THE EFFECT OF ADDING LITHIUM AND HEAT TREATMENT ON Mg_2Si/Al COMPOSITE MICROSTRUCTRE

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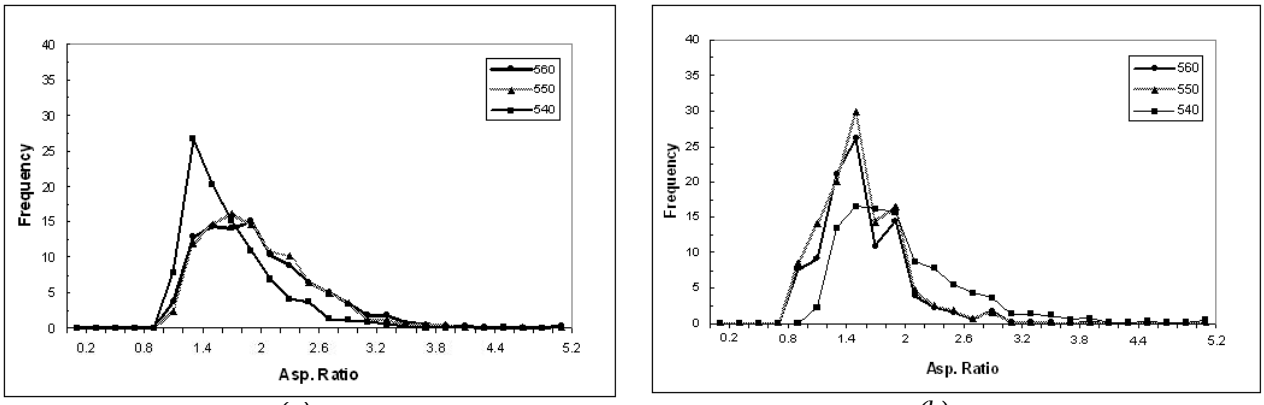
INTRODUCTION

Particulate reinforced aluminium metal matrix composites (Al-MMCs) as an advanced engineering material are being increasingly used in modern automobile industry for critical structure applications because of their high specific tensile strength and modulus, as well as their high wear resistance, in particular, low thermal-expansion [1], and improved mechanical properties at a wide range of temperatures. These properties led to the application of aluminium MMCs in the automotive industry, especially for cylinder blocks, cylinder heads, pistons, and brake disc. Al–Si alloys with high Mg content is in fact an in situ aluminium matrix composites containing a large amount of hard particles of Mg2Si, and the Mg2Si/Al composite has a potential as automobile brake disc material because the intermetallic compound of Mg2Si exhibits has high melting temperature, low density, high hardness, low thermal expansion coefficient and reasonably high elastic modulus [2]. However, the coarse reinforcement of the primary Mg2Si particles in the normal composite leads to poor properties. Therefore, the composite with coarse primary Mg2Si particles need to be modified to obtain adequate mechanical strength and ductility. The modification of the microstructure is one of the most important and simple methods for improving the mechanical property. Therefore, to improve the composite property by simple cast modification process seems to be the most hopeful and effective solution while facing increased commercial competition.

ABSTRACT

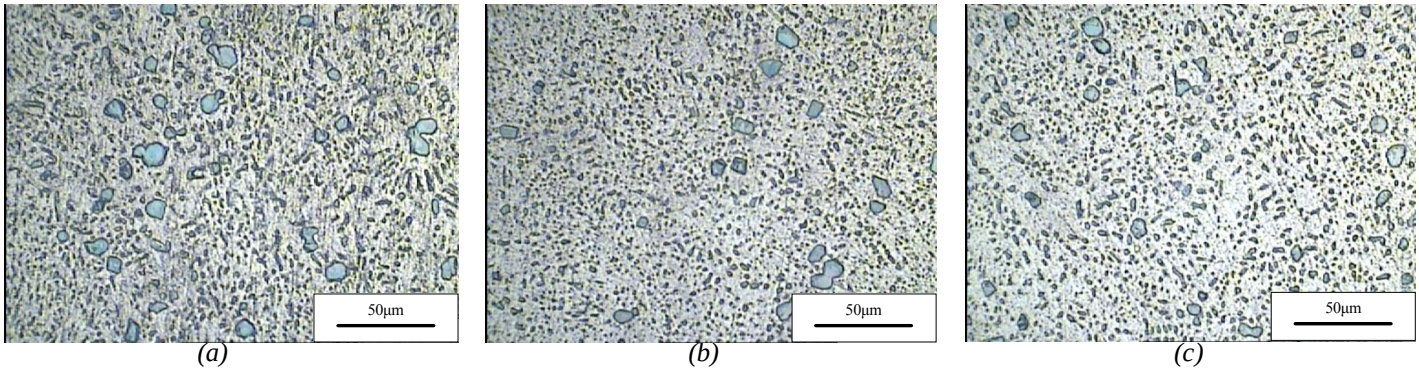
Aluminium metal matrix composites (Al-MMCs) are regarded as advanced engineering materials in automobile industry, especially for pistons and brake disc because of their superior properties such as high wear resistance. In this study Mg2Si/Al composites were produced by in situ route and 0.1wt % of pure lithium was added. All of the samples have been heated to the range of temperature 530°C to 560 °C under different times of holding. Microstructure of composite specimens was examined using optical microscopy and image analyzer. The study shows that by adding lithium into Mg2Si/Al composites the size of the primary Mg2Si particles reduces but has minor effect on size of secondary Mg2Si particles. Higher holding time and temperature leads to smaller secondary Mg2Si particles, without noticeable change in primary Mg2Si particles. The best results were observed at 550°C and 2 hours holding time.

Tables and Figures



(a) *(b)*

Fig.1: (a) Asp. Ratio Distribution of Primary Mg_2Si, (b) Asp. Ratio Distribution of Secondary Mg_2S



(a) *(b)* *(c)*

Fig. 2: Microstructures of Mg_2Si/Al composite at 2 hours of holding and different temperatures, (a)540°C, (b)550°C, (c)560°C

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