

10 The Role of Surface Engineering in Tribology

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10.1 INTRODUCTION

Tribology is the study of the science and technology of interacting surfaces in relative motion, including friction, wear, lubrication, and related design factors [1]. Because tribology is so closely linked to practical applications, elaborative research and empirical experience are extremely important in today's circumstances. The operating environment and contact mechanism are two of the most critical factors that affect the investigation of tribology. To understand the tribological behaviour, it is necessary to have a knowledge of physics, chemistry, metallurgy, and mechanics, which makes tribology an interdisciplinary science. Tribology deals, in particular, with friction, wear, and lubrication. Friction is defined as a body's resistance to

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12 Tribology in the Automotive Sector

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12.1 INTRODUCTION

Automotive vehicles are classified as follows: petroleum, gaseous, electric, and hybrid electric vehicles. Based on their usage, the automotive sector is categorized into four segments: two-wheelers, three-wheelers, passenger, and commercial vehicles.

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Pineapple Leaf Fibres for Automotive Applications



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Abstract Fibre-reinforced polymer composites (FRPCs) are playing a significant role in manufacturing of goods/products in service for lightweight applications. Among FRPCs, natural fibre-reinforced polymer composites (NFRPCs) are one in forefront and replacing both the conventional and unconventional reinforced composites since they are eco friendly in nature and have several benefits like low price, ease of manufacturing, [REDACTED] etc. In this chapter, a solemn attempt is made to study the pineapple leaf fibre (PALF) bolstered with polymer matrix composites (PMCs). PALFs are rich in cellulose, comparatively cheap and extravagantly available. PALFs reinforced with polymers such as thermoplastic/thermoset matrices are widely used in automotive sectors. PALF-reinforced polymer matrix composites have a wide range of applications in automotive industries, manufacturing of dashboards, package trays, door panels, headliners, seat backs, interior parts and many other parts. This chapter also explores the type of NFRPCs used by several automotive organizations.

Keywords Natural fibre · Pineapple leaf fibre · Polymer composites · Automotive · Hybrid-electric vehicles

Abbreviations

BMC	Bulk moulding compound
CMC	Ceramic matrix composites
ESEM	Environmental scanning electron microscopy
FRPC	Fibre-reinforced polymer composites

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CHAPTER 11

PREPARATION AND CHARACTERIZATION OF POLYMER MATRIX COMPOSITES WITH REINFORCED FLY ASH AND SILICON CARBIDE

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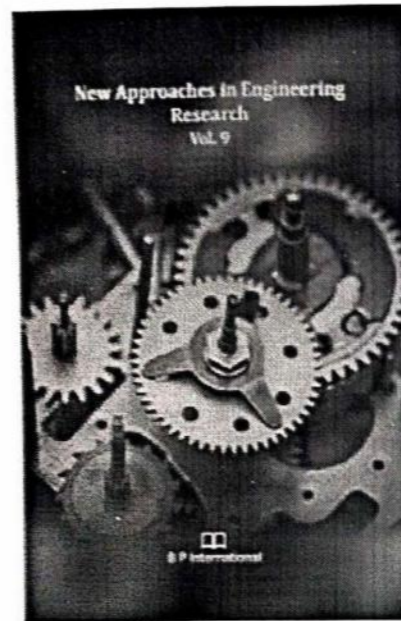
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Study on Compact UWB Microstrip Antenna with Quadruple Band-Notched Characteristics for Short Distance Wireless Telecommunication Applications

Kalyan Rayavaram

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Abstract

In this paper the design and simulation of a compact ultra-wideband (UWB) microstrip antenna with quadruple band-notched characteristics for short distance wireless telecommunication applications were explored. There are various methods which are helpful for introducing a notch in UWB antenna. The most commonly used technique is by adding different slots on the radiating material or in the ground plane or also on the feed line. The design process of the antenna is carried on FR4 substrate with dielectric constant 4.4, loss tangent 0.02, thickness of 0.8mm and the size of the proposed antenna is $30 \times 20 \text{ mm}^2$. The rectangular monopole antenna endures a rectangular radiating patch with chamfered bevel slots on the top side, and a defective ground plane on the bottom side of the substrate. To realize single, dual, triple and quadruple band notch characteristics, slot-1 is created on the patch to achieve first notch at 3.5 GHz which eliminates WIMAX signal, slot-2 is created on the patch to achieve second notch at 4.6 GHz which eliminates INSAT signal, slot-3 is created on the patch to achieve third notch at 5.5 GHz which eliminates WLAN signal and also fourth notch is created at 9.5GHz which eliminates X band frequency with slot-1 outer length. The proposed antenna is well miniaturized and can be easily integrated with any compact devices. The simulated result shows that proposed antenna gain a good range of UWB from (2.6 GHz to 13.4 GHz).

Keywords: Band notched characteristics; chamfered bevel slots; defective ground plane; monopole antenna; ultra wide band

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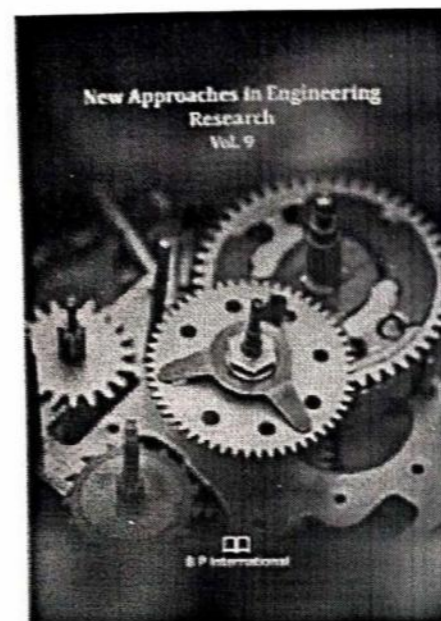
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Keywords: Band notched characteristics; chamfered bevel slots; defective ground plane; monopole antenna; ultra wide band

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CHAPTER 22

MXene-based flexible polymer composites as high dielectric constant materials


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22.1 Introduction

Today, with the fast development of modern electronic devices and electric power systems, polymeric materials as dielectrics with a high dielectric constant (ϵ) and low dielectric loss ($\tan\delta$) are the need of the hour for fabricating high-energy-density dielectric capacitors [1,2]. Electric displacement (permittivity) and electric insulation (electric breakdown strength) are significant parameters of a dielectric capacitor to attain better energy density. However, these parameters have opposing properties and are difficult to simultaneously increase so that energy density is elevated. In general, high electric displacement is attained by the reduction of electric insulation and vice versa [3]. In this respect, polymer-based dielectrics have shown promising results, with elevated energy density because of their excellent breakdown strengths of over 300 MV m^{-2} resulting from low-polarity covalent bonds [4,5]. The main challenge in developing high energy density polymer materials is their low permittivity which can be further improved by incorporating various fillers into the polymer matrix thereby forming polymer composites [3,4].

Polymer composite science and technology is a broad and quickly emerging field. Polymer composite materials consist of multiphase in which functional fillers are incorporated within the polymer matrices, resulting in synergetic structural properties that cannot be attained with a single component [6,7]. In general, the uniform dispersion of fillers within the polymer matrices leads to the design of ideal polymer composites. Moreover,

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