

# Tribology of fiber reinforced polymer matrix composites—A review

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## Abstract

The use of fiber reinforced polymer matrix composites (FRPCs) is in boom in many structural, industrial, automotive, and engineering applications. Polymer matrix composites have been turned out the most hopeful material which can replace the conventional materials, metals, and woods. Owing to this the demand for analyzing the tribological behavior of FRPCs is amplified. In the current article an inclusive literature survey on the tribological behavior of FRPCs in terms of friction and wear properties of composite materials is explored. The paper reviews the effects of different operating parameters and material parameters on wear rate and frictional behavior of FRPCs. The analysis reveals that operating parameters like sliding velocity, sliding distance, load, temperature and material parameters like a fiber volume fraction, orientation of fibers, fiber length, filler content, and effect of surface treatment have a significant effect on the tribological behavior of composite material. The wear rate of FRPCs is controlled by adding the proper amount of filler content and fiber orientation.

## Keywords

Wear, friction, composites, synthetic fiber polymer matrix composites, natural fiber polymer matrix composites, tribology

## Introduction

The simplest definition of tribology is the study of friction, wear, and lubrication between two rotating elements. Analysis of tribological behavior is important for the reason that wear and friction related failures lead to heavy cost to the industry and shut down the industries. Due to growth in structural and automotive industries, conservation of metals and natural resources like wood is a major issue. Consequently, there is a need to replace the conventional material by composite materials which can perform in the inflexible conditions like high load, high temperature, and high corrosive and high pressure.<sup>1</sup> Chandramohan and Marimuthu have revealed the advantages of composite materials over the conventional materials. Composites provide very good strength to the weight ratio, so it is favorable in most of the design needs. Composites are in demand nowadays, due to its characteristics like light weight, high strength, corrosion resistance, high fatigue strength, less noisy in operation condition, etc.<sup>2</sup> Among the four groups of tribo-materials, such as polymer matrix composites (PMCs), metal matrix

composites (MMCs), ceramic matrix composites (CMCs) and carbon-carbon composites (CCCs), PMCs are widely used due to its less weight, self lubrication properties, resistance to wear, and corrosion.<sup>3</sup>

Natural fiber reinforced composite materials are attractive over the conventional material due to its easy accessibility, renewability, lower weight, less price, low density, and biodegradability.<sup>4</sup> India has rich accessibility of natural fibers such as jute,

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