

SHORT COMMUNICATION

Mechanical properties of abaca fiber reinforced polypropylene composites: Effect of chemical treatment by benzenediazonium chloride



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Received 30 October 2014; accepted 7 October 2015
Available online 20 October 2015

KEYWORDS

Abaca fibers;
Benzenediazonium chloride;
Polypropylene;
Coupling agent;
Mechanical properties

Abstract Untreated abaca fibers and benzenediazonium chloride treated abaca strands were employed as reinforcements for fabricating polypropylene composites by injection molding method. Various composites were fabricated with different fiber loadings of 30%, 35%, 40%, 45% and 50% with and without coupling agents. Abaca composites without coupling agents with 40% fiber loadings were found to have optimum properties when mechanical characterization was done and the investigation also revealed that untreated and treated composites with coupling agents were found to have improved tensile strength, flexural strength and impact strength when correlated to composites without coupling agents. Among various surface modifications performed, benzenediazonium chloride treated abaca strands reinforced polypropylene composites with coupling agents showed superior properties. For composites including coupling agents, surge in tensile strength and flexural strength was observed with hike in fiber content up to 50% whereas optimum impact properties were shown at 40% fiber loading. Between untreated composites with coupling agent and without coupling agent, composites with coupling agent showed 77.50% hike in tensile strength for 50% fiber loading. Benzenediazonium chloride treated composites with coupling agent showed 70.07% increase in tensile strength when compared to benzenediazonium chloride treated composites without coupling agent for 50% fiber loading. Untreated composites with coupling agent showed 64.91% increase in flexural strength when compared to untreated composites without coupling agent for 50% fiber loading. Benzenediazonium chloride treated composites with coupling

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<http://dx.doi.org/10.1016/j.jksues.2015.10.001>

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A review on natural areca fibre reinforced polymer composite materials

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Abstract

Natural fibres, nowadays, have become the matter of discussion in the research field amongst various scientists to inculcate it in the formation of composites instead of production of composites using synthetic fibres like glass, carbon and aramid. This is due to various advantages associated with natural fibres like eco-friendly, low cost, availability in abundance and its bio-degradability. Lots of work has been carried out in the production of natural fibre reinforced polymer composites, using natural fibres like jute, hemp, cotton, sisal, kenaf, bagasse, areca, abaca, bamboo etc. and their properties have been studied. Here is an attempt made on the literature survey of areca fibre reinforced polymer composites where different properties of areca fibres, its maturity level, surface treatment effect on properties of fibres, composite formation with different matrices, its mechanical properties, thermal and acoustic properties related to different composites has been highlighted.

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Keywords: natural fibres; natural fibre composites; betel nut/areca nut fibres and composites; chemical treatment; mechanical properties.

1. Introduction

Basically, composite is defined as the material consisting of binder which is a continuous phase and the fibrous filler as reinforcement which is the discontinuous phase. Matrix present in the polymer composites supports the reinforcement and helps to stay it in proper position and orientation. Ductility is more and hardness is less for the polymeric resin and this resin is responsible for the toughness of composites. Reinforcement is harder than matrix and it is embedded into matrix. Reinforcement is the load carrying material and it strengthens the composites by imparting its properties into the matrix.

Composites can be classified based on matrix and based on the reinforcement. Based on matrix, there are three types; metal matrix composites, ceramic matrix composites and polymer matrix composites. It is very simple to manufacture the polymer matrix composites than metal matrix and ceramic matrix composites

because polymer processing does not require high temperature and pressure and the types of equipment needed for composite fabrications are simple. Polymer matrix composites are further classified into thermoplastic, thermoplastic elastomeric and thermoset polymer composites. Based on the shape of reinforcement, the composite classification can be made as particulate composites, fibrous composites and laminate composites. Fibrous composites are subdivided into short fibre (discontinuous) reinforced and long fibre (continuous) reinforced polymer composites. Based on the occurrence of fibres, again fibrous composites can be classified into natural fibre reinforced composites and synthetic fibre reinforced composites.

Over past several years, lots of work has been done in the field of development of natural fibre reinforced polymer composites; where the focus is more on cellulose based fibres which is naturally available, is incorporated into the polymer matrix to form bio-composites [1]. These cellulose fibres have properties like high strength, specific stiffness, availability, light weight, non-hazardousness, renewability, non-

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Ni–Si₃N₄: Electrodeposition, Properties and Corrosion Behavior¹

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Received January 23, 2016

Abstract—Ni–Si₃N₄ composite coatings were developed by electrodeposition from a nickel sulfate bath solution on a mild steel substrate. The corrosion behavior of the obtained coatings was analyzed by electrochemical methods. The amount of Si₃N₄ particles in the deposit was identified and estimated by the energy dispersive X-ray diffraction spectrometry. The structure and surface morphology of the coatings were characterized by the X-ray diffraction and scanning electron microscopy. In this work a comparative corrosion behavior and surface morphology of the composites generated in both the absence and the presence of sodium dodecyl sulfate with Si₃N₄ was accessed.

Keywords: Si₃N₄ nanoparticles, X-ray diffraction, scanning electron microscopy, energy dispersive X-ray diffraction, sodium dodecyl sulfate

DOI: 10.3103/S1068375517030127

INTRODUCTION

Electrodeposition is one of the oldest and simplest methods for developing particle-reinforced composite coatings. Ni-based composite coatings have improved material properties with regard to the corrosion resistance, wear resistance, friction coefficient, self-lubrications, high temperature stability, electrical contacts and improved catalytic activity [1–5]. The nickel composite coatings are of a scientific and practical interest in surface morphology and corrosion protection as they have improved material properties induced by the properties of reinforced nanomaterials. The Ni composite coatings or its alloy coatings containing a dispersed phase of non-metallic particles showed good mechanical properties. The used non-metallic particles size varies from semi-micro to micro scale. Nowadays a lot of research is focused on the generation of metal-nanoparticles composite coating and examination of their material properties.

The major problem during the production of composite coatings by electrodeposition is the agglomeration of nanoparticles in the bath solution and it leads to non-uniform distribution of the particles in the coatings [6, 7]. Agglomeration of nanoparticles leads to a significant decrease in mechanical properties of the deposits. Literature review shows that using of surfactant can change surface charge of the particles and decrease their tendency to agglomeration. Further-

more, surfactant increases the uniform distribution of nanoparticles in the coating [8–10]. The using of surfactant will depends on the charge of the nanoparticles used in the coating.

Many authors have studied the effect of surfactants in the co-deposition of nano-sized particles in different Ni matrices. For instance, the influence of surfactant sodium dodecyl sulphate (SDS) in the co-deposition of nano sized CeO₂ to nickel matrix was investigated and it was found that the concentration of surfactant up to 0.1 g L⁻¹ increased the inclusion of CeO₂ particles in the nickel matrix and imparted higher microhardness [11]. The effect of surfactant cetyl trimethyl ammonium bromide (CTAB) on the co-deposition of SiC to the Ni matrix was studied and it was reported that it renders de-agglomeration of SiC particles in the solution and also helps in the uniform distribution of particles in Ni deposit [12]. The influence of hydrophobic tail length of a cationic surfactant containing an azobenzene group (AZTAB) on the extent of co-deposition of SiC particles in the nickel matrix was examined and the results revealed that AZTAB with a shorter tail co-deposits a higher amount of SiC particles than the surfactant with a longer tail [13]. The presence of cationic surfactant (Hexadecyl pyridinium bromide) in the bath solution was reported to increase the co-deposition of Al₂O₃ particles in nickel matrix and to reduce their agglomeration resulting in the uniform distribution of Al₂O₃ in nickel matrix. The influence of surfactants SDS and

¹ The article is published in the original.

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Simulation model for electron irradiated IGZO thin film transistors

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An efficient drain current simulation model for the electron irradiation effect on the electrical parameters of amorphous In-Ga-Zn-O (IGZO) thin-film transistors is developed. The model is developed based on the specifications such as gate capacitance, channel length, channel width, band voltage etc. Electrical parameters of un-irradiated IGZO samples were simulated and compared with the experimental parameters and 1 kGy electron irradiated parameters. The effect of electron irradiation on the IGZO sample was analysed by developing a mathematical model. © 2018 Chinese Institute of Electronics.

Author keywords

electron irradiation; IGZO; simulation model; TFT

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Surface potential based model for amorphous IGZO thin film transistors

He, H., Tang, H., Zheng, X.
(2011) *ICCRD2011 - 2011 3rd International Conference on Computer Research and Development*

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Structural and vibrational characteristics of a non-linear optical material 3-(4-nitrophenyl)-1-(pyridine-3-yl) prop-2-en-1-one probed by quantum chemical computation and spectroscopic techniques

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Abstract

Chalcone and its derivatives are well-known for their high non-linear optical behavior and charge transfer characteristics. The effectiveness of charge transfer via ethylenic group and increase in NLO response of the chalcone upon substitutions are of great interest. The present study focuses the

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Zn doped CdO thin films with enhanced linear and third order nonlinear optical properties for optoelectronic applications

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Abstract. Thin films of undoped and zinc doped CdO have been deposited on glass substrate using spray pyrolysis technique with various dopant concentrations of Zn such as 1, 5 and 10%. Influence of Zn doping on CdO thin films for the structural, morphological, optical and nonlinear optical properties are reported. XRD analysis reveals that as prepared pure and Zn doped CdO films show polycrystalline nature with face centered cubic structure. Also, Zn doping does not significantly modify the crystallinity and not much increase in the crystallite size of the film. SEM images shows grains which are uniform and grain size with increase in dopant concentration. The transmittance of the prepared CdO films recorded in the UV visible spectra and it shows 50 to 60% in the visible region. The estimated optical band gap increases from 2.60 to 2.70 eV for various dopant concentrations. The nonlinear optical absorption of Zn-doped CdO films have been measured used the Z-scan technique at a wavelength 532 nm. The nonlinear optical absorption coefficient (β), nonlinear refractive index (n_2) and the third order nonlinear optical susceptibility ($\chi^{(3)}$) of the pure and Zn doped films were determined.

Keywords: CdO thin films, Zn doped CdO thin films, Non Linear Optical Properties, Spray Pyrolysis.

INTRODUCTION

Thin film technology is considered as a promising application in solar cell, which harnesses the energy of the solar radiation into useful electrical energy. Transparent conducting oxide such as cadmium oxide (CdO) films had been extensively studied because of its application in semiconductor optoelectronic devices [1]. Among the conducting oxides, cadmium oxide has been considered as a suitable II – IV n-type semiconductor material because of high transmittance in the visible and UV regions of the electromagnetic spectrum coupled with high ohmic conductivity [2]. CdO is an n-type semiconductor with a simple cubic structure having direct band gap of 2.2–2.7 eV and two indirect band gaps of 1.18–1.20 eV and 0.8–1.12 eV [3]. It is well known that the quality and properties of thin films depend on various process parameters, such as the deposition rate, thickness of the film, the molar concentration of the starting solution and dopant material concentration. Here, we report the characterization of undoped and doped CdO thin films prepared by easy and simple spray pyrolysis technique. Literature shows that materials like Al, In, F, Mn were used as dopant materials for the preparation of CdO thin film but, there are few reports seen on zinc doped CdO thin films. The optoelectronic properties of CdO thin films could be controlled by doping with different metallic ions [4]. In this paper, the linear transmittance spectrum and Z-scan technique are used to characterize the linear and nonlinear optical properties of zinc doped CdO thin films. This paper also deals with the preparation and characterization of Zn doped CdO thin films with various dopant concentrations and the

Advances in Mechanical Design, Materials and Manufacture
AIP Conf. Proc. 1943, 020070-1–020070-9; <https://doi.org/10.1063/1.5029646>
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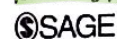

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Combined effect of surface roughness and pressure-dependent viscosity over couple-stress squeeze film lubrication between circular stepped plates

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and KR Vasanth²

Proc IMechE Part J:
J Engineering Tribology
2018, Vol. 232(5) 525–534
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Abstract

In this paper, the effect of surface roughness and pressure-dependent viscosity over couple-stresses squeeze film lubrication between circular stepped plates is studied. The modified average Reynolds equation is derived for the one-dimensional roughness structures, namely the radial roughness pattern and azimuthal roughness pattern. Modified equations for the nondimensional pressure, load-carrying capacity, and nondimensional squeeze film time are obtained. Also, the obtained results of our study for some special cases are compared with the previously published smooth surface case, and the results are found to be in very good agreement. It is observed that, one-dimensional azimuthal (radial) roughness pattern on the rough circular stepped plate increases (decreases) the load-carrying capacity and the squeeze film time as compared to the smooth case.

Keywords

Squeeze film, circular stepped plates, surface roughness, couple-stress fluid, pressure-dependent viscosity

Date received: 8 December 2016; accepted: 21 June 2017

Introduction

The squeeze film structure has gained momentum in the recent past due to its technological applications in several engineering/industrial processes, such as gears, turbo-machinery, disc clutches, viscous dampers, viscolock systems, animal joint, the reciprocating engine, machine tools and braking apparatus, etc. The squeeze film phenomena arise when two lubricated surfaces approach mutually with normal velocity. Since the viscous lubricant contained has a resistance and cannot be instantaneously squeezed out, it provides a certain time for these surfaces to come in to contact. Because of their wide applications, many contributions to the squeeze film characteristics have been made, such as the problems in circular plates by Murti,¹ Hasegawa,² and Ahmad et al.³ and in spherical plates by Gould⁴ and Lin.⁵ All these studies focus upon the squeeze film performance with ideal assumption that bearing surfaces are perfectly smooth.

However, squeeze film surfaces are generally rough in engineering practice due to the process that has been used in forming and finishing stages. On the other hand, the roughness height is usually of the

same order as the mean asperity in a lubricated contact. To look in to the effects of surface roughness, Patir and Cheng^{6,7} generated an average flow model of a randomly generated rough surface with known statistical properties over the surface area. In this approach, the actual flow between rough surfaces is equated to an averaged flow between nominally smooth surfaces. Using the stochastic concept, Christensen^{8,9} introduced another film averaging approach for striated roughness. Christensen and Tonder¹⁰ derived the stochastic models for hydrodynamic lubrication of rough surface and derived generalized form of Reynold's equation applicable to rough bearings. Further, Prakash and Tonder¹¹ studied the effect of roughness in circular squeeze

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