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Varun Mittal and Shishir Sinha*

Effect of chemical treatment on the mechanical and water absorption properties of bagasse fiber-reinforced epoxy composites

Abstract: The present article presents a study on the mechanical and water absorption properties of bagasse fiber-reinforced epoxy composites. Bagasse fibers are subjected to chemical treatment with 5% sodium hydroxide followed by 5% acrylic acid at ambient temperature to enhance the bonding strength between the fiber-polymer, resulting in high values of the mechanical properties and a reduction in the water absorption properties of the composites. We analyzed the optimum value of fiber treatment, and it was found that 15% treated fiber loading yields enhanced the mechanical properties together with a reduction in water absorption properties.

Keywords: bagasse fiber; composites; epoxy resin; mechanical properties; water absorption.

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1 Introduction

Reinforcement of polymer matrix with natural fibers is widely performed, resulting in materials with excellent mechanical properties [1]. Agricultural residues such as wheat straw, bagasse, wood particle, and corn can also be explored as readily available natural fiber resources for similar applications [2]. Research on these lignocellulose materials is important because of the advantages these fibers possess over conventional reinforcing materials such as low density, high specific properties, non-abrasive nature, high level of filler loadings, high available amount, renewability, safe working environment, etc. [3–6]. Because of its low cost and good mechanical properties, bagasse fiber (BF) is considered the most abundantly available fiber among all similar types of resources. It can be used as an effective reinforcing material with polymer [7, 8]. Zheng et al. [9] performed surface treatments of BF with benzoic acid and examined the mechanical properties of the composite by using the orthogonal optimal method. They observed that the interface modifier improved the tensile strength significantly and had little impact on the strength of the composite. Vilay et al. [10] found higher tensile and flexural properties, and less water absorption for urylic acid-treated BF polyester composites up to 20 wt% compared with untreated fiber-based polyester composites. Mulinari et al. [11] observed that the modification of bagasse cellulose with 10 wt% zirconium oxychloride was effective, and it was proved that it effectively improves the tensile modulus compared with that of non-modified sugarcane bagasse-high-density polyethylene composite. Mulinari et al. [12] studied sugarcane BF that is modified by using zirconium oxychloride to improve its mechanical properties. They found that the mechanical properties of chemically modified fiber high-density polyethylene are superior to those of bleached fiber. Cerqueira et al. [13] found that BF treated with 10% sulfuric acid solution followed by treatment with 1% sodium hydroxide solution had improved tensile, flexural, and impact strength in comparison with the pure polymer. Rodrigues et al. [14] performed modification of sugarcane BF by esterification through anhydride, and observed a high improvement in the tensile modulus in comparison with the pure polymer. Ashori et al. [15] investigated the effects of multiwalled carbon nanotube as a reinforcing agent on the mechanical and physical properties of BF/high-density polyethylene composites. It was found multiwalled carbon nanotube provides high tensile and flexural properties; however, the notched impact strength of the composites gradually decreased with increasing fiber loading. Arrakhiz et al. [16] studied the mechanical properties of alfa, coir, and BF-reinforced polypropylene composites. They observed an improvement in the mechanical properties of alkali-treated fiber composites compared with neat polypropylene. In fact, it was observed that composites with a 30 wt% fiber content show optimum mechanical properties.

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Natural fiber-mediated epoxy composites – A review

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ABSTRACT

With growing inclination towards the eco-friendly technology, natural fiber based polymer composite materials have been gaining a lot of momentum nowadays. The present review discusses the much research that has been carried out in the area of the epoxy-based composites reinforced with natural fibers. Influence of the various factors like the fiber content, fiber geometry, fiber size, surface treatment technique and coupling agent on different properties like mechanical, thermal, behavior towards water absorption and others have been presented. It can be inferred that there is a need and scope for improvement of the surface properties of natural fiber using various methods like physical and chemical treatments, addition of coupling agents, etc. for the manufacturing of the composites having desired properties. These techniques not only modify surface morphology, but also improve other processing parameters like the hydrophilic character of fiber (which is desirable to be low), and hence improve several characteristics such as mechanical properties, thermal stability, water absorption and other considerations of the composites.

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1. Introduction

Composite materials are not new to the world. In nature, wood is a naturally occurring composite consisting of cellulose fibers (reinforcement) in lignin (matrix); moreover in a building system, the wall is a composite of cement and bricks. Fiber-built polymer matrix composites are finding applications in households and industries because they have more favorable properties such as high stiffness, greater strength, better fatigue performance, more corrosion resistance, low thermal expansion, low energy consumption during manufacturing and have non-magnetic properties [1–3]. Over the past decade, the use of bio-fibers as substitute for synthetic fiber (carbon and glass), as fillers in the development of polymer matrix composites has attracted much attention. The properties of bio-fibers like abundance, low density, low cost, renewable quality, high modulus, harmlessness, and biodegradability facilitates association with polymers to produce composite materials [4–6].

There is increased awareness about the properties of natural fiber based epoxy composites to meet engineering requirements. Epoxy resin and its composites have received considerable attention over the years for their use as structural materials at low temperature. For both industry and research communities, it is, therefore, a matter of concern to overview and assess the status quo and put efforts for more sustainable and feasible commercial exploitation and further development. The main objective of this review is to study the formulation, characteristics and performance of various cellulosic fiber mediated epoxy composites, hence to provide the fundamental basis for further research in the area and to enable the optimization of the composites for possible industrial uses. Numerous reports are available on natural fiber epoxy based composites and their characteristic analysis [7–9].

2. Epoxy

The epoxy resin is a feasible polymer which has effective strength, good toughness and appreciable resilience. It has good resistance to moisture and chemical attack. It also has great electrical insulating properties and is devoid of volatile matter [10]. They can be cured at ambient temperature without any pressure by using a curing agent or may be heat cured. They can be bonded to nearly all materials like wood, glass, natural fibers and metal [11–13]. They exhibit little or no shrinkage after curing. Properties of epoxy resin are shown in [Table 1].

3. Natural fiber

Vegetable, animal and mineral fibers are part of the natural

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A Study of Next Generation Wireless Network 6G

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ABSTRACT: Wireless mobile communication is being used from many years, but day by day Need of facilities on mobile is increasing, so time to time next integrated Versions of network is introduced. There are various generations of mobile Network 1G, 2G, 3G, 4G and 5G. Latest version is 5G, but only some countries are using 5G wireless network. 5G network is strong and very fast wireless communication network, it is and it will fulfill most of the requirement of users. But it is not end of the desires , so for meet desires of user next generation of mobile network also introduced 6G & 7G. This paper is about introduction and advancement of 6G & 7G for future.

KEYWORDS: 1G,2G,3G,4G,5G,6G, Handover.

I. INTRODUCTION

Today the whole world is aware of the revolutionary changes in cell phone communication field. Wireless communication has brought in the new innovation in this field. In the context of present scenario the 3G experienced better internet experience. Later on 3g has been unprovised. It has been felt the urgency to have a better communication networks then 5g has came which can be a complete wireless communication without any hindrance and limitations. It is completely advanced in terms of wireless communication. In 5G system each and every cell phone will have a permanent home "IP address and care of address".

Now awaiting future will experience 6G. In present time cell phones have everything and are compact, with high memory and high speed with low power consumption. Today Bluetooth technology and other technology are just like a child's play. 6G wireless cell phone communication network shall meet world class standard covering the whole world under its communication just like Global covering system has been devised by some companies. This individual system creates difficulty in space roaming. 7G mobile phone communication system is developed to integrate these in one unit communication system.

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Introduction and need of IPv6

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ABSTRACT

Day-to-day the number of Internet users is increasing rapidly. One IP address is assign to the each host, but there are limited addresses in IPv4. So, to resolve addressing problem new IP addressing technique IPv6 is now. IPv6 is advance and improved version of previous IP version. This paper is giving the introduction and need of IPv4 and comparing with IPv4. We will discuss the great and various features of IPv6 over IPv4.

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Implementation of New IPv6 Tunneling Transition Technique: II6T

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Reliability Assessment of A.T.M. with Redundant Central Unit

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Abstract: *In this paper, the authors have done their analysis to compute the working capability of a ATM system. In this study, the authors assume single ATM. The capability of the system is affected by all the units of the system. The authors have been used two parallel redundant central computers to improve system's overall performance. Single bank computer is available to fulfil user's requirements.*

Using supplementary variables technique, the author has done mathematical formulation of the system. This mathematical model has been solved by employing Laplace transform. Probability of states has been computed. Reliability of considered system has been obtained. Steady-state behavior of the system and a particular case has also been obtained to improve practical utility of the system.

An important reliability parameter, viz. mean time to failure of considered system has also been computed to improve practical utility of the model. Graphical illustration followed by a numerical computation has been appended at the end to highlight important results of the study.

Keywords: *Reliability assessment, working capability, supplementary variables, Laplace transform, steady-state behavior etc.*

1. INTRODUCTION

An automated teller machine (ATM) is a computerized tele-communication device that provides the customers of a financial institution with access to financial transactions in a public space without the need for a human clerk or bank teller. On most modern ATMs, the customer is identified by inserting a plastic ATM card with a magnetic stripe or a plastic smart card with a chip that contains a unique card number and some security information, such as an expiration date or CVC (CVV). Security is provided by the customer entering a personal identification number (PIN). They are sometimes referred to as "ATM machines", an example of RAS syndrome. Fig-1(a) shows an ATM mouth.

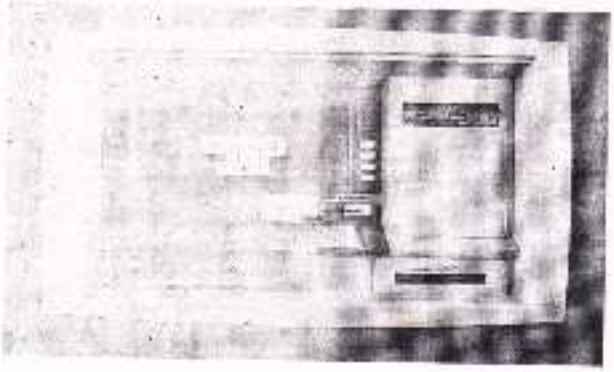

Fig-1(a): Shows ATM mouth

Using an ATM, customers can access their bank accounts in order to make cash withdrawals (or credit card cash advances) and check their account balances.

2. REVIEW & LITERATURE

Britain was the first country to see the world's first ATM in 1967 located at a branch of Barclays Bank, Enfield. The system was developed by De La Rue.

The first mechanical cash dispenser was developed and built by Luther George Simjian. Installed in 1939 in New York city by the Bank of New York, but removed after 6 months due to the lack of customer acceptance.

Therefore, the history of ATMs paused for over 25 years, until De La Rue developed the first electronic ATM, which was installed first in Enfield town in North London, United Kingdome on 27th June 1967 by Barclays Bank. This instance of invention is credited to Joan Shepherd Barron although various other engineers were awarded patents for related technologies at the time. Shepherd Barron was awarded an OBE in the 2005 New York's Honors list.

The first person to use the machine was the British comedy actor and actor Reg Varney. The first ATMs accepted only a single use token or voucher which was retained by the machine. These worked on various principles including radioactivity and low coercivity magnetic codes that was read by the card reader to make [illegible] the machine dispensed pre-

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Reliability Measures for Solar Power Plant Employing Algebra of Logics

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Abstract: *In this paper, the authors have considered a solar power system for its reliability analysis by using algebra of logics. In this system, there are two solar panels in standby redundancy. On failure of solar panel X_1 we can follow online solar panel X_2 with the help of perfect switching device X_3. The authors have been used algebra of logics for the formulation and solution of mathematical model of solar power system. Reliability of the whole system has been obtained. Reliability function for the system as a whole has been computed in two different cases e.g., when failures follow Weibull and exponential time distribution. An important reliability parameter, mean time to system failure (M.T.T.F.), has also been obtained to improve practical utility of the model. A numerical computation together with its graphical illustration has been mentioned in the end to highlight important results of the study.*

Keywords: *Solar power generation plant, algebra of logics, Boolean function, reliability assessment, MTTF, exponential time distribution, Weibull distribution etc.*

1. INTRODUCTION

In this study, the authors have considered a solar power system for its reliability analysis by using algebra of logics [2]. System configuration of considered system has been shown in fig-1. In this system, there are two solar panels in standby redundancy. On failure of solar panel x we can follow online solar panel X_2 with the help of perfect switching device X_3. These solar panels produce the solar energy and it can be saved in four batteries B_1, B_2, B_3 and B_4. There are two automatic switching devices ASD_1 and ASD_2 to change the battery links. Batteries supply DC power to the sine-wave inverter X_{10} that converts this DC power into AC power. Finally, this AC power feed the connected electric equipments. The cables used to connect any two equipments are hundred percent reliable. Note that any one battery is sufficient to feed all the consumer requirements.

2. REVIEW OF LITERATURE

In the past studies [1-3], authors have used various techniques for reliability evaluation but Boolean function technique is the simplest one. In this technique, it is very easy to compute reliability of the system. The main thing is that, in this technique, we can easily incorporate in it even the repair facility.

3. MATERIAL & METHODS

The authors have been used algebra of logics [2-3] for the formulation and solution of mathematical model of solar power system. Reliability of the whole system has been obtained. Reliability function for the system as a whole has been computed in two different cases e.g., when failures follow Weibull and exponential time distribution. An important reliability parameter, mean time to system failure (M.T.T.F.), has also been obtained to improve practical utility of the model. A numerical computation together with its graphical illustration has been mentioned in the end to highlight important results of the study.

The following assumptions have been associated with this model:

(1) Initially, all the components are good and workable.

(2) Reliability of every component of the system is known in advance.

(3) Each component will remain either good or bad.

(4) Transmission of power from one component to any other is 100% reliable.

(5) Switching device used to on-line standby solar panel is perfect.

(6) Failures are statistically independent.

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A mathematical modeling framework to evaluate the performance of single diode and double diode based SPV systems

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ABSTRACT

In order to predict the performance of a PV system, a reliable and accurate simulation design of PV systems before being installed is a necessity. The present study concerns the development of single and double diode model of solar PV system and ensures the best suited model under specific environmental condition for accurate performance prediction. The information provided in the manufacturers' data sheet is not sufficient for developing a Simulink based single and double diode models of PV module. These parameters are crucial to predict accurate performance of a PV module. These parameters of the proposed solar PV models have been calculated using an efficient iterative technique. This paper compares the simulation results of both the models with manufacturer's data sheet to investigate the accuracy and validity. A MATLAB/Simulink based comparative performance analysis of these models under inconsistent atmospheric conditions and the effect of variations in model parameters has been carried out. Despite the simplicity, these models are highly sensitive and respond to a slight variation in temperature and insolation. It is observed that double diode PV model is more accurate under low intensity insolation or shading condition. The performance evaluation of the models under present study will be helpful to understand the I–V curves, which will enable us in predicting the solar PV system power production under variable input conditions.

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1. Introduction

Solar PV systems are environmentally friendly and assist in minimizing GHG emissions that would have otherwise arisen due to the use of fossil fuels for power generation. Feeding electricity into the grid by solar PV plants can help in to transmit equal amounts of electricity as would have been generated from the GHG intensive grid (most power grids receive electricity from coal based power plants). However, the high cost of photovoltaic power system modules inhibits optimum and utmost utilization of available solar energy. Thus, before actually installing the system, it is necessary that reliability and accuracy of the system is ensured in simulated environments.

Solar PV systems are environmentally friendly and assist in minimizing GHG emissions that would have otherwise arisen due to the use of fossil fuels for power generation. Feeding electricity into the grid by solar PV plants can help in to transmit equal amounts of electricity as would have been generated from the GHG intensive grid (most power grids receive electricity from coal based power plants). However, the high cost of photovoltaic power system modules inhibits optimum and utmost utilization of available solar energy. Thus, before actually installing the system, it is necessary that reliability and accuracy of the system is ensured in simulated environments.

A PV system converts light into electricity. More precisely, a PV cell converts incoming solar radiation into direct current (DC). A PV cell is the heart of the solar power system, and sunlight being free of cost and available in abundance, can be used as an alternative energy source. The word "photovoltaic" originates from the word "light" pronounced as "photo" in Greek, and "voltaic" from Alessandro Volta—an electricity pioneer. The ability of photovoltaic material to convert Light energy into electrical energy was discovered by Edmond Becquerel—a French physicist, in 1839. Although the use of sunlight to produce electric current in solid materials was also recognized by Becquerel, it took a century to understand this procedure of conversion. Nonetheless, scientists have identified materials that exhibit photovoltaic properties of converting light energy into electrical energy at the atomic level (Tossa et al., 2014; Alsayid, 2012). A number of solar cells are attached in series or parallel (depending upon the necessity) in a single support system known as a "PV module". Depending

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Synthesis and Characterizations of Cu–Ag Core–Shell Nanoparticles

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A core–shell structure composed of copper and silver has been prepared by chemical reduction method. The structure and composition of the synthesized Cu–Ag core–shell have been characterized using UV-vis spectroscopy, X-ray diffraction (XRD), field emission scanning electron microscopy (FESEM) and transmission electron microscopy (TEM). The results show that an Ag layer of 25–35 nm thickness is covered onto the surface of Cu particle having size of approximately 394 ± 110 nm.

Keywords: Nanoparticles, Silver, Copper, Core–Shell.

1. INTRODUCTION

Core–shell nanoparticles take much more attention from last decades due to their unique electronic properties. High electrical conductivity and oxidation stability has made silver nanoparticles more promising material for electronic devices, conductive coatings and metal inks for inkjet printing.[1–3] But the high cost of Ag materials limits their use.[4] To solve this problem, Ag can be replaced by Cu due to its low cost (about one percent of Ag cost) and high electrical conductivity (only 6% less than that of Ag). However, Cu is easily oxidized under ambient conditions. Formation of an Ag shell on Cu core may be an alternative technique to prevent spontaneous oxidation of Cu particles. Therefore, the core–shell Cu–Ag structures have attracted much attention to solve the problems of the high cost of Ag and the low oxidation stability of Cu.[5] Core–shell type nanoparticles are formed by reduction of metal ions of the "shell" on a pre-synthesized "core" and it shows different plasmonic properties than that of alloy type. While the alloys have one characteristic plasmon band in the visible region,[6] the core–shell type nanoparticles in general show two plasmon bands[7–8] and only the characteristic plasmon band of the shell metal[8] if the shell thickness is very less (< 4 nm). Thus the nanoscale thickness of the layers gives rise to enhanced properties and widespread applications[5] and thus draws much attention among researchers. Many works have been reported on the synthesis and characterization of the properties of different types of core–shell nanoparticles like Ag–Au,[7–9] Pd–Ag,[10] Pt–Au[11] and Ag–Cu.[12] Cu–Ag core–shell nanoparticles have been synthesized by electrochemical deposition, thermal evaporation, pulsed wire evaporation method and chemical reduction processes.[4] The present work focuses on a one step chemical synthesis of Cu–Ag core–shell nanoparticles. Further literature review reports the synthesis of Ag–Cu alloy nanoparticles[13] by this method with the only difference that, instead of capping agent they purged the mixture of $AgNO_3$ and $CuSO_4$ with N_2 gas and the entire reaction has been carried out under ice cold condition and N_2 atmosphere. But no work has been reported on the synthesis of Cu–Ag core–shell nanoparticles by this process.

2. EXPERIMENTAL PROCEDURE

2.1. Synthesis of Cu–Ag Nanoparticle

All the chemicals used for synthesis of Cu–Ag core–shell structures are of analytical grade and used without further purification. Silver nitrate ($AgNO_3$, Merck), copper sulphate pentahydrated ($CuSO_4 \cdot 5H_2O$, Merck), sodium borohydride ($NaBH_4$, Merck), and Polyvinyl Pyrrolidone (PVP, Alfa Aesar) were used for synthesis of Cu–Ag core–shell structures by chemical reduction method. Deionized water was used throughout the experiment. The PVP was used as the capping agent and $NaBH_4$ was used as the reducing agent. The metal salt solution [0.1 mol/L] copper sulphate was prepared in a round bottom flask. One gram PVP was added and stirred until the clear solution was obtained. The reaction mixture was stirred for 10 min using magnetic stirrer. Sodium borohydride solution (0.5 mol/L) was added slowly through a dropping funnel in the reaction mixture and stirred for 1 h, as a result a dark red solution was obtained. The silver nitrate solution [0.1 mol/L] was prepared separately and added in the reaction mixture by drop by drop. The dark green precipitate was obtained and separated by filtration. The obtained precipitate was washed with ethanol water mixture.

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COMPARING THE TEMPERATURE RESULT IN STEADY STATE THERMAL FOR C I ENGINE PISTON COATED WITH SINGLE TBC MATERIAL LAYER

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Abstract— There is a very vital role of Diesel Engine on Public Economy. On both Agriculture and Transportation for higher fuel economy with compatible prices. Here the work carried out by the constant from heat engine where 35-40% is used as useful work. The cooling system used in engine absorb heat energy generate due to friction and due to combustion and vanish it to surroundings to ensure engine temperature always remain below the safe level. Due to the emission of such waste energy in the environment it is need to find out the use of some thermal barrier system which overcome all this type of problem. Now the major thrust is to improve performance characteristics and the efficiency of the internal combustion engine due to the environmental considerations and some continuous technological demand from industries besides rapid increase in the cost of the fuel. On the other hand, there is increasingly important to improvement in engine material by the introduction of new alternative fuels. In order to overcome the problem there some idea has generated to solve the problem such a type and that can be solve by using TBC material coating on the surface of piston crown by using different material and comparing the result.

Keywords: TBC, Piston, CI Engine, Diesel Engine, Temperature.

I. INTRODUCTION

Generally, the used of TBC material coating on gas turbine blade. Than it is partially added on the SI engine piston crown, the petroleum crisis and the subsequent increase in the cost of fuels, the improvement of fuels and the improvement of fuel economy of the I C Engines has become a high priority to the researchers. Reducing heat rejection in reciprocating engines is a possible way of reducing fuel consumption. The used of TBC material coating on the surface of piston is help in maintain the temperature inside the cylinder the result of this raisence in temperature of piston skirt which reduces the thermal stresses and complete combustion of hydro carbon which reduce the emission of harmful gases at exhaust. The comparative result analysis for used of different TBC material coating on the top surface is done by tool ANSYS 14.

II. TBC COATING ON PISTON CROWN

There is a very wide used of TBC material to increase the performance of SI engine for maintain the temperature inside the combustion chamber. The uses of TBC coating material inside the CI Engine increase the Performance by reduce the heat loss along the piston length and width of this reduce thermal stresses on the skirt of piston. The Coating is done with the help of Plasma Spray on the surface of piston crown. Here TATA INDICA V2 Diesel Variant Aluminium Alloy piston is used for analysis work on ANSYS and find out the Temperature Distribution along the surface of piston length. Here the TBC material used for analysis up to a working condition of temperature 800°C due to the low thermal conductivity of TBC material it will restrict the flow of heat from piston Crown to piston skirt which reduce the deformation of piston due to increase of thermal stresses and also increase the life of piston.

III. EFFECT OF TBC COATING AND METHOD OF COATING

In our analysis ANSYS 14 is used to get out the results of temperature variation on the surface of piston. There are different methods the use of coating on the surface of piston crown they are as follows:

1. Physical Vapour Decomposition (PVD)
2. Chemical Vapour Decomposition (CVD)
3. Ion Coating

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PULSE FREQUENCY EFFECT ON MICROSTRUCTURE, MORPHOLOGY, MICRO HARDNESS AND WEAR RESISTANCE OF ELECTRODEPOSITED Ni-SiC COMPOSITE COATINGS

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Abstract This paper describes the work on Ni-SiC composite coatings produced by pulse electrodeposition on copper substrate. XRD analysis was done for the coated layer and confirms the presence of SiC in the coatings. It has been found that SiC was engulfing in Ni matrix in that microhardness and wear resistance property improved. SEM (scanning electron microscopy) and EDS (energy dispersive spectroscopy) were done to investigate microstructure, morphology and SiC (vol.%) reinforcement in Ni-SiC metal matrix composite(MMCs) coatings.

Keywords: Pulse electrodeposition, Ni-SiC composite coatings, microhardness, wear rate.

I. Introduction

Metal matrix composites (MMCs) coatings by electrodeposition technique have been generating significant interest in surface and coatings technology. Electrodeposited nickel is the most widely used coating as it shows good mechanical properties, excellent corrosion resistance, high electrical and thermal conductivity and good magnetic property. Nickel composite coatings are deposited with SiC, Al_2O_3, ZrO_2, TiO_2, La_2O_3, and CeO_2 particles [2]. Electrodeposition of Ni-SiC composite in which matrix made by Ni metal and SiC ceramic reinforced in that matrix having very good mechanical properties used in engineering application like automobiles, electronic, textile, ceramic, paper industries, energy sector etc. These composite coatings not only depend on the concentration, size, distribution and nature of the reinforced particles but also on type of solution used and parameters like current density, temperature, pH value etc. [1, 3]. Entrapment of the particulate in composites depends on suspension and parameters like current density, pH temperature etc. gave appreciable effect on hardness and COF [3]. Pulse current can produce deposits with more uniform particle distribution and better surface morphology compared to direct current because it provides T_{off} time to cathodic substrate during which particulate SiC got enough time to well reinforced in between the Ni matrix and enhanced the composites property [5, 4]. In pulse current compare to dc having lower porosity and improved corrosion resistance [1, 2].

Microhardness for pulse current plated samples was higher than the direct current plated sample and internal stress was lower for it [2, 4-6]. Also pulse electrodeposition method plays a crucial role because it is more efficient in fabrication of metals and alloys due to its independently controllable parameters and higher instantaneous current densities compare to other electrodeposition [4]. The properties of metals and alloys can be controlled and improved by modifying their microstructure when using pulse current, it shifted the polarization curve and greatly affected by the

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Article

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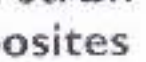

Effect of alkali treatment on the thermal properties of wheat straw fiber reinforced epoxy composites

Varun Mittal and Shishir Sinha

Abstract

This paper focuses on the study of the effect of fiber content and alkali treatment on the thermal properties of wheat straw epoxy composite. Four levels of fiber loading (10, 20, 30, and 40 wt%) of wheat straw and three levels of alkali treatment (1, 3, and 5%) were considered and merged into epoxy composites. The composites were prepared by hand layup technique. The thermal stability of the components was studied by thermogravimetric analysis and differential scanning calorimetry, as well as by the differential thermogravimetric. The experimental results show that the thermal stability of the composites prepared from 3% alkali-treated fibers is superior as compared to the untreated and another level of alkali-treated fiber composite. This is mainly due to the efficient fiber–matrix adhesion in the alkali-treated wheat straw epoxy composites. Scanning Electron Microscopy (SEM) and Fourier Transform Infrared Spectroscopy (FTIR) studies were carried out to evaluate the microstructure and composition of wheat straw fiber/epoxy composites, respectively.

Keywords

Composites, epoxy, Scanning Electron Microscopy (SEM), thermal properties, wheat straw

Introduction

Over the past two decades, natural fiber has been receiving healthy growth as a substitute for synthetic fiber reinforcements such as glass fiber in plastics. The use of natural fiber reinforced composite material as an alternative to traditional metal materials is becoming widespread. These materials have many plus points like low weight, high specific strength and stiffness, good environmental resistance and long shelf life. Natural fiber reinforced composites are gaining more impacts day to day. Composites parts can be easily prepared as compared to other materials like metals, glasswork. Keeping in view of the various advantages associated with natural fiber reinforced composite, various researchers across the world are concentrating in this field under the focused area of less energy used, thereby operating cost.[1,2] Alemdar and Sain analyzed the mechanical and thermal behavior of cellulose nanofibers which were isolated from wheat straw by a chemi-mechanical method using thermogravimetric analysis (TGA) and they observed that the mechanical strength and degradation temperature of the fibers are increased after every step of the treatment.[3] Pan et al. worked on the effects of wheat straw fiber (WSF) content, concentration of coupling agent on the mechanical properties of WSF polypropylene composites and they observed that mechanical strength of the composites increased linearly with increasing WSF content up to 40%, whereas the elongation at break decreased and good tensile strength is achieved at the 10 wt% of coupling agent concentration.[4] Zou et al. studied the effect of wheat straw lengths, concentration and split on flexural, impact resistant, and tensile property of wheat straw polypropylene composites and results say that the mechanically split fiber composites have superior strength than the whole fiber composites.[5] Dong and Davies worked on the flexural strength of wheat straw reinforced polyester composites and compared the experimental and calculated results. They observed that flexural modulus decreases with the addition of

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Study the effect of fiber loading and alkali treatment on the mechanical and water absorption properties of wheat straw fiber-reinforced epoxy composites

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Abstract: The aim of this research was to study the feasibility of using wheat straw fiber with epoxy resin for developing natural fiber-polymer composites. For this purpose, the epoxy resin was reinforced with 5, 10, 15, 20, and 25 wt.% of the wheat straw fiber with the help of the hand lay-up technique. Further, in order to improve the composite characteristic, wheat straw fibers were treated with three different concentrations of alkali (1%, 3%, and 5%). The mechanical and water absorption properties of the treated fiber composites were characterized and compared with those of untreated fiber filled epoxy composites. It was observed that the mechanical properties and water resistance were reduced with the increase in wheat straw fiber loading from 5 to 25 wt.%. Among the three levels of alkali treatment, the composite made with 3% alkali-treated fiber exhibited superior mechanical properties than the other untreated and treated fiber composites, which pointed to an efficient fiber-matrix adhesion. The scanning electron microscope was used to observe the surface features of the wheat straw fiber.

Keywords: composites; epoxy resin; mechanical properties; water absorption; wheat straw.

1 Introduction

The requirement for natural fiber composite products such as ply board, door panels, dashboards, etc., has been increasing worldwide in recent years [1, 2]. Owing to the low cost, low density, and effective mechanical properties of various natural fibers such as jute, bagasse, wheat straw, rice straw, coir, and banana, it is possible to use them as replacements for synthetic fibers in a composite application [3]. Various industries like packaging, automotive, and building construction have been encouraged to use biofibers in their applications in lieu of non-renewable reinforcing materials [4–6]. The chemical composition of wheat straw is similar to that of wood and cellulose structures, which are embedded in an amorphous matrix of hemicellulose and lignin. They have good mechanical strength. Various investigations have been carried out on several types of biofibers such as coir, wheat straw, banana, hemp, bamboo, and wood to study the influence of these fibers on the mechanical and thermal properties of composite materials. Some investigations have been carried out on wheat straw fiber (WSF) to study the effect of fiber on the mechanical and physical properties of composite materials.

For instance, Avella et al. examined the thermal and mechanical properties of wheat straw reinforced polyester composites. Initially, WSF is treated with high-temperature steam, which provides the fiber a more positive property and more cellulose content. The authors reported that the treated fiber composite has a higher value of the Young modulus than the neat polyester. From their thermal study, they found that the presence of WSFs in the composite increases the rate of polyester crystallization, this is due to the nucleating effect, while the crystalline of samples remains unchanged [7]. Xiaojun et al. analyzed the various properties of medium-density wheat straw particle board using different adhesives like methylene diphenyl diisocyanate, urea formaldehyde, soybean protein isolate, and soybean flour as well as chemical treatment of the wheat straw. They reported that among all adhesives, the particle board made from methylene diphenyl diisocyanate showed the best mechanical performance and water resistance than the other adhesives. The treated wheat straw particle board had improved

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Effect of chemical treatment on thermal properties of bagasse fiber-reinforced epoxy composite

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Abstract: The present paper deals with a study of the thermal properties of bagasse fiber (BF)-reinforced epoxy composites. BFs are subjected to untreated and chemical treatments with 1% sodium hydroxide followed by 1% acrylic acid at ambient temperature before the composites are made. The thermal stability of the components was studied by thermogravimetric analysis and differential scanning calorimetry, as well as by differential thermal gravimetric analysis. Thermal analysis results of untreated BF-reinforced epoxy composite were compared with treated BF-reinforced epoxy composite. The chemical treatment of BF induces reasonable changes in the thermal stability of the polymer composites.

Keywords: bagasse fiber; chemical treatment; composites; epoxy resin; thermal properties.

1 Introduction

Natural fibers mainly consist of cellulose, hemicelluloses, pectin, and lignin. The individual percentage of these components varies with dissimilar types of fiber. This variation can also be accomplished by growing and harvesting conditions. The main benefits of using natural fibers in composites are the cost of materials and their sustainability and low density as compared with synthetic fibers. Natural fibers can cost as little as USD 0.016–0.08/kg and can be grown in a short period of time [1, 2]. They are also easy to grow and have the potential to be a cash crop for local farmers. The treatment techniques of fibers are currently an area of research involving substantial attention because these treatments may help to enhance the mechanical and thermal properties of the composites. The respective treatment methods that have been studied by various researcher are covered in [3–5]. From the various treatment methods, alkaline treatment has been selected due to it being inexpensive and the ease of the process [6, 7]. Acetylation is another treatment that is common with cellulose to form a hydrophobic thermoplastic and has the potential to have the same results on natural fibers [8]. Some of the natural fiber-based polymer composites are already being used in various applications like packaging, building, furniture, and automobile industries. Improvement of the thermal stability of the composite by suitable treatment provides higher temperature resistance if the respective composites are likely to attain higher temperatures than the designed limit. There is very little information available regarding the thermal behavior of natural fiber-based composite at high temperatures [9–16]. Thus, for the current study, bagasse fiber (BF) was reinforced with epoxy with different fiber loadings to investigate its thermogravimetric stability up to 900°C, and compared with chemically treated BF-reinforced composite.

2 Materials and methods

2.1 Material used

2.1.1 Bagasse fiber

Sugarcane residue was procured from a local sugar mill (Saharanpur, Uttar Pradesh, India). BF was sieved from the sugarcane residue for the removal of unwanted impurities. After separation, the moisture content of fiber was found to be 6–7%. The length of the BF varied from 5 to 30 mm with an average length of 8 mm. The fibers were washed with distilled water to remove any unwanted adhered impurities; this was followed by drying in a hot air oven at 70°C for 48 h to remove the moisture.

The epoxy resin (AW106) and the curing agent (HV953U) are useful polymers and have good strength, toughness, and resilience. When both are mixed they have an excellent resistance to chemical and moisture attack, having outstanding electrical insulating properties and an absence of volatile matter on curing. It has

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Original Article

Surface Modification of Nano-Hydroxyapatite Using Bisphosphonate Moieties: Effect on Morphology and Crystalline Nature at Higher Temperature

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Nano-hydroxyapatite (n-HA) was synthesized using sol gel technique with calcium and phosphorus precursors. Surface of synthesized n-HA was modified using bisphosphonate group grafting in aqueous solution of 0.1M etidronic acid at a pH 10. The modified nano hydroxyapatite was further subjected to sintering at various temperatures i.e. 80, 400, 600, 800°C to obtain different crystallite sizes. Modified hydroxyapatite was characterized using FTIR, WDXRF, TEM, SEM, DLS and Contact angle. Crystallite size was determined using XRD and DLS. FTIR and WD-XRF revealed that modification did not affect the pristine structure and the stoichiometry of Ca/P of hydroxyapatite structure. Morphology results confirmed the presence of etidronate fragment bounded to the Hydroxyapatite structure. Morphology of hydroxyapatite changed from cylindrical/grain to sheet and needle with increase in sintering temperature as rendered by TEM and SEM. Contact angle revealed modified hydroxyapatite possess super hygroscopic surface.

Introduction

A large number of clinical methods are used for the replacement or repair of tissues in the human body that have been damaged through disease or injury. Therapies available currently like autografts, allografts or xenografts are based on replacement of the damaged tissue using donor graft tissues that pose numerous problems mainly related to shortage of donors or donor sites, volume of donor tissues, donor site pain and morbidity, rejection of grafts by human immune system and transmission of diseases[1]. To avoid the risks in grafting, tissue engineering provides effective alternative based on its fundamental principal of regenerating damaged tissues instead of replacing them. The scientific research in this field is therefore focused on developing biological substitutes like scaffolds which serves as a framework to support the cell migration into the defect from the surrounding tissues and provides a suitable substrate for cell attachment, cell proliferation, differentiated function and cell migration[2, 3].

They can also be used to achieve drug delivery with high loadings and efficiency [3]. They can be fabricated using natural polymers such as alginate, proteins, collagens, gelatin, fibrins, and albumin or biodegradable synthetic polymers such as polyvinyl alcohol, Poly (glycolic acid), Poly (lactic acid) their copolymers poly (p-dioxanone), poly(caprolactone) polyanhydrides and polyorthoesters. But for the synthesis of scaffold, biocompatibility, biodegradability and mechanical strength are important parameters to be considered. Addition of an osteoconductive component i.e. biomaterial is one of the important methods for the fabrication of biodegradable scaffolds with higher mechanical strength and improved biocompatibility.

Hydroxyapatite, bioglass, apatite, calcium pyrophosphate etc. are some of the biomaterials that are widely used for the synthesis of scaffolds. Out of these materials, hydroxyapatite (HA) provides excellent mechanical properties and osteoconductivity to the scaffold. It is one of the most biocompatible, bioactive ceramics because of its significant chemical and physical resemblance to the mineral constituents of human bones and teeth [4]. HA is widely used as powders or in particulate forms in various bone repairs and as coatings for metallic prostheses to improve their biological properties[5, 6]. Thermodynamically, it is the most stable calcium phosphate ceramic compound nearest to the pH, temperature and composition of the physiological fluid [7]. It has an exact stoichiometric Ca/P ratio of 1.67 and is chemically very similar to the mineralized human bone. Due to the chemical similarity between HA and mineralized bone of human tissue, synthetic HA exhibits strong affinity to host hard tissues[8]. Due to its wide application in human body a due attention is required to

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Original Article

Synthesis of Bioactive Scaffolds Based on Polyurethane and Surface Modified Hydroxyapatite (HA) Nanocomposites for Bone Repairing and Regeneration

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Ethylene acid sulfone modified nano Hydroxyapatite (m-nHA) was incorporated into biodegradable polyurethane (PU) scaffolds synthesized from castor oil and its effect was studied on various properties like bioactivity, biodegradability and mechanical properties. The m-nHA/PU nano-composite scaffolds were prepared in-situ using foaming method in presence of modified HA nano particles which were dispersed in castor oil using a high shear homogenizer. The ratio of castor oil to MDI in PU scaffolds was maintained to [www] and filler concentration was 40% by weight of the mixture. The resulting m-nHA/PU nanocomposites scaffolds were characterized for chemical, morphological and mechanical properties using Fourier transform infrared absorption (FTIR), scanning electron microscopy (SEM) and X-ray diffraction (XRD). Bioactivity and biodegradability were studied using *in vitro* cell culture and soaking in SBF. PU nanocomposites scaffolds have an open and interconnected pores with size range of 100-600µm. Further, in vitro cell culture studies showed cytocompatibility of these novel engineered surface could maintained exponential growth up to a day time span and improved cell viability, as compared to bare plastic surface. Overall, these developed surfaces improves cell growth which can be utilized for safe, in vitro tissue threat regeneration.

Introduction

Tissue engineering plays a pivotal role in regeneration of damaged or accidentally injured tissues. Numerous techniques available for the preparation of scaffolds (templates) for this purpose are autografts, allografts, xenografts [1] and a large amount of research efforts are dedicated towards advancement of these techniques. However, despite of all the efforts there are major drawbacks like presence of donor sites, tissue volume to harvest, feeble immune response, rejection of grafts and others adverse biofouling response. Latest efforts further favours synthesis of bio-degradable scaffolds with highly porous structure, high biocompatibility and bioactivity [1, 2].

In the recent researches it has been found that the bioactivity of scaffolds can be increased to a greater extent by introducing some special types of ceramics that themselves possess bioactive responses. These ceramics like hydroxyapatite (HA), bioglass, apatite, calcium phosphate, carbon fibers, glass fibers, polymer fibers and silica particles are mostly used for metallic prostheses to enhance biological properties. Among these ceramics HA has exact stoichiometric Ca/P ratio of 1.67 and its chemical structure has closely resemblances to bone tissues. However, its use is restricted due to some limitations such as difficulty in implants owing to its hardness, fragile and inflexible nature. To overcome these limitations, HA is fabricated as biodegradable composite materials with natural polymers like alginate, proteins, collagens, gelatin, fibrins, albumin and synthetic polymers like polyvinyl alcohol, poly(glycolic acid), poly(lactic acid), poly(p-dioxanone), poly(caprolactone) polyurethanes and polyorthoesters. Further, biomedical significance of these nano-composite scaffolds can be efficiently enhanced by morphological modifications or doping of osteoconductive components on to HA [3, 4].

Surface Modification of HA enhances the biocompatibility of these materials which in turn significantly improves and accelerate invasion of bone tissues into the scaffolds. To obtain desired properties for surface of HA particles, use of

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Research Article

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Synthesis and Characterization of Triethanolamine (TEA) Grafted Nano Sheets of Hydroxyapatite

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ABSTRACT

The surface morphology of hydroxyapatite (HAp) was transformed into nano-sheets of rectangular shape by grafting the triethanolamine (TEA). The reaction was carried out using a precipitation method. The prepared HAp nano sheets were characterized using different techniques such as SEM, TEM, FTIR, XRD and WD-XRF in order to observe morphological, compositional and structural characteristics of newly formed HAp nano sheets. XRD analysis shows that the structure of HA remains almost unchanged with a slight effect on its crystallinity. The presence of TEA on to the HAp surface was also confirmed by the FTIR technique. SEM and TEM techniques depicted presence of TEA on HAp surface has significantly changed its overall morphology. The combined estimation of FTIR and WD-XRF studies however revealed a strong interaction between the grafted TEA molecules and surface groups of HAp. The grafting did not affect the pristine structure of HAp and stoichiometry of its Ca/P group. Further, the approximation of contact angle of HAp nano-sheets exhibited a strong hygroscopic tendency of this nano material

Keywords: Hydroxyapatite; Triethanolamine; Scanning electron microscope; Transmission electron microscope; Contact angle

INTRODUCTION

Hydroxyapatite (HAp) has great potential to be successfully used as an adsorbents, catalyst and biomaterials such as for orthopedic implants [1]. It is derived from the various surfaces characteristics of HAp e.g. highly reactive functional groups at the surface, pH, acidity, high hydrophilic tendency and abundance of surface charges. Due to high surface reactivity of HAp, the material conducts the easy exchange of HPO4 2- groups by carbonate ions or organic substances [2]. Further, there are many other exclusive properties associated with the P-OH groups present at HAp surface that are responsible for the good adsorption of protein molecules and other organic species [3].

Since last decades, numerous research studies have been carried out using HAp especially with the aim to construct organic-mineral hybrid apatite system so as to get strong influence of these small organic species on the size and morphological properties of HAp [4-6]. As natural bone consists of inorganic/organic composite structure in the diameter about 20 nm and length about 50 nm [7], from the view point of bionics. Therefore, HAp/organic mineral constructs oriented research is of great importance now these days for composing a desired scaffold system with advanced features. In the frame work of HAp/organic mineral system research different processes have been proposed till date. Most of these based on the extent of interaction between Ca2+ or P ions and other anionic groups of organic minerals on the surface of HAp [8]. Different coupling agent have been used for this purpose such as organo functional silanes [9], dodecyl alcohol [10], photocrosslinkable chitosan [11], triethanolamine (TEA) [12], etidronic acid [13], hexyl, octyl, and decyl phosphate in mixed acetone/ water solvents [10] etc. These organic agents are highly beneficial for promotion of interfacial adhesion between filler and polymer matrix during scaffold

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Identification of unknown parameters of a single diode photovoltaic model using particle swarm optimization with binary constraints

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ABSTRACT

Abstract-Photo-voltaic (PV) is a static medium to convert solar energy directly into electricity. In order to predict the performance of a PV system before being installed, a reliable and accurate model design of PV systems is essential. To validate the design of a PV system like maximum power point (MPP) and micro-grid system through simulation, an accurate solar PV model is required. However, information provided by manufacturers in data sheets is not sufficient for simulating the characteristic of a PV module under normal as well as under diverse environmental conditions. In this paper, a particle swarm optimization (PSO) technique with binary constraints has been presented to identify the unknown parameters of a single diode model of solar PV module. Multi-crystalline and mono-crystalline technologies based PV modules are considered under the present study. Based on the results obtained, it has been found that PSO algorithm yields a high value of accuracy irrespective of temperature variations.

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1. Introduction

In the current scenario, socio-economic development and human welfare around the world depends on energy. Fossil fuels account maximum share in the overall generation. However, carbon emissions and depletion are some issues associated with the use of fossil fuels. The energy demand around the world is continuously increasing. If this escalating demand is to be met with fossil fuels, the extensive use of fossil fuels will release a large amount of CO_2 and other greenhouse gases. Renewable energy sources on the other hand are abundant in nature and contain quite low or no greenhouse-gas emissions. Therefore, it is the necessity of today's world to concentrate on renewable energy sources for electricity generation. Solar energy has been a paramount part of renewable energy sources as it is available directly from the sun, whereas wind, wave, hydro etc. are indirectly derived. Solar energy is also available in abundance and is non exhaustible, but the technology to harness solar energy is still improving. Solar PV technology exploits the solar radiation and directly converts it into electricity. The utilization of photovoltaic (PV) technology as a source of power at user end is increasing, due to easy implementation and low maintenance cost compared to other forms of energy conversion [1]. PV technology has the highest power density amongst all renewable energy resources with global mean of 170 W/m^2 [2]. In order to predict the performance of a PV system, a reliable and accurate model design of PV systems is a necessary before being installed.

Performance of the PV system is affected by change in temperature and insolation [3]. Ideally a PV module needs to be operated at maximum power point (MPP). This incorporates advance research in real time optimization techniques like fuzzy logic, artificial neural network, perturb and observe algorithms etc. [4]. Therefore, it is essential to have a comprehensive study and performance analysis of a PV model to predict the outcome of a PV module under diverse atmospheric conditions.

The parameters provided in the manufacturers datasheet under standard test conditions (STC) include short-circuit current, open-circuit voltage, voltage at maximum power, current at maximum power and temperature coefficients of current, voltage and power. Although, provided data is essential but not enough to predict accurate I-V characteristic curves under varying insolation and temperature levels. Single diode PV model is extensively used by several researchers [5–9,11,12,45–47] due to its simplicity. Humada et al. [12] compared and summarizes the techniques for parameter extraction. Further, they have also compared single-diode and double diode models for one, two, three, four and five parameters by setting a model evaluation criterion. The study suggests that five parameter (single-diode) model is the most widely model due to its

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Experimental investigation on power output of different photovoltaic array configurations under uniform and partial shading scenarios

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ABSTRACT

The power output of photovoltaic systems is considerably affected by complete or partial shading of the modules in an array and it depends on the type of configuration, module position, and shading scenario. In this paper, the effect of uniform and non-uniform shading scenarios on the output of solar photovoltaic modules of different interconnection schemes has been investigated. In order to determine the characteristics curves of a photovoltaic system, experiments have been conducted on a given array size under different shaded conditions. Further, random shading patterns have been artificially generated using meshes of different transmissivity. The impact of bypass diode on the power output of a photovoltaic system has also been observed. Finally, the performance of different module configurations is analyzed and the most efficient configuration under uniform insolation and partial shading conditions have been identified. The results found under the present experimental study have a guiding significance for photovoltaic system design and operation under the influence of partial shading.

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1. Introduction

The impact of an energy resource and its availability play a significant role in the development of world's developing societies and their substantial future. Energy needs of human population around the globe are met using fossil fuels. But these fossil fuels are finite, rapidly depleting and their continuous utilization has detrimental consequences on the environment. Also, the world energy demand has increased by thirty folds in last two decades. With nuclear energy and hydro-electricity as an exception all other present energy resources are limited. As the present day energy demand has been continuously soaring, so have been the adverse environmental consequences of its production. This excessive use of fossil fuels produces harmful greenhouse gases in the atmosphere and leads to climate change causing a catastrophic global threat to life on earth. Hence, a non-polluting alternative energy source to meet the present day energy demand is required. The Sun is the most direct source of energy which can be harnessed in different ways. Photovoltaic (PV) technology is the simplest and elegant way to harness solar energy. PV converts insolation (incident solar radiations) directly into electricity through solar cells. Today energy generation through PV technology is a rapidly growing and increasingly important renewable alternative as compared to other renewable and conventional electricity generating technologies. However, shading has a serious impact on the output of a PV system.

All the chosen PV modules in an array are ensured to be identical in terms of electrical properties. Yet these modules behave differently when operating under inhomogeneous insolation causing mismatch losses in a PV system. In context to both efficiency and energy yield, the design of a PV system requires the evaluation of its operation under diverse atmospheric conditions (uniform or partial shading). Partial shading has an intensely non-linear influence on the energy yield and the electrical performance of a PV system. Significant shading will cause a system to never reach its potential payback point [1,2]. Due to partial shading, the obtained I-V curves gets deviated from its standard form and a considerable decrease in the output power of a PV array is noticed [2,3]. Shading from nearby objects has a strong effect, even a small or transient shadows causes considerable power losses. In large solar PV arrays, partial shading due to nearby trees, buildings, birds or bird litters is an important issue associated with PV array performance. In the recent years, the effect of partial shading on the power output of solar PV system has been extensively discussed [4–6]. Loss of power output due to shading has been discussed in various studies [7–12]. Depending on the intensity and sheer size of the shade, numerous local

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The Effect of Electronic Payment on Customer Satisfaction

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Ms. Aditi Yadav (Student- Subharti University) (Co-Author)

Abstract

Retail electronic payment system has progressed in the recent years in various countries. We find that India is no exception .Reserve Bank in its Vision statement has set the objective to proactively promote electronic payments with an objective towards cash less society. The formation of National Payments Corporation (NPCI) in the year 2009 has set the stage for development of retail electronic payments which offers enormous opportunity to move towards cashless and less cash society. Using T test, with an objective to assess the contribution of NPCI, we find that significant difference exist in products such as electronic clearing, ECS (Debit), National Electronic Funds Transfer (NEFT), and Card Products when we compare the period after formation of NPCI and before formation of NPCI. Various innovative products, such as Immediate Payment Services (IMPS), National Automated Clearing House (NACH) and Prepaid Instruments (PPI), were launched after the formation of NPCI. There is enormous opportunity since the ratio of retail electronic clearing to systematically important payments such as Real Time Gross Settlement and CCIL grew from 1 percent in the year 2005-06 to 3 percent in the year 2013-2014. I intend to discuss with you all about a silent revolution that has been sweeping the country. It is about the payment systems in India. I said 'silent revolution'. That is because, the payment system has been evolving and changes have been continuous over the last 35 years, it has rarely got noticed as a revolutionary change. Let us see how it evolved and beneficially impacted settlement of economic transactions of common persons and businesses and how it is now poised for still larger impact.

INTRODUCTION

The driving force in the development of national payment systems of any country is usually the central bank of that country. The Reserve Bank of India as the central bank of India has been playing this developmental role and has taken several sufficient steps for Safe, Efficient, Accessible, Secure, Sound, and Authorized payment systems in the country.

The Board for Regulation and Supervision of Payment and Settlement Systems (BPSS), a sub-committee of the Central Board of the Reserve Bank of India is the highest policy making body on payment systems in the country. The BPSS is empowered for authorizing, prescribing policies and setting standards for regulating and supervising all the payment and settlement systems in the country. In India, the payment and settlement systems are regulated by the Payment and Settlement Systems Act, 2007 (PSS Act) which was legislated in December 2007. The initiatives taken by RBI in the mid-eighties and early-nineties focused on technology-based solutions for the improvement of the payment and settlement system infrastructure, coupled with the introduction of new payment products by taking advantage of the technological advancements in banks. The continued increase in the volume of cheques added pressure on the existing set-up, thus necessitating a cost-effective alternative system.

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RESEARCH ARTICLE OPEN ACCESS

Reliability Measures of Standby Systems with Operating Units

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ABSTRACT
In this paper, the author is study of complex standby system, where the standby is unable to start operation instantaneously upon the failure of working unit .In this model two units work normally in the system and the third unit works as a cold standby

Keywords: Complex standby system, M.T.T.F, Supplementary variable

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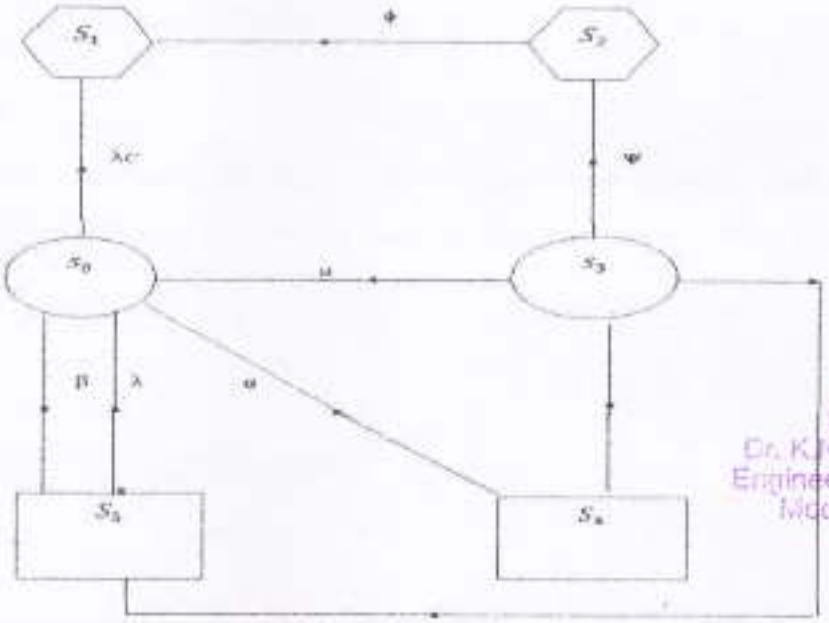
I. INTRUDUCTION

The author analysed a standby system , here switching mechanism is perfect .the author study of complex standby system ,where the standby is unable to start operation upon the failure after working. if external services is required the call service man and wait to solve the required maintenance it maybe replacement and critical human error and repair also of failure unit . In this model two unit work normally and the third unit worked as a cold standby . Here we study this system using supplementary variables and Laplace transform respectively for mathematical formulation and solve the problem .The system would in a degraded state when only one unit would be operating . The critical human error can occur by any working state and take as the system to be complete failure.

Notations

$P_i(t)$: Study state probability that the system is in state S_i($i = 0,1,2,3,4,5$)
λ_c : Constant failure rate of a unit.
λ_1 : Constant failure rate of the system due to critical human error.
α : Repair rates from state S_4 .
β : Repair rates from state S_5 .
ϕ : Constant waiting rates for replacement.
ψ : Constant replacement rates.
μ : Constant repair rates from S_3 to S_0 states .
$P_i(x,t)$: Probability at the state S_i($i = 4,5$)



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ECE

Wireless Sensor Networks Security

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Abstract Wireless Sensor Network (WSN) consist of spatially distributed autonomous sensors to monitor physical or environmental conditions, such as temperature, sound, vibration, pressure, motion or pollutants and to cooperatively pass their data through the network to a main location. It is used in applications both for mass public and military. The sensing technology combined with wireless communication makes it lucrative for being exploited in abundance in future. The inclusion of wireless communication technology also incurs various types of security threats. The intent of this paper is to investigate the security related issues and challenges in wireless sensor networks. We also discuss the holistic view of security for ensuring layered and robust security in wireless sensor networks.

Keywords Sensor, Security, Attack, Holistic, Challenge.

1 Introduction

Wireless Sensor Networks (WSN) are emerging as both an important new tier in the IT ecosystem and a rich domain of active research involving hardware and system design, networking, distributed algorithms, programming models, data management, security and social factors [1].

We explore various types of threats and attacks against wireless sensor network in Section 3. Section 4 reviews the related works and proposed schemes concerning security in WSN and also introduces the view of holistic security in WSN. Finally Section 5 concludes the paper delineating the research challenges and future trends toward the research in wireless sensor network security.

Today's sensors can monitor temperature, pressure, humidity, soil makeup, vehicular movement, noise levels, lighting conditions, the presence or absence of certain kinds of objects or substances, mechanical stress levels on attached objects, and other properties [2]. In case of wireless sensor networks, the communication among the sensors is done using wireless transceivers. However, while the routing strategies and wireless sensor network modeling are getting much preference, the security issues are yet to receive extensive focus. In this paper, we explore the security issues and challenges for next generation wireless sensor networks and discuss the critical parameters that require extensive research by the researchers from the security. We discuss these issues and challenges in this paper. To address the critical security issues in wireless sensor networks we talk about cryptography, steganography and other basics of network security and their applicability in Section 2. The basic idea of sensor network is to disperse tiny sensing devices which are capable of sensing some changes of incidents/parameters and communicating with other devices, over a specific geographic area for some specific purposes like target tracking, surveillance, environmental monitoring etc. The attractive features of the wireless sensor networks attracted many researchers to work on various issues related to these types of networks.

2. Feasibility of Basic Security Schemes in Wireless Sensor Networks

Security is a broadly used term encompassing the characteristics of authentication, integrity, privacy, nonrepudiation, and anti-playback [3]. The more the dependency on the information provided by the networks has been increased, the more the risk of secure transmission of information over the networks has increased. For the secure transmission of various types of information over networks, several cryptographic, steganographic and other techniques are used which are well known. In this section, we discuss the network security fundamentals and how the techniques are meant for wireless sensor networks.

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2.1 Cryptography

The encryption-decryption techniques devised for the traditional wired networks are not feasible to be applied directly for the wireless networks and in particular for wireless sensor networks. WSNs consist of tiny sensors which really suffer from the lack of processing, memory and battery power [4]. Applying any encryption scheme requires transmission of extra bits, hence extra processing, memory and battery power which are very important resources for the sensors' longevity. Applying the security mechanisms such as encryption could also increase delay, jitter and packet loss in wireless sensor

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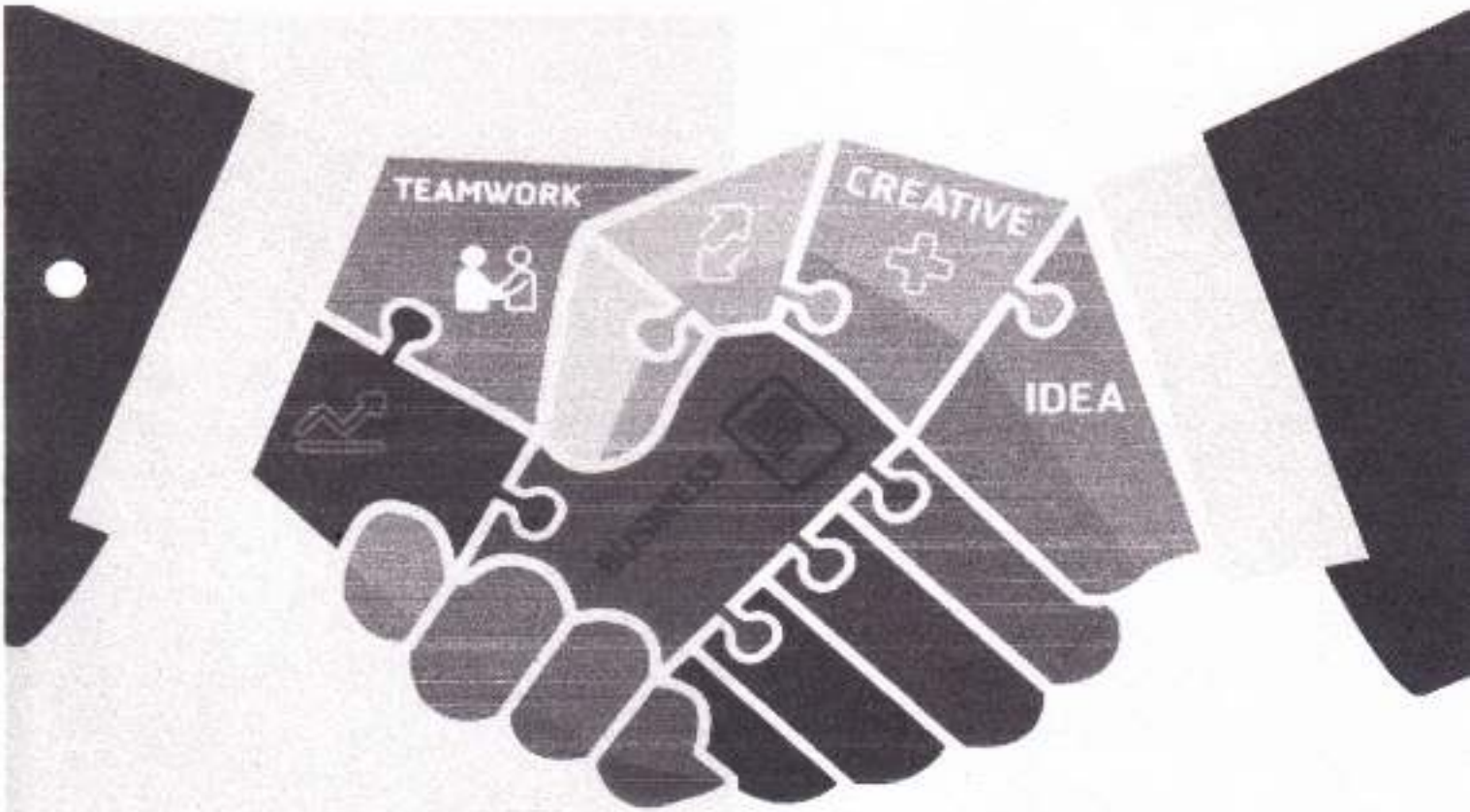

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FACTORS INFLUENCING SELECTION OF HOSPITAL FOR MEDICAL TOURIST IN DELHI AND NCR

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Abstract

An immeasurable review of the current literature reveals that non –discriminatory theoretical frame work for the entire study of medical tourism industry exists. The study, therefore aim to fill this gap by proposing an integrated model for the investigation of this flourish tourism field .It is developed with a view to capturing the current situation of medical tourism in a given country and region fro demand and supply and demand prospective. Both qualitative and quantitative techniques are suggested as systematic tool to test validate the model.

Medical tourists are consumers as well as all medical tourists have been to utilized the services for infirmities ranging from acute, chronic and congenital illness like cardiovascular diseases to advanced medical treatments like bone marrow transplant, cardiac , eye surgery, hip replacement etc. As we know that many option available for medical tourist in other countries like Malaysia and Thailand etc .The purpose of this paper is to investigate how some factors like advanced medical facilities like Popularity and competency of doctor, cost of treatment , Pre-procedural, stage, procedural stage, post procedural stage, visa experience in Delhi NCR hospitals to attract medical tourist.

In the present paper a study of Factors influencing selection of hospitals for medical tourist in Delhi NCR have been made. The data has collected information through a structured questionnaire from 100 inbound patients from 22 nations visiting 16 big hospitals in Delhi for medical treatments. 60 % of the earning come from Bangladesh ,Iraq ,Pakistan and the Maldives , India's major trade partner ,the US and EU 14% from United states and 11% from European Union. Medical tourism has been the largest contributor to India total health services export , accounting 70 % total revenue of $ 890 million earned in 2015-2016 according to the first comprehensive survey on the sector complied by Director General commercial intelligence and statistics under the commerce ministry .Asian countries led by Bangladesh ,Iraq ,Pakistan and the Maldives accounted more than 60%of foreign exchange earning of health service The key competitive strengths reported are economy in costs, big brand hospitals, qualified doctors, availability of all kinds of medical treatments, high tech procedures, online consultancy, less waiting time for treatment, good infrastructure and hygiene and cleanliness. However, patients faced challenges in finding good interpreters /translators, obtaining visa, getting insurance covers, problems are also faced by them in respect of follow ups and monitoring care, behavior of tour operators, corruption, differential pricing policies and inadequate lodging arrangements.

Introduction

Medical Tourism in India is a prospering business, drawing loads of international patients. Medical Tourism industry is an organizational entity . The development of technology and infrastructure facilities largely contributes for employment opportunities and increase of national income .India is a growing one of the developing countries which has growing destination for medical tourism. The climatic condition together with the varieties of medical herbs and plants and advancement in medical science provide the scope for medical tourism. Alternative medical system in India, providing treatments like Ayurveda, Naturopathy and Homeopathy facilitate medical tourism. The major medical tourism hubs are India, Cuba, Argentina, Malaysia, South Africa, Thailand and Jordan. India is placed among the top three medical tourism industry in the Asia and other two countries are Thailand and Singapore ." These three countries together accounted for about60 % of total Asian revenue in 2012"the report medical value travel in India by KPMG and Ficci said. Medical tourism is patient movement from highly developed nations to other areas of

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WILEY

RESEARCH ARTICLE

Mechanical, thermal, and water absorption properties of wheat straw/bagasse-reinforced epoxy blended composites

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Abstract

This study is to investigate the mechanical, thermal, and water absorption properties of wheat straw and bagasse fiber reinforced epoxy blended composites. To enhance these properties, wheat straw fiber was blended with bagasse fiber. The wheat straw and bagasse fibers were prepared with various weight ratios (80/20, 60/40, 40/60, and 20/80) and then incorporated into the epoxy matrix by molding technique to form composites. The mechanical, thermal, and water absorption characteristics were examined using blended composite samples. In this research, it has been observed that increases in the bagasse fiber content in wheat straw/epoxy composites result in superior the mechanical, thermal, and decreasing the moisture absorption property. A scanning electron microscope was used to observe the fracture surface of the samples.

KEYWORDS

bagasse fiber, mechanical properties, SEM, thermal properties, wheat straw fiber

1 | INTRODUCTION

There is a blending in the omnipresence of composite materials. It is evident in various formations in nature. Mankind has been using natural fiber composites since prehistoric times. One such example is wood, a stringy composite containing cellulose fibers joined with lignin matrix. Biodegradability, low density, less production energy requirements, less safety risk, good permeability, and thermal insulation properties form the merits of natural fibers which can be wood, sisal, hemp, agave, cotton, ramie, coir, flax, jute, abaca, banana, bamboo, kenaf, wheat straw, bagasse etc.[1–3] Among all available natural fibers, wheat straw and bagasse fiber are most abundant.[1] However, they have hydrophilic nature resulting in poor bonding with polymer matrix. Improvement in mechanical properties will make natural fiber to find more applications as in interior automotive components, household goods, etc. It can be achieved by various surface modification techniques such as silane treatment, alkaline treatment, acetylation, maleated coupling, acrylation treatment, and enzyme treatment for fiber.

Bisanda[4] studied the effect of alkali treatment on the wetting ability and coherence of sisal epoxy composites. It observed that alkali treatment improved the adhesion characteristics, due to improved work of adhesion because it enhances the surface tension and surface roughness. The resulting composites showed improvements in the compressive strength and water resistance. They observed that alkali-treated fiber has an absence of lignin and other waxy surface substances that increase the possibility on mechanical interlocking and chemical bonding. Ray et al.[5] studied the effect of the alkali treatment on the jute fiber for 0, 2, 4, 6, and 8 hr by mercerization at room temperature. They found the Young's modulus of the jute fibers improved by 12%, 68%, and 79% after 4, 6, and 8 hr of treatment, respectively. They also observed that fiber treated for 4 hr, the flexural strength improved by 20%, and the flexural modulus improved by 23%. Goda et al.[6] investigated the effect of alkylation on the tensile properties of ramie fiber. They treated the ramie fiber with a NaOH solution and was subjected to applied loads of 0.049 and 0.098 N. The results showed that the tensile strength of the treated ramie fiber was by improved 68–18%

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Mathematical modelling of water absorption behavior of bagasse fiber reinforced epoxy composite material

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Abstract

Natural fibers reinforced polymeric materials have drawn considerable attention to academicians and researchers over last two decades. The environmental friendly nature, low cost and sustainability of these natural fibers are the main advantages. Among all advantages one issue that needs to be addressed is the hydrophilic tendency of these fibers which is highly undesirable and ultimately leads to the degradation of properties of these fiber reinforced polymer composites. The major cause of hydrophilic tendency is the presence of voids and non crystalline part of these fibers which affects the fiber and polymer matrix adhesion too. Therefore in order to maximize the potential of these natural fiber reinforced polymer composites this issue should be overcome. Therefore it is important to develop the proper mechanism and understanding the water or moisture absorption behavior of these composites. In the present work 3% sodium hydroxide followed by 3% acetic acid is used for the treatment of bagasse fibers at room temperature in order to improve the bonding strength between the fiber-polymer and to suppress the water absorption. Mathematical investigation of water absorption behavior of Bagasse fiber reinforced epoxy composites at different fiber loadings (5%, 10%, 15%, and 20%) has been done and mechanism of kinetic behavior of water absorption is established.

Next

Previous

Keywords

Natural fiber; Hydrophilic; Water absorption; Polymer composites; Bagasse

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Synthesis and characterization of etidronic acid (ETD) grafted nano sheets of hydroxyapatite

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Summary

The surface of prepared nano hydroxyapatite (nHA) has been changed into nano sheets by grafting the etidronic acid (ETD) in aqueous media. The modified nano hydroxyapatite was further subjected to sintering at various temperatures i.e. 60, 400, 600, 800 C to obtain different particle size (10-100nm). Nano sheets of hy xyapatite

cial to synthesis of polymeric materials with high de nano particles as filler dispersion (2). Agglomeration o cleties in composite materials are increase the po of mechanical and chemical properties failure. Homo dispersion of filler in polymer matrix is increase the cial bond between polymer and inorganic reinforcing f (3). Ultrasonication and mechanical stirring are tw techniques have been used to reduce agglomeration sample preparation of HA. However both technique less effective and temporary (4). Grills chemical reactio provide permanent solution to solve dispersion prob altering of HA surface. It has been found that two fun groups -POH-OH and -PO-OH presents on active site oxyapatite surfaces for further modification (5). T modifications is an effective technique to further enha biocompatibility which significantly improves and acc ulation of bone tissues in scaffolds (6). The surface droxyapatite can be modified with various organi etanes containing of bisphosphonate group because proved interaction between calcium or phosphate spec apatitic surface and the anionic groups of the organi ound (7). Bisphosphonates are used in the treatment o ders of bone diseases which are associated with hig resorption, such as metastatic bone disease, page ease, and osteoporosis as the two phosphonate group structure (P-C-P) helps in binding of calcium on hyd atite (8). Several studies on the modification of hyd atite using different compounds containing bisphosp groups such as ibandronate (9), zoledronate (10), alen (11) and olpadronate (12) have been reported. Anion edronate (disodium (1-hydroxyethylidene) bisphos

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Synthesis and Evaluation of Antimicrobial Activity of 4 - Thiazolidinones of Ketoanils

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Abstract **- A new series of 4-Thiazolidinones with heterocyclic nucleus have been synthesised by cyclocondensation of ketoanils with thioglycolic acid under reflux. The ketoanils obtained by condensation of methyl glyoxal, methyl-bis-glyoxal and glyoxoacetanilide with various amines under reflux.The structure of synthesised 4-Thiazolidinones confirmed by elemental analysis and spectral (IR, H^1NMR) data. Some of these compounds were evaluated for *in- vitro* growth inhibitory activities against *Staphylococcus aureus, Stalophylococcus epidermidis, Micrococcus leuteus* bacteria and *Candida albicanes* fungi.**

Keywords**- Glyoxals, Ketoanils, Amines, Thioglycolic acid, Thiazolidinones, Antibacterial and Antifungal activities.**

I. INTRODUCTION

High versatility in properties of Thiazolidinones, leading to manifold applications in several field of development, viz. medical sciences[1-7,11,13,14,21], industries [22],analytical[8,9], coordination[26] and synthetic chemistry[10,11,15].etc. high stability, easy synthesis[10] and tendency to participate in substitution and condensation reactions have been temptation *in frequent synthesis and characterization of Thiazolidinones.* Novel structural features of Thiazolidinones leading to occurrence of keto enolic forms in equilibrium on account of adjacent position of active methylene and ketonic groups in ring make these compounds preponderant over their heterocyclics. Scare knowledge in the chromatographic[8,19] and coordination chemistry of Thiazolidinones in spite of colours and presence of three potent donors, nitrogen, oxygen and sulphur, in heterocyclic ring, attach, enhanced interest with these organics.

Some important methods of synthesis of Thiazolidinones involving cyclocondensation or cyclisation open chain compound are also reported. Distinguished structural[11,15], biological[15,16, 23], analytical and and coordination features of Thiazolidinones in general, and scare knowledge in cyclocondensation products of Ketoanils with Thiocarboxylic acids and nonavailability of any reference on Thiazolidinones obtained by cyclocondensation of Ketoazomethinines of Methyl glyoxal, Methyl-bis-glyoxal and Glyoxoacetanilide with amines in particular aroused our interest to synthesise to some new compounds by the method of cyclocondensation of these glyoxals. The choice of method of cyclocondensation for synthesising Thiazolidinones lies in its easy and convenient handling and high yield.

II. MATERIALS AND METHODS

Reagents and Conditions:

1. *Acetone, Acetyl acetone, Acetoacetanilide,* Selenium dioxide, Ether, reflux for 6 h.
2. Methyl glyoxal, Methyl-bis-glyoxal and Glyoxoacetanilide, Amines, Ether,
3. Ether- Benzene (1:1v/v) , reflux for 6-8 h.
4. Ketoanil, Thioglycolic acid(98%),Absolute Alcohol, Dry Benzene , reflux for 15-25 h.

Synthesis of 4-Thiazolidinones takes place in three steps;

Step-1: Preparation of Glyoxals

For the precipitation of methyl glyoxal 1 mole of Selenium dioxide was mixed with 1mole of acetone containing 200 ml of ether and refluxed for 6 hours. Mustered yellow reaction mixture was decanted and solvent was driven off on water bath. Glyoxal was passed through the column of silica gel using ether as developer to ensure compete removal of selenium metal.

Methyl-bis-glyoxal and glyoxoacetanilide were prepared by mixing 0.5 mole of acetylacetone or 1 mole of acetoacetanilide with 1 mole of selenium dioxide in alcohol(95%) and refluxing the reaction mixture for 6-8 hours. Brown yellow reaction mixture of methyl-bis-glyoxal and brown coloured mixture of glyoxoacetanilide were decanted and alcohol was evaporated on water bath. Viscous semisolid glyoxals were purified by distillation under reduced pressure.

Step-2: Synthesis of Ketoanils

Solution of amine (0.10 mole) and methyl glyoxal (0.10 mole), methyl-bis-glyoxal (0.05 mole) and glyoxoacetanilide (0.10 mole) in ether or ether-benzene(1:1,v/v) were mixed together with vigorous stirring at room temperature. Product

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Performance analysis for summer air conditioner with priority repairs

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Online published on 4 May, 2018.

Abstract

In this study, the authors have considered a summer air conditioning system for a place in hot and dry weather. The authors have computed the availability and profit function for the system. Since the system under consideration is of Non-Markovian nature, the author has been used supplementary variables to convert this into Markovian. Probability considerations and Laplace procedure have been used for mathematical formulations of the system. This mathematical model has been solved by using Laplace transform. In obtain probabilities of various transition states depicted in fig.1(b). Reliability, availability and M.T.T.F. for considered system have been obtained. Graphical illustration followed by a numerical computation has also been appended at last to highlight important results of this study.

Keywords

Parallel redundancy, Markovian process, supplementary variables, steady-state behavior, availability, profit function.

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Direct torque control of induction motor using SVM-VSI .

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ABSTRACT

The theory of operation for the control techniques is presented. A mathematical model for the direct torque control of the induction motor drive is developed. A simulation model is developed in MATLAB/SIMULINK and is used to obtain the basic operation performance of the DTC induction motor drive.

In conventional direct torque control (DTC), the selection of flux linkage and electromagnetic torque errors are made within the respective flux and torque hysteresis bands, in order to obtain fast torque response, low inverter switching frequency and low harmonic losses. However, DTC drive utilizing hysteresis comparator suffers from high torque ripple and variable switching frequency. Space vector modulation is the strategy to minimize the torque ripple of induction motor in which, the stator flux level is selected in accordance with the efficiency optimized motor performance. In this work space vector modulation method is incorporated with direct torque control for induction motor drives. However, the direct torque control space vector modulation strategy is the calculation of the required voltage space vector to compensate the flux and torque errors exactly by using a predictive technique and then its generation using the space vector modulation at each sample period.

Keywords: Induction Motor; SVM-VSI; DTC; PWM.

I. INTRODUCTION

In industrial application, the electric motors play crucial role as heart of the system. Therefore, the best performance motor control systems contribute to a great extent, to the desirable performance of automated sectors by enhancing the production rate and the quality of products. In fact the performance of today's automated system is defined in terms of efficiency, smoothness and accuracy.

In recent years, the commercial applications of the Field-Oriented Control (FOC) of Induction Motor (IM) drives have greatly increased. A number of studies has been developed to find out different solutions for the control of the IM drives with two objectives, namely (i) fulfillment of the requirements for a precise and quick control of the motor flux and torque, and (ii) reduction of the complexity of the algorithms involved in a FOC.

A new technique for the torque control of induction motors was developed and presented by I. Takahashi as Direct Torque Control (DTC) [1]–[3], and by M. Depenbrock as Direct Self Control (DSC) [4],[5]. Since the beginning, the new technique was characterized by simplicity, good performance and robustness [6]–[16]. The basic scheme of DSC is preferable in the high power range applications, where a lower inverter switching frequency can justify higher current distortion. Differently from FOC, DTC does not tend to reproduce the

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Design of Toll Plaza using a Coupled Multiple Queue Multiple Server Queuing Model

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Abstract

Toll plaza operation is a critical component of roadway operations throughout the country, as tools provide both revenue for expansions and opportunities for demand management. Electronic tolling has introduced a new form of driver decision making at toll plaza due to the additional payment. Describe the user conveyor marking at toll plaza due to the additional payment. Recommendation for future research include to examine traffic flow and safety impact at toll plaza under varying traffic condition and demand with open road tolling lanes strategies. Developing enhancements to vision to address parameters limitation associated with discrete choice modeling at toll plaza. Multi-server queuing analysis can be used to estimate average time and queue length at toll plaza and parking exit plazas given arrival rates, number of services, and services rates. After discussing the steam behavior of traffic and making a few reasonable assumptions to simplify traffic streams in toll plazas, we break the travel process in toll plazas into two stages: Toll collection and Merging. We apply queuing theory to each stage, modeling each stage as a queuing system. Having determined that an optimal toll plazas minimizes travel time, we derive a formula to calculate the average wasted time per driver in terms of number of incoming lanes, traffic flow and number of toll booths.

Keywords: Queuing Model, Toll Plaza, Coupled

Overview and Problem Statement

Toll financing has been used throughout the history of civilization to make the building of long-distance roads possible. Toll roads in Asia were known to ancient Greek writers in antiquity. The first turnpikes in America were built in the 1790s and helped to open the Midwest to settlement. Beginning in the 1940s, America's first modern freeways were financed with tolls, paving the way to the Interstate system Americans now enjoy. Today developing nations such as China are building their own networks of superhighways, and they too are turning to the toll booth to foot the bill. As the congestion and pollution from too many cars on the streets become an increasing concern in many cities, another benefit of tolling has revealed itself: Tolls are being used successfully in places such as Singapore and London not just to finance road construction, but to limit the flow of vehicles into the urban core, increasing transit usage and unclogging the crowded streets.

The emergence of ETC has resulted in an array of challenges at toll plazas in the United States. The introduction of electronic toll collection has become increasingly widespread at tolling facilities throughout the United States as a result of documented benefits associated with its implementation. Toll operators and ETC's efficiency, accuracy and cost effectiveness, while consumers enjoy the convenience and ease of use (9). Investments in ETC often have short return on investment periods due to their low cost per transaction and high levels of lane throughput. The advent of ETC lanes prompted agencies to slowly migrate more lanes over to this technology. Despite the user convenience, these facilities have introduced some additional challenges. Confusion at the toll plaza, difficult merging scenarios, and the unexpected behavior has actually increased certain crash patterns at toll plazas (4).

Mixed use lanes, express lanes, and dedicated lanes vary from tolling agency to tolling agency with no standardization as to which lanes allow certain types of traffic (2). Toll plazas are often situated at the junction point of major arterials and highways where

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DEFLUORIDATION STUDY OF GROUND WATER USING ADSORBENT PREPARED FROM MANGO BARK

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ABSTRACT

Groundwater is counted as a renewable resource and is considered as a major source for fulfilling the exponentially increasing water demand across the world. However this source is depleting with increasing anthropogenic activities and addition of fluorides in the water and thus, deterioration of quality and supply of safe drinking water is a major concern throughout the world. The removal behaviours of fluoride ions from ground water by adsorption method using activated carbon were investigated. Water being one of the most essential substances found in abundance from nature bears the risk of high pollution from various sources where it plays a vital role to serve as a major ingredient to the flora and fauna making it to about 75% found on earth's crust. The aim of this research is to develop a cost-effective environment friendly adsorbent for removal of fluoride from ground water which can be applicable to rural areas of many developing countries. This research paper addresses Mangifera Indica (mango) bark for the removal of fluoride. The Activated carbon prepared has been characterized by XRD analysis. Batch experiments have been performed to reveal the influence of various parameters on adsorption experiment such as adsorbent dose (0.5-2 gm), initial fluoride concentration (10-50mg/L) and agitation time (30 – 150 min). The optimal value of 2gm adsorbent dose was observed where the adsorbent showed the maximum defluoridation capacity of 90%. The adsorption isotherms, Langmuir and Freundlich were plotted and from the achieved data, it is observed that both Langmuir and Freundlich isotherms are well –fitted. The present study demonstrated that treated mangifera indica bark powder could remediate fluoride contaminated water.

KEYWORDS: Fluoride, Adsorption, Adsorbent & Activated Carbon

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Original Article

INTRODUCTION

Water delivered to any consumer must be free from pathogenic organisms and must comply with the high requirements of modern hygiene according to the World Health Organization (WHO) where in the quality of water depends upon the location of the source and the state of environmental protection in a given area.The level of fluoride in drinking water is a very important physicochemical factor which must be considered when assessing water quality for human consumption because of its range which is restricted for any human body to consume. Thus, in order to ensure compliance with the prescribed limits World Health Organization (WHO) has recommended maximum concentration for fluoride ions in ground water to be 1.5mg/l. [IV].Due to its existence in the form of minerals in rocks, fluoride tends to pollute the ground water naturally and such a condition is exacerbated by an excess of anthropogenic activities time and again. Phosphate rocks also participate in fluoride pollution due to its rampant exposure to people in various forms and in numerous countries such as Asia, Africa, America and Europe. Such cases are observed where concentration range was observed from 1–35 mg/l in ground

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ORIGINAL PAPER

Preparation and characterization of aliphatic polyurethane and modified hydroxyapatite composites for bone tissue engineering

Lokesh Kumar[1] · Dheeraj Ahuja[1]

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Abstract

Surfaces of nano-hydroxyapatite (n-HA) particles were modified by grafting of etidronic acid (ETD, 0.1 M) and were reinforced into polyurethane scaffolds prepared by foaming method to develop porous modified nano hydroxyapatite/polyurethane (m-HA/PU) nanocomposite scaffolds for bone tissue engineering. Particle size and morphology of nanoparticles were studied using X-ray diffraction, transmission electron microscopy (TEM) and scanning electron microscopy (SEM), respectively. TEM and SEM results revealed that the surface of obtained modified hydroxyapatite (m-HA) particles was completely changed from grain- to plate-type structure with the size of 40 nm. Chemical structure, mechanical properties and biomedical application were studied using Fourier transform infrared spectroscopy (FTIR), universal testing machine and in vitro studies. In FTIR spectra, disappearance of peaks around 2270 cm^{-1} confirmed the formation of polyurethane nanocomposite scaffolds and bands in the spectral range of 1400 and 800–900 corresponds to the presence of calcium and phosphate groups due to hydroxyapatite. As the concentration of m-HA increased from 0 to 30 wt%, the compressive strength of the resulting PU/m-HA nanocomposites increased from 0.094 to 22.4 MPa. In vitro study with simulated body fluid (SBF) for 4 weeks indicated that surface was partially hydrolysed. Cell culture study showed that m-HA/PU nanocomposite scaffold is well suited for application in bone tissue engineering.

Keywords PU scaffolds · Castor oil · Cytocompatibility · SEM · Tissue engineering

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Article

Smart Monitoring and Controlling of COVID 19 using IOT, Big Data, Machine Learning

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Abstract

Our goal is to develop an environment to monitor and controlling a corona virus of 2019 (COVID-19) with IOT i. e. Intelligent Internet of Things. Analytics have changed the way disease outbreaks are tracked and managed, hence saving lives. Using technology smart sensor, facial recognition and location, existing surveillance cameras to identify, trace, and monitor people that may have contracted the coronavirus. The Internet of Things, a network of interconnected systems and advances in data analytics, artificial intelligence and ubiquitous connectivity can help by providing an early warning system to curb the spread of infectious diseases.

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Feasibility Analysis And Economic Valuation Of Hybrid System Having Time Of Use Pricing For Residential Load

Ravindra Kumar Yadav, P.N. Hrisheekesha, Vikas Singh Bhadoria

Abstract: the worlds demand of electrical energy is escalating very fast mainly due to industrialization and change in life style of human beings. This growing demand of electricity cannot be fulfilled in future because of depletion of fossil fuels with a rapid rate thereby showing the complete depletion within almost 200 years. The word community is examining for new long lasting resources for generation of electricity and the best option is renewable energy resource. In this study a feasibility analysis and financial assessment of grid connected solar PV system along with battery energy storage system for residential load with time of use pricing (TOU) is discussed. The feasibility and financial assessment is accomplished by using HOMER Software. It is observed from this study that the system under consideration gives minimum expenditure with solar PV panels and Battery Energy Storage System (BESS). Simulations results of HOMER demonstrates that the total net present cost, levelized cost of energy, operating cost is reduced significantly when compared with the existing grid system. In this system the purchase price sell back price are equal.

Index Terms: Battery Energy Storage System (BESS), HOMER , Levelized Cost of Energy (LCOE), Total Net Present Cost (TNPC), Time of Use (TOU), Utility Grid.,

1 INTRODUCTION

Escalating global electricity demand and depletion of fossil fuels has created a paramount concern to search for other inexhaustible energy resources to meet the future energy demand. Solar energy is one of renewable energy resource available free of cost and inexhaustible, in view of this a prompt progress in installation of solar panels in residential and institutional buildings are in fashion around the world in past few years [1]. The generated power from solar panels is nourished to grid with a rapid rate in spite of its intermittent and fluctuating nature; the utilities are adopting battery energy storage facility for continuous and reliable power supply to consumers [2]. The distributed generators (DGs) categories and its effects on distribution system are emphasizes in [3-4] which suggested the future scope of DGs. Further, the utility grid also needs means for energy storage to balance the generation and demand along with providing stability in the utility grid. The energy storage application inculcates capacity firming, spinning reserve, load-leveling, with improved power quality issues and frequency regulation [5-6]. The optimal power management for grid connected solar photovoltaic systems with battery energy storage can be computed using dynamic programming. BESS system can also be used for peak load saving with the aim to minimize the demand charge by considering different tariffs for the energy from the PV and the utility grid [7]. Improved harmony search algorithm is used to scrutinize the techno-economic optimization of lead-acid storage battery size to minimize the total annual operating cost of grid connected solar PV system with battery energy storage system [8]. In small and medium scale generating systems the battery energy storage is used as a means of power backup facility [9]. BESS can also play the role to minimize the demand charge of energy by using linear programming in dispatch schedule which minimizes the net energy exchanged with the grid [10]. The distributed solar PV power generation being the more cost effective than grid extension shows a viable option to fulfill the future energy needs with increased reliability by using battery energy storage system [11]. The grid connected distributed power generation by PV with battery storage system plays an important role in TOU pricing scenario. The energy demand of consumers is fulfilled by grid and solar PV panels along with battery energy storage system in accordance with TOU pricing. In TOU pricing based system the supplied energy selects the best economical source to supply the power to consumers. The paper is organized as follows: Section II describes the system configuration and Section III presents the system configuration and section III presents the problem formulation. Section IV gives optimization results analysis. Finally, results of simulation study are discussed in details.

2 SYSTEM CONFIGUARATION

In this section the description of system component is given. The system component includes HOMER software, Solar PV Generator, battery energy storage system, input data of forecasted residential load and solar radiations at selected location.

2.1 HOMER Software

Hybrid Optimization of Mulliple Electric Renewables abbreviated as HOMER is developed by the National Renewable Energy Laboratory in USA. HOMER is augmented and dispersed by HOMER Energy. HOMER evaluates the designing task of on grid and off grid distributed generators. The block diagram of proposed system is given in Fig.. HOMER requires input data, component costs and resource availability and simulates different feasible system configurations. HOMER provides the opportunities of techno economic evaluation by displaying the simulation results [12].

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Effect of Liquid Polymer on Performance of Polymer Modified Bitumen and its Mixes

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Abstract

An efficient road transport system provides a good level of service for its users. Roadways are considered to be the most common and important way for inland transport. Asphalt road infrastructure development is one of the major sectors contributing to the National economy. Modification of asphalt generally involves use of modifiers these appears in solid forms. The limitation of using such materials lies in the high softening and mixing temperatures. Blending of polymers/rubbers/latex with asphalt at high temperature for long duration, phase separation of polymer from Asphalt apart from availability of materials indigenously. This result in high cost of PMBs. Liquid polymers are easy to blend with asphalt at relatively low temperature and for a short blending time. The road development programmes envisaged for the country involving large amount of money, manpower, and materials call concerted efforts in the construction of new roads, but also the improvements of existing roads and their durability for design life. Liquid polymers have also been used for soil stabilization. This paper depicts the use of a new modifier Vinyl Acrylic Copolymer (Liquid form) for development of cost effective and high performance modified binder and its mixes applicable for construction and maintenance of asphalt roads. The goal of improving bitumen properties is achieved using 0.5 percent of a co- polymer of Vinyl and Acrylic Acetate functional groups in liquid polymer-II(LP1). Advantages of liquid polymer with bitumen binder are ease of mixing with bitumen at relatively low temperature. Improved compatibility of polymer with bitumen was obtained as there is no phase separation. Polymer modified asphalt composition was characterized as per IRC: SP: 53-2010 to assess the effect of modification on the properties of VG-30. LP-1 modified binder is used for preparation of asphalt mixes for B C grade-1 as per MoRTH 5th revision 2013. Job mix was prepared using VG-30 as per Marshall method and optimum binder content was examined as 5.3%w/w mixes. For comparative study Marshall Samples were also prepared with modified binder at the same optimum binder content (i.e. 5.3%). To study the behavior of conventional and modified bituminous mixes various engineering and volumetric properties as Retained Stability, Tensile Strength, Tensile Strength Ratio (TSR), Marshall Stability, flow value, unit weight, air voids are determined. The study indicated that the binder properties were improved marginally & accordingly the mechanical properties bituminous mixes were also found improved w.r.t Retained Stability and Indirect Tensile Strength and TSR. Bituminous concrete (BC) mixes developed with liquid polymer modified binders satisfied the requirement of IRC SP-53, 2010. The performance of modified mixes improved further with admixture of liquid polymer and fly ash to satisfy the requirements of high performance parameters such as rutting, thermal cracking and fatigue.

Keywords: *Asphalt Road, Liquid Polymer, Blending, PMBs*

1.0 Introduction

Polymer modification of bitumen is the incorporation of polymers in bitumen by mechanical mixing or chemical reaction. The various polymers investigated included plastomers (e.g. polyethylene (PE), polypropylene (PP), ethylene-vinyl acetate (EVA), ethylene-butyl acrylate (EBA)) and thermoplastic elastomers (e.g. styrene-butadiene-styrene (SBS), styrene-isoprene-styrene (SIS), and styrene/ethylene/butylene-styrene (SEBS)), although none of these were initially designed for bitumen modification. These polymers were reported to lead to some improved properties of bitumen, such as higher stiffness at high temperatures, higher cracking resistance at low temperatures, better moisture resistance or longer fatigue life [1-2]. PMB usually shows better overall performance with respect to mechanical properties, and

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