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IFERP

ISSN (Online) 2456 -1304

International Journal of Science, Engineering and Management (IJSEM)

Vol 9, Issue 3, March 2022

On RHF and Bernoulli Polynomial for the numerical solution of differential equations

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***Abstract*— Approximation of the solution of the differential equations is done by Bernoulli polynomial. Bernoulli polynomial and operational matrix of differentiation were used in reducing differential equations into algebraic equations. The method and its application is demonstrated through illustrative examples and found that the method is computationally attractive. The Bernoulli polynomial method has been applied to compare the numerical solution of differential equations with the existing method of Rationalized Haar Function.**

***Index Terms*— Bernoulli polynomial, Rationalized Haar function(RHF), Differential equations**

I. INTRODUCTION

Differential equations have lots of application in both the science and engineering field. Differential equations (DEs) are used in different fields of mathematical modeling. Regularly, obtaining an analytical solution for some DEs is not possible. Thus, few numerical techniques were introduced to calculate approximate solutions for such equations. Such as Legendre polynomial[1], Chebyshev polynomial [2], Hermite polynomial [3,4], Bernoulli polynomial [5, 6]. Recently, a new method developed to solve numerical problems by the concept of graph theory called Hosoya polynomial, one can refer for graph theory terminologies and developed method in [7, 8, 9, 10, 11, 12,13]. Wavelet based numerical method, such as Modified wavelet full-approximation scheme [14], Bernoulli wavelet [15], Hermite wavelet [16] and Rationalized haar functions[17]. Bernoulli polynomial is applied for the numerical solution for integral equations [18]. This article, gives the Bernoulli polynomial method for the numerical solution of differential equations and comparison with the existing method(RHF)[17].

II. PROPERTIES OF BERNOULLI POLYNOMIAL AND FUNCTION APPROXIMATION

Bernoulli polynomial is defined by [5, 6],

$$B_m(t) = \sum_{i=0}^{m} \binom{m}{i} \alpha_{m-i} t^i$$

Where α_i, $i = 0,1,\dots,m$ are Bernoulli numbers which are in a sequence of signed rational numbers emerging in the series expansion of trigonometric functions given by,

$$\frac{t}{e^t - 1} = \sum_{i=0}^{\infty} \alpha_i \frac{t^i}{i!}.$$

The sequence of Bernoulli numbers is

$$\alpha_0 = 1, \alpha_1 = \frac{-1}{2}, \alpha_2 = \frac{1}{6}, \alpha_4 = \frac{-1}{30}, \alpha_6 = \frac{1}{42}, \alpha_8 = \frac{-1}{30}, \alpha_{10} = \frac{5}{66}, \dots$$

and $\alpha_{2i+1} = 0, i = 1,2,3,\dots$

The Bernoulli Polynomials are,

$B_0(t) = 1$, $B_1(t) = t - \frac{1}{2}$, $B_2(t) = t^2 - t + \frac{1}{6}$, $B_3(t) = t^3 - \frac{3}{2}t^2 + \frac{1}{2}t$, $B_4(t) = t^4 - 2t^3 + t^2 - \frac{1}{30}$, $B_5(t) = t^5 - \frac{5}{2}t^4 + \frac{5}{3}t^3 - \frac{1}{6}t$, $B_6 = t^6 - 3t^5 + \frac{5}{2}t^4 - \frac{1}{2}t^2 + \frac{1}{42}$, and so on.

Function approximation: A function $f(x) \in L^2[0,1]$ is expanded as:

$$f(x) = \sum_{i=0}^{N} a_i B_i(t) = A^T B(t) \tag{2.1}$$

where A and $B(t)$ are $N \times 1$ matrices given by:

$$A = [a_0, a_1 \dots, a_N]^T \tag{2.2}$$

and

$$B(t) = [B_0(t), B_1(t), \dots, B_N(t)]^T. \tag{2.3}$$

1. Method of Solution

Here, let us take the differential equation

$$g_0(t)y''(t) + g_1(t)y'(t) + g_2(t)y(t) = g_3(t),\ t \in [0,1) \tag{3.1}$$

with initial condition

$$y(0) = y_0,\ y'(0) = y_0' \tag{3.2}$$

where $g_0(t), g_1(t), g_2(t)$ and $g_3(t)$ are functions of a

IFERP
ISSN (Online) 2456 -1304
International Journal of Science, Engineering and Management (IJSEM)
Vol 9, Issue 3, March 2022

First Redefined Zagreb Index of Generalized Transformation Graph

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***Abstract*— In Mathematical chemistry, The topological chemical descriptive is valuable part to investigate (QSPR) & (QSAR). Here, The articulations for the First Redefined Zagreb index of generalized transformation graph Gxy and its complement were acquired.**

***Index Terms*— Zagreb index; First Redefined Zagreb index, Mathematics Subject Classification: 05C76, 05C07, 92E10**

I. INTRODUCTION

The investigation of topological indices plays an highly vital part in QSAR & QSPR. Topological indices associate the exact physico-chemical properties. For more details see [4], [7], [10], [11]. Let p and q be the vertices and edges of simple undirected graph G respectively, its compliment $\bar{G}$. . Let Vs (G) set of vertices & $E_S(G)$ set of edges of Graph G respectively. Let u & v both vertices adjacent to each other such that uv = e an edge of G. degree represented by $de_G(u)$, the cardinality of edges incident to vertex u.

Ranjini et al. [13] characterized the First Redefined Zagreb index $ReZG_1$, that is

$$ReZG_1(G) = \sum_{uv \in E(G)} \frac{de_G(u) + de_G(v)}{de_G(u).de_G(v)}$$

The generalized transformation graphs and topological indices introduced by H. S.Ramane et al. [8,9]. W.Nazeer et. al [12] obtained the First Redefined Zagreb index of line graph of subdivision of friendship & star graphs and M. Ahmad et. al [15] computed First Redefined Zagreb index of dominating David derived networks.

Here we acquired the expresssions for generalized transformation graphs Gxy and their compliments $\overline{G^{xy}}$ interms of First Redefined Zagreb index.

II. GENERALIZED TRANSFORMATION GRAPHS GXY

The semi total − point graph $T_2(G)$ was introduced by Chikkodimath & Sampathkumar[14].R.B Jummannaver et al.[3] defined k^{th} Generalized transformation graphs, some new graphical transformation defined by Basavanagoud et al. [1] which generalizes the semi total-point graph.

The generalized transformation graph G^{xy}, $V_s(T_2(G)) = V_s(G) \cup E_s(G)$ and i,j$\in V_s(G^{x,y})$. The points i & j are adjacent in G if and only if (1)&(2) holds:

(1) i, j $\in V_s(G)$, i,j points are not adjacent if x = − & i,j are adjacent if x = +

(2) i$\in V_s(G)$ and j $\in E_s(G)$, i,j points are not incident if y = −and i,j points are incident if y =+

2.1 Proposition: [1] q & p be the edges and vertices of graph G. Let u $\in V_s(G)$ and e$\in E_s(G)$. Then degrees of line vertices & vertex in G^{xy}

(a) $de_{G++}(u) = 2\, de_G(u)$
(b) $de_{G++}(e) = 2$.
(c) $de_{G+-}(u) = q$
(d) $de_{G+-}(e) = (-2+p)$.
(e) $de_{G-+}(u) = (-1+p)$
(f) $de_{G-+}(e) = 2$.
(g) $de_{G--}(u) = q+p-(2de_G(u)+1)$
(h) $de_{G--}(e) = (-2+p)$.

Number of vertices of G^{xy} is p+ q. By 2.1 Proposition & considering that $de_{\bar{G}}(u) = p - (de_G(u)+1)$.

2.2 Proposition: q & p be the edges and vertices of graph G. Let e$\in E_s(G)$ & u $\in V_s(G)$, degrees of line vertices and vertex of $\overline{G^{xy}}$

(a) $de_{\overline{G^{++}}}(u) = q+p-(2de_G(u)+1)$
(b) $de_{\overline{G^{++}}}(e) = q+p-3$
(c) $de_{\overline{G^{+-}}}(u) = p-1$
(d) $de_{\overline{G^{+-}}}(e) = q+1$
(e) $de_{\overline{G^{+-}}}(u) = q$
(f) $de_{\overline{G^{+-}}}(e) = q+p-3$
(g) $de_{\overline{G^{+-}}}(u) = 2\, de_G(u)$
(h) $de_{\overline{G^{+-}}}(e) = 1+ q$

Notations used for future Results

$de_{G++}(u) = a_1$ $\quad$ $de_{G++}(e) = b_1$
$de_{G+-}(u) = a_2$ $\quad$ $de_{G+-}(e) = b_2$
$de_{G-+}(u) = a_3$ $\quad$ $de_{G-+}(e) = b_3$
$de_{G--}(u) = a_4$ $\quad$ $de_{G--}(e) = b_4$

ISSN (Online) 2456 -1304

International Journal of Science, Engineering and Management (IJSEM)

Vol 9, Issue 2, February 2022

Second Redefined Zagreb Index of Generalized Transformation Graph

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***Abstract*— The topological indices are useful part in the investigations of quantitative structure property relationship (QSPR) and quantitative structure activity relationship (QSAR) in mathematical chemistry. During this paper, the expressions for the Second Redefined Zagreb Index of the Generalized Transformation Graphs Gxy and its supplement graphs are acquired.**

Keywords: Second Redefined Zagreb index; Redefined Zagreb index; generalized transformation graphs

Mathematics Subject Classification: 05C76, 05C07, 92E10..

I. INTRODUCTION

In the context of new technologies for molecular innovation, such as combinatorial chemistry and high-throughput screening, topological indices play a crucial role for the examination of molecular diverseness and lead to optimization through well demonstrate structure-property relationships [2]. The study of topological indices play a prominent role in Quantitative structure-activity relationships (QSAR) and Quantitative structure property relationships (QSPR) study. Topological indices correlate the precise the physico-chemical properties (stability, boiling point, enthalpy of vaporization, strain energy etc) of chemical compounds specially organic family. For more details, see [4, 5, 6, 7, 10, 11].

A Graph consists of set of vertices and set of edges. It can be represented as G = (V,E) where V=v1,v1,v1… are vertices and E= e1 e2, e3,… are edges

Let G be a simple, undirected graph with p vertices and r edges.

Let Vs(G) and Es(G) be the vertex set and edge set of G respectively.

If p and q are adjacent vertices of G, then the edge connecting them will be represented as pq. The degree of a vertex p in G is that the amount of edges incident thereto and is represented by dG(p). Ranjini et al. [13] defined the Second Redefined Zagreb ReZG2 index, that is,

$$ReZG_2 = \sum_{pq \in E(G)} \frac{d_G(p).d_G(q)}{d_G(p) + d_G(q)} \quad 1$$

Recently, H. S. Ramane et al. [8,9] acquired some topological indices of generalized transformation graphs and its supplements.

W.Nazeer et. al [12] acquired the Second Redefined Zagreb index of line graph of subdivision of star and friendship graphs and M. Ahmad et. al [15] computed Second Redefined Zagreb index of dominating David derived networks.

During this paper we acquired the articulations for the Second Redefined Zagreb (ReZG2) index of generalized transformation graphs Gxy and their supplements $\overline{G^{xy}}$

II. GENERALIZED TRANSFORMATION GRAPHS (GXY)

The semi total − point graph $T_2(G)$ of a graph G is a graph its vertex set is V ($T_2(G)$) = V (G)∪E(G) and two vertices are adjacent in $T_2(G)$ if and only if (i) they're adjacent vertices of G or (ii) one is a vertex of G and other is an edge of G incident with it .It was established by Sampathkumar and Chikkodimath [14]. Basavanagoud et al. [1] defined

Iranian J. Math. Chem. 13 (4) December (2022) 301–316

IRANIAN JOURNAL OF
Mathematical Chemistry
Journal homepage: ijmc.kashanu.ac.ir

Original Scientific Paper

Generalized Schultz and Gutman Indices

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ARTICLE INFO

Article History:
Received: 4 June 2022
Accepted: 6 October 2022
Published online: 30 December 2022
Academic Editor: Mostafa Tavakoli

Keywords:
Generalized First Schultz indices
Generalized Gutman indices
Schultz polynomials

ABSTRACT

The degree and distance both are significant concepts in graphs with wide spread utilization. The combined study of these concepts has given a new direction to the topological indices. In this article, we present the generalized degree distance indices (Generalized First Schultz indices) $DD(a,b)$ and generalized Gutman indices (Second Schultz indices) $ZZ(a,b)$. The computed values of these indices on certain families of graphs along with some bounds and characterizations are obtained. Also, we present the relationship between $DD(a,b)$ and $ZZ(a,b)$. Further, we present the Schultz polynomials along with the statistical analysis of certain graphs.

1. INTRODUCTION

The graph $G = (V,E)$, which is discussed in this paper is finite, undirected graph, without loops or multiple edges. In general, we use, $p = |V|$ and $q = |E|$ to denote the number of vertices and edges of a graph G, respectively. The number of edges adjacent to a vertex called the degree of a vertex; the minimum degree is denoted by $\delta(G)$ and the maximum

•Corresponding Author (Email address: bchaluvaraju@gmail.com)
DOI: 10.22052/IJMC.2022.246460.1629

Industrial Engineering Journal
ISSN: 0970-2555
Website: www.ivyscientific.org

Industrial Engineering Journal
Volume 15 Issue 12 * December 2022

Comparative Study on Strength of Partial RCC Beam by Experimental results and ANSYS Software results

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Abstract – Research on RCC beam by conducting tests is a very tedious job, it requires more materials, labour and time. Hence to reduce this burden best way is go with less experimental tests and more analytical by using software. In this research 4 types of beams of size 150mm x 250mm x 2000mm were casted and tested for 28 days flexural strength. 4 types of beams are M_{40} concrete throughout the section called conventional beam or reference beam, M_{40} for top 76mm and M_{20} for bottom174mm called partial beam, M_{40} for top 76mm and M_{20} for bottom174mm with 0.5% Industrial Crimped Steel Fibre (ICSF) +0.25% Waste Tyre Steel Fibre (WTSF) called partial beam with fibres & M_{40} for top 76mm and M_{20} for bottom174mm with 0.5% Industrial Crimped Steel Fibre (ICSF) +0.25% Fibre (WTRSF) +20% replacement of cement by fly ash called partial beam with fibre and fly ash. All these beams were analyzed by ANSYS Software by using hardened concrete properties as input data and comparison was done for flexural strength between all 4 types of beams.

Keywords: Conventional RCC beam, Partial RCC beam, Flexure, Industrial Crimped Steel Fibres, Waste Tyre Recycled Steel Fibres, Fly ash, ANSYS.

1. INTRODUCTION

According to IS456-2000 clause 38.1 (d) In Limit state of collapse the tensile strength of concrete is ignored, hence the development of Partial beam. Partial beam is the beam have nominal grade of concrete (Minimum grade of concrete) in tension zone with the idea of saving cement usage. Understanding strength of materials plays a major role in the design of structures to make them economical. In flexural members, understanding compressive strength, tensile strength and shear strength is of prime importance. Flexural members may fail due to either by compression, tension and shear or by combination of tension and shear. In RCC beam design, characteristic of concrete (f_{ck}), yield strength of steel (f_y) and area of tensile steel plays a major role. As per IS456-2000 G-1.1 d) if X_u/ d is greater than the limiting value, the section should be redesigned. X_u will divide the beam into two zones, compression and tension. It is a well known fact that, always load will transfer from weak material to strong material, hence concrete in tensile zone will transfer the load to steel, since tensile strength of steel much higher than concrete. Nominal grade of concrete M_{20} is enough in tensile zone to transfer the force to the steel,. Cement used in tensile zone can be reduced either by changing grade of concrete in

ISSN: 2096-3246
Volume 54, Issue 02, December, 2022

IMPACT OF HYBRID FIBERS ON PROPERTIES OF FRESH CONCRETE AND STRENGTH OF HARDENED CONCRETE

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DOI: 10.5281/zenodo.7485565

Abstract – *Concrete has superior tensile strength but efficient compressive strength. Concrete can be referred to as sacrificial concrete because it acts as a strain-transferring medium for RC flexural elements below the neutral axis. High-grade concrete will not only be uneconomical but also unfriendly to the environment when used throughout the segment. Therefore, using M20 nominal grade concrete below the neutral axis may be advocated. The use of nominal grade concrete below the neutral axis causes early cracks. Early cracks would lower the serviceability limit condition. Fibres will be used as a solution to increase the initial crack load and reduce crack width. In this study, ICSF (Industrial Crimped Steel Fibres) and WTSF (Waste Tyre Steel Fibres) are used. To determine fresh and hardened concrete properties, fibre combinations of 0.20%(ICSF) + 0.05%(WTSF), 0.30%(ICSF) + 0.10%(WTSF), 0.40%(ICSF) + 0.15%(WTSF), 0.50%(ICSF) + 0.25%(WTSF), and 0.60%(ICSF) + 0.25%(WTSF) were used. For freshly laid concrete, slump tests and compaction factor testing were performed. 28 days on cured concrete, tests for flexural strength, split tensile strength and compressive strength were performed. Added 20% fly ash to mix to replace cement.*

***Keywords*: *Industrial Crimped Steel Fibres (ICSF),Waste Tyre Steel Fibres (WTSF)*, Fly ash, Fresh concrete properties, Hardened concrete properties.**

1. INTRODUCTION

More cement is required in case of high-grade concrete. Thus, the use of cement in such high quantity leads to global warming, around 10% of CO_2 emission globally is because of cement production. Cement usage in construction must be reduced immediately. As stated in IS456-2000, the concrete's tensile strength is disregarded. One way to use less cement in the tension zone is to use concrete that is at least grade M20 and partial beams.ultimate load is approximately same for both. Less for partial beam as compared to crack load in conventional beam, thus achieving limit state of serviceability is a bit difficult [1]. As the depth of high-grade concrete grows in the compression zone, initial crack load resistance also increases. [2]. To determine the state of stress-strain, the occurrence and progression of cracks, and the correlations between load-compressive stress, load-tensile stress, and load-displacement with a change in concrete grade, a three-layer beam was used [3]. Fibers can be utilised in the tensile zone of partial beams to increase the initial fracture load. Fibers both postpone the initial crack load and narrow cracks. In concrete structures all around the world, tonnes of various fibres are used to prevent cracks and reduce the width of existing ones. Steel Fiber Reinforced

Industrial Crimped Steel Fiber (ICSF) and Waste Tyre steel Fiber (WTSF) Effects on M_{20} Grade Fresh and Hardened Concrete Properties

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Abstract -

Concrete is efficient in compressive strength and inferior in tensile strength. In RC flexural members below neutral axis concrete serve as strain transferring media, can be called as sacrificial concrete. Use of high grade concrete throughout the section will be uneconomical and also non environmental friendly. Hence use of nominal grade concrete M_{20} below neutral axis can be recommended. Use of nominal grade concrete below neutral axis leads to early cracks. Early cracks will reduce the limit state of serviceability. To enhance the initial crack load and to reduce the width of cracks, solution will be fibres. Industrial Crimped Steel Fibres (ICSF) and Waste Tyre Steel Fibres (WTSF) are used in this study. 0.20%ICSF + 0.05%WTSF, 0.30%ICSF + 0.10%WTSF, 0.40%ICSF + 0.15%WTSF, 0.50%ICSF + 0.25%WTSF and 0.60%ICSF + 0.25%WTSF fibers combination was used to find fresh and hardened concrete properties. Slump test and Compaction factor tests were conducted for fresh concrete. 28 days Compressive strength, Split tensile strength and Flexural strength were conducted on hardened concrete. Also used 20% fly ash to replace cement.

Keywords: Industrial Crimped Steel Fibres (ICSF), Waste Tyre Steel Fibres (WTSF), Fly ash, Fresh concrete properties, Hardened concrete properties.

DOI Number: 10.48047/nq.2022.20.10.NQ55127

NeuroQuantology 2022; 20(10): 1634-1640

1. INTRODUCTION

In high grade concrete, cement requirement is more. Use of more and more cement leads to global warming, around 10% of CO_2 emission globally is because of cement production. Reducing use of cement in construction is need of the hour. As mentioned in IS456-2000, the tensile strength of the concrete is ignored. Partial beam is one of the solutions to reduce cement in the tension zone and using minimum grade M20 concrete. Ultimate load is approximately same for conventional and partial beams but crack load in partial beam is less compare to conventional beam, therefore it is difficult to achieve limit state of serviceability [1].The high grade concrete depth increases in compression zone, increases resistance to first crack load. [2].To find the state of stress-strain, formation and development of cracks, three-layer beam of load-compressive stress, load-tensile stress, load-displacement relationships with a change in grade of concrete[3].

To enhance the initial crack load in partial beams, fibres can be used in tensile zone. Fibres delay the initial crack load and also reduce the width of cracks. Tonnes of different fibres are using to avoid cracks and to reduce width of cracks in concrete structures all over the world. Steel Fiber Reinforced Concrete (SFRC), Glass Fiber Reinforced Concrete (GFRC), Synthetic Fiber Reinforced Concrete (SNFRC), Natural Fiber Reinforced Concrete (NFRC).The effective utilization of fibres in concrete improves static and dynamic characters like tensile strength, energy dissipation, Impact resistance and fatigue resistance. Also, improves isotropic strength properties not common in the conventional concrete [4]. The investigation on the influence of Polypropylene Fibers with different length can be an effective method, as there is a necessity to solve the problem of brittleness in concrete always [5]. Hybrid Fiber Reinforced Concrete consists of two or more different fibers to enhance the properties of concrete [6]. Increase of compressive strength from 10 to 20% with inclusion of steel fibres. Increase of Flexural strength from 12 to 40% with the inclusion of steel fibers. Split tensile strength increases 3 to 35% with addition of steel fibers [7]. There is decrease ofWorkability of Concrete with increase in steel fibers. Maximum range for steel fibers is 0.3%to 0.45% since no change in slump is observed and obtained slump is 100mm which is allowed with design [8].Improvement of Compressive strength does not show by the addition of steel fiber, but considerably increases the split tensile strength. This may be due

Turkish Journal of Computer and Mathematics Education *Vol.12 No.10(2021), 126-128*
Research Article

Comparative Study of Conventional and Partial RCC Beams and Slabs for Flexural and Shear strength – A review

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Article History: Received: 10 January 2021; Revised: 12 February 2021; Accepted: 27 March 2021; Published online: 28 April 2021

Abstract: IS456-2000, Clause 38.1 Assumptions, one of the assumptions is; the tensile strength of concrete is ignored. As per this assumption, Instead of using high grade concrete in tension zone, use of nominal grade concrete or creating vacuum near neutral axis, to develop "Partial RC beam or slab". Both beam and slab are bending structural elements, hence understanding of flexural and shear strength is very important. Review of research papers gives an insight on difference between conventional and partial bending elements. Ultimate flexural strength will be nearly same in both partial elements and conventional bending elements. Initial crack load is less in partial bending elements compare to conventional elements. But partial elements are the best solution to reduce usage of cement in RC structural elements. Understanding shear strength of partial bending elements is very essential in the shear reinforcement design, but less research work is done on shear strength of partial flexural elements. Use of less cement in partial elements reduces CO2 emission, makes structure economical and it is also the solution for global warming

Keywords: Conventional bending elements, Partial bending elements, Flexural strength, shear strength, less cement, CO2 emission, global warming..

1. Introduction

Cement is used to bind other materials together in construction. Cement is mixed with fine aggregates, coarse aggregates and water to produce concrete, the most widely used construction material in the world. Over 10^5 billion kN of concrete is used each year. Cement is the basic ingredient of concrete, around 8% of global CO_2 emissions come from cement production. Reducing usage of cement without compromising strength in construction is need of the hour. Shape optimization is the best technique to reduce the size and materials in concrete structures. But, casting different shapes of RCC cast in situ structures is difficult due to complicated form work and arrangement of reinforcement. Hence development of partial beam/slab is the best solution. In partial structural element either grade of concrete can be varied in compression and tension zone or vacuum can be created in less stressed part, ie near neutral axis. Minimum grade of concrete M_{20} will be provided in tension zone as mentioned in IS456, higher grade can be provided in compression zone. There will be great reduction in usage of cement in deep beams and also in thick (flat) slabs. Precast lightweight partial structural elements also contribute reduction in cement usage and become economical.

2. Comarative Study Of Conventional Beams/Slabs And Partial Beams/Slabs For Flexural And Shear Strength

Xu = (0.87* fy*Ast)/ (0.368*fck*b) as per IS 456 2000, d' = ((2 x cover) + diameter of bar), d' is the thickness of concrete available to develop bond between steel and concrete. (D – (Xu + d')) is the area for brick fills, where D is overall depth. Analysis of composite section is done by Method of Initial Functions (MIF). There is no much difference between strength of brick in filled beams and conventional beams. Cost of casting in filled beam is almost same as conventional beam, no extra cost is needed. Economy and reduction of weight depends on percentage of replacement [1].

Beam size 150 mm x 300 mm x 2430 mm. Conventional beam M_{30} grade throughout, Partial beam M30 + M20 NA at 91mm and M30 + M20 NA at 79 mm. Average crack load for conventional beam is 68.33 kN for conventional beam. 62.33 kN for M30 + M20 NA at 91mm and 55.33 kN for M30 + M20 NA at 79 mm beam. Average Ultimate load for conventional beam is 106.33 kN for conventional beam. 95.33 kN for M30 + M20 NA at 91mm and 95 kN for M30 + M20 NA at 79 mm beam. This shows ultimate load is nearly same for conventional and partial beams but crack load is less in partial beam compare to conventional beam, hence it is difficult to achieve limit state of serviceability [2].

Near neutral axis, stress is less; the amount of concrete required is less compare to top and bottom, where stress is high. Near neutral axis vacuum is created by providing waste PVC pipe. ANSYS 12.1 software is used to analyze the strength of beam. For concrete Solid65, steel reinforcement link8, PVC pipe shell 181, and steel plate

IFERP

ISSN (Online) 2394-2320

International Journal of Engineering Research in Computer Science and Engineering (IJERCSE)

Vol 8, Issue 11, November 2021

IOT Based Automatic Medicinal Herbs Monitoring and Controlling

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Abstract—Medicinal herbs, known as medicinal plants, have been used in traditional medicine, which fusion hundreds of chemical compounds for serving as barrier against pest, parasites, ailment and lactarian carnivores. Climatic conditions such as duration of day, precipitation and thermal reading fundamentally impact the physical, synthetic and natural characteristics of therapeutic species . A strategy can be created and executed to make appropriate maps for therapeutic herbs dependent on ecological reasonableness, agronomic, efficiency, calculated and quality appropriateness. However, the development of these plants has got an importance to save their wild populaces. In this manner, indoor atmosphere checking and management are pervasive in numerous spots, from open workplaces to individual houses. This technique is to build up an Automatic medicinal herbs monitoring framework which performs sensing and automation activity. Past examination has dissected that an overwhelming plant divider framework will viably downsize the groupings of stuff and unpredictable natural mixes and balance out the carbonic corrosive gas fixation in the inside environmental factors. This article proposes a remote viewing and controlling framework that is explicit to the plant dividers. The framework uses the IOT innovation and furthermore open cloud stages to change the administration system, to improve the quantifiability to upgrade client encounters of plant dividers and to flexible the unpracticed indoor atmosphere.

Index Terms—Medicinal herbs, Plant divider, Remote viewing, Sensing and Automation, IOT

I. INTRODUCTION

Medicinal plants, known for herbal medicine. Detected in prehistoric period and manipulated as customary medicament practice. flora blend hundreds of synthetic composites for obligations encompasses resistance against pest, saprophytes, sickness, and vegan mammals for a healthier life herbal action has a vital role. Numerous precarious illness can be healed via flora discerned in elevation and peak areas etc. utmost adoration view is favored to the herbal supplement since from ancient period. Unknown and known illness can be combated through herbal supplement. Current scenario, society moderate the impact of herbal supplement flora play a vital plague not only in factory of pharmaceutical, but also maquillage, food and liquor areas. Cultivation necessity of herbal supplement is a chief factor to safeguard their citizenry in the zealous market it is requisite to thrive a systematic production cuffs to decrease fare and amplify the standards of the goods.

This paper demonstrates various electronics detectors interfaced to the controller .Detectors values are then passed to the database , user can view condition of the framework and control using Smartphone application. Framework can run on two modes, namely manual and auto mode. In Manual operation user can control different appliances which is connected to the plant dividers. In auto mode framework itself automate the process based on detector values.

II. LITERATURE REVIEW

Remotely the board framework and observing is the best arrangement. In this kind of plant framework, key factors for example temperature, stickiness and CO_2 gas level are gathered and checked continuously by the client. Gathered information's are sent with legitimate input to the client and remotely alter the watering, lighting impacts to keep up indoor atmosphere for suitability. These framework is essentially dependent on cloud stages and their administrations. This paper actualizes the board and checking arrangement which works remotely to specific plant divider dependent on cloud stage. The ongoing administration and checking framework handles work remotely from any geological territory. It improves indoor air quality, lighting quality, client experience and control the air trade framework and lighting framework[1].In this article, a remote checking and control framework which is explicit to the plant dividers. This research includes Internet of Things innovation and the Azure open cloud stage to computerize the administration system to improve the versatility, upgrade client encounters of plant dividers, and additive to a green indoor climate.The information are constantly processed to the cloud utilizing the WiFi convention to guarantee security and accessibility. In this they are thought of control elements of watering, lighting and ventilation in a plant divider framework. These capacities are legitimately constrained by a nearby microchip as indicated by pre-characterized settings that are privately put away and remotely synchronized with the cloud. The cloud part exploits the IoT Hub foundation and different administrations, for example capacities, stockpiles and web perception offered by the Azure platform. Via an electronic UI, overseers clients can screen an indoor atmosphere progressively, check memorable information from a database, and update the timings of the siphon, light and fan capacities, just as summon actuators for the board purposes[2].So as to beat the downside in the current

GRADIVA REVIEW JOURNAL

ISSN NO : 0363-8057

Tribological Behaviour Study of Zirconia Toughened Alumina Bio-inert Biomaterial Used in Total Hip Joint Implant

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International Journal of Scientific Research in Science, Engineering and Technology
Print ISSN: 2395-1990 | Online ISSN : 2394-4099 (www.ijsrset.com)
doi : https://doi.org/10.32628/IJSRSET

Design and Fabrication of Simple Solar Grass cutter

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Article Info
Volume 9, Issue 4

Page Number : 320-324

Publication Issue :
July-August-2022

Article History
Accepted : 05 August 2022
Published: 16 August 2022

ABSTRACT

In the recent years weed cutter machines are quite common in agriculture field and for lawn maintenance. The grass cutters were operating with IC Engine will use gasoline. The gasoline operated engines will generate harmful emissions which pollute the environment. Also the constant rise in fuel prices and the impact of gas emissions from burned fuel into the atmosphere make it necessary to use the sun's plentiful solar energy as a source of power to operate a grass cutter. Accordingly with the use of abundantly available solar energy it is attempted to make a "Simple Solar Grass Cutter". The fabricated grass cutter involves a solar panel, stainless steel blade, D.C motor, battery, and control switch. The control switch provided on the solar-powered lawnmower closes the circuit and permits current to pass to the motor, which drives the blade. The battery is chargeable and charged continuously by solar energy.

Keywords: Solar grass cutter, Solar Panel, Control switch

I. INTRODUCTION

Today's pollution is a serious problem for the entire world. Man-made pollution is present in our homes. Gas-powered lawn mowers are guilty of causing pollution because they emit gases. Additionally, it is inefficient due to rising fuel prices. Consequently, solar-powered lawn mowers are introduced. The use of solar energy to drive an electric motor, which in turn moves a blade, is what is referred to as a solar-powered lawn mower. However, those grass cutters which operate with engine are expensive. This design serves as an alternative to the harmful gas-powered lawnmower. Solar energy is a type of renewable energy source that can be either passive or active. Essentially, solar energy is a free energy source that is simple to use. Then, a solar-powered lawn mower will be manually controlled using this free solar energy. The blades are rotated by a motor for the purpose of cutting the grass. Since no fuel or wire extensions are required for the power supply, the project is pollution-free and environmentally safe. The conditions in India are taken into account in all of the assumptions and decisions made in the design of this project.

1.1 Problem Statement

The solar lawn mower is considered after the effectiveness of others felt insufficient due to the following factors:

1 Pollution is there due to the use of grass cutter working on IC engine.

International Journal of Scientific Research in Science, Engineering and Technology
Print ISSN: 2395-1990 | Online ISSN : 2394-4099 (www.ijsrset.com)
doi : https://doi.org/10.32628/IJSRSET

Design and Fabrication of Trailer Disc Braking System

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Article Info
Volume 9, Issue 4

Page Number : 48-54

Publication Issue :
July-August-2022

Article History
Accepted 04 July 2022
Published 10 July 2022

ABSTRACT

This journal states the component which is absolutely subject to the braking mechanism, where the main contrast is that the regular trailer axle is been changed with the new hub and the front part of the trailer, as pole of the trailer and farm truck is been given an extra part of slowing down control. This part is the single chamber which is the principal part to work the brakes. At the point when the driver applies a critical brake because of latency, it comes over on the working vehicle. As the cylinder pushes the oil forward from the pipe it applies the brakes and the trailer stops with the working vehicle. The accidents can be prevented by implementing it. The semi-truck is a separable trailer hauling loads around 6-7 tons. It is found that because of an extreme burden on the trailer in India there are questionable jerks on the tractor trailer. The farm vehicle and the trailer have the likelihood to break down or fall. This might hurt the driver, the street, and the existence of individuals who are around the farm vehicle while the mishap happens.

Keywords : Cylinder Pushes, Trailer Disc Braking System, Aluminum Brakes

I. INTRODUCTION

The first documented case of brakes in use turned into in historic Rome. These easy brakes had been composed of a lever that after pulled, pressed a timber block onto the outdoor of a metallic covered wheel. The number one pressure for braking with this tool turned into friction. This approach turned into powerful because of the sluggish speeds at which the carts travelled; however, it turned into an insufficient shape of slowing runaway carts. This approach of braking turned into used for hundreds of years with little layout improvement [1].

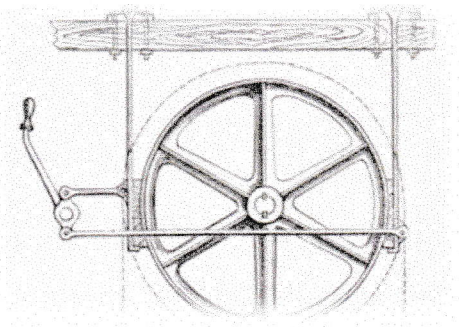

Fig 1: Lever Brake Example

International Journal of Scientific Research in Science, Engineering and Technology
Print ISSN: 2395-1990 | Online ISSN : 2394-4099 (www.ijsrset.com)
doi : https://doi.org/10.32628/IJSRSET

Portable Electric Ploughing and Levelling Machine

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Article Info
Volume 9, Issue 4

Page Number : 43-47

Publication Issue :
July-August-2022

Article History
Accepted : 03 July 2022
Published: 09 July 2022

ABSTRACT

This journal paper is primarily based on the layout and fabrication of transportable electric powered ploughing and leveling machine for the operations like ploughing and leveling the farming land and doing away with undesirable weeds from farm and also sand desires to be opened in order that atmospheric air flows thru sand. Our mission is of a single wheel cart that runs thru a motor with battery and established with a ploughing and leveling blades. This device may be operated routinely and manually too. Basic solid aspect software is used to layout our assignment. Based on the studies, carried out the fabrication of portable electric powered ploughing & leveling machine in a manner this is affordable to the small scale farming.

Keywords : Electric plough, electric powered leveling, battery powered, transportable design

I. INTRODUCTION

This machine is designed for small agriculture discipline [1]. This device is portable so that it can be carried everywhere we desired to carry out the ploughing and levelling operations on the land. This machine is green and occasional price compared to the conventional tractors [2]. It is lower priced for farmers folks that can't find the money for conventional tractor to perform the same operations [3]. This machine consists of set of 3 blades for ploughing operation and in the back of that sliding mechanism is established for levelling blade and single wheel is mounted thru a connecting rod onto which is the small angles are welded to hold a gripping contact with the ground and additionally for the loosening of the soil and also to attain uniform rotation with the assist of electric motor [4].

International Journal of Scientific Research in Science, Engineering and Technology
Print ISSN: 2395-1990 | Online ISSN : 2394-4099 (www.ijsrset.com)
doi : https://doi.org/10.32628/IJSRSET12293185

Automatic Solar Operated Lake Cleaning Floating Machine

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Article Info
Volume 9, Issue 4
Page Number : 32-37
Publication Issue :
July-August-2022
Article History
Accepted : 01 July 2022
Published: 07 July 2022

ABSTRACT

This paper is focus on design and fabrication of Automatic solar operated lake cleaning floating machine. This project basically concentrated to clean the lake. Based on the current problem in the lake, we designed and fabricated a floating machine. Our project is remotely operated lake cleaning machine, aim to be preventing human accident and minimize error during the operation. Also, in order to minimize the emission, we used electric energy as an energy resource for our project.

Keywords : Lake Cleaning, Unmanned, Eco-Friendly, Garbage

I. INTRODUCTION

Lake pollution is a major issue in India. Over a thousand of aquatic animals and plants are affecting by pollution. Lake is major source of fresh water for human beings, plants and animals. By executing the plan and based on the implementation, we found problem that are occurs in river and lake in India[1].We get an idea about a remote-control system from this paper, where the sewage cleaning machine is remotely operated. In order to diminish the spreading of diseases to human. It moreover progresses the rack of life and tangible quality nourishment items. Within the proposed systems, the machine is working with inaccessible control to clean the sewage. Consequently, this framework maintains a strategic distance from the impacts from the sewage waste [2].Utilizing methods would be efficiently Because it frequently covers an expansive domain of exercises and joined with credibility to getting influenced by distinctive afflictions from the diverse type of microorganisms display within the sewage whereas cleaning with human contact[3]. This venture is a programmed oceanic vehicle that can be remotely worked for cleaning the water bodies. By utilizing Robots, but we are making it by inaccessible control without using the robot, hence making within affordable price [4].The extent is centered on the plan of an electric driven vehicle that can recover control using solar vitality innovation. In this project they implemented solar power has energy to drive the vehicle [5].

By investigating a few of the journal papers, we came across the thought to develop our venture. The automatic solar operated floating machine is utilized to clean the squanders, Plastics and other squander flotsam and jetsam from the lake for the clean water asset. Nowadays, IC engine is used to clean the lakes. But in IC engine will emit a lot of pollutant particles

Scientific Journal Impact Factor = 7.136
Online ISSN : 2394-4099
Print ISSN : 2395-1990

UGC Journal No : 47147

International Journal of Scientific Research in Science, Engineering and Technology

CERTIFICATE OF PUBLICATION

Ref : IJSRSET/Certificate/Volume 9/Issue 4/8404 05-Jul-2022

This is to certify that **Arvind Kumar, VasanthaKumar, Manjunath Ichchangi, Imran Mokashi, D Dritha Kumar, Dinakara M S , Prashanth Kutinha** have published a research paper entitled ***'Automatic Solar Operated Lake Cleaning Floating Machine'*** in the International Journal of Scientific Research in Science, Engineering and Technology (IJSRSET), Volume 9, Issue 4, July-August-2022.

This Paper can be downloaded from the following IJSRSET website link
https://ijsrset.com/IJSRSET12293185

DOI : https://doi.org/10.32628/IJSRSET12293185

IJSRSET Team wishes all the best for bright future

IJSRSET

Editor in Chief
IJSRSET
website : http://ijsrset.com

Peer Reviewed and Refereed International Journal

International Journal of Scientific Research in Science, Engineering and Technology
Print ISSN: 2395-1990 | Online ISSN : 2394-4099 (www.ijsrset.com)
doi : https://doi.org/10.32628/IJSRSET

Artificial Intelligence Assisted Solar Biomass Hybrid Dryer for Drying Cocoa

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Article Info
Volume 9, Issue 4
Page Number : 38-42
Publication Issue :
July-August-2022
Article History
Accepted : 01 July 2022
Published: 07 July 2022

ABSTRACT

This journal paper aims to design and fabrication of artificial intelligence assisted solar biomass hybrid dryer for drying cocoa. This work mainly concentrates on offering an authentic and reliable solution to the drying of cocoa beans. Commercially available solid edge software was used for designing the solar biomass hybrid dryer for drying cocoa. Based on the research and calculation, done the fabrication of solar biomass hybrid dryer for drying cocoa which aims to minimize manpower and time consumption in drying cocoa beans.

Keywords: Cocoa dryer, Hybrid dryer, Solar dryer, Biomass dryer, Ecofriendly.

I. INTRODUCTION

Cocoa beans are widely used in different areas for various applications such as supporting brain health, cure for diseases it acts as a good source of antioxidant, regulating cholesterol level in the blood and it helps for the prevention of skin cancer and diabetes and it is also mainly used for manufacturing of chocolates [1].

The traditional ways of drying cocoa seeds are two ways such as open air drying and solar roof heat drying. So this drying methods use to take 3 to 4 days for drying in open air drying and solar roof drying. There will be sudden changes in weather so it may affect the quality of cocoa beans. For good quality of cocoa seeds the moisture content should be maintained 5% to 7% [2]. In these methods of drying its difficult to maintain this moisture content level so, came across with the concept of making "artificial intelligence assisted solar biomass hybrid cocoa dryer for drying cocoa".

In this work, designed that if the weather changes it will not affect the cocoa seeds. We made a hybrid dryer it can dry cocoa seeds quickly by using simultaneously solar heat and biomass heat. So, it will reduce the time of drying and for maintaining the moisture content with the help of artificial intelligence to continuously check the moisture content in the seed. So, it will reduce labour for monitoring the drying of cocoa seeds and it will maintain the criteria and the quality of seeds will be good.

II. OBJECTIVES

To design and fabricate artificial intelligence assisted solar biomass hybrid cocoa dryer. To use artificial intelligence to maintain the moisture content to 5% to 8% which helps to maintain good quality cocoa beans. To reduce the time of cocoa drying. To improve the quality of cocoa beans and to reduce the labor cost. To

Biomass Conversion and Biorefinery
https://doi.org/10.1007/s13399-022-02748-y

ORIGINAL ARTICLE

Removal of heavy metals from wastewater using low-cost biochar prepared from jackfruit seed waste

Mohammed Khadem[1] · Abid Husni Ibrahim[2] · Imran Mokashi[3] · Alaa Hasan Fahmi[4] · Syed Noeman Taqui[5] · V. Mohanavel[6] · Nazia Hossain[7] · Isa Baba Koki[8] · Ashraf Elfasakhany[9] · Mohammed A. H. Dhaif-Allah[10] · Manzoore Elahi M. Soudagar[11] · Akheel Ahmed Syed[12]

Received: 7 January 2022 / Revised: 6 April 2022 / Accepted: 26 April 2022

Abstract

The present study focuses on using jackfruit seed waste (JSW) for bioremediation of heavy toxic metals from water. The fruit is abundantly grown in India and Far East countries and produces myriad tons of seeds. A simple procedure is developed in the laboratory by thermally activating JSW by orthophosphoric acid at 500 °C. Surface morphology, porosity, and structural analyses of the resultant biochar were conducted. The activated biochar was applied for batch adsorption of several heavy metal ions: Fe(III), Cd(II), Cu(II), Pb(II), and Mn(VII) at pH 7. The average heavy metal uptake by activated JSW biochar is 76.4 mg g^{-1}, 79.4 mg g^{-1}, 97.9 mg g^{-1}, 79.9 mg g^{-1}, and 79.8 mg g^{-1} for Fe(III), Pb(II), Cu(II), Cd(II), and Mn(VII), respectively. The experimental conditions were optimized to remove heavy metals at neutral pH. The adsorption process was exothermic, and Langmuir and pseudo-second-order kinetic study models were best fitted. The observation was in close agreement with the experimental data. Thermal and structural characterization of biochar at post-adsorption analyses was conducted. The study has distinguished features of simplicity, cost-effectiveness, and viability compared to many of the literature-reported biomass waste.

Keywords Heavy metals · Biochar · Adsorption · Wastewater · Jackfruit seed waste

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Published online: 08 May 2022

Hindawi
Adsorption Science & Technology
Volume 2022, Article ID 9009214, 20 pages
https://doi.org/10.1155/2022/9009214

Research Article

Adsorption of Crystal Violet Dye from Aqueous Solution using Industrial Pepper Seed Spent: Equilibrium, Thermodynamic, and Kinetic Studies

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Received 7 May 2022; Revised 15 July 2022; Accepted 24 August 2022; Published 13 September 2022

Academic Editor: Lakshmipathy R

The economic viability of adsorbing crystal violet (CV) using pepper seed spent (PSS) as a biosorbent in an aqueous solution has been studied. A parametrical investigation was conducted considering parameters like initial concentration of dye, time of contact, pH value, and temperature variation. The analysis of experimental data obtained was carried out by evaluating with the isotherms of Freundlich, Sips, Tempkin, Jovanovic, Brouers–Sotolongo, Toth, Vieth–Sladek, Radke–Prausnitz, Langmuir, and Redlich–Peterson. The adsorption kinetics were studied by implementing the Dumwald-Wagner, Weber-Morris, pseudo-first-order, pseudo-second-order, film diffusion, and Avrami models. The experimental value of adsorption capacity ($Q_m = 129.4\,\mathrm{mg\,g^{-1}}$) was observed to be quite close to the Jovanovic isotherm adsorption capacity ($Q_m = 82.24\,\mathrm{mg\,g^{-1}}$) at ($R^2$), coefficient of correlation of 0.945. The data validation was found to conform to that of pseudo-second-order and Avrami kinetic models. The adsorption process was specified as a spontaneous and endothermic process owing to the thermodynamic parametrical values of ΔG^0, ΔH^0, and ΔS^0. The value of ΔH^0 is an indicator of the process's physical nature. The adsorption of CV to the PSS was authenticated from infrared spectroscopy and scanning electron microscopy images. The interactions of the CV-PSS system have been discussed, and the observations noted suggest PSS as a feasible adsorbent to extract CV from an aqueous solution.

Alexandria Engineering Journal (2022) 61, 3131–3145

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Effect of non-conjugate and conjugate condition on heat transfer from battery pack

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Received 22 May 2021; revised 9 August 2021; accepted 14 August 2021
Available online 02 September 2021

KEYWORD

Battery;
Li-ion;
Temperature;
Conjugate;
Heat transfer;
Conductivity ratio

Abstract Li-ion battery packs provide high energy density but with a concern of thermal management. Hence cooling mechanism is necessary to have a good life and reliability on the battery system. The main objective of this article is to investigate the effect of conjugate and non-conjugate boundary conditions on battery pack heat transfer characteristics. In conjugate conditions, coolant flow is considered with heat flux continuity at the battery and fluid interface. In non-conjugate condition, just convection condition is adopted. The finite volume method is adopted for the numerical analysis, and a code is written for computations of the governing equations. Effects of different parameters like heat generation, conductivity ratio, coolants, and Biot number on temperature distribution in the battery pack are analyzed. The maximum temperature contours are located near the top end of the battery, whereas at the bottom end, the battery's temperature is low. Such high and low-temperature regions in the battery pack create uneven thermal stresses, resulting in battery failure. To have better performance results for the battery system, one should maintain the proper balance of thermal conductivity between the solid and fluid domains. From comparative analysis it is found that the non-conjugate condition gives the temperature distribution in battery to be of symmetrical nature and more uniform. Practically, this is not true which is confirmed by the realistic conjugate condition where the high temperature zones are closer to the trailing edge of the battery pack. Liquid metals and nanofluids provide a much safer operating temperature of the pack where the maximum temperature is well below the critical temperature. The application of conjugate

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Peer review under responsibility of Faculty of Engineering, Alexandria University.

https://doi.org/10.1016/j.aej.2021.08.042

Journal of Radioanalytical and Nuclear Chemistry
https://doi.org/10.1007/s10967-021-07920-8

Studies on the dependence of natural radioactivity on clay minerals of soils in Davanagere district of Karnataka, India

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Received: 30 April 2021 / Accepted: 22 July 2021

Abstract
The paper presents the distribution of natural radionuclides in soils with various clay minerals of Davanagere district. The activity concentration of natural radionuclides in soil were measured using NaI(TI) gamma spectrometry and the minerals present in the soils were identified using Fourier–transform infrared spectroscopy. The normality of the frequency distribution curve of ^{226}Ra, ^{232}Th and ^{40}K concentration was verified using Kolmogorov–Smirnov test. The major trace minerals observed in the soils were determined based on the intensity of corresponding peaks. The soil with clay minerals Quartz and Hematite showed higher radionuclide content.

Keywords Clay minerals · NaI(TI) spectrometer · Hazard indices · FTIR spectroscopy · Soils · Davanagere

Introduction

The background radiation to which people are exposed continuously comes from natural and artificial sources. The natural radiation comes from cosmic rays and radionuclides present in various environmental matrices such as soil, sediment, plants, air, water and rocks [1–5]. The artificial sources of radiation are X-rays and radioisotopes used in medical activities [6–9] and release of various radionuclides during industrial activities such as power generation using coal power plants [10, 11]. The average radiation dose received by human beings from these sources is 2.4 mSv y^{-1} [12]. Out of this, about 57% of the radiation dose comes from radon (^{222}Rn) and its progeny [13]. The natural radioactivity in the environment originate from natural radionuclides which are part of the radioactive series such as ^{238}U, ^{232}Th, and singly occurring radionuclide ^{40}K in different geological and geochemical formations. Since, about 98% of gamma dose is received from ^{226}Ra and its progeny, the precursor radionuclides of ^{226}Ra in ^{238}U series are ignored [13]. There is a need to evaluate the activity concentration of radionuclides in soils as the soil available in the region is used as raw material for construction of buildings. In India, buildings are made of bricks blended with almost 80% of soil, which may be composed of higher activity concentrations of natural radionuclides [13]. People spend about eighty percent of time in an indoor environment. Hence, from health perspective, the radiation dose limit is estimated and the radiological risks associated with the use of soil in the construction of building are assessed [14].

The present study forms a first detailed investigation on the activity of natural radioactivity in soils of the Davanagere district and the evaluation of associated radiological hazards to the population of the region. Soil contains clay minerals and some of the clay minerals selectively enrich natural radionuclides. Clay minerals are classified on the basis of their various layered structure. There are a few classes of clay, such as mica (illite), serpentine, kaolinite, smectites (montmorillonite, saponite), vermiculite, pyrophyllite (talc), sepiolite, hematite, biotite, calcite and quartz [15]. Fourier-transform infrared spectroscopy was used to identify the various clay minerals present in soils of Davanagere district.

Geology of the study area

Davanagere district occupies an area of 5926 km^2, which has six taluks viz., Channagiri, Honnali, Harihara,

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Published online: 15 August 2021

INTERNATIONAL JOURNAL OF ENVIRONMENTAL ANALYTICAL CHEMISTRY
https://doi.org/10.1080/03067319.2021.2020764

Assessment of effective dose and radiological risk from natural radioactivity in rock samples of Davanagere locality, Karnataka, India

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ABSTRACT

This paper presents the results of a systematic investigation of the natural radioactivity in rock samples of Davanagere locality, Karnataka, India. The radioactivity in rocks was measured using the NaI(Tl) gamma-ray spectrometer. An effort was made to identify the minerals present in rock samples by FTIR spectroscopy. The activity of ^{232}Th, ^{226}Ra and ^{40}K radionuclides in rocks vary from 27.96 ± 1.00 to 103.85 ± 1.90, 50.89 ± 1.98 to 135.28 ± 3.15 and 512.46 ± 4.86 to 974.31 ± 7.05 Bq kg^{-1} with a mean value of 59.79 ± 1.45, 85.79 ± 2.54 and 787.03 ± 6.19 Bq kg^{-1}, respectively. Radiological hazard parameters such as radium equivalent activity, external and internal hazard indices absorbed dose rate, ELCR for indoor exposure and annual effective doses for different body organs were estimated. The activity of natural radionuclides were found to be high compared to the national and world average values. However, the hazard indices were found to be within the recommended limits. The Quartz, Calcite and Kaolinite extinction coefficients in rocks ranged from 87.37 to 121.73, 31.43 to 119.14, and 33.10 to 63.97, respectively. The radionuclide activity concentration was found to depend on the kaolinite and calcite minerals.

ARTICLE HISTORY
Received 5 September 2021
Accepted 5 November 2021

KEYWORDS
External hazards index; internal hazards index; NaI(Tl) spectrometer; radium equivalent activity; FTIR spectroscopy; clay minerals

1. Introduction

The assessment of gamma radiation dose to the human population through natural background radiation is important because natural radiation is the largest contributor to the population dose around the world. Human beings are continuously exposed to ionising radiation that exists outside and within the planet [1]. Two important sources of natural radiation exposure are terrestrial and extra-terrestrial sources. The terrestrial radiation originates from the radionuclides present in the earth's crust and the extraterrestrial radiation comes from cosmic rays that penetrate the earth's atmosphere from outer space. The total radiation dose to human inhabitants is around 2.8 mSv per year, out of this 85% (2.4 mSv) comes from the natural sources [2].

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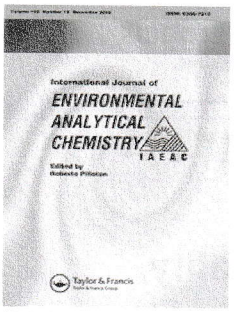

International Journal of Environmental Analytical Chemistry

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/geac20

Assessment of effective dose and radiological risk from natural radioactivity in rock samples of Davanagere locality, Karnataka, India

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To cite this article: Malleshi Kavasara, Vinutha P R, Kaliprasad C S & Narayana Yerol (2022): Assessment of effective dose and radiological risk from natural radioactivity in rock samples of Davanagere locality, Karnataka, India, International Journal of Environmental Analytical Chemistry, DOI: 10.1080/03067319.2021.2020764

To link to this article: https://doi.org/10.1080/03067319.2021.2020764

Published online: 05 Jan 2022.

Journal of Radioanalytical and Nuclear Chemistry
https://doi.org/10.1007/s10967-021-08114-y

Evaluation of radiological hazards due to natural radionuclide in rocks and the dependence of radioactivity on the mineralogy of rocks in Udupi district on the south west coast of India

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Received: 21 August 2021 / Accepted: 13 November 2021

Abstract
Radiological hazards due natural radioactivity in rocks were assessed in the Udupi district on the south west coast of India. The activity of radionuclides ^{226}Ra, ^{232}Th and ^{40}K in rocks, as a commonly used construction material were estimated. The radiological hazards to the population of the region were evaluated. The ^{232}Th activity concentration in granitic rocks was found to be high. To trace the sources of radioactivity in rocks, the mineralogical studies were carried out using XRD and FTIR technique. The studies indicated that the thorium phosphates and potassium bearing feldspars minerals are the main source of radioactivity in rocks.

Keywords Rock · Natural radioactivity · Spectroscopy · Hazard indices · Mineralogical

Introduction

Human beings are continuously exposed to ionising radiations originating from extra-terrestrial and terrestrial sources. The extra-terrestrial radiation comes from cosmic rays and the terrestrial radiation originates from ^{232}Th and ^{238}U series as well as singly occurring radionuclides like ^{40}K, which are present in soils and rocks [1]. The granitic rocks, granite pegmatites and syenites contain higher concentration of uranium, thorium and potassium and are directly linked to the mineralogy [2]. In rocks heavy minerals such as zirconium, monazite, apatite, magnetite, ilmenite and riebeckite contain 61 to 65% of uranium [3]. Thorium is found in rare earth mainly as oxides, silicates, carbonates and phosphates. Other granitic bodies and pegmatite may also have high thorium content [4]. In most rocks thorium is about three times more abundant than uranium [5]. Thorium is relatively enriched in acid igneous rocks, especially in granites and the normal composition in these rocks are15 μg g^{-1} for thorium and 5 μg g^{-1} for uranium [6]. The higher concentration of ^{40}K in granites are associated with alkaline feldspar [7].

The naturally occurring rocks are commonly used as construction materials. Rocks that are used for construction contribute to radioactivity in the environment in two different ways. Firstly, the radon gas, a progeny of ^{226}Ra, decays into dwellings and workplaces [8–11]. The radon progeny such as ^{218}Po, ^{214}Po and ^{214}Bi are alpha emitting radionuclides and they can get attached to the lungs causing considerable lung dose [12]. Secondly, human beings are exposed to gamma rays emitted by ^{226}Ra, ^{232}Th, and ^{40}K, present in rocks. The radiation dose resulting from radionuclides present in building material such as rocks can go up to several mSv y^{-1} [13]. Over the recent years, many studies has been carried out to assess the radiological hazards of naturally occurring radioactive elements in building materials [14, 15]. The exposure to higher levels of thorium may result if people reside near mining areas. The inhalation of thorium dust has been linked to an increase in the risk of developing lungs illness, including lung cancer and pancreatic cancer [16]. The study region is one of the major rock mining areas. The workers and people residing near the mining site have to take care to minimise the radiation dose originating from air born radioactivity.

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Published online: 01 December 2021

POLYCYCLIC AROMATIC COMPOUNDS
2022, VOL. 42, NO. 6, 3748–3761
https://doi.org/10.1080/10406638.2021.1872655

Taylor & Francis
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Different Versions of Atom-Bond Connectivity Indices of Some Molecular Structures: Applied for the Treatment and Prevention of COVID-19

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ABSTRACT

In theoretical chemical sciences, the different versions of the Atom-Bond Connectivity (ABC) indices are used in the statistical analysis of drug molecular structures which are helpful for chemical and medical scientists to find out the chemical and biological characteristics of drugs. In this article, we compute and analyze the different versions of the ABC indices of some significant molecular structures of drugs which are applied to test the medicinal and pharmaceutical characteristics, such as calculated 50% inhibitory concentration IC_{50} values and Half maximal effective concentration values for the Treatment and Prevention of COVID-19.

ARTICLE HISTORY
Received 7 September 2020
Accepted 30 December 2020

KEYWORDS
Chemical graph; molecular descriptor; ABC indices; regression models

MATHEMATICS SUBJECT CLASSIFICATION (2010)
05C90; 92E10; 94C15; 97M60

Introduction

Right now, the COVID-19 pandemic is upsetting human wellbeing and the economy around the globe. It is begun in Wuhan[1] and has quickly spread all over the world. The coronavirus (2019-nCoV) is a betacoronavirus and offers hereditary grouping and viral structure with extreme intense respiratory disorder coronavirus (SARS-CoV) and Middle East respiratory condition coronavirus (MERS-CoV). No particular prescription for the new illness is as of now accessible. It is, in this way, earnest to distinguish fitting antiviral specialists to battle the microorganism. A compelling examination to tranquilize disclosure is to test in the case of existing antiviral medications are effective in the treatment of related viral infections. Scientists tried some current antiviral drugs and got positive outcomes to hinder the disease and transmission of the 2019-nCoV in vitro.[2–6] Some of these compounds are favipiravir, ribavirin, remdesivir (GS5734), theaflavin, chloroquine, and hydroxychloroquine.

Let $G = (V, E)$ be a simple connected graph with vertex set $V(G)$ and edge set $E(G)$. A molecular graph is a graph such that its vertices correspond to the atoms and the edges to the bonds. Then the chemical structure of the drug can be expressed by a molecular graph, which is a model used to describe a synthetic compound. The degree (or, valency) $d(u)$ of a vertex u is the number of vertices adjacent to u. For all further notions and terminologies, we refer to.[7,8]

A molecular descriptor focuses on the numerical portrayal of a molecular structure as totally as conceivable Molecular connectivity indices are the most generally utilized molecular descriptors. These molecular meters, are known as graph invariants because of their definitions from the ideas of the graph theory and are the more generally referred to as topological indices as they

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International J.Math. Combin. Vol.1(2021), 1-10

PBIB-Designs and Association Schemes from Minimum Neighborhood Sets of Certain Jump Sizes of Circulant Graphs

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Abstract: A set $S \subseteq V$ of a graph $G = (V, E)$ is a Neighborhood set of G if $G = \bigcup_{v \in S} \langle N(v) \rangle$, where $\langle N(v) \rangle$ is the subgraph induced by v and all vertices adjacent to v. The neighborhood number, $\eta(G)$ is the minimum cardinality of a neighborhood set of G. The minimum neighborhood set S with $|S| = \eta(G)$ is called η-set. Generally, the partially balanced incomplete block(PBIB)-Designs are obtained from the family of strongly regular graphs. Surprisingly, in this paper we obtain the PBIB-Designs and m-association schemes for $1 \leq m \leq \lfloor \frac{p}{2} \rfloor$ arising from η -sets of certain jump sizes of circulant graphs.

Key Words: Association schemes, PBIB-designs, neighborhood sets, circulant graph.

AMS(2010): 05B05, 05C51, 05C69, 05E30, 51E05.

§1. Introduction

Let $G = (V, E)$ be a finite and undirected graph with no loops and multiple edges of vertex set V and edge set E. As usual $p = |V|$ and $q = |E|$ denote the number of vertices and edges of a graph G, respectively. For graph-theoretical terminologies which are not defined here, we follow [15].

For a given positive integer p, let $s_1, s_2, \cdots, s_t$ be a sequence of integers with $0 < s_1 < s_2 < \cdots < s_t < \frac{p+1}{2}$. The Circulant graph $C_p(s_1, s_2, \cdots, s_t)$ is the graph on p vertices labeled as $v_1, v_2, \cdots, v_p$ with vertex v_i adjacent to each vertex $v_{(i \pm s_j)(mod\ p)}$ and the values s_j; $1 \leq j \leq t$ are called jump sizes.

The applications are mainly in pure mathematics and technology which mysteriously reflects the abstract concrete dichotomy of the theory of Circulant. Also, which are important in digital encoding; this is a wondrous technology it enables devices ranging from computers to music players to recover from errors in transmission and storage of data and restore the original data. For more details, we refer to [17].

Bose and Nair [3] introduced a class of binary, equi-replicate and proper designs, which are called partially balanced incomplete block (PBIB)-Designs. In these designs, all the elementary contrasts are not estimated with the same variance. The variances depend on the type of association between the treatments. There are many applications of PBIB-Designs in cluster

[1]Received January 13, 2021, Accepted March 2, 2021.

Turkish Journal of Computer and Mathematics Education *Vol.12 No.10 (2021), 204-210*

Research Article

Information Set based Local Directional Number for Face Recognition

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Article History: Received: 10 January 2021; Revised: 12 February 2021; Accepted: 27 March 2021; Published online: 28 April 2021

Abstract: Many algorithms were proposed on face recognition based on the Holistic method, Feature-based method, and also more recently based on local texture patterns. Few local texture patterns utilize the positions of the intensity values like Local Directional Pattern and Local Directional number for obtaining the knowledge (features). This paper proposes the new features based on positions of intensity values and the intensity values in the patch of an image to compute membership function value. The information set concept is used to compute the features that are non-overlapping blocks to restrict the number of features. The proposed method is tested with benchmark databases like ORL and Sheffield and Yale. The classification of the subjects was done with Support Vector Machine (SVM) and K-nearest neighbour Classifier to validate the results. Bio-metric performance curves like Receiver operating Characteristics (ROC) and K-fold validation test is performed. The experimental result shows that the accuracy of recognition has improved over the previously mentioned methods.

Keywords: Face recognition; Fuzzy set; Mask set; Information set; SVM; KNN.

1. Introduction

Most of the research in face recognition are classified into two groups: i) Holistic methods in which the entire face(high dimensional) acts as an input to the recognition system, ii) Feature-based schemes which deal with local features such as the eyes, mouth, and nose and their statistics which are fed into the recognition system, and iii) Hybrid schemes, are derived from both the local features as well as the whole facial region are fed into the recognition system. Some popular face recognition approaches in representing the frontal face are as follows. That is Principal component Analysis derived from Eigenvalues and eigenfaces [1], neural networks [2], graph matching [3], hidden Markov model [4], Although appearance-based schemes are widely used because of their simplicity and implementation. The local texture features popular because of their robustness to illumination and other effects like glasses, facial growth, and variations in a pose. The Local-Global Graph algorithm [3] is a face recognition technique which uses Voronoi tessellation, and for segmenting the image, they used Delaunay graphs with this method a graph is built. The geometrical feature matching [5],-based schemes requires the most accurate and highly reliable facial feature detection and tracking algorithms, in many situations, this is difficult to accommodate. The template matching [5] and line edge map [6]. Local appearance-based texture features Local Binary Pattern LBP[7], Local Directional Pattern LDP[8], Local Ternary Pattern LTP[9], and many other variants of LBP have been proposed for face recognition. These approaches have been evaluated in terms of the facial representations adopted by them. The local texture descriptors based on LBP and its variants have widely used because of their sturdiness performance in uninhibited surroundings. LBP computes the local texture features for block or window based on a central pixel within the window. The adjacent pixels are assigned '0' or '1', taking central pixel as the threshold normally for the 3X3 window. We get an 8-bit binary code. In other words, The LBP operator codes the local texture feature of an image by binarizing the neighboring gray levels with respect to center value and thus forms an eight-bit binary pattern. The limitation of LBP is that it performs inadequately in the presence of substantial illumination change and random noise [9], a little variation in the gray level can change the LBP code.

The Local Directional Pattern (LDP) [8] adopts an interesting texture encoding scheme. In this directional edge, response values around a position are used by convolving an image with kirsch masks. In brief, LDP computes the code using kirsch masks set the values are set to '0' or '1' depending upon the responses from masks used. Local Directional Pattern (LDP) gives better results compared to LBP. LDP code dependent on the selection of the number of prominent edge responses, hence it may produce inconsistent patterns in uniform and near-uniform facial regions like forehead and chicks.

The Local Ternary Pattern (LTP) was proposed by Tan and Triggs [9]. It is an advanced version of the LBP code 2-valued to a 3-valued code that provides more consistency in uniform and near-uniform regions.

ISSN: 0974-5823 Vol. 6 (Special Issue, Nov.-Dec. 2021)

International Journal of Mechanical Engineering

Adhesive wear studies of Fiber reinforced Filler filled polymer Based composites-A Systematic Review

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Abstract:

Composite materials are becoming increasingly popular in today's world, with their use in a variety of commercial applications. With the increased use of these materials in Automobiles, it is critical to investigate their wear and friction performance. Since these materials experience vibration while Automobile movement. Many researchers are currently working to determine the wear and friction behaviour of polymers. The purpose of this paper is to provide critical information about the dry sliding impact on FRP Composites. The article mainly focused on the dry sliding response of polymers, with filler material and fiber reinforcement. Further polymers operating in different Environmental condition also studied. Furthermore, the reviews provide both continuous and statistical instruments for determining specimen wear behaviour.

Keywords: *Epoxy, Dry sliding wear, SEM, Taguchi technique, POD Machine.*

Introduction:

Polymer composites are used in a variety of applications and under a variety of operational situations. Polymer composites are used in several industries, including the automotive, aerospace, naval, and, more recently, oil and gas industries. Due to their outstanding strength, cheap cost, and high strength-to-weight ratio, polymers and polymer-based materials are often utilised. [1-3] FRPs are extensively used in the self-propelled vehicle and flying machine industries, as well as in the construction of spacecraft and maritime vehicles, due to their exceptional qualities [4-6]. Many applications need polymer composites with machine driven behaviour and dry sliding wear properties. Specimens of polymer were subjected to a battery of tests to forecast their resistance to dry sliding impact and guarantee their strength and service life. The wear process is characterised by the slow loss of material resulting from the sliding motion of two rubbing surfaces. Sixth, wear effects were made public to ensure that components are used properly. Several studies have shown the resistance to wear of polymer matrix specimens subjected to sliding and abrasive wear. It is governed by the material's general characteristics and the external wear state, which is

ISSN: 0974-5823 Vol. 6 (Special Issue, Nov.-Dec. 2021)

International Journal of Mechanical Engineering

Design and Fabrication of Electric Tiller Machine with Fertilizer Dispenser for Arecanut and Coconut Plantation

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Abstract

This paper focuses on the conception and production of an electric tiller machine for arecanut and coconut plantations that includes a fertiliser dispenser. When designing the electric power tiller, a software application called Solid Edge was used. Following the findings of our research, electric power tiller was fabricated in a manner that was compatible for engineering applications.

Keywords: *Electric tiller, power tiller, ecofriendly, fertilizer dispenser, manuring*

I. Introduction

A power tiller is an agricultural machine used for preparation of soil, weeding, sowing which contains a set of rotating blades mounted wheel type housing and it is powered by IC engine or electric motor. Through literature review and also the practical applications, came across several advancements and different design types in the field of power tiller. Below we have discussed a few types of power tillers.

Four Wheeled Power Tillers:

There are a variety of power tillers available in the market for big open farms as well as for medium open farms. One such type of tiller is the four wheeled power tiller. These tillers are used in open farms such as paddy cultivation, wheat cultivation etc. However, these huge power tillers cannot be used in areca nut farms because there will be no space for the tiller to move around. Such tillers are efficient, but they cause noise and air pollution [1]. Figure 1 shows the conventional four wheeled power tiller.

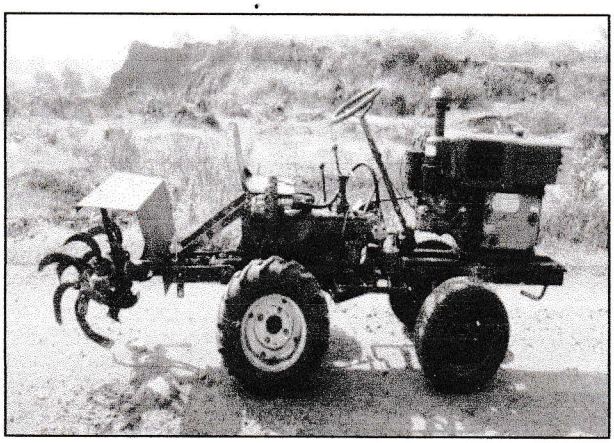

Fig 1. Four wheeled power tiller

ISSN: 0974-5823 Vol. 6 (Special Issue, Nov.-Dec. 2021)

International Journal of Mechanical Engineering

DESIGN AND FABRICATION OF HYBRID CLEANING ROVER

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Abstract

This journal paper aims to design and fabrication of hybrid cleaning rover. This research work predominantly offers an authentic and trustworthy solution for the typical garbage collection problems. Commercially available solid edge software was used for modeling the hybrid cleaning rover. Based on the research and calculation, carried out the fabrication of hybrid cleaning rover which aims to minimize manpower and time consumption in cleaning the land surface.

Keywords: *Cleaning Rover, Garbage, Waste, Eco-friendly*

I. Introduction

Waste Management is the major problem faced around the nation and world. Waste management is the practices and procedures needed to control from its origin to ultimate deposition. It typically comprises the collection, shifting, treatment and discarding the waste, along with supervising and controlling the waste management system. Waste management deals with different sort of wastes, which includes industrial, chemical, biological and domestical. Waste is produced by human activity, which can pose adverse effects on animals and human being [1].

India has been facing major problem related to collection of waste [2]. Present system in our country unable to deal with the large amount of waste generated from the different sources, which can have adverse effects on the environment [3]. Indian government has also been striving their best minimize waste from different sources. Government has also been launched different schemes towards cleanliness. Recently, Indian government has come up with an initiative called as "Clean India Mission", through that initiative they are making awareness regarding waste management and their problems and solutions [4]. Thus, we come up with an idea of hybrid cleaning rover (Garbage Collector), which operates under the automation. The Hybrid Cleaning Rover is the solution for cleaning of foot path, public places, beaches etc., by reducing human efforts. This rover is a mechatronics-based project, which will be helpful for collection of garbage. Since this hybrid cleaning rover operates via remote or mobile application, it reduces the human effort and time consumption in the collection of waste. This hybrid cleaning rover mainly relies on rechargeable lead acid battery. In addition, it can also charge by the use of solar energy. Therefore, we have come up with a solution to establish a Hybrid Cleaning Rover.

II. Objective

To design and fabricate hybrid cleaning rover. To reduce pollution which is being generated from household, public places and beaches? To increase the performance efficiency. To reduce the human effort and time consumption in collecting garbage. To make an eco-friendly and economically reliable machine.

ASTES

Advances in Science, Technology and Engineering Systems Journal Vol. 6, No. 3, 263-270 (2021)

www.astesj.com

ASTESJ

ISSN: 2415-6698

Dry Sliding Wear Behaviour of ZA27/ MoS2 Metal Matrix Composite

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ARTICLE INFO

Article history:
Received: 22 March, 2021
Accepted: 02 May, 2021
Online: 27 May, 2021

Keywords:
ZA 27
Molybdenum disulphide (MoS_2)
Wear Loss
Reinforced

ABSTRACT

The Present work is to investigate effect of dry sliding wear behaviour of ZA27 base alloy, after reinforcing it with Molybdenum Di Sulphide (MoS_2) particles from 0% to 4% in five steps. To examine the wear behaviour of both reinforced and un-reinforced material, dry or unlubricated pin on disc tests were conducted. These tests were conducted at varying speeds and loads of 1.5m/s,3m/s, 4.6m/s, 6.15 m/s and 5N, 10N, 20N and 25Nrespectively with a constant sliding distance of 1000m. The results revealed that, MoS2 reinforced ZA27 alloy showed less wear loss as compared to base ZA27 alloy. Delamination, abrasion, and adhesive wear were observed at high speed and load. Worn surface of tested specimen were analysed and examined through Scanning Electron Microscope (SEM). To confirm presence of Molybdenum disulphide in prepared material, Energy Dispersion X-ray (EDX) test is carried out for 4% of Molybdenum disulphide reinforced ZA-27 material.

1. Introduction

From the last few decades, metal matrix composite has played a vital role in the improvement of physical and mechanical properties of traditional materials. Also, it plays a significant impact from an economic point of view due to its wide range of application in engineering material. It will always be a choice of many researchers to further improve its performance through changing or varying its composition[1]-[5]. Maximum work was done on the various Aluminium series in the field of non-ferrous metal. In comparison with aluminium less scope is given to other non-ferrous metal like brass, copper, magnesium, and zinc.

Pure zinc cannot compete with other non-ferrous material. But zinc when reinforced with the various proportion of aluminium, at certain composition, it can be observed that zinc properties improved to such level that it can be easily compete with other traditional non-ferrous material such as copper, brass, bronze, aluminium and also cast iron in the field of moderate load, medium speed and moderate operating temperature, generally ZA 27 applied for bearing and tribo material [6]-[9]. Many researchers have experienced that 27% of aluminium reinforcement shows good mechanical and physical properties compared to other percentages. ZA27 stands for zinc containing 27 percentage of aluminium.ZA27 possesses tribo-mechanical properties, eco-friendly, excellent fluidity and foundry castability as well as low initial cost. Resistance to corrosion and high mechanical strength at room temperature are other admirable properties of ZA27 alloy [10]-[12]. These exceptional properties have motivated the researchers to further enhance its mechanical and tribological properties through reinforcing ZA 27alloy with a different metal, non-metal and ceramics with varying current alloy composition or changing method of casting. As a result, author [10],studied wearing of ZA 27 after Reinforcing with 2% graphite. In [13], reinforced graphite with ZA 27, varying its size and percentages to study it's mechanical properties. In [14], ZA 27is experimented with zircon by its varying percentage. Author [7] , reinforced small quantity of Manganese (Mn) with a weight range of 0.1% to 0.7% in ZA27 metal using the normal casting method. In paper [15], tribological test is conducted after reinforcing Mn content with ZA27 alloy. In paper [16], Za27 with 2% Magnesium (Mg) material is tested. Author [12], presented the paper on results of tribological investigations of composites with substrate made of the ZA-27 alloy reinforced by

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Hardness Examination of ZA 27/MoS2 Hybrid metal matrix composite using Vicker and Brinell hardness test

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Article History Received: 10 January 2021; Revised: 12 February 2021; Accepted: 27 March 2021; Published online: 28 April 2021

Abstract: ZA 27 is a family group of Zinc Aluminium alloy which possess excellent mechanical and tribological properties. In present work, Vicker and Brinell hardness examination of ZA27 is carried out after reinforcing it with MoS2 particle in proportion of 0%, 1% and 2% using the stir casting method. Casted material is machined and turned surface that can be placed in a hardness testing machine. Before placing in a machine, flattened surfaces of both reinforced and unreinforced materials are mirror polished using sandpaper. Examination of both Vicker and Brinell hardness test results is carried out for both unreinforced and reinforced ZA 27/MoS2 hybrid metal matrix composites. Result revealed that as the percentage of MoS2 increased, the hardness of ZA 27 alloy also increased but a different range of result observed for Brinell and Vickers testing machine which is discussed in this paper.

Keywords: ZA 27, MoS2, Vicker hardness, Brinell Hardness

1. Introduction

Definition of harness according to The Metals Handbook is "Ability of the metal to resist plastic deformation, generally by indentation. However, the term hardness may also refer to stiffness or temper or abrasion or cutting to resistance to scratching. It is the one of mechanical characteristic of a metal, which gives it the ability to resist being permanently, deformed (bent, broken, or have its shape changed), when a load is applied. The **more** the hardness of the metal, the**more** resistance it has to deformation.

Hardness is one of the most characteristic properties of materials and also plays a key role in the development of humanity, as it has made it possible to build increasingly more sophisticated devices and machines. The first modern method for measuring metal hardness is credited to Brinell, who used a hard steel ball as the indenter to measure the hardness. Instead, several other hardness tests, including the Vickers, Berkovich, Knoop and Rockwell tests, were developed.

Hardness test may provide valuable metallic material details such as tensile strength, hardness resistance, and ductility. The test is typically useful for the collection of components, for process and quality assurance and for commercial product acceptance testing.

Even hardness one of characterization of metal, many researchers studied and analysed various parameter of hardness and various hardness testing machine was used to study the hardness. Samuel R. Low [1] discussed Rockwell

hardness testing methods, it's significance, procedure and conducted some case studies of obtained result in detail. Shakeel [2]A analysed and written research article on Hardness measured with traditional Vickers and Martens hardness method, in which comparison between both hardness method was carried out. P. Zhang[3] explained the relationship between strength and hardness. B Y R. Hill [4] researched on the theoretical aspect of Brinell hardness test.

M. Tiryakioğlu[5] conducted detailed research regarding hardness strength relation for Aluminium Alloy and developed empirical relationship between the strength and hardness D.Tabor [6] enlighten various hardness testing methods and their significance in his review article. G SANGAIAH [7] studied the microhardness testing of alum crystals. ZA27 stands for zinc containing 27 percentage of aluminium.ZA27possesses good mechanical and tribological properties as well as low initial cost [8][9].

In present work, the Vicker hardness test and Brinell hardness test are conducted for za 27/ MoS2 hybrid composite which is prepared after the stir casting method. till now no literature found for the comparative study of these two hardness result for mentioned composite. So aim of present work is to determine Brinell and Vicker hardness of ZA 27 base metal and 1% and 2 % MoS2 reinforced ZA 27 alloy.

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Article

Biodiesel Production Using Modified Direct Transesterification by Sequential Use of Acid-Base Catalysis and Performance Evaluation of Diesel Engine Using Various Blends

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Citation: Khan, T.M.Y.; Badruddin, I.A.; Soudagar, M.E.M.; Khandal, S.V.; Kamangar, S.; Mokashi, I.; Mujtaba, M.A.; Hossain, N. Biodiesel Production Using Modified Direct Transesterification by Sequential Use of Acid-Base Catalysis and Performance Evaluation of Diesel Engine Using Various Blends. *Sustainability* **2021**, *13*, 9731. https://doi.org/10.3390/su13179731

Academic Editors: Juan José Hernández Adrover and Barry D. Solomon

Received: 5 July 2021
Accepted: 27 August 2021
Published: 30 August 2021

Abstract: Biodiesel is a seemingly suitable alternative substitute for conventional fossil fuels to run a diesel engine. In the first part of the study, the production of biodiesel by modified direct transesterification (MDT) is reported. An enhancement in the biodiesel yield with a considerable reduction in reaction time with the MDT method was observed. The required duration for diesel and biodiesel blending was minimized including glycerol separation time from biodiesel in the MDT method. The development in the automotive sector mainly focuses on the design of an efficient, economical, and low emission greenhouse gas diesel engine. In the current experimental work *Ceiba pentandra*/*Nigella sativa* and diesel blends (CPB10 and NSB10) were used to run the diesel engine. A variety of approaches were implemented to improve the engine performance for these combinations of fuels. The fuel injector opening pressure (IOP) was set at 240 bar, the torriodal re-entrant combustion chamber (TRCC) having a six-hole injector with a 0.2 mm orifice diameter each, provided better brake thermal efficiency (BTE) with lower emissions compared with the hemispherical combustion chamber (HCC) and trapezoidal combustion chamber (TCC) for both CPB10 and NSB10. CPB10 showed better performance compared with NSB10. A maximum BTE of 29.1% and 28.6% were achieved with CPB10 and NSB10, respectively, at all optimized conditions. Diesel engine operation with CPB10 and NSB10 at 23° bTDC fuel injection timing, and 240 bar IOP with TRCC can yield better results, close to a diesel run engine at 23° bTDC fuel injection timing, and 205 bar IOP with HCC.

Keywords: *Ceiba pentandra*; *Nigella sativa*; sequential acid-base catalysts; nozzle geometry; combustion chamber shapes; efficient engines

1. Introduction

In the perspective of green emissions, biodiesel was regarded as a supplement to diesel as fuel [1,2]. Being a renewable fuel with low emission characteristics, biodiesel production has spiked. Biodiesel is produced by the transesterification of triglycerides with methanol using a catalyst [3]. There are rigorous technological proliferations to make

energies

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Article

Performance of Common Rail Direct Injection (CRDi) Engine Using Ceiba Pentandra Biodiesel and Hydrogen Fuel Combination

T. M. Yunus Khan [1,2,*], Manzoore Elahi M. Soudagar [3,*], S. V. Khandal [4], Syed Javed [2], Imran Mokashi [5], Maughal Ahmed Ali Baig [6], Khadiga Ahmed Ismail [7] and Ashraf Elfasakhany [8]

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Citation: Khan, T.M.Y.; Soudagar, M.E.M.; Khandal, S.V.; Javed, S.; Mokashi, I.; Baig, M.A.A.; Ismail, K.A.; Elfasakhany, A. Performance of Common Rail Direct Injection (CRDi) Engine Using Ceiba Pentandra Biodiesel and Hydrogen Fuel Combination. *Energies* **2021**, *14*, 7142. https://doi.org/10.3390/en14217142

Academic Editor: Jeffrey S. Cross

Received: 18 August 2021
Accepted: 14 October 2021
Published: 1 November 2021

Publisher's Note: MDPI stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Abstract: An existing diesel engine was fitted with a common rail direct injection (CRDi) facility to inject fuel at higher pressure in CRDi mode. In the current work, rotating blades were incorporated in the piston cavity to enhance turbulence. Pilot fuels used are diesel and biodiesel of Ceiba pentandra oil (BCPO) with hydrogen supply during the suction stroke. Performance evaluation and emission tests for CRDi mode were carried out under different loading conditions. In the first part of the work, maximum possible hydrogen substitution without knocking was reported at an injection timing of 15° before top dead center (bTDC). In the second part of the work, fuel injection pressure (IP) was varied with maximum hydrogen fuel substitution. Then, in the third part of the work, exhaust gas recirculation (EGR), was varied to study the nitrogen oxides (NOx) generated. At 900 bar, HC emissions in the CRDi engine were reduced by 18.5% and CO emissions were reduced by 17% relative to the CI mode. NOx emissions from the CRDi engine were decreased by 28% relative to the CI engine mode. At 20%, EGR lowered the BTE by 14.2% and reduced hydrocarbons, nitrogen oxide and carbon monoxide by 6.3%, 30.5% and 9%, respectively, compared to the CI mode of operation.

Keywords: hydrogen (H_2); biodiesel of ceiba pentandra oil (BCPO); hydrogen fuel flow rate (HFR); exhaust gas recirculation (EGR); common rail direct injection (CRDi)

1. Introduction

Concerns about fossil fuels depletion and economic viability along with environmental regulations have projected biodiesels as a feasible option that works for the internal combustion (IC) engine. There has been a surge in the implementation of diesel engines in the automotive sector which are energy efficient, durable and reliable. Despite these credits, the NOx emissions are of critical concern. Dual fuel utilization has resulted in improved performance of diesel engines with considerable NOx reduction [1–3]. The hydrogen-diesel engine (heavy duty) was reported to have smooth operational condition at 98% H_2 composition at lower loads. A similar operational capacity was noticed at 85%

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Article

Adsorption Method for the Remediation of Brilliant Green Dye Using Halloysite Nanotube: Isotherm, Kinetic and Modeling Studies

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Citation: Ukkund, S.J.; Puthiyillam, P.; Alshehri, H.M.; Goodarzi, M.; Taqui, S.N.; Anqi, A.E.; Safaei, M.R.; Ali, M.A.; Syed, U.T.; Mir, R.A.; et al. Adsorption Method for the Remediation of Brilliant Green Dye Using Halloysite Nanotube: Isotherm, Kinetic and Modeling Studies. *Appl. Sci.* **2021**, *11*, 8088. https://doi.org/10.3390/app11178088

Academic Editors: Ştefan Ţălu, Sławomir Kulesza and Ilya A. Morozov

Received: 21 July 2021
Accepted: 25 August 2021
Published: 31 August 2021

Abstract: The first-ever use of halloysite nanotube (HNT), a relatively low-cost nanomaterial abundantly available with minor toxicity for removing brilliant green dye from aqueous media, is reported. The factors affecting adsorption were studied by assessing the adsorption capacity, kinetics, and equilibrium thermodynamic properties. All the experiments were designed at a pH level of around 7. The Redlich-Peterson isotherm model fits best amongst the nine isotherm models studied. The kinetic studies data confirmed a pseudo model of the second order. Robotic investigations propose a rate-controlling advance being overwhelmed by intraparticle dispersion. The adsorbent features were interpreted using infrared spectroscopy and electron microscopy. Process optimization was carried out using Response Surface Methodology (RSM) through a dual section Fractional Factorial Experimental Design to contemplate the impact of boundaries on the course of adsorption. The examination of fluctuation (ANOVA) was utilized to consider the joined impact of the boundaries. The possibilities of the use of dye adsorbing HNT ("sludge") for the fabrication of the composites using plastic waste are suggested.

Turkish Journal of Computer and Mathematics Education *Vol.12 No.10 (2021), 294-300*

Research Article

Visual Impairment Assistance System

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Article History: Received: 10 January 2021; Revised: 12 February 2021; Accepted: 27 March 2021; Published online: 28 April 2021

Abstract: Visually challenged people have no knowledge of outdoor hazards and require visual aids to avoid threats. Furthermore, they face many difficulties compared to other people in doing their day to day work. Even though they have guide canes to help them it becomes difficult to recognize the faces of the people. They find it difficult to identify the familiar as well as unknown faces. Recognizing familiar faces confidently without anyone's help is a very difficult task for a blind person. This model uses deep learning techniques that can identify familiar and unknown faces for visually impaired people. Apart from recognizing faces, blind people find it difficult to read simple signboards and important instructions. A few of the examples are the menu cards of the restaurants, Direction boards, locating washrooms, etc. The proposed model will help the visually challenged people to read the images by converting the image into a text and then converting the same text which is read into audio. For converting the image to text, OCR technology was used. Recognizing face is a very important task for the visually challenged people as a failure of this may even lead to life-threatening problems and reading sign boards and other simple text is also very important in the daily life of visually challenged people. Hence the development of this visual impairment assistance system will help the visually challenged people to live a better life.

Keywords: Deep learning techniques, OCR technology.

1. Introduction

According to the world blind union, there are about 253 million people around the world with serious vision problems and about 47 million of them are blind [1]. Visually disabled people can only sense light and darkness, and cannot see things in front of them. Furthermore, they move around based on their senses and experiences with the aids of guidance cans to detect and avoid collision with moving and stationary obstacles. Sometimes, the guide canes don't offer their required safety levels because they don't provide perception of the obstacles or objects types and also, do not give information about the walking path. Guide canes don't help visually challenged people to identify the faces of the known and unknown people.

The main aim of this proposed system is to develop a system that helps blind people to survive in the community without the help of a second person. It will help the blind people to perform their daily activities normally and will help in problems such as communication with familiar and strange objects around them. This system involves three main modules.

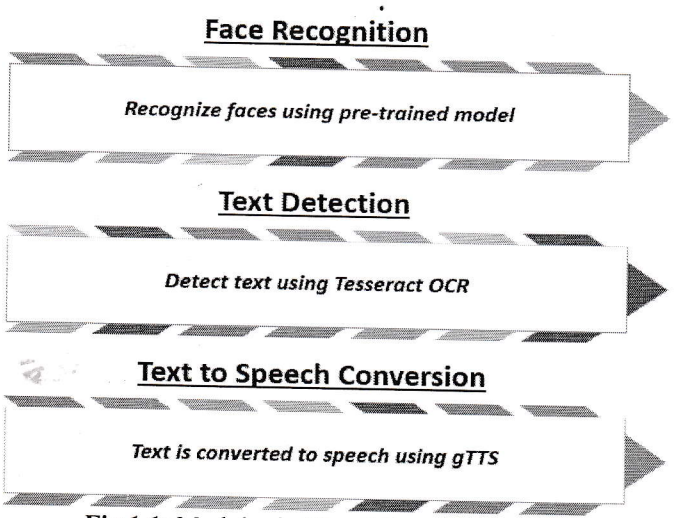

Fig 1.1: Modules in Visual Impairment Assistance System

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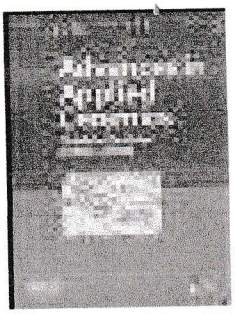

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ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/yaac20

Zirconia: as a biocompatible biomaterial used in dental implants

V. Sharanraj , C. M. Ramesha , K. Kavya , Vasantha Kumar , M. Sadashiva , B. R. Chandan & M. Naveen Kumar

To cite this article: V. Sharanraj , C. M. Ramesha , K. Kavya , Vasantha Kumar , M. Sadashiva , B. R. Chandan & M. Naveen Kumar (2020): Zirconia: as a biocompatible biomaterial used in dental implants, Advances in Applied Ceramics, DOI: 10.1080/17436753.2020.1865094

To link to this article: https://doi.org/10.1080/17436753.2020.1865094

Published online: 23 Dec 2020.

International Journal of Thermal Sciences xxx (xxxx) xxx

Contents lists available at ScienceDirect

International Journal of Thermal Sciences

journal homepage: http://www.elsevier.com/locate/ijts

Nusselt number analysis from a battery pack cooled by different fluids and multiple back-propagation modelling using feed-forward networks

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ARTICLE INFO

Keywords:
Battery pack
Coolants
Prandtl number
Nusselt number
Reynolds number
Conductivity ratio

ABSTRACT

In this article, analysis of average Nusselt number (Nu_{avg}), which indicates the heat removal from the battery pack cooled by flowing fluid is carried out considering coupled heat transfer condition at the pack and coolant interface. Five categories of coolant, mainly gases, common oils, thermal oils, nanofluids, and liquid metals, are selected. In each coolant category, five fluids (having different Prandtl number *Pr*) are selected and passed over the Li-ion battery pack. The analysis is made for different conductivity ratio (*Cr*), heat generation term (Q_{gen}), Reynolds number (*Re*), and *Pr*. *Pr* varying in the range 0.0208–511.5 (25 coolants) and *Cr* for each category of coolant having its own upper and lower limit are used to analyze the heat removed from the battery pack. Using single feed-forward network and integrating two feed-forward networks having multi-layers with back-propagation is employed for artificial neural network (ANN) modelling. In this modelling, the concept of the main network and space network is devised for multiple back propagation (MBP). The numerical analysis revealed that the temperature distribution in battery and fluid is greatly affected by increasing *Cr*. The maximum temperature located close to the upper edge of battery is found to get reduced significantly with the increase of *Cr*, but upto a certain limit above which reduction is marginal. The analysis carried out reveals that *Cr* and Q_{gen} have no role in improving Nu_{avg} while *Pr* and *Re* vary it significantly in each step. Moreover, Nu_{avg} is found to increase with *Re* continuously irrespective of any *Cr* and Q_{gen}. While, for oils with an increase in *Pr* and *Re*, Nu_{avg} was found to reduce significantly. Nanofluids are found to be more effective in improving heat transfer from the battery pack when cooled by flowing nano-coolants over it. The MBP networks proposed are successfully trained, and hence they can be used for prediction of Nu_{avg}.

1. Introduction

The increasing price of oil and environmental concerns has lead the automotive industry to develop appropriate alternatives such as HEV (hybrid electric vehicles) in place of oil-based engines. A recent survey by the energy department of US has shown that only 15% of the fuel is used for functioning of the vehicle and its components in conventional IC engines, and more than 40% of the fuel is wasted as heat through emissions [1]. The hybrid vehicles use technology designed to decrease the use of gasoline and diesel. The HEVs are usually operated by lithium-ion (Li-ion), nickel-zinc, and lead-acid batteries to decrease the use of gasoline and diesel fuel. Among these, Li-ion battery (LIB) can be considered as the most important option owing to high energy density, high stability, and slow discharge rates. Nevertheless, the issues related to the thermal safety of LIB cannot be neglected [2–5]. The heat generation rate in these battery cells during charging is on average of 2–20 W per cell with a peak of up to 50 W, thus increasing the temperature of the battery cells [6]. Therefore cooling of these battery cells becomes necessary. Also, the LIBs have to convert more chemical energy into heat energy by a series of exothermic reactions during abusive conditions and operations at elevated ambient temperatures. This leads to more heat buildup in the battery, producing a substantial deterioration and the condition of fire, burning, and explosion hazards [7–9]. Hence, BTMS

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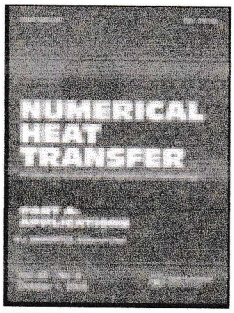
https://doi.org/10.1016/j.ijthermalsci.2020.106738
Received 3 April 2020; Received in revised form 23 August 2020; Accepted 9 November 2020



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Numerical Heat Transfer, Part A: Applications
An International Journal of Computation and Methodology

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/unht20

Optimization and analysis of maximum temperature in a battery pack affected by low to high Prandtl number coolants using response surface methodology and particle swarm optimization algorithm

Asif Afzal , Imran Mokashi , Sher Afghan Khan , Nur Azam Abdullah & Muhammad Hanafi Bin Azami

To cite this article: Asif Afzal , Imran Mokashi , Sher Afghan Khan , Nur Azam Abdullah & Muhammad Hanafi Bin Azami (2020): Optimization and analysis of maximum temperature in a battery pack affected by low to high Prandtl number coolants using response surface methodology and particle swarm optimization algorithm, Numerical Heat Transfer, Part A: Applications, DOI: 10.1080/10407782.2020.1845560

To link to this article: https://doi.org/10.1080/10407782.2020.1845560

Published online: 22 Nov 2020.

Journal of Thermal Analysis and Calorimetry
https://doi.org/10.1007/s10973-020-10063-9

Maximum temperature analysis in a Li-ion battery pack cooled by different fluids

Imran Mokashi[1,2] · Sher Afghan Khan[1] · Nur Azam Abdullah[1] · Muhammad Hanafi Bin Azami[1] · Asif Afzal[3]

Received: 2 November 2019 / Accepted: 10 July 2020

Abstract

The use of Li-ion battery in electric vehicles is becoming extensive in the modern-day world owing to their high energy density and longer life. But there is a concern of proper thermal management to have consistent performance. Therefore, proper cooling mechanism to have a good life and reliability on the battery system is necessary. The main objective of this analysis is to assess the maximum temperature that causes thermal runaway when the battery pack is cooled by several fluids. Five categories of coolants are passed over the heat-generating battery pack to extract the heat and keep the temperature in the limit. Different kinds of gases, conventional oils, thermal oils, nanofluids, and liquid metals are adopted as coolants in each category. This analysis is a novel study which considers different categories of coolant and conjugate heat transfer condition at the battery pack and coolant interface. In each group of coolant, five types of fluids are selected and analyzed to obtain the least maximum temperature of battery. The flow Reynolds number (Re), heat generation (Q_{gen}), and conductivity ratio (Cr) are other parameters considered for the analysis. The Nusselt number for air and water as coolant with increase in Re is studied separately at the end. The maximum temperature is found to increase with Q_{gen} and decrease for Re and Cr. Thermal oils, nanofluids, and liquid metals are found to provide maximum temperature in the same range of 0.62 to 0.54. At the same time, gases have nearly the same effect at different values of Re and Cr.

Keywords Li-ion battery · Conjugate · Maximum temperature · Coolants · Conductivity ratio · Heat generation

List of symbols

Cr	Conductivity ratio
L	Length of the battery cell (m)
k	Thermal conductivity (W m^{-1} k^{-1})
q'''	Volumetric heat generation (W m^{-3})
Q_{gen}	Dimensionless volumetric heat generation
Pr	Prandtl number
Re	Reynolds number
T*	Temperature (°C)
T	Non-dimensional temperature
u	Velocity along the axial direction (m s^{-1})
U	Non-dimensional velocity along the axial direction
u_∞	Free stream velocity (m s^{-1})
v	Velocity along the transverse direction (m s^{-1})
V	Non-dimensional velocity along the transverse direction
w	Half-width (m)
W_s	Non-dimensional width
Nu_{avg}	Average Nusselt number

Greek symbols

α	Thermal diffusivity of fluid (m^2 s^{-1})
ν	Kinematic viscosity of the fluid (m^2 s^{-1})
ρ	Density of fluid (kg m^{-3})
μ	Dynamic viscosity

Subscripts

c	Center
f	Fluid domain
b	Battery
∞	Free stream
max	Maximum

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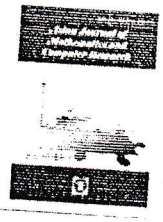
Published online: 03 August 2020

Asian Journal of Mathematics and Computer Research

25(1): 1-7, 2018

ISSN: 2395-4205 (P), ISSN: 2395-4213 (O)



ARITHMATIC-GEOMETRIC INDEX OF GENERALIZED TRANSFORMATION GRAPHS

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AUTHORS' CONTRIBUTIONS

This work was carried out in collaboration between both authors. Author AK designed the study and wrote the protocol. Author RJ gathered the initial data, interpreted the data and produced the initial draft. Both authors read and approved the final manuscript.

ARTICLE INFORMATION

Editor(s):

(1) Habil. M. Marin, Transilvania University of Brasov, Romania.

Reviewers:

(1) Ashish Tiwari, Nit Kurukshetra, India.

(2) Cahit Taşdemir, Bitlis Eren University, Turkey.

Received: 10th February 2018

Accepted: 16th April 2018

Published: 1st May 2018

Original Research Article

ABSTRACT

The topological indices play an importatnt role in the studies of quantitative structure property relationship (QSPR) and quantitative structre activity relationship (QSAR) in mathematical chemistry. In this paper, the expressions for the *Arithmetic – Geometric*(AG_1) index of the generalized transformation graphs G^{xy} and for their complement graphs are obtained.

Keywords: *Arithmetic - geometric* (AG_1) index; generalized transformation graphs

Mathematics Subject Classification: 05C76, 05C07, 92E10.

1 Introduction

In the context of new technologies for molecular discovery, such as combinatorial chemistry and high-throughput screening, topological indices play an important role for the analysis of molecular diversity and lead to optimization through well-established structure-property relationships [1]. The study of topological indices play a prominent role in Quantitative structure-activity relationships (QSAR) and Quantitative structure property relationships (QSPR) study. Topological indices correlate the certain physico-chemical properties (boiling point, enthalpy of vaporization, stability, strain energy etc) of chemical compounds specially organic family. For more details, see [2, 3, 4]. Let G be a simple, undirected graph with n vertices and m edges. Let $V(G)$ and $E(G)$ be the vertex

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ARITHMATIC-GEOMETRIC INDEX OF GENERALIZED TRANSFORMATION GRAPHS

ANJUM KHAN ; RAJU JUMMANNAVER

***Asian Journal of Mathematics and Computer Research*, Volume 25, Issue 1, Page 1-7**

Published: 1 May 2018

Abstract

The topological indices play an importatnt role in the studies of quantitative structure property relationship (QSPR) and quantitative structre activity relationship (QSAR) in mathematical chem- istry. In this paper, the expressions for the *Arithmetic - Geometric*(AG_1) index of the generalized transformation graphs G^{xy} and for their complement graphs are obtained.

Keywords: Arithmetic - geometric (AG1) index; generalized transformation graphs

Journal of Radioanalytical and Nuclear Chemistry (2018) 316:609–617
https://doi.org/10.1007/s10967-018-5825-1

Studies on distribution of radionuclides and behavior of clay minerals in the soils of river environs

C. S. Kaliprasad[1] · P. R. Vinutha[2] · Y. Narayana[1]

Received: 25 December 2017 / Published online: 23 March 2018

Abstract
In the present investigation, the activity concentrations of radionuclides in the soils of Cauvery river environs were measured using HPGe gamma ray spectrometer. FTIR spectroscopy was used to find minerals present in soil samples. The mean values of ^{40}K, ^{226}Ra and ^{232}Th in the soil samples was found to be 132.9, 22.95 and 26.88 Bq kg^{-1} respectively. The estimated absorbed dose rate and hazard indices were found to be within the safety limits. The extinction coefficients for quartz, sepiolite and kaolinite in soil varied from 0.64 to 37.24, 0.39 to 34.47 and 9.66 to 35.81 respectively. The correlation matrix showed that the clay mineral like kaolinite influences the increase in activity concentration of radionuclides.

Keywords Cauvery river · Radionuclides · Clay minerals · Dose rate · Radium · Gamma ray spectrometer

Introduction

The assessment of gamma radiation dose delivered to the human population through natural background radiation is important because the natural radiations are the largest contributors to the population dose around the world [1]. The total radiation dose received by human population is about 2.8 mSv per year, out of this 85% (2.4 mSv) comes from the natural background radiation exposure [2]. The main sources of natural background radiation are cosmic rays and terrestrial radioactive decay series ^{238}U and ^{232}Th and singly occurring radionuclides like ^{40}K present in soil [3]. The activity concentration of radionuclides in soil depends on the geochemical, geological and geographical circumstances of the location. Some investigations have reported that the mobility and activity of radionuclides depends on the vital physico-chemical parameters [4]. In the soil, clay minerals are one of the major constituents. Organic matter and clay are known to have high cation exchange capacity, that helps to absorb and exchange the cations to fix the radionuclides [5]. Clay mainly contains alumina, silica, and water, which also contains small quantities of iron, alkali metals, and alkaline earths. Clay materials are classified into different layered structure based on the difference in their layered structure. There are few classes of clay, such as mica (illite), serpentine, kaolinite, smectites (montomorillonite, saponite), vermiculite, pylophyllite (talc), and sepiolite [6]. Therefore, the measurement of natural radionuclides concentrations and associated dose rate is important. The characterization of soil and its minerals is vital to understand the influence to the increase of activity. In view of this, in the present investigation the role of minerals in the natural radioactivity level of Cauvery river basin soil has been studied.

Materials and methods

Study area

The Cauvery river is one of the major rivers in South India, which originates at Brahmagiri hills in the Western Ghats and it flows through Karnataka, Kerala and Tamil Nadu. The length of the river within Karnataka is 320 km (total 800 km) from the origin of the river and it covers an area of

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PBIB-DESIGNS AND MATRIX FORM OF ASSOCIATION SCHEMES ARISING FROM MINIMUM EDGE COVERING SETS OF SOME CIRCULANT GRAPHS

Article · March 2018

DOI: 10.5281/zenodo.1199428

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Stiffening of Earthquake Resistant Green Buildings

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Abstract: ***Structural Engineers major challenge in present situation is constructing a seismic resistant structure. Energy efficiency and usage has become increasingly important to the public, government bodies and industries in recent years. Major per capita energy usage is associated with domestic used energy resources which also responsible for greenhouse gases. In optimizing energy efficiency of buildings, openings play a major role as they largely influence the energy load. This study aims to increase lateral stiffness of openings by providing different bracings. Frames considered are – (a) Bare frame, (b) Diagonal bracing, (c) Frame with X bracing, (d) Frame with V bracing, and (e) Frame with Chevron (inverted V) bracing.***

Key words: *Structural Engineers, Energy efficiency, Earthquake, Lateral stiffness, Bracings.*

1. INTRODUCTION

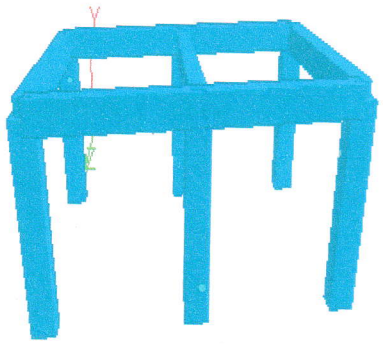
Buildings are major contributor of global major energy use produces significantly excess carbon emissions than those in the transportation automobiles, and so they are the major energy consuming sector in the world. As the responsibility about the environmental effects of building is increasing, private and public bodies are steadily requiring the building activities to design and construct structures with minimum environmental effect [1]. Accordingly, many researches have been done on energy efficient building design. In this regard, window openings are responsible for more than ten percent of the building energy load and so are understand to have considerable impact on the total energy usage [2].

1.1 IMPACT OF WINDOWS ON BUILDING ENERGY LOAD

As one of the major approaches to minimum energy design is to invest in the building's arrangements and enclosure [3], many research considered the influence of enclosures on the energy load. Several works have been done on the influence of window design on building energy load regarding the elements such as openings size, position, glazing characteristics and orientation. In the beginning, one or two factors were analyzed simultaneously. The effect of openings size was analyzed only [4], and more research were done on position and openings size [5].Glazing characteristics and size are also taken into account [6], and the direction and window size were studied at the same time [7]. In addition, few earlier studies considered the effect of orientation, window size and glazing characteristics [8].

1.2 STRUCTURAL SYSTEMS AND COMPONENTS FOR STIFFENING

Using a suitable structural system is crucial to good earthquake performance of energy efficient structures. Moment-frame is the most widely used structural system for lateral load resistance, alternate structural systems also are usually used (Figure 1), same as structural walls, Frame-wall system and Braced-frame system. Occasionally, even more superfluous structural systems are essential, Example. Hollow cylinder, Hollow cylinder -in- Hollow cylinder and Group Hollow cylinder systems are essential in several buildings to enhance their earthquake behavior. These framed systems are adopted depending on the size of window openings, external loading, and other design necessities of the energy efficient building. One structural frame system widely used creates special challenges in achieving better earthquake performance of buildings, the Flat slab-column framed system. The openings made the structure flexible in the lateral direction and hence the building deflect significantly even under small amount of shaking. Again, it has relatively low lateral stability, and therefore ductility requirement during strong earthquake tends to be large. Wide openings should not be adopted without providing in the building stiff and strong lateral force resisting structural elements, like Braces and Structural walls.



(i)

IOT BASED INTELLIGENT FARMING

Ajesh[1], Mubeena Perveen Taj[2], Prashanth Kumar H R[3], Abdul Jabbar[4] ,[1,2,3,4]Assistant Professor, BIT,MANGALORE,.

Abstract— **From the world's horticultural produce, chicken is known to be the most supported produce due to its supplement rich sustenance that gives more protein, minimum fat and cholesterol, and lesser vitality than different sorts of poultries. Additionally, it is not easier to take care of and generate its species. For a long time, the chicken creation has been expanding on a normal of 4.63% yearly as a result of institutionalized cultivating the board and great assembling works on, prompting increasingly chicken utilization and an expanded fare number of both household and worldwide goals. Then again, a lacking of work in chicken generation forms has influenced crisp chicken fare, which is observed to be the primary issue. Another huge snag cannot be right information sharing and people shrewdness in chicken cultivating which impacts proficiency. This examination expected to explore a foundation utilizing an automatic system which uses an Embedded System and Smart Phone for chicken cultivating the board and critical thinking utilizing an Arduino Uno. A trial and relative investigation of the savvy framework was connected in an example chicken ranch in this examination. The discoveries of this investigation found that the framework could screen encompassing climate conditions including stickiness, temperature, atmosphere quality, and furthermore the channel fan switch control in the chicken ranch. The framework was observed to be agreeable for ranchers to use as they could viably control the homestead anyplace whenever, bringing about cost decrease, resource sparing, and gainful administration in chicken cultivating .**

Index Terms— **Arduino Uno, Embedded System, Automatic System**

I. INTRODUCTION

Poultry ranches, predominantly chicken homesteads delivering meat or eggs, can be exceedingly particular activities. To expand benefits and plan future undertaking exercises, a practicality investigation preceding venture and legitimate administration amid the task are required. Appropriate administration guarantees proficient creation and great quality items (meat or eggs). This is practiced by controlling maladies, keeping up feed effectiveness, appropriate treatment of squanders, and legitimate disinfecting of the poultry house. Because of short turnover rates of poultry runs and solid market request, the poultry business could possibly be a productive venture.

Thailand was considered as a farming rich nation as far as nourishment and ecological assets. By and by, such flourishing was bit by bit relapsed legitimately adding to a low rural efficiency and rancher salaries. The ranchers moreover needed bits of knowledge in rural promoting systems and Fantastic generation arranging.

For quite a while, the chicken age in Thailand has been developing a typical of 4.63% yearly in perspective on standardized developing the board and incredible gathering deals with, provoking logically chicken usage and an extended passage number of both private and all inclusive objectives. Then again, a lacking of work in chicken creation forms has influenced crisp chicken fare, which is observed to be the central issue. Another critical impediment cannot be right learning sharing and people knowledge in chicken cultivating which impacts proficiency.

This examination intends to set up another model by utilizing a cutting edge innovation connected to chicken cultivating known as a "Savvy Farm" or "Wise Farm", which is required to clear up the cultivating issues. Brilliant Farm could see any changed data got from a self-loader microchip, disturbing all warning to an associated PC. The homestead observing could be led by means of use programs on PDAs for comfort use, efficient, and expanding work lessens.

The real equipment segments used to plan and build up this task are Arduino Uno which is an ATMEGA328P microcontroller, printed circuit board, Ethernet Shield to associate with the web, a LED, a CPU fan and a few sensors like the DHT22 module which is a temperature and mugginess sensor, MQ2 gas sensor and LDR module. Inserted C is the language used to compose the code and programming used to do that is Arduino IDE .

II. LITERATURE REVIEW

Intarakamhaeng et al. [1] worked on the model of managing the farm which contains technology based on automation with radio-frequency identification of objects (RFID). Use of RFID resulted in identifying five kinds of animals like cattle, buffalo, sheep, pigs and rabbits which were recorded automatically too.

Bahrudin et al. [2] worked on a system which contains fire alarm that uses real-time monitoring module which detects the appearance of smoke which is mixed in the air and captured images from a camera within a room when fire occurs. The inserted frameworks used to build up this fire caution framework in that Raspberry Pi as well as Arduino Uno were used. The key component of the framework is the ability to send remotely ready when system recognizes a fire. Right when the proximity of smoke is perceived, the system will demonstrate an image of the room state in a site page. The system will require the customer confirmation to report the event to the Firefighter using a Short Message Service (SMS). The advantage of using this system is that it will reduce the probability of false mindful uncovered of the Firefighter. The camera will simply get an image, so this structure will eat up only a touch of amassing and power.

Kumar et al. [3] proposed a creature wellbeing observing model (AHMS) for restrain the physiological parameters, for example, rumination, temperature of body, and pulse with temperature encompassing and stickiness. The framework created could likewise look at the anxiety comparing to warm

Mechanical and Microstructural Properties of Multi-Axially Forged LM6 Aluminium Alloy

Sudheer S. Sajjan, Mithun V. Kulkarni, S. Ramesh, P. C. Sharath, R. Rajesh and Vasantha Kumar

Abstract In the present investigation, commercially available light metal aluminium LM6 alloy was processed by Multi-axial forging (MAF) at ambient temperature. MAF was carried out to an equivalent strain in 0.83, 1.66 and 2.4 i.e., 6 passes, 12 passes and 18 passes, respectively. The mechanical properties like tensile test, compression test, hardness and microstructural characterization were studied in processed and unprocessed samples. Ultimate tensile strength (UTS) and ductility improved from 137 to 185 MPa and 3 to 6.2% for as-received to processed samples, respectively. After 18 passes of MAF, the compression strength (CS) has improved from 342 to 530 MPa. Hardness increased as the number of forging passes increases as compared to unprocessed samples. Optical microscopy images were used to study microstructure observations, the average grain size is reduced from 60 to 2 μm for as-received to processed samples, respectively. Strength and hardness increased because of the grain refinement for the processed samples and the introduction of the high amount of dislocation density into the material during the MAF process. Fracture study was conducted by utilizing scanning electron microscopy, dimples on tensile fracture surfaces revealed that ductile mode of fracture.

Keywords LM6 aluminium alloy · Multi-axial forging (MAF) · Microstructure

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S. S. Hiremath et al. (eds.), *Advances in Manufacturing Technology*,
Lecture Notes in Mechanical Engineering,
https://doi.org/10.1007/978-981-13-6374-0_16

Finite Element Analysis of Zirconia Ceramic Biomaterials Used in Medical Dental Implants

V. Sharanraj[1], C.M. Ramesha[2], V. Kumar[3], M. Sadashiva[4]

Abstract: Zirconia is an advanced ceramic material widely used in dental implants because of its good inert characteristics like minimum interaction and good aesthetic properties. The finite element method (FEM) is an effective approach for the analysis of dental implants and dental structures. In the present work, a three-dimensional (3D) model of a molar tooth was generated by CATIA V5 software, and an analysis was carried out by the commercial FEA (Finite Element Analysis) software Ansys 14.5 to evaluate the displacement, strain, stress, fatigue life and factor of safety in the proximal region of the zirconia molar tooth implant under static load conditions of 50, 100, 150, 200, 250 and 300 N. The results show that the displacement, strain and stresses, fatigue life and factor of safety were within the material admissible limits for zirconia. Hence, the study reveals that zirconia can be a candidate biomaterial suitable for dental implants as compared to metal implants.

Keywords: biomaterial, zirconia, ceramic, dental implant, FEM

1. Introduction

Biomaterials are vital materials in the field of medical dental implantation, which are intended to interact with biological systems. A dental implant is an artificial substitute for the replacement of a missing tooth. Based on the biological interaction with materials, biomaterials are categorized into three types, i.e. bio-inert materials, bio-active materials and bio-resorbable materials. Bio-inert materials are those materials that have minimum interaction with the surrounding tissue, namely titanium alloy (TI-6AL-4V ELI), alumina and zirconia [1]. Bio-active materials are materials that when placed in the human body interact with the surrounding tissues, namely glass, ceramics and bioglass. Bio-resorbable materials are those materials that start dissolving when placed in the human body and are then slowly replaced by advancing tissue, namely bone. However, today bio-inert materials are extensively used in dental implants due to their unique characteristics of minimal interaction with the surrounding tissue, good biocompatibility, high yield strength and corrosion resistance [2].

Dental anatomy is a field of anatomy dedicated to the study of tooth structure, as shown in Figure 1. A dental implant is an artificial substitute for the root of a tooth that is placed into the jawbone and ultimately fuses with the bone in order to support a replacement tooth. Teeth are the hardest substances in the human body. Besides being essential for chewing, the teeth play an important role in speech [2]. After a tooth has been damaged or decayed, restoration of the missing structure can be achieved with a variety of treatments with a variety of materials, including zirconia; small restorations placed inside a tooth are referred to as intracoronal restorations.

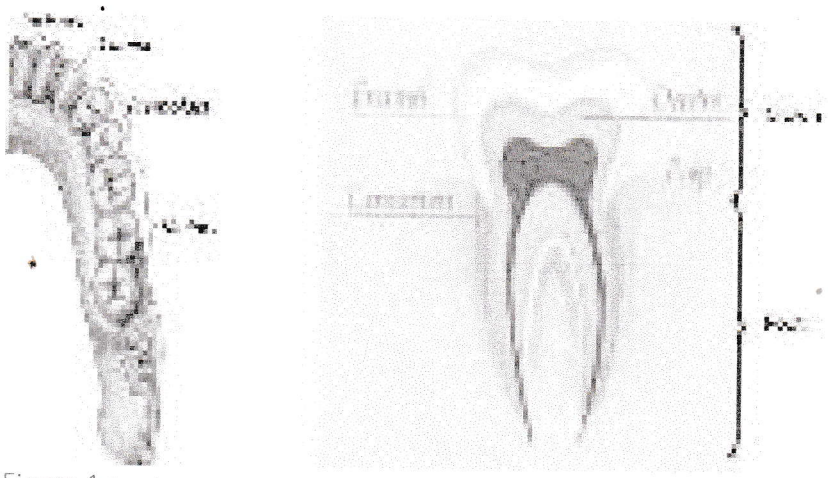

Figure 1 Dental anatomy [1] (© V. Sharanraj)

Kumar *et al. Vessel Plus* 2019;3:35
DOI: 10.20517/2574-1209.2019.006

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Finite element analysis of polyether ether ketone 450G biomaterial used as cardiovascular stent implant

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How to cite this article: Kumar V, Ramesha CM, Sharanraj V. Finite element analysis of PEEK 450G biomaterial used as cardiovascular stent implant. *Vessel Plus* 2019;3:35. http://dx.doi.org/10.20517/2574-1209.2019.006

Received: 9 Apr 2019 **First Decision**: 18 Jul 2019 **Revised**: 22 Jul 2019 **Accepted**: 5 Sep 2019 **Published**: 19 Sep 2019

Science Editor: Yonghui Ding **Copy Editor**: Jia-Jia Meng **Production Editor**: Jing Yu

Abstract

Aim: This research paper aims to modeling and finite element analysis of PEEK 450G biomaterial used as cardiovascular stent implant.

Methods: Commercially available CATIA V5 and ABAQUS 6.0 software were used for modeling and finite element analysis of cardiovascular stent implant to evaluate the radial displacement, stress distribution, and plastic strain in the proximal area of PEEK 450G biomaterial under pressure load conditions of 0.8, 1.0, and 1.2 MPa.

Results: The results show that, both in non-linear bending analysis and non-linear pressure analysis, that PEEK 450G stent exhibits very good radial expansion and lowest stress concentration in plaque and also which is well below the yield level (100 MPa), however plastic strain is quite high.

Conclusion: The blood circulation will be appropriate and also chances of vessel damage may be reduced more. Hence the study reveals that PEEK 450G can be best alternate biomaterial appropriate for cardiovascular stent implant.

Keywords: Biomaterial, polyether ether ketone 450G, biocompatibility, finite element analysis, stent implant

Experiment on of Nozzle Flow with Sudden Expansion at Mach 1.1

Article *in* International Journal of Recent Technology and Engineering · September 2019

DOI: 10.35940/ijrte.B1150.0882S819

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Vehicle Number Plate Reconstruction Using Blind Restoration Technique

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1. ABSTRACT

Nowadays, records of fatal driving are increasing. It has become an essential part of Intelligent Transport System to detect the fast moving vehicles to avoid fatal driving. Vehicle number plate recognition of fast-moving vehicles can be used to track and notify the driver about the violation of the traffic rules. Speedy vehicles may pose difficulty in capturing the license plate by the surveillance camera. The result is blurred unrecognizable image. To reconstruct the original imager, a Deconvolution practice known as Blind Image Deconvolution is proposed in which blur kernel is constructed using the parameters angle and length of blurred keyed in number plate. This system can construct the image which is unrecognizable by the human.

Key Words: Hann windowing, Hough transform, BID, Histogram equalization, NBID

2. INTRODUCTION

The regional transport office of each state assigns every vehicle a unique number which can be used to identify the owner. When the vehicle breaks the traffic rules, and over speed, the image captured by the surveillance camera can be used to find the faulty driver. The captured image is given as input to an application, which will identify the number plate, crop it and by using the blind image deconvolution algorithm deblur the number plate image. To identify the number plate, we can make use of the blur length estimation algorithm and blur angle estimation algorithm. These algorithms are necessary because the number plate image captured may be in a different angle or may be in different length.

The aim of this paper is to solve the problem of blurring in captured images of over-speeding vehicles in order to extract information about the license plate. This system mainly eliminates the noise present in the image and to make it in human-readable form. The process goes in four steps. They are

(i) Getting a blurred capture image.

(ii) Preprocessing the blurred image.

a. Converting to the grayscale image.

b. Histogram Equalization

(iii) Blur angle and blur length estimation.

(iv) Blind Image Deconvolution.

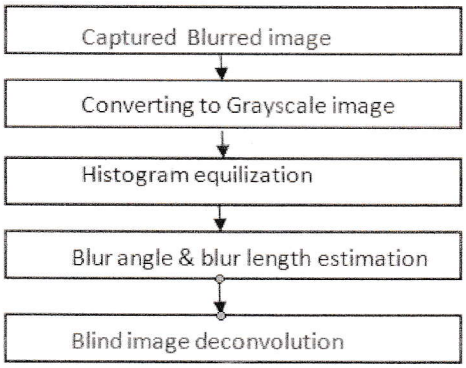

Figure 2.1: Block diagram of our scheme.

3. LITERATURE SURVEY

[1] In this paper Bayesian framework is used. Firstly in this is to devise a statistical distribution for both the gradients of the sharp image and the measurement noise. This joint distribution is used to pose a maximum a posteriori (MAP) issue, which yields point estimates for both the sharp image and the blur kernel and can marginalize the joint distribution with respect to one of the unknown random variables and then solve maximum a posteriori of the marginalized distribution.

[2] In this paper, a neural network is trained to compute estimates of sharp image patches from observations. Instead of regressing directly to patch intensities, this network learns to predict the complex Fourier coefficients of a deconvolution filter to be applied to the input patch for restoration. By applying the network independently to all

Architecture of an IoT-based System for Cricket Supervision

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Abstract: Cricket is one of the most played game all over the world. However cricket players face many injuries during the match and training. Upper Limb injuries, Back Injuries, Lower Limb injuries are some of the common injuries which occurs during the match. These injuries may lead to serious health issues and sometimes it may even lead to death. Internet of Thing (IoT) is a new technology which can be used to diagnose the health issues and can prevent the adverse effects which may occur due to the injuries. This proposal includes sensing device (RFID), telecommunication devices (Zigbee) and Cloud Computing.

Keywords: IoT, RFID, Zigbee, Cloud Computing.

I. Introduction

Cricket, with millions of fans all over the globe is one of the most popular game in the world. [1]ICC, is the organization which is responsible for developing and improving the quality of cricket. Many steps are taken to improve the architecture of IoT. The most common architecture which is used is M2M Architecture [2]. This M2M architecture has
two main layers. The first layer is a default gateway and the second layer is the network layer. The default layer consist of the components while the network layer consist of the routing and storing information. One of the main technology which can be used in this proposal is Wireless Body Area Networks (WBANs). It is a sensor which is used to measure blood pressure, heart rate and body motion. Hence it is possible to monitor the health of the players while playing using this IoT technology. [3] Radio Frequency Identification (RFID) sensors are used to sense the activity of the players. In this the sensors is used to identify the nodes and then should have the ability to communicate with the human and other devices.

II. Literature Review

Wearable monitoring devices has the capacity to collect all the required data. Data such as heart beat, Pulse rate etc. can be collected by this wearable devices. Sensors gather the required information such as pulse rate, oxygen level in the blood etc. and then forward the collected information to the gateway. Here the gateway can be anything such as mobile phone or any communication device. Communication can take place using wireless network technologies. Here WBANs communicate with wireless network technologies such as Zigbee, Wireless Personal Area Network (WPAN) and Wireless Local Area Network (WLAN). The main aim of this proposed system is due to the lack of IoT framework. Numerous other paradigms have been investigated and proposed in different articles. In Otto et a, a health care system consisting of WBANs and application software implemented on a Personal Digital Assistant(PDA) or a personal computer is proposed. This system supports ECG sensor types which can be used to monitor the heart activity.

A.Existing System: At present this method of detecting the health problems and preventing them is used in the football game [4]. Where the player's accessories such as shoes and jerseys are equipped with IoT

International Journal of Recent Technology and Engineering (IJRTE)
ISSN: 2277-3878, Volume-8, Issue-2S3, July 2019

Efficient Gesture based Language Recognition using SVM and Lloyd's Algorithm

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ABSTRACT--- undertaking in the field of human-computer interaction (HCI) and computer vision. 10 years prior to the undertaking appeared to be practically unsolvable with the data given by a single RGB camera. In this work, we have actualized a presumable exact strategy to perceive static gestures or image frames from a live camera or video data. As Hand Gesture Recognition is identified with two noteworthy fields of image processing and AI (machine learning), in this way, this report likewise refers to the different tools and APIs that can be utilized to implement different strategies and methods in these fields.

Keywords — Sign language recognition, live camera, SVM, Gesturing, Lloyd's algorithm, audio output, TensorFlow, CNN

I. INTRODUCTION

Deaf-mute individuals need to speak or communicate with typical individuals for their day by day routine and schedule. The deaf and dumb individuals all through the world utilize the sign language or the gesture-based communication to speak with other people. Be that as it may, it is conceivable just for the people who have experienced special preparing and training to comprehend the language. Communication via gestures uses hand motions and different methods for non-verbal practices to pass on their proposed meaning and intended word strength. It includes consolidating hand shapes, direction and hand movements, arms or body movement, and outward appearances(facial) at the same time, to smoothly express the speaker's contemplations.

A gesture is an example which might be static, dynamic or both [1], and is a type of interchanges which are non-verbal in which substantial movements pass on information. Motions incorporate movement of head, hands, fingers or other body parts [2]. Regardless, Gesture Recognition, by and large, suggests the whole strategy of following human movements, to their depiction and change to semantically critical directions. Gesture Recognition and all the more explicitly hand motion acknowledgment can be utilized to upgrade Human-Computer Interaction (HCI) and improve the viable usage of the accessible data stream.

Revised Manuscript Received on July 10, 2019.

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Communication via gestures and its recognition remains an extensive issue because of the intricacy of visual analysis and quickness of basic changes in marked gestures or motions [3]. Most of the countries have their own standardized sign languages (ISL-Indian Sign Language). Segmentation is the primary challenge in any form of gesture recognition as a method. The continuous or moving object captured image has many challenges. Several segmentation algorithms show high-efficiency rates for a particular database of gestures; but, they're quickly rendered less effective as video backgrounds degrade, or because the personal hand positions deviate from the middle of captured frame space. There are many more technologies projected and proposed as an RGB-based image segmentation technique conjointly like YCbCr- based mostly image segmentation technique, none of those systems provides a correct means for real-time human-computer interaction where by it gets a great deal and a lot more difficult to predict the output using mentioned methods.

The second challenge within the gesture recognition is separating sign acts or gesture forms from the transitional movements between the visual gestures [4]. On the off likelihood that the speed of motions shifts too, the presence of image edges may well be too flighty to even take into account producing nice scientific or analytical assessments and estimates. If the speed of gestures varies, then the looks of image frames conjointly capricious analyse.

II. EXISTING SYSTEM

There are several methods of implementation and systems existing at present. Every one of them is diverse in a few or different capacities. Some have distinctive calculation and methods utilized for perceiving the hand motion [5]. Hand gesture acknowledgment framework is considered as a path for increasingly natural and capable human-computer interaction tool.

Majority of the existing systems are based on python programming implemented by using Machine Learning and Deep learning. Some of the systems are built and developed using MATLAB programming where computing and sigmoid function thresholds are clearly shown using the built-in functions of the software which helps to ease the modification and debugging.

AN EFFICIENT IOT BASED SMART HOME AUTOMATION SYSTEM USING ARDUINO AND SMS

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ABSTRACT: Every day we aim for a relaxed routine and technology makes it happen through automation. A home automation system is a solution that enables automation of home appliances.

Real world entities can be remotely connected with an effective and booming technology, IOT. Internet of Things (IOT) is one of the easiest and the most effective technology that anticipates the idea of remotely associating and observing the real-world objects using Internet.

This paper intends to focus on the design and implementation of a cost-effective yet flexible, adjustable and secured home-based automation system using a Smartphone in order to enable the authorized user to control the home appliances in on/off, to regulate the output power, and to set the usage timing which would be based on an Android App. It contains the commands like switching on/off the AC, Fan, Washing machine, etc. Along with this, we use GSM technology which controls the devices by sending a single SMS in the absence of internet connectivity.

Keywords: *Home Automation, Internet of Things, Micro controller, SMS, GSM, ARDUINO, Relay*

I. INTRODUCTION

In the recent decade, the explosive growth in cellular mobile communication is constantly changing the way people used to live and work. Nowadays, mobile handsets are handheld computers with the capabilities of integrated mobile radio communication. Applications are mobile compatible which makes the mobile phones a real intelligent device.

Internet of Things (IOT) is growing rapidly as a topic of conversation both in the workplace and beyond. New innovative concepts take birth from this technology which leads in development of smart homes automation to provide intelligent, comfort, secure and improved quality of life.

This system is accomplished by an Android mobile phone, a GSM modem, and a controller board incorporating a microcontroller. The mobile phone serves as a remote controller through which a user can interact with the home appliances. The controller board resides at home and works as a home server, which carries out the task of operating and monitoring the home appliances. The home server communicates with the remote control through Internet connectivity.

The user-friendly graphical user interface is provided on the mobile phones. This App characterizes the process of accepting the commands from user in order to control different appliances that could be connected via internet. When a user chooses any option like ON or OFF, the respective device connected to the controller board will be turned on or off depending on the command that is given.

The main advantage of this system is a normal SMS can be sent to the GSM Modem in case of internet connection failure and in the absence of Android Mobile phone.

II. RELATED WORKS

Self-contained electric or gas powered home appliances became viable in the 1900s with the introduction of electric power distribution and also led to the introduction of washing machines, water heaters, refrigerators, sewing machines, dishwashers, and cloth dryers [1]. With advent of these appliances, the idea of home automation became more prominent.

In [14]. The authors proposed some approach called " a Java-based Home Automation System" which is used Wi-Fi technology to support the communicated devices. The main dis-advantages of this approach is the Wi-Fi range limitation.

A Bluetooth based home automation control is described in [7]. In [16] a GSM based system for home automation is described which uses voice commands for control. In [8], Voice command for home automation has been described.

The proposed system is developed using IOT technology for monitoring and controlling a wider range of appliances. This paper is mainly involved with the home appliances automation system. Here the medium for communication between the Android based mobile application and the home appliances connected to the system is an internet connection.

III. MOTIVATION

The aim of this system is to investigate a cost-effective solution that helps in controlling of home appliances. The main objectives of this system are:

Convenience: To provide the user with comfort & convenience to control the connected home appliances from any remote device having internet connectivity.

Real-time Control: To facilitate the user in monitoring the real-time status of each of the connected appliances and make adjustments as & when he/she feels it necessary.

Report Generation: To allow the user to analyze the usage of the various appliances & the time of usage through a generation of detailed reports that gives the user a complete picture of the working & efficiency of each appliances.

Notifications: To provide user appliance related notifications regarding a state of the appliance etc. as and when required.

IV. SYSTEM DESIGN

A. Proposed System Architecture

An efficient, a low-cost smart home appliances automation system for remotely controlling and monitoring the smart home

International Journal of Recent Technology and Engineering (IJRTE)
ISSN: 2277-3878, Volume-8, Issue-2S3, July 2019

Performance Test on Classification Algorithms

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ABSTRACT--- Nowadays, a huge amount of data is generated due to the growth in the technologies. There are different tools used to view this massive amount of data, and these tools contain different data mining techniques which can be applied for the obtained data sets. Classification is required to extract useful information or to predict the result from these enormous amounts of data. For this purpose, there are different classification algorithms. In this paper, we have compared Naive Bayes, K, and random forest classification algorithm using Weka tool. To analyze the performance of these three algorithms we have considered three data sets. They are diabetes, supermarket and weather data set. In this work, an analysis is made based on the confusion matrix and different performance measures like RMSE, MAE, ROC, etc.*

Keywords — Naive Bayes, K, Random Forest, Root Mean Squared Error (RMSE), Mean Absolute Error(MAE), Receiver Operating Characteristic(ROC), Weka*

I. INTRODUCTION

Data Mining is a technique where valid information or knowledge is obtained by analyzing the hidden patterns in the data. Various tools are available where we can run different classification algorithms to gain the required information. The classification algorithms can determine the category to which the new observation belongs. In this paper, we are comparing the accuracy of three well-known classification algorithms: Naïve Bayes, K* and Random forest. The algorithms are run on three data sets: Diabetics, Supermarket and Weather.

A. Naïve Bayes: It is a simple algorithm used for building classifiers. These classifiers assume that for each class variable the value of a particular feature is independent of the amount of any other feature.

B. K*: This algorithm belongs to the family of "Lazy Learners." In this algorithm, entropy is used as the distance measure.

C. Random forest: It is a classification algorithm which constructs multiple decision trees and combines them to get a better prediction result.

II. LITERATURE SURVEY

In Paper [1] random forest is described as tree predictors where each tree depends on the values of a random vector sampled independently and with the same distribution for all trees in the forest. The study consists of randomly selected input or a combination of the data at each node to grow each tree. Based on the characteristics such as accuracy, error, strength, and correlation the result was compared with other algorithms. It is shown that for large data set low error rate is possible, but the improvement was less on the small data set.

In paper [2] random forest classification algorithm is used to predict the risk of diabetes. Here electronic health record used to store the data of each patient during his admission to the hospital. They have used map reducing programming where map function maps the data set values with similarity variables to predict the risk on early stage. Most of the data in this record are unstructured, and the reduce function reduces the variables. The accuracy obtained by using this technique is 0.87.

In paper [3], random forest algorithm is used to predict the behavior of the customer. A customer plays an important role when it comes to buying the products from any store. Here the survey was conducted by giving the different questions to the customer based the product, their fascinating thing, a place they want to visit, the price of the product, priority on choosing the product and many more. Based on this data and random forest algorithm the prediction is made and the accuracy obtained is 94 %.

In paper [4], Naive Bayes algorithm is used to classify the SMS received by the Rescue Agencies during disasters. Initially, using NLP a bag of words per item is created. Then, Naïve Bayes Classifier is developed using the training set. Finally, the Naïve Bayes Text Classification is done. It classifies the messages into five different classes (Spam, Invalid, Alert1, Alert2, Alert3) based on the pre-classified information that is used as the learned classifier. Up to 89% accuracy is achieved by using this technique. Further improvement can be achieved by increasing the number of entries in the learned classifier.

In paper [5], the Naive Bayes algorithm is used to classify the large text document into the specified domain. Animal and plant domain article in Wikipedia is the data set used for the analysis. The accuracy provided by this method is about 98.8%. Here entire work is divided into two phases. In the first phase, content is extracted from the web page, tokenized, stop word is removed and stemming is done. Stemming is the process of mapping different morphological variant of the word into base word. To help the classifier to learn, or the classifier to classify the document, feature extraction is done in the second phase.

In paper [6], K* algorithm is used to overcome the curse dimensionality problem by using different characteristics.

Revised Manuscript Received on July 10,2019.
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Chemical Data Collections 9–10 (2017) 208–219

Contents lists available at ScienceDirect

Chemical Data Collections

journal homepage: www.elsevier.com/locate/cdc

Data Article

Synthesis, single crystal structure and spectroscopic aspects of chalcone 2(2E)-1-(4′-bromobiphenyl-4-yl)-3-(2, 3-dimethoxybenzaldhyde) prop-2-ene-1-one

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ARTICLE INFO

Article history:
Received 12 March 2017
Revised 21 June 2017
Accepted 23 June 2017
Available online 27 June 2017

Keywords:
Bromobiphenyl
Dimethoxybenzaldhyde
FT-Raman
UV
FT-IR
NLO
Chalcone
TGA
Single crystal XRD

ABSTRACT

The title compound, (2E)-1-(4′-bromobiphenyl-4-yl)-3-(3,4-dichlorophenyl)-3-hydroxypropan-1-one (BDCP) was synthesized, spectrally characterized (IR, UV, FT-IR, ^{1}H NMR, and FT-Raman), and its three- dimensional structure was confirmed by single crystal diffraction studies. In addition, Second Harmonic Generation (SHG) efficiency of the crystal, thermogravimetric analysis (TGA), and powder XRD were performed. The bromo phenyl ring makes a dihedral angle of 50.8 (2)^0 and 34.5 (2)° with the methoxy phenyl ring and central phenyl moiety. The dihedral angle between the methoxy phenyl ring and the central phenyl moiety is 17.1(2)^0. The short contacts C9—O1...Cg1 and C3—H3...Cg3 are involved in crystal structure stabilization. The SHG conversion of the BDCP is found to be 1.33 times that of Urea.

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International Journal of Pure and Applied Physics.
ISSN 0973-1776 Volume 13, Number 3 (2017), pp. 335-342

http://www.ripublication.com

Synthesis, spectral characterization, optical and crystal structure studies of (2*E*)-1-(4'-bromobiphenyl-4-yl)-3-(2-methoxyphenyl)prop-2-en-1-one

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Abstract

The title compound, (2*E*)-1-(4'-bromobiphenyl-4-yl)-3-(2-methoxyphenyl) prop-2-en-1-one (BDCP) was synthesized, characterized using UV-Visible, FT-IR, FT-Raman, Mass spectrometry and ^{1}H NMR. In addition, powder XRD and thermal studies of the BDCP was carried out. The optical studies of the compound using SHG method are performed. The crystal has shown good SHG property with SHG conversion efficiency 1.36 times that of Urea.

Keywords: NLO crystal, Optical property, Chalcone, SHG, Hydrogen bond. NMR spectroscopy

1. INTRODUCTION

Nonlinear optical (NLO) materials play a major role in fast developing fields like photonics and optoelectronics [1-2]. The NLO properties iike second harmonic generation (SHG) and third harmonic generation (THG) exhibited by many materials have been reported in the literature. Among many materials, organic materials are highly attractive due to their high damage resistance, high nonlinearities and ultra fast response [3-4]. The advantages of using organic molecules as NLO materials are that they can be designed to optimize the desired NLO property by having different donor and acceptor groups in the molecules [5-6]. A number of organic materials have been identified and synthesized, showing considerable NLO effects. However only a few of

International Journal of Physics and Applications.
ISSN 0974-3103 Volume 9, Number 1 (2017), pp. 25-31

http://www.irphouse.com

NLO AND OPTICAL PROPERTY OF NEWLY SYNTHESIZED CHALCONE COMPOUND (2*E*)-1-(4'-BROMOBIPHENYL-4-YL)-3-(3-BROMO-4-METHOXYPHENYLL)PROP-2-EN-1-ONE

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Abstract

The title compound (2*E*)-1-(4'-bromobiphenyl-4-yl)-3-(3-bromo-4-methoxyphenyll)prop-2-en-1-one (BDCP) was synthesized using 4'-(4-bromophenyl) acetophenone and 3-bromo-4-methoxy benzaldehyde in 1:2 ratio. The NLO, crystalline and optical property of newly synthesized chalcone compound was characterized by SHG, powder XRD, FTIR and UV-Visible spectroscopy. The second harmonic generation (SHG) efficiency of the chalcone crystal was found to be 1.26 times that of urea. This is a strong second harmonic generation (SHG) efficiency among chalcone derivatives. The UV-VIS spectrum shows a cut-off wavelength at 430 nm. The crystal has strong absorption band in the UV region. In the present study the crystallinity of the chalcones was confirmed using powder XRD method.

1. INTRODUCTION

The design and synthesis of organic molecules exhibiting nonlinear optical (NLO) properties have been motivated by their potential for applications in optical communications, optical computing, data storage, dynamic holography, harmonic generators, frequency mixing and optical switching [1-2]. Organic materials are of particular interest because of their versatile synthetic flexibility that offers one to fine

Natural Radionuclides and Radon Exhalation Rate in the Soils of Cauvery River Basin

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Air, Soil and Water Research
Volume 10: 1–7

DOI: 10.1177/1178622117746948
SAGE

ABSTRACT: In this study, systematic measurement of activity concentrations of ^{40}K, ^{226}Ra, and ^{232}Th and radon exhalation rate has been done in soil samples of Cauvery River environment. The activity was measured using HPGe gamma-ray spectrometer, and the mean values of ^{40}K, ^{226}Ra, and ^{232}Th in the soil samples were found to be 182 ± 4, 34 ± 2, and 19 ± 1 Bq kg^{-1}, respectively. The radon exhalation rate was measured by "Can technique" using SSNTD (LR-115) films. The mean values of radium concentration, surface exhalation, and mass exhalation rate were found to be 118.95, 293.61, and 108.53 mBq kg^{-1} h^{-1}, respectively. The radiological hazard indices due to natural radioactivity were calculated and compared with international recommended values, which are lower than the recommended level. The radon exhalation rate is lower than the recommended level.

KEYWORDS: Cauvery, radon, gamma dose, radioactivity, soil

RECEIVED: August 17, 2017. **ACCEPTED:** November 15, 2017.

TYPE: Original Research

FUNDING: The author(s) received no financial support for the research, authorship, and/or publication of this article.

DECLARATION OF CONFLICTING INTERESTS: The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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Introduction

Soil is the top surface of the earth's crust and it is formed due to the weathering of rocks. The soil contains radionuclides headed by the radioactive decay series ^{238}U, ^{232}Th, and singly occurring ^{40}K. ^{238}U and ^{232}Th contribute about 30% to 60% of the internal radiation dose, and the worldwide average annual effective dose per person ranges from 1.4 to 2.4 mSv y^{-1}, which depends on the concentration of natural radionuclides present in a particular location.[1] Radon (^{222}Rn) is a naturally occurring radioactive isotope of ^{238}U series, which has half-life of 3.82 days. Radon is one of the significant sources of natural radiation. The radon decay products which are attached in aerosol cause greater biological effect through inhalation and can lead to lung cancer on prolonged exposure. ^{218}Po, ^{214}Pb, ^{214}Bi, and ^{214}Po are the short-lived decay products of radon; these decay products give rise to maximum dose through emission of alpha and beta particles. Therefore, the studies on radon exhalation rate, radionuclides distribution, and its associated dose rate in the soil are significant. The riverine environs are of greater interest due to the population, which lives near river basin. The soils found near river basin are also used for construction of materials such as bricks and plastering material to walls in areas of South Karnataka, India. The published data on radionuclides concentration in riverine environs are sparse, and therefore, an attempt was made in the present investigation to study natural radionuclides distribution and radon exhalation rate in the soils of Cauvery River basin.

Materials and Methods

Sample collection and preparation

The sampling stations along Cauvery River are indicated in Figure 1. Sampling station K1 corresponds to the upper reaches of the river and K14 corresponds to the lower reaches. The soil samples from the river basin were collected following standard procedures.[2] The collected soil samples were brought to the laboratory and oven dried at 110°C till constant dry weight was obtained. The dried samples were sieved through 250-µm mesh and then stored in a sealed polyvinyl chloride container for 30 days to attain secular equilibrium between radium and its progeny.[3]

Activity measurement

The activity concentrations of ^{40}K, ^{226}Ra, and ^{232}Th in soil were measured using a high-resolution N-type HPGe (NGC 3019, DSG) detector–based gamma spectrometry system. The detector was shielded using thick lead blocks to avoid interference of external gamma radiations. The output of the detector was analyzed using a 16-K multi channel analyzer (MCA-3 series/P7882; FAST ComTec). The spectrometer was calibrated using International Atomic Energy Agency (IAEA) standard reference materials. The standards used were RG-U, RG-Th, and RG-K for uranium, thorium, and potassium, respectively. The gamma spectrum was obtained with a counting period of 20 000 seconds. The peaks corresponding to 1.46 MeV (^{40}K), 609.31 keV (^{214}Bi), and 911.07 keV (^{223}Ac) were considered for evaluating the activity levels of ^{40}K, ^{226}Ra, and ^{232}Th, respectively.[4]

Radon exhalation rate

The radon exhalation rate in the soil samples of the Cauvery River was determined by "Sealed Can Technique" using SSNT detectors. About 100 g of the dried and sieved (250 µm) soil sample was taken in each "Can" (diameter: 7.0 cm and height: 10.5 cm),

Biomechanical Analysis on Stent Materials Used as Cardiovascular Implants

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Abstract. Atherosclerosis is the most common cause of death in the world, accounting for 48% of all deaths in the world. Atherosclerosis, also known as coronary artery disease occurs when excess cholesterol attaches itself to the walls of blood vessels. Coronary stent implantation is one of the most important procedures to treating coronary artery disease such atherosclerosis. Due to its efficiency, flexibility and simplicity, the use of coronary stents procedures has increased rapidly. In order to have better output of stent implantation, it is needed to study and analyze the biomechanical behavior of this device before manufacturing and put into use. Biomaterials are commonly used for medical application in cardiovascular stent implantation. A biomaterial is a non-viable material used as medical implant, so it is intended to interact with biological system. In this paper, an explicit dynamic analysis is used for analyzing the biomechanical behavior of cardiovascular stent by using finite element analysis tool, ABAQUS 6.10. Results showed that a best suitable biomaterial for cardiovascular stent implants, which exhibits an outstanding biocompatibility and biomechanical characteristics will be aimed at which will be quite useful to the human beings worldwide.

Keywords: Atherosclerosis, Coronary artery, Cardiovascular stent, Biomaterials, Finite Element Analysis

INTRODUCTION

Atherosclerosis is the most common cause of death in the world, accounting for 48% of all deaths in the world. Atherosclerosis, also known as coronary artery disease occurs when excess cholesterol attaches itself to the walls of blood vessels. Embedded cholesterol also attracts cellular waste products, calcium and fibrin. This leads to a thickening of the vessel wall by complex interaction with constituents of the artery. The resulting pasty build-up known as plaque can narrow or even block the arteries that obstruct the flow of oxygen rich blood. [1] CADs are now a days the leading cause of death in the Western countries: a recent report of American Heart Association states that, on the basis of 2006 mortality rate, nearly 2300 Americans die of CAD each day, an average of 1 death every 38 seconds. This data explains well the high incidence of such pathologies which lead to high social and economic costs; in fact, the estimated direct and indirect cost of CVD for 2010 is $ 503.2 billion. [2] Several procedures are available to revascularise a blocked artery, including balloon angioplasty and stenting, bypass surgery and atherectomy. [3] Fourty years ago, coronary artery bypass surgery (CABG) was the popular revascularization treatment used to treat obstructive coronary artery diseases. However, it was claimed that frequent coronary closures occurred and hence emergency surgical revascularization was necessary.[4,] [5]

Stenting shows some advantages compared to other possible treatments, as it does not any surgical operation and has less complication, pain and a more rapid recovery. So the use coronary stents in interventional procedures has rapidly increased from 10% in 1994 to over 80% in current practice.[6] In order to have the better output of stent implantation, it is needed to analyze the biomechanical behavior of the stent before manufacturing and utilizing. One of the most effective methods to investigate the mechanical behavior of stent is finite element method (FEM). In comparison with expensive experiments carried out in hospitals and laboratories, numerical simulations accomplished by computers have advantages in both flexibility and cost. [7]

Advances in Mechanical Design, Materials and Manufacture
AIP Conf. Proc. 1943, 020041-1–020041-10; https://doi.org/10.1063/1.5029617
Published by AIP Publishing. 978-0-7354-1638-3/$30.00

Available online at www.sciencedirect.com

ScienceDirect

Materials Today: Proceedings 24 (2020) 1462–1467

materialstoday: PROCEEDINGS

www.materialstoday.com/proceedings

IConAMMA 2018

Effect of Mechanical properties on Multi Axially Forged LM4 Aluminium Alloy

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Abstract

Commercially available LM4 Aluminum alloy was subjected through Severe Plastic Deformation (SPD) method by Multi-Axial Forging Process (MAF) in ambient temperature. In this process, the material was processed successfully up to 5 Passes and mechanical properties such as tensile strength, compression strength and hardness of the as received and processed samples at ambient temperature were evaluated. The MAF processed sample result showed that the ultimate strength, percentage elongation and compression strength improved by 55 MPa, 3.75% and 162 MPa respectively as compared with the unprocessed sample. Hardness also increased with the increase in the number of passes. In the case of microstructure, grain size reduced from 110 µm to 8 µm after subjecting the sample to MAF. Fractography explains the nature of the fracture from received to processed samples by decreasing the size of the dimple and the type of fracture observed was ductile in nature. Improvement in strength and hardness of processed samples was observed due to the grain refinement and high amount of density dislocation in the material during MAF.

Keywords: LM4 Al alloy, Multi Axial Forging, Mechanical properties, Microstructure.

Selection and peer-review under responsibility of the scientific committee of the International Conference on Advances in Materials and Manufacturing Applications, IConAMMA 2018.

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Selection and peer-review under responsibility of the scientific committee of the International Conference on Advances in Materials and Manufacturing Applications, IConAMMA 2018.