

*Original Research Article*

Influence of reinforcement and processing on aluminum matrix composites modified by stir casting route

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Abstract

In the present study, the individual and combined effect of reinforcement on aluminum (Al; 6063) alloy is discussed. These Al metal matrix composites with individual and multiple reinforcements are finding increased application in aerospace, auto- mobile industry, underwater machines, and transportation application, due to improved mechanical and tribological prop- erties like strong, stiff, wear, and impact resistance. Al 6063 alloy reinforced with different elements such as two types of ceramic mortar ash (MA) and nanofibrillated composite (NFC), industrial waste met coke ash (MCA), and agro waste straw ash with the constant rate of 5 wt% for each reinforced element. The results show a significant effect on the mechanical properties such as tensile strength and hardness. Damping characteristic improved by mixing of MA and NFC together and the results shown that the damping characteristics can be good for MCA reinforcement. Logarithmic decrement slowly increased by adding all types of reinforced metal together. NFC has high resistance to wear loss followed by MA and MCA but for mixing all types of reinforcements together resulted in good improvement in wear loss. Microstructure analysis of Al matrix composites is the small grain size and uniform distribution with good particulate matrix interface bonding.

Keywords

wear rate, damping response, mechanical properties, metal matrix composites

# Introduction

The most popular matrix for the metal matrix composites (MMCs) is aluminum (Al). MMCs are based on Al and its highly acclaimed for the attractive property combinations which they possess, making them very popular and top choice candidate material for a wide range of engineering applications.1,2 MMCs particulate has nearly isotropic properties when compared to long fiber-reinforced compo- sites. Aluminum matrix composite (AMC) reinforced can be fabricated with the stir casting process, by means of

carbide, fly ash red mud were fabricated via stir casting method, and the results reveal higher wear resistance when compared to red mud. Rao et al.9 proposed various reinfor- cements such as fly ash, silicon carbide, and aluminum oxide to aluminum matrix will enhance the mechanical and tribology properties. Krishnamurthy et al.10 showed the influence of titanium diboride (TiB2) loading on the dry sliding wear of Al 6063 matrix alloy-TiB2 composite mate- rials and the results improved the wear performance of the Al 6063 matrix alloy.

mechanical stirring.3–5 The processing choice method

depends on the property requirements, consideration cost factor, and application of future prospects.6

Suragimath and Purohit’s7 experiments conducted by changing the weight fraction of fly ash (5% and 15%) while keeping silicon carbide constant, and the results show that by increasing fly ash increase wear resistance. Evangeline and Motgi’s8 practical investigation was conducted to ana- lyze the varying weight percentages of (3–6%) silicon

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