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Effect of Fiber Orientation on Tribological Performance of Abaca Fiber Reinforced Epoxy Composite Under Dry Contact Conditions

[M. Milosevic](#) [®] ; [A. Ruggiero](#); *P. Valasek; D. Dzunic; S. Mitrovic* 

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Abstract

Abstract: Today, natural fibers and their composites are increasingly present in the industrial production of various materials, ranging from the textile industry, through construction, all the way to the automotive and aerospace industry. Their wide application is justified by the replacement capabilities of composite materials reinforced with synthetic fibers. This paper presents tribological research of abaca fiber reinforced epoxy composite material. Fiber orientation and its effect on the tribological performances of the composite was analyzed. The extremely low viscosity epoxy resin reinforced with NaOH treated long abaca fibers is investigated under the different operating conditions. The unidirectional abaca fibers reinforced the epoxy resin and formed composite specimens with fibers in three directions, Parallel (P-O), Anti-Parallel (AP-O), and Normal (N-O), respecting the sliding direction. The specimens were fabricated by fiber volume fraction of 30 wt% using the vacuum infusion technique. The block- on-disc (BOD) apparatus was employed to exhibit the tribological tests. To conduct the test, a normal load of 35N and 45N was applied. The experimental results showed that the presence of abaca fiber significantly improved the wear characteristics of the matrix than the neat epoxy. An increased coefficient of friction was observed in samples with anti-parallel oriented fibers at an applied load of 35N. The conducted research showed that the use of abaca fibers as fillers could improve the tribological characteristics of the epoxy resin-based composite material.

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Autore del Volume

*Department of Mechanical Engineering, SRM Institute of Science & Technology (SRMIST)
Kattankulathur, Tamil Nadu India*

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*Department of Mechanical Engineering, SRM Institute of Science & Technology (SRMIST)
Kattankulathur, Tamil Nadu India*

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