

Research Article

Investigation on Mechanical and Wear Behaviors of LM6 Aluminium Alloy-Based Hybrid Metal Matrix Composites Using Stir Casting Process

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In this investigation, aluminium-silicon-based alloy (LM6) with the addition of (0, 2.5, 5, and 10%) copper-coated short steel fiber and 5% boron carbide (B_4C) element-strengthened composites was fabricated by the stir casting method. Mechanical properties and tribological behaviors of LM6-based hybrid composites were investigated, and microstructures of different castings were examined by an image analyzer. The test was conducted at different loads (10, 20, 30, and 40 N) and different sliding spaces (500, 1000, 1500, and 2000 m), respectively. The results revealed that the sample loaded with 10% of reinforcement recorded the highest tensile strength of 231 MPa. On the other hand, the hardness value increased from 71 to 144 BHN, when 15% of reinforcement was added to the sample. It was also noted that 10% copper-coated steel fiber improved wear resistance up to 50% when compared to LM6. A field emission scanning electron microscope was employed to observe the morphology of the worn surfaces of composites at different sliding distances and load conditions. The hybrid composite revealed that the combination of both short steel fibers and reinforcement of ceramic particles enhanced the mechanical properties, obtaining superior wear resistance.

1. Introduction

Aluminium-based metal matrix composite (AMMC) is widely used in automobiles, sports, aerospace, marine, and other engineering fields. It is because of high strength-to-weight ratio, wear resistance, good corrosion resistance, and better machinability. Aluminium alloy-based ceramic composites fabricated through liquid metallurgy technique

offered superior mechanical and tribological properties [1]. Wear is one of the vital parameters for considering aluminium hybrid metal matrix materials. The main drawback of materials is that they exhibit poor tribological properties. Tribological performance of aluminium reinforced with different ceramic particles using a pin on disc tribometer exhibited better wear characteristics [2]. Aluminium alloy reinforced with B_4C composites was prepared by means of