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RESEARCH ARTICLE

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Significance of addition of carbon nanotubes and fly ash on the wear and frictional performance of aluminum metal matrix composites

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Abstract

In order to improve the wear and frictional behavior of the aluminum metal matrix composites, carbon nanotube, and fly ash were added as reinforcements. Powder metallurgy technique was used to fabricate the hybrid metal matrix composites. Experimentations were carried out using pin on disc type wear test rig. The analyzed experimental results showed that, in comparison to the pure aluminum and mono reinforcement combination, the wear loss and coefficient of friction of hybrid metal matrix composites were greatly reduced. It was noted that compared to pure aluminum wear loss was decreased to 89.58%, 86.97%, 83.3% by adding 0.25, 0.5, 0.75 wt% carbon nanotube (CNT), respectively. By the addition of 4, 8 and 16 wt% FA to pure Al wear loss was decreased to 83.85%, 89.58%, and 78.12%, respectively. It was also noted that compared to Al/8 wt% FA mono reinforced composites, wear loss was decreased to 77%, 71.26%, and 53.22% with the addition of 0.25, 0.5, 0.75 wt% CNT, respectively. With the addition of 4, 8, 16 wt% FA, wear loss decreased to 81%, 88%, and 75% over Al/0.25 wt% CNT composites, respectively. The microstructural study of the worn-out surfaces revealed low abrasive and adhesive wear by the presence of carbon nanotubes and fly ash in aluminum metal matrix. The reinforcing mechanisms of the wear and frictional properties were also discussed.

KEYWORDS
carbon nanotubes, fly ash, metal matrix composite

1 | INTRODUCTION

Aluminum metal matrix composites (MMCs) can be used for structural applications due to its excellent physical, mechanical, and tribological properties. MMCs reinforced with ceramic fibers or particles in particular can provide enhanced strength, stiffness, hardness and damping and wear properties.[1] Wear is very important phenomena in the design of composites to ensure reliability of materials in sliding surfaces applications. Recent researches have pointed out more