg content of Al-7%Si alloy, alumina particle size and content, pretreatment of alumina particles, melt temperature, stirring rate and cooling rate on the microstructure and properties of Al base MMC has been reported. The presence of $\geq 0.7\%$Mg and melt temperatures above the liquidus facilitate particle incorporation into the melt. Pretreatment of alumina particles with sodium tetra borate improves particle distribution. High cooling rate of the composite ingot prevents segregation of particles.

1. INTRODUCTION

In recent years particulate reinforced metal matrix composites (MMC) have been extensively developed because of a combination of factors which include ease of fabrication and availability of inexpensive ceramics as particulates. Particle reinforced MMCs present isotropic properties which permits their processing using conventional metal working techniques.

The liquid metal technique to produce Al base MMC reinforced with particles is considered to be simple and economical. The properties of these MMCs are controlled by particle size and distribution, wetting of particles by the matrix alloy, alloy composition, reactivity at the particle/matrix interface etc. Wetting of ceramic particles by liquid metal is necessary for proper bonding. Various procedures have been recommended to improve the wetting of ceramic particles by liquid metals including increase in liquid metal temperature pre treatment of reinforcement, coating of the reinforcement, and addition of alloying elements like Mg,Li and others to the Al alloy melt. Preparation of MMC at temperatures low enough for the melt to be