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Harpreet Singh, Hiralal Bhowmick

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Tribological Behaviour of Hybrid AMMC Sliding against Steel and Cast Iron under MWCNT-Oil Lubrication

Harpreet Singh[1], Hiralal Bhowmick[1]*

[1]Department of Mechanical Engineering, Thapar Institute of Engineering & Technology, Patiala-147004, Punjab, India.

* Corresponding Author: hiralal.bhowmick@thapar.edu

ABSTRACT

The work presented here focused the tribological behaviour of aluminium metal matrix hybrid composites (AMMC) sliding against steel (EN31) and cast iron (CI), under particle laden oil lubricated condition. Tribological characteristics are evaluated using a pin-on-disc tribometer with Al6061-SiC-Cpins sliding against EN31 and grey CI discs. For the particulate lubrication, multiwalled carbon nanotube (MWCNT) is dispersed in a SN500 grade base oil and a stable nano-lubricants formed. From the experimental observation it is found that the MWCNT additive significantly enhanced the anti-wear and antifriction capabilities for the both the tribopairs. Further, the fractography and morphological studies of composite pins reveals the formation of tribolayers and mechanically mixed layers and illustrates the underlying friction and wear mechanism.

Keywords: Metal-matrix composite, Lubrication, Lubricant additive, MWCNT, Friction, Wear.

1 Introduction

Tribological response of aluminium and its alloys has long been proven to be poorest. However, with growing demand of lightweight materials in various components such as in cylinder-piston liner arrangement the challenge and demand of improved lubricated tribological behavior of these materials are very essential [1]. Presently, the self-lubricating nature of aluminium alloy–graphite (Al/Gr) composites have gained keen attention from the tribologists and the allied research areas, primarily owing to their minimal level of friction and wear[2,3] reduction in the temperature at contact surfaces[4], excellent anti-seizure effects[5] and also in a situations where component weight reduction is a key objective. Significant efforts have been made to understand the friction-wear behaviour of aluminium metal matrix composites (AMMCs) reinforced with