

# OPTIMIZATION AND BEHAVIOR OF NANO SCALED SILICON CARBIDE REINFORCED MAGNESIUM COMPOSITES DEVELOPED USING POWDER METALLURGY TECHNIQUE

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## ABSTRACT

Magnesium is well known for its light weight characteristics and being abundantly available material in the earth. During the 19th century magnesium was produced and used in large quantity for making aircraft components and automobile applications. In engineering applications magnesium was not used alone but magnesium alloy was normally used for these applications for weight reduction to strength ratio. Also, magnesium alloy has superior characteristics compared to other structural metals. Some of the alloying metals used are aluminium, zinc, manganese, calcium, tin, lithium, zirconium, etc. In this research, a magnesium alloy was developed by powder metallurgy technique and optimized using Taguchi based Grey-Analysis method. A varieties of weight fractions of SiC is being reinforced with the optimized compositions of magnesium alloy. Simultaneously the impact over the mechanical properties after the addition of SiC with the different strain rates have been studied. Mg-Zn-CuMn alloy was optimized by varying the weight fractions of alloying elements using Taguchi based grey method. The optimal compositions of Mg-3Zn-1Cu0.7Mn (ZC31) Mg alloy was obtained. ZC31/SiC composite was formed by powder metallurgy technique and then hot extrusion was performed and thereafter the mechanical properties were studied using 0.005s<sup>-1</sup>, 0.016s<sup>-1</sup>, and 0.05s<sup>-1</sup> strain rates. The density of the composite increased with increase of SiC weight fraction because of increased percentage of denser SiC particles. Reduced porosity levels obtained in ZC31/SiC composites due to post sintering hot extrusion. The effect of addition of SiC to the ZC31 Mg alloy matrix improved the micro hardness, UTS & UCS of ZC31/SiC composites. Fracture study reveals ductile fracture followed by trans crystalline fracture observed with the increase of SiC weight fraction as well as strain rate in the ZC31/SiC Mg composites.

**Keywords:** Nanoscaled · Siliconcarbide · Magnesium · Micro-hardness · Tensilestrength · Compressive-strength · Mechanical-behaviour · Optimization · Taguchi · Grey-analysis

