



Experimental Investigation of Mechanical and Wear Properties of AL7075/Al₂O₃/MICA Hybrid Composite

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Abstract

Composite materials are the recent advancement technique in the field of material science. A composite material gives a unique property that is never shown from the particular alloy material. The dispersion of Reinforcement particles with the matrix material changes its mechanical and tribological properties. Because of its lightweight and high strength, Aluminum Metal Matrix Composite AMMC is used in many fields. Depends upon the Reinforcement particles, matrix property can change. Aluminum 7075 is the durable alloy used in the aerospace and automotive industries. In this present investigation, Al 7075 is dispersed with Alumina (Al₂O₃) and Mica by the stir casting process. And the samples are characterized by various mechanical tests like Hardness test and Impact test and studied using a scanning electron microscope. From the report, the mechanical properties of Al 7075 compositions are improved compared to the non-reinforced base material.

Keywords Aluminum alloy · Stir casting · Ceramic · Mechanical properties · SEM analysis

1 Introduction

The modern engineering world expects a material with high strength and low weight. In the past few years, metal matrix composite materials, polymers, and ceramics have played a vital role in mechanical industries. They are high in strength and low in weight, and Composite density materials have risen in quantity and product numbers continually, entering and consistently capturing new markets. Most of the engineered materials market, ranging from everyday products to sophisticated niche applications, contains modern composite

materials. Compared to their traditional material, the composite materials are lightweight and are proved. Kumar et al. [1] reported that Al₂O₃ and SiC resulted in improving the hardness and density of the aluminum composite. Also, they said 2–6% of Al₂O₃ fabricated by liquid metallurgy technique would improve the hardness of the composite material. Kumar et al. [1]. The composite of Al7075 with Al₂O₃ has excellent hardness and tensile properties than Al6061 with SiC. The wear rate of the composite materials is decreasing while increasing the distance of sliding and minimum speed. Baradeswaran et al. [2] A have investigated that Al₂O₃ can improve the tensile, hardness, and flexural strength. The presence of Graphite was used to reduce the coefficient of friction. He prepared an Aluminium composite of 5% graphite with 2–8% of Al₂O₃ by Liquid metallurgy technique was show good mechanical results end wear resistance properties. The addition of Graphite may reduce the hardness of the composite material.

Raghavendra et al. [3] have investigated the tribological characterization of Al7075 with Al₂O₃ and SiC. Reinforcement particle of Alumina taken in the form of 50–150 micron. They prepared a ratio of 3% SiC and 3–12% Alumina by Stir Casting technique. Finally, he reports that Al7075, with 3% of both SiC and Alumina, has better tribological properties. Sambathkumar et al. [4] reported that the mechanical properties of the hardness of Aluminium 7075

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