



(An Autonomous Institution - AFFILIATED TO ANNA UNIVERSITY, CHENNAI)

S.P.G.Chidambara Nadar - C.Nagammal Campus

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Academic Year 2023 – 2024

Publication Details

**Details of research papers per teacher in CARE Journals
notified on UGC website during the year**

3.4.3 Details of research papers per teacher in CARE Journals notified on UGC website during the year







Name of the Author(s)	Department of the Author(s)	Title of the Paper	Name of the Journal	Month and Year of publication	ISSN	Link to the notification in UGC enlistment of the Journal
Raj, Vinnarasi A. (58550032000); Sankar, Karthikumar (57194616260); Narayanasamy, Pandiarajan (55070355400); Moorthy, Innasi Ganesh (56168642200); Sivakumar, Natesan (10539493100); Rajaram, Shyam Kumar (55208546700); Karupiah, Ponmurugan (15829959300); Shaik, Mohammed Rafi (55098241300); Alwarthan, Abdulrahman (6603802919); Oh, Tae Hwan (57213539960); Shaik, Baji (55799344700)	Mech	Development and Characterization of Bio-Based Composite Films for Food Packing Applications Using Boiled Rice Water and Pistacia vera Shells	Polymers	August, 2023	20734360	https://www.scopus.com/inward/record.uri?eid=2-s2.0-85168809071&doi=10.3390%2Fpolym1516345&partnerID=40&md5=7e379ef5666d31d1e0ac15ae1524498
S. Thanga Kasi Rajan (57205603409); Nagarajan, K.J. (57188651061); Balasubramani, V. (56979503000); Sathickbasha, K. (57203779437); Sanjay, M.R. (57042636700); Siengchin, S. (23989534700); Balaji, A.N. (58823131500)	MECH	Investigation of mechanical and thermo-mechanical characteristics of silane-treated cellulose nanofibers from agricultural waste reinforced epoxy adhesive composites	International Journal of Adhesion and Adhesives	August, 2023	1437496	https://www.scopus.com/inward/record.uri?eid=2-s2.0-85168801854&doi=10.1016%2Fijadhadh.2023.103492&partnerID=40&md5=94aea6cea36fed6e7921c29c5c61d21
Kenet Nancy Mary, M. (58339788900); Jancirani, A. (57192412270); Baskaran, R. (38961044300); Anbarasan, R. (6602688372)	BT	Synthesis, characterization and non-isothermal degradation kinetics of rose Bengal end capped poly(aniline)/Cr2O3 nanocomposite	Chemical Papers	August, 2023	3666352	https://www.scopus.com/inward/record.uri?eid=2-s2.0-85167827350&doi=10.1007%2Fsl1696-023-03015-8&partnerID=40&md5=448ce52a82b9d97c537e5454b60ce8fc
Prithiviraj, M. (57190253011); Subbiah, Rathinavel (57758111400); Manimaran, P. (55760290700); Kannan, K. (57212106259)	MECH	Cellulose fiber extraction and characterization from derris scandens (Roxb.) benth root for polymer composite reinforcements	Biomass Conversion and Biorefinery	August, 2023	21906815	https://www.scopus.com/inward/record.uri?eid=2-s2.0-85166299338&doi=10.1007%2Fsl13399-023-04669-w&partnerID=40&md5=71662519e7b247951fa467cd36390b
Dass, Ruby (57189869189); Thirumoorthy, Gopalakrishnan (56956706000); Ananthkrishnan, Gayathri (57475827400); Kannan, Anusha (57206208274); Rajendran, Sureshbabu (57212414235); Narayanan, Manikandan (59454896600); Arputharaj, Kannan (8273684400)	ECE	Optimum design of planar quasi-Yagi antenna for wearable Internet of Things (IoT) applications	Microwave and Optical Technology Letters	August, 2023	8952477	https://www.scopus.com/inward/record.uri?eid=2-s2.0-85165554418&doi=10.1002%2Fmop.33839&partnerID=40&md5=9a19945bcbac8985dcd2337fd2dc839
Poornasundari, Baluchamy (58672968500); Arivoli, Subramanian (6508052746); Pradiba, Dinakararajan (36931224600); Mariaamalraj, Samykanu (57190982710); Velmurugan, Kumaresan (57224448011)	BT	Investigation of Larvicidal Activity and Histopathological Variations of Brown Algae Spatoglossum asperum J. Agaradh against Aedes aegypti, Culex quinquefasciatus, and Anopheles stephensi	Science and Technology Asia	December, 2023	25869027	https://www.scopus.com/inward/record.uri?eid=2-s2.0-85180850534&partnerID=40&md5=15d549ef43ca531e3807418688bcd2d
Suriya kala, S. (58614327900); Prince winston, D. (58614479200); Pravin, M. (57219714246); Sakthivel, G. (57212106259)	EEE	Maximum power enhancement in solar PV modules through modified TCT interconnection method	Sustainable Energy Technologies and Assessments	December, 2023	22131388	https://www.scopus.com/inward/record.uri?eid=2-s2.0-85171997599&doi=10.1016%2Fseta.2023.103462&partnerID=40&md5=0038495bd87c5dbd6743072b5ff910
Thangaraj, Hariharasudhan (57404485300); David, Prince Winston (57751300700); Balachandran, Gurukarthik Babu (57210725213); Sivasekar, Gowthama Kannan (58143336600)	EEE	Performance evaluation of natural Olea europaea (olive oil)-based blended esters with butylated hydroxyanisole and butylated hydroxytoluene: optimization using response surface methodology	Environmental science and pollution research international	December, 2023	16147499	https://www.scopus.com/inward/record.uri?eid=2-s2.0-85182954450&doi=10.1007%2Fsl1356-023-31533-1&partnerID=40&md5=7879d5e89425d869b62f1df82999d6e
Velumani, D. (58768531400); Mageshkumar, P. (51964145800); Yuvaraj, K. (57302449700)	CIVIL	Properties of Binary and Ternary Blended Cement Containing Pond Ash and Ground Granulated Blast Furnace Slag	Polish Journal of Environmental Studies	December, 2023	12301485	https://www.scopus.com/inward/record.uri?eid=2-s2.0-85179925058&doi=10.15244%2Fpjoes%2F170852&partnerID=40&md5=4b0c58411ef834d6e2f9f992eca18cd9
Kanimozhi, B. (54960212600); Rajkumar, P. (57218481817); Mahalingam, S. (57217041085); Senthil, S. (57850856800); Jayalakshmi, D.S. (56403459900); Bai, H. Girija (56500627200); Tharizhmani, Vivek (36740632800); Kesavakumar, Ramadoss (57216617106); Pranesh, Venikat (57211094878)	MECH	Formation damage and improved recovery in kaolinitic high enthalpy gas fields with fabric geological settings	Gas Science and Engineering	July, 2023	29499097	https://www.scopus.com/inward/record.uri?eid=2-s2.0-85170644504&doi=10.1016%2Fj.jgsce.2023.204993&partnerID=40&md5=4F9b26ac25330e3ab1b07a5a3955ec
Narayanasamy, P. (55070355400); Parthippan, B.K. (57234172500); Ramkumar, T. (56971076000); Sivashanmugam, N. (57218871192)	MECH	Experimental studies on automated DC pulsed MIG welding of Monel 400 sheets	Materials and Manufacturing Processes	July, 2023	10426914	https://www.scopus.com/inward/record.uri?eid=2-s2.0-851656601088&doi=10.1080%2F10426914.2023.2238076&partnerID=40&md5=e1329e9a6d4b59070e6bf421b1899f
Ashok, R. (58093478500); Sundaram, M. (57191492729); Jaffino, G. (55221844500); Jose, J. Prabin (57211985290)	ECE	Weighted Moth-Flame Optimization Algorithm for Edible Oil Quality Detection Using Microwave Technologies	Food Analytical Methods	July, 2023	19369751	https://www.scopus.com/inward/record.uri?eid=2-s2.0-85165135900&doi=10.1007%2Fsl12161-023-02517-1&partnerID=40&md5=99c279b1568e9b53b48992c276b212b
M.K. Marichelvam (58479125500); P. Manimaran (55760290700); Khan, Anish (58121241100); M, Geetha (58479368600); K, Kandakodeeswaran (58479125600); Abduljabbar, Ahmed H. (57191920856); Syafri, Edi (57196348984); Wazzan, Mohammad A. (57208531003); Wazzan, Huda (57394183000); Khan, Waseem (59434466000)	Maths	Development and Characterization of Sustainable Bioplastic Films Using Cellulose Extracted from Prosopis juliflora	Journal of Natural Fibers	July, 2023	15440478	https://www.scopus.com/inward/record.uri?eid=2-s2.0-85164289271&doi=10.1080%2F15440478.2023.2231271&partnerID=40&md5=e8f580c65d237dcb6d941bceb7f12b
Ganesan, Sakthivel (57226727189); David, Prince Winston (49362680300); Murugesan, Pravin (57219714246); Balachandran, Praveen Kumar (57196456808)	EEE	Solar Photovoltaic System Performance Improvement Using a New Fault Identification Technique	Electric Power Components and Systems	July, 2023	15325008	https://www.scopus.com/inward/record.uri?eid=2-s2.0-85165562567&doi=10.1080%2F15325008.2023.2237013&partnerID=40&md5=72c86d7cc203ad5675e099b48eda4a54
Balachandran, Gurukarthik Babu (57210725213); Narayanasamy, P. (55070355400); Alexander, Anandha Balaji (57224402977); David, Prince Winston (49362680300); Mariappan, Rajesh Kannan (57218504812); Ramachandran, Muthu Eshwaran (5851079100); Indran, Suyambulingam (54787733800); Mavinkere Rangappa, Sanjay (57042636700); Siengchin, Suchart (23989534700)	EEE, MECH	Multi-analytical investigation of the physical, chemical, morphological, tensile, and structural properties of Indian mulberry (Morinda tinctoria) bark fibers	Heliyon	November, 2023	24058440	https://www.scopus.com/inward/record.uri?eid=2-s2.0-85175241747&doi=10.1016%2Fheliyon.2023.e21139&partnerID=40&md5=8dc304a1bdf41e7e4ccfb58d0b3b2bc
S. Siva Kaylasa Sundari (58680828500); S, Shamim Rishwana (58680961000); J, Dhanaalakshmi (58681228000); M, Arunjunai Raj (58680692300); C.T, Vijayakumar (57725228800)	CHEM	Fumarate metal organic frameworks as reactive and curing reaction alternant in hydrophobic bispropargyl ether based matrix resin system	Journal of Polymer Research	November, 2023	10229760	https://www.scopus.com/inward/record.uri?eid=2-s2.0-85175692271&doi=10.1007%2Fsl10965-023-03817-0&partnerID=40&md5=80526a0a62bacda4bc5fb9c0830b96e
Medadurai, Kaliraj (58737140100); Pandiarajan, Narayanasamy (55070355400); Balasubramanian, Balavairavan (58737949200); Pandiarajan, Balasundar (5720523164)	MECH	Fabrication and Testing of Crop Waste Ceiba pentandra Shell Powder Reinforced Biodegradable Composite Films	ACS Omega	November, 2023	24701343	https://www.scopus.com/inward/record.uri?eid=2-s2.0-85178327894&doi=10.1021%2Facsomega.3c05577&partnerID=40&md5=e848155043fca424631c9118f8bc377
Meenakshi, A. (58546951800); Mahalakshmi, S. Devi (59451465700); Sivagami, S. Vanitha (58804118300); Rajasekaran, M. (58319234200)	CSE	CYBER ATTACKS DETECTION USING GoogleNet MODEL FOR ENVIRONMENTAL AWARE SMART CITY APPLICATIONS	Journal of Environmental Protection and Ecology	November, 2023	13115065	https://www.scopus.com/inward/record.uri?eid=2-s2.0-85181973797&partnerID=40&md5=f68014a028425277ea2cd5cbef61744a
Palanisamy, Chandrasekaran (37002592600); Parvathikumar, Ganeshprabhu (57215095022); Gnanasekaran, S. (7801629489); Chelladurai, Samson Jerold Samuel (57198802331); Sivananthan, S. (56180498200); Adhavan, B. (49961152200); Geetha, N.K. (56480311400); Arthanari, Ramesh (57198803574); Tibebu, Solomon (57421678000)	CIVIL	Study on the Behavior of Self-Cleaning Impregnated Photocatalyst (TiO2) on Cement Mortar	Advances in Materials Science and Engineering	November, 2023	16878434	https://www.scopus.com/inward/record.uri?eid=2-s2.0-8517837969&doi=10.1155%2F2023%2F3571526&partnerID=40&md5=ad1e6eb3bf8556e0c83cdcc2e443

Sugumar, S. (57226675401); Winston, D. Prince (49362680300); Ganesan, K. (56644245000); Pravin, M. (57219714246)	EEE	Comparative analysis of Hybrid, conventional and staircase static reconfiguration methods to mitigate partial shading effects: Unveiling the superiority of two-step staircase (2SS) reconfiguration	Solar Energy	November, 2023	0038092X	https://www.scopus.com/inward/record.uri?eid=2-s2.0-85171527932&doi=10.1016%2Fj.solener.2023.112029&partnerID=40&md5=2ce57da6243867ce1e7bf2344ba6a0a9
Kalidoss, Sakthiraj (58749896200); Balasubramanian, Karthikeyan (59040679500)	PHYSICS	Effect of Reducing Agent on The Electrochemical Performance of The Ag ₂ O/PVA Nanocomposite	Analytical and Bioanalytical Electrochemistry	November, 2023	20084226	https://www.scopus.com/inward/record.uri?eid=2-s2.0-85178942040&doi=10.22034%2Ffabric.2023.709112&partnerID=40&md5=21d0fa150eb421ad5fe259de28cbee7
Ramesh, T. (58709363000); Saravanakumar, S.S. (59220240100); Balavairavan, B. (57211921880); Senthamaikannan, P. (57115388800)	MECH	Development and Characterization of a Poly(lactic Acid)/Sesame Husk Powder-Based Biocomposite Film for Packaging Application	Waste and Biomass Valorization	November, 2023	18772641	https://www.scopus.com/inward/record.uri?eid=2-s2.0-85175829860&doi=10.1007%2Ff12649-023-02317-y&partnerID=40&md5=b39cac2a00ecdbf26120304a0a06df0
Rajasekaran, M. (58319234200); Thanabal, M.S. (26428500500); Meenakshi, A. (58546951800)	CSE	Association rule hiding using enhanced elephant herding optimization algorithm	Automatika	November, 2023	51144	https://www.scopus.com/inward/record.uri?eid=2-s2.0-85178190968&doi=10.1080%2F00051144.2023.2277998&partnerID=40&md5=839dad464371637d1ad7e6ab031a1b6c
Pandian, Pandimuni (58698746700); David, Prince Winston (49362680300); Murugesan, Palpandian (57609560800); Murugesan, Pravin (57219714246)	EEE	Performance Analysis of Novel Solar PV Array Configurations with Reduced Tie Interconnection to Extract Maximum Power under Partial Shading	Electric Power Components and Systems	October, 2023	15325008	https://www.scopus.com/inward/record.uri?eid=2-s2.0-85176914520&doi=10.1080%2F15325008.2023.2280115&partnerID=40&md5=13fc9ca434916c21e7050ca9c54c618
Rajasekaran, M. (58319234200); Thanabal, M.S. (26428500500); Meenakshi, A. (58546951800)	CSE	ASSOCIATION RULE MINING BASED ON INTELLIGENT CRAVING HONEY BEE OPTIMISATION FOR PRIVACY PRESERVATION IN ENVIRONMENTAL APPLICATIONS	Journal of Environmental Protection and Ecology	October, 2023	13115065	https://www.scopus.com/inward/record.uri?eid=2-s2.0-85178439882&partnerID=40&md5=720df1981fbfaeeb9aaf35e0faf0210ea
Meenakshi, A. (58546951800); Rajasekaran, M. (58319234200); Kalpana, V. (57996943300); Selvarani, K. Ignatius (57201701899)	CSE	DETECTION OF CYBER SECURITY ATTACK USING MACHINE LEARNING BASED MULTI-HEURISTIC CUCKOO SEARCH OPTIMISATION SCHEME FOR SMART CITY APPLICATIONS	Journal of Environmental Protection and Ecology	October, 2023	13115065	https://www.scopus.com/inward/record.uri?eid=2-s2.0-85178407293&partnerID=40&md5=fabcf4f43b6f796ee9e67d28a926a8bf
Murugesan, Palpandian (57609560800); Winston David, Prince (49362680300); Murugesan, Pravin (57219714246); Kalyani Solaisamy, Nithya (58621882300)	EEE	One-step adaptive reconfiguration technique for partial shaded photovoltaic array	Solar Energy	October, 2023	0038092X	https://www.scopus.com/inward/record.uri?eid=2-s2.0-85172453407&doi=10.1016%2Fj.solener.2023.111949&partnerID=40&md5=d139c370f09198b76458e9afdb10c0f5
Ramachandran, Muthu Eshwaran (58571079100); Singh, Ramya Ranjit (57220401275); Balachandran, Gurukarthik Babu (57210725213); Mohan, Devie Paramasivan (59343725700); David, Prince Winston (5721300700); Anantharaman, Meenakshi (59343415400); Ganesan, Nirmla (59343878200)	EEE	Energy Monitoring for Renewable Energy System Using Machine Learning Algorithms	Recent Advances in Electrical and Electronic Engineering	October, 2023	23520965	https://www.scopus.com/inward/record.uri?eid=2-s2.0-85174596960&doi=10.2174%2F123250965258879231011182850&partnerID=40&md5=542117fb090624f55624ad796ea8e68a
Ramkumar, T. (56971076000); Nathan, D. (56504741200); Selvakumar, M. (57190185101); Vigneshkumar, V. (58644240400); Narayanasamy, P. (55070355400)	MECH	Printing High-Strength High-Elongation Al4043 Alloy Using UNS A94043 Welding Wires through Wire Arc Additive Manufacturing	Journal of Materials Engineering and Performance	October, 2023	10599495	https://www.scopus.com/inward/record.uri?eid=2-s2.0-85174042925&doi=10.1007%2Ff11665-023-08822-4&partnerID=40&md5=e1ce885257e501c0cc81631d31969f5b
Thangaraj, Hariharasudhan (57404485300); David, Prince Winston (49362680300); Raj, Marshal (57209458186); Balachandran, Gurukarthik Babu (57210725213)	EEE	Extensive Energy, Exergy, Economic, Exergoeconomic, Enviroeconomic, and Energy Payback Time Analysis and Investigation on Bifacial Solar Photovoltaic Module with Nonbiodegradable Waste as Reflectors	Energy Technology	January, 2024	21944288	https://www.scopus.com/inward/record.uri?eid=2-s2.0-85174534743&doi=10.1002%2Fente.202300829&partnerID=40&md5=99eb69ac1c95564365f3766d32362c88
Ravindran, Santhiya (54961011300); Balachandran, Gurukarthik Babu (57210725213); Murugesan, Pravin (57219714246); David, Prince Winston (49362680300)	EEE	Energy, Exergy, Economic, Environmental, Exergoenvironmental, Exergoeconomic, and Enviroeconomic Analysis of Photovoltaic/Thermal System with Double-Fan Arrangement for Effective Condensation and Evaporation: An Experimental Approach	Energy Technology	January, 2024	21944288	https://www.scopus.com/inward/record.uri?eid=2-s2.0-85174592365&doi=10.1002%2Fente.202300836&partnerID=40&md5=182906773534321117bdd0e90b9a65b
Ramachandran, Thirumalaivasan (58627881500); Manoharan, Devaprakash (58627337500); Natesan, Sivakumar (57202028321); Rajaram, Shyam Kumar (55208546700); Karupiah, Ponnurugan (15829959300); Shaik, Mohammed Rafi (55098241300); Khan, Mujeeb (56185231400); Shaik, Bajji (55799344700)	BT	Synthesis and Structural Characterization of Selenium Nanoparticles-Bacillus sp. MKUST-01 Exopolysaccharide (SeNPs-EPs) Conjugate for Biomedical Applications	Biomedicines	September, 2023	22279059	https://www.scopus.com/inward/record.uri?eid=2-s2.0-85172864994&doi=10.3390%2Fbiomed11092520&partnerID=40&md5=f00d0e67b80ec7c506029cd707bf6df4
Priscilla, J. (57218658850); Arul Dhas, D. (8069598600); Hubert Joe, I. (8987090700); Ronaldo Anuf, A. (57793242800)	BT	Spectroscopic Investigation, DFT Calculations, anti-Inflammatory Activity and Molecular Dynamic Simulation Study on Fagaramide Alkaloid	Polycyclic Aromatic Compounds	September, 2023	10406638	https://www.scopus.com/inward/record.uri?eid=2-s2.0-85133829168&doi=10.1080%2F10406638.2022.2094973&partnerID=40&md5=2918e8931c6f8140ffbf163e6aac9044
Balachandran, Gurukarthik Babu (57210725213); Alexander, Anandha Balaji (57224402977); Murugesan, Pravin (57219714246); David, Prince Winston (49362680300); Shanmugasundaram, Karthi Keyan (58570943700); Sankarraj, Karthikeyan (58571461700); Ramachandran, Thirupathy (58571079000); Ramachandran, Muthu Eshwaran (58571079100); Kasi, Ponrapakaran (58571592600)	EEE	Harnessing the Potential of Bellamyia eburnea Shell-Derived Nanoparticles Through Electro-mechanical Optimization in the Performance of PCL Bio-composites: A Green Insulation Revolution	Waste and Biomass Valorization	September, 2023	18772641	https://www.scopus.com/inward/record.uri?eid=2-s2.0-85170523047&doi=10.1007%2Ff12649-023-02260-y&partnerID=40&md5=5569e6c3116bcf8394e19144bf4747e1
Baskaran, R. (38961044300); Sribala, M.G. (57222377635); Balachandran, Gurukarthik Babu (57210725213); Gandhi, S. (58709597000)	BT	Investigation under different particle size effects of chitin with vinyl ester on mechanical behavior	Biomass Conversion and Biorefinery	September, 2023	21906815	https://www.scopus.com/inward/record.uri?eid=2-s2.0-85172811500&doi=10.1007%2Ff13399-023-04936-w&partnerID=40&md5=4105f08328a90a4d6e9f52450cd4a715
Muthugurupackiam, K. (36806583200); Pandiaraj, P. (56835669200); Gurusamy, R. (55539049600); Muthuselvam, I. (58925194500)	Maths	Further Results on (a, d) -total Edge Irregularity Strength of Graphs	Baghdad Science Journal	December, 2023	20788665	https://www.scopus.com/inward/record.uri?eid=2-s2.0-85186968416&doi=10.21123%2Fbsj.2023.8545&partnerID=40&md5=ceda4728946ba6065121661145ab29c1
Meenakshi, A. (58546951800); Asha, S. (57415517400); Haripriya, R. (58805279900); Asir, D. (57202115451)	CSE	ENSEMBLE DEEP TRANSFER LEARNING MODEL FOR NETWORK ATTACKS DETECTION IN INTERNET OF THINGS WITH SENSOR NETWORKS	Journal of Environmental Protection and Ecology	2023	13115065	https://www.scopus.com/inward/record.uri?eid=2-s2.0-85181958434&partnerID=40&md5=0a3327bbac7c5e682b7a0cd1207b0d3
Meenakshi, A. (58546951800); Nithya, S. (59431831300); Suganthi, P. (58631830500); Sangeetha, V. (57210551454)	CSE	DETECTION OF NETWORK INTRUSION FOR IoT BASED SMART ENVIRONMENTS BY OPTIMAL LEARNING MECHANISM AND BY USING DISCRETE ResNet CLASSIFIER	Journal of Environmental Protection and Ecology	2023	13115065	https://www.scopus.com/inward/record.uri?eid=2-s2.0-85178490671&partnerID=40&md5=5ab81c538637786690aa192b6aa9562
Kannan, V. Rajesh (58741533300); Abirami, A.M. (36631517700); Askarunisa, A. (36631575300)	CSE	EFFECTIVE TRUST MANAGEMENT FRAMEWORK BASED ON REPTILE-MOTH FLY OPTIMISATION FOR WIRELESS SENSOR NETWORKS	Journal of Environmental Protection and Ecology	2023	13115065	https://www.scopus.com/inward/record.uri?eid=2-s2.0-85178419720&partnerID=40&md5=c6c508efeeaa0f38f003163614dd720
Rajprabu, R. (58804812100); Kavitha, K. (57218643956)	ECE	TOMATO MATURITY ENHANCEMENT AND CLASSIFICATION WITH SRGAN AND VGG-16: A HYBRID APPROACH	Journal of Environmental Protection and Ecology	2023	13115065	https://www.scopus.com/inward/record.uri?eid=2-s2.0-85181912783&partnerID=40&md5=f09a13a879850949945c0510824a7ba7
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Solomon, Jebaraj Manickam Aswin Immanuel (58902799200); Selvakumar, Gurusamy (55509067900); Kumar, Shanmugakani Senthil (57795288700); Narayanasamy, Pandiarajan (55070355400)	MECH	Experimental investigation of wire electrical discharge machining parameters on WE43 magnesium alloy	Metallurgical Research and Technology	February, 2024	22713646	https://www.scopus.com/inward/record.uri?eid=2-s2.0-85185811343&doi=10.1051%2Fmetal%2F2024005&partnerID=40&md5=5b2a6533db32788c3a72797dccc491cc

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Ganesan, Sakthivel (57226727189); David, Prince Winston (57751300700); Balachandran, Praveen Kumar (57196456808); Colak, İlhami (6602990030)	EEE	Power enhancement in PV arrays under partial shaded conditions with different array configuration	Heliyon	January, 2024	24058440	https://www.scopus.com/inward/record.uri?eid=2-s2.0-85182801243&doi=10.1016%2Fj.heliyon.2024.e23992&partnerID=40&md5=40e6e9ae9ab509e5739163db4d250a73
Pandian, Pandimuni (58698746700); Winston David, Prince (49362680300); Murugesan, Palpandian (57609560800); Murugesan, Pravin (57219714246)	EEE	Novel Active Battery Balancing Methodologies for Lithium Batteries: An Experimental Comparative Analysis	Energy Technology	January, 2024	21944288	https://www.scopus.com/inward/record.uri?eid=2-s2.0-85181705259&doi=10.1002%2Fente.202301050&partnerID=40&md5=78169d40a1f6e46162786321c23dfd
Pandian, Pandimuni (58698746700); David, Prince Winston (49362680300); Murugesan, Pravin (57219714246); Balachandran, Praveen Kumar (57196456808)	EEE	A selective cross-tied array configuration technique for partial shaded solar PV system	Electrical Engineering	January, 2024	9487921	https://www.scopus.com/inward/record.uri?eid=2-s2.0-85182188822&doi=10.1007%2Fs00202-023-02209-3&partnerID=40&md5=a809eb55f5ebc030f3ade9762116f17
Suresh Kumar, Kavitha (59231616100); Winston David, Prince (49362680300)	EEE	Performance analysis of winnowing dynamic reconfiguration in partially shaded solar photovoltaic system	Solar Energy	January, 2024	0038092X	https://www.scopus.com/inward/record.uri?eid=2-s2.0-85182388331&doi=10.1016%2Fj.solener.2024.112309&partnerID=40&md5=a2fcb15175dc24d8ff076af671513921
Thangaraj, Hariharasudhan (57404485300); Winston David, Prince (49362680300); Raj, Marshal (57209458186); Babu Balachandran, Gurukarthik (58813956900)	EEE	Performance of stand-alone bifacial photovoltaic module using non-biodegradable waste as reflectors for tropical climatic region of southern India: An experimental approach	Solar Energy	January, 2024	0038092X	https://www.scopus.com/inward/record.uri?eid=2-s2.0-85182414977&doi=10.1016%2Fj.solener.2023.112302&partnerID=40&md5=2c28c9f53fbd4f995a96f38e93d6f30
Ganesan, K. (56644245000); Winston, D. Prince (49362680300); Nesamalar, J. Jeslin Drusila (57160429400); Pravin, M. (57219714246)	EEE	Output power enhancement of a bifacial solar photovoltaic with upside down installation during module defects	Applied Energy	January, 2024	3062619	https://www.scopus.com/inward/record.uri?eid=2-s2.0-85173848645&doi=10.1016%2Fj.apenergy.2023.122070&partnerID=40&md5=ee5d1e6ca7a7d3114af5ca7c0434a809
Geetha, M. (56587644100); Chandra Guru Sekar, R. (56938693000); Marichelvam, M.K. (55320255700); Tosun, Ömür (55010760800)	Maths	A Sequential Hybrid Optimization Algorithm (SHOA) to Solve the Hybrid Flow Shop Scheduling Problems to Minimize Carbon Footprint	Processes	January, 2024	22279717	https://www.scopus.com/inward/record.uri?eid=2-s2.0-85183427468&doi=10.3390%2Fpr12010143&partnerID=40&md5=79fe8a7a78db47078df2b703c190daa2
Balachandran, Gurukarthik Babu (57210725213); Devisridhivadhharshini, M. (58983491400); Ramachandran, Muthu Eshwaran (58571079100); Santhiya, R. (54961011300)	EEE	Comparative investigation of imaging techniques, pre-processing and visual fault diagnosis using artificial intelligence models for solar photovoltaic system – A comprehensive review	Measurement: Journal of the International Measurement Confederation	June, 2024	2632241	https://www.scopus.com/inward/record.uri?eid=2-s2.0-85190294434&doi=10.1016%2Fj.measurement.2024.114683&partnerID=40&md5=a169a97bd05d86df5272e1ee31d1d99
Vaishnavi, Ellappan (54883968900); Balasubramaniam, Keerthana (57359721000); Nagaraj, Karuppiah (55191561100); Wadaan, Mohammad Ahmad (15045991900); Maitly, Prasenjit (57194410456); Baabab, Almohannad (56051105600); Kamaleu, Subramanian (57208087867); Renganathan, Rajalingam (6701682658); Abjihith, S.M. (58915627600); Badgujar, Nilesh Prakash (8266892100); Shamim Rishwana, S. (55748397900)	CHEM	Synthesis of CdTe quantum dots using Glutathione promoted in Vitro interaction between Lysozyme and Flavonoids: An investigation through spectroscopic methods	Journal of Molecular Structure	June, 2024	222860	https://www.scopus.com/inward/record.uri?eid=2-s2.0-85186509424&doi=10.1016%2Fj.molstruc.2024.137818&partnerID=40&md5=88b9709c42991538edaa99732b3949d9
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Pandiyarajan, Narayanasamy (59175875900); Nunthavararwong, Peerawatt (55836757000)	MECH	Recent Advancements in Sealants Solutions for Surface Coatings: A Comprehensive Review	Journal of Bio- and Tribo-Corrosion	June, 2024	21984220	https://www.scopus.com/inward/record.uri?eid=2-s2.0-85196221831&doi=10.1007%2Fs40735-024-00865-x&partnerID=40&md5=8bee314d32f8678bae53c97f76b9a3af
Ganesan, K. (56644245000); Winston, D. Prince (49362680300); Sugumar, S. (57226675401); Prasath, T. Hari (57193442432)	EEE	Performance investigation of n-type PERT bifacial solar photovoltaic module installed at different elevations	Renewable Energy	June, 2024	9601481	https://www.scopus.com/inward/record.uri?eid=2-s2.0-85191341363&doi=10.1016%2Fj.renene.2024.120526&partnerID=40&md5=b60523f089e28917d6a4b4625b23a86
David Blesley, S. (59147409800); Narayanasamy, P. (55070355400); Balasundar, P. (56580222700); Balavairavan, B. (57211921880)	MECH	Effect of Voltage and concentration of polyetherimide on surface morphology and corrosion properties of A291D by electro-spin coating	Heliyon	June, 2024	24058440	https://www.scopus.com/inward/record.uri?eid=2-s2.0-85194387598&doi=10.1016%2Fj.heliyon.2024.e31884&partnerID=40&md5=5203cd95a7e69a8b5ee11440ed34039d
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Parvathikumar, Ganeshprabhu (57215095022); Sahadevan, Brintha (58168799100); Palanisamy, Chandrasekaran (37002592600)	CIVIL	Scrap steel mill scale as river sand replacement in cement concrete: effect on durability characteristics	Journal of Material Cycles and Waste Management	March, 2024	14384957	https://www.scopus.com/inward/record.uri?eid=2-s2.0-85188171776&doi=10.1007%2Fs10163-024-01902-0&partnerID=40&md5=36eb8988bcc53a0d7773a80837ef651
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Ganesh Babu, A. (57224454766); Saravanakumar, S.S. (59220240100); Balavairavan, B. (57211921880); Senthimaraikannan, P. (57115388800)	MECH	Modification of rice hull powder by in situ generation of silver nanoparticles for antibacterial composite filler applications	Macromolecular Research	March, 2024	15985032	https://www.scopus.com/inward/record.uri?eid=2-s2.0-85188505101&doi=10.1007%2Fs13233-024-00257-7&partnerID=40&md5=57331e862ef03ad57f1677bf2bb7094e
P. Aravind (58921559300); D. Prince Winston (58921370700); S. Sugumar (57226675401); M. Pravin (58921559400)	EEE	Optimal battery based electrical reconfiguration technique for partial shaded PV system	Applied Energy	May, 2024	3062619	https://www.scopus.com/inward/record.uri?eid=2-s2.0-85186765532&doi=10.1016%2Fj.apenergy.2024.122942&partnerID=40&md5=5c5965ab519dd729d9bc59a0d1846801
Sindhuja, N. M. Mary (57203789455)	ECE	Hybrid β Ω -indexing based fractal antenna for multi-band wireless applications	Multimedia Tools and Applications	May, 2024	13807501	https://www.scopus.com/inward/record.uri?eid=2-s2.0-85192513959&doi=10.1007%2Fs11042-024-18928-z&partnerID=40&md5=80a7431f55538fcbcc02a631a47d137e

Article

Development and Characterization of Bio-Based Composite Films for Food Packing Applications Using Boiled Rice Water and *Pistacia vera* Shells

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Abstract: Customer demand for natural packaging materials in the food industry has increased. Biocomposite films developed using boiled rice water could be an eco-friendly and cost-effective packaging product in the future. This study reports the development of bio-based films using waste materials, such as boiled rice water (matrix) and *Pistacia vera* shells (reinforcement material), using an adapted solution casting method. Several film combinations were developed using various concentrations of plasticizing agent (sorbitol), thickening agent (oil and agar), and stabilizing agents (Arabic gum, corn starch, and *Pistacia vera* shell powder). Various packaging properties of the film were analyzed and examined to select the best bio-based film for food packaging applications. The film fabricated with *Pistacia vera* shell powder in the biocomposite film exhibited a reduced water solubility, swelling index, and moisture content, as compared to polyethylene packaging material, whereas the biocomposite film exhibited poor antimicrobial properties, high vapor transmission rate, and high biodegradability rate. The packaging properties and characterization of the film indicated that the boiled rice water film with *Pistacia vera* shell powder was suitable for packaging material applications.

Keywords: *Pistacia vera*; biocomposite film; biodegradable; packaging properties

1. Introduction

The demand for packaging materials in the food sector has increased, and worldwide attention has been focused on natural biopolymers for the development and improvement of food packaging materials. The abundant use of synthetic polymers in the food packaging industry has resulted in harmful effects on humans and the environment. In the last two decades, enormous quantities of toxic plastic packaging chemicals in the form of microplastics have been dumped into marine environments, polluting the marine ecosystem. Groh et al. reported that various plastic packaging chemicals exhibit toxic and bioaccumulating properties [1]. Alabi et al., stated that the food packaging sector releases large amounts



Investigation of mechanical and thermo-mechanical characteristics of silane-treated cellulose nanofibers from agricultural waste reinforced epoxy adhesive composites

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ABSTRACT

The issue of deforestation has been of considerable concern in recent years. So as to contribute to a solution to this problem a major aim of this study has been to develop a sustainable environment by using agricultural industry waste in structural applications rather than wood. By this way, the study employed cellulose nanofibers (CNFs) derived from red banana empty fruit bunches to solve issues related to landfill gas emissions and the simultaneous utilization of organic wastes. The impact of silane treatment on the physicochemical, thermal, and morphological properties of CNFs was examined. Compression moulding was utilized to make different loading levels of silane-treated CNFs (SCNFs) reinforced epoxy nanocomposites. The resultant nanocomposites were evaluated by using various physical, mechanical, thermal, and micro-structural characterization tests. Properties such as tensile strength, flexural strength, impact strength, glass transition temperature, micro-hardness, thermal stability, and so forth, were evaluated under controlled laboratory conditions. Field emission scanning electron microscopy revealed the size and distribution patterns of the SCNFs in an epoxy matrix. Coefficient of effectiveness, cole-cole plots, and cross-link density studies confirmed the adhesion behavior of SCNFs with epoxy resin as a function of SCNF loading. All the findings led to the conclusion that the SCNF reinforced epoxy composites would make suitable materials for lightweight structural applications.

1. Introduction

A great deal of research has been done on synthetic nanofiller polymer composites for a wide range of engineering applications such as automotive components, building construction materials, electronic devices, and biomedical applications. Unfortunately, most of these synthetic nanofiller materials have not attained the criteria for environmental sustainability. Furthermore, the majority of these synthetic nanofiller materials have yet to meet the standards for environmental sustainability. Additionally, the manufacturing and selling costs of synthetic nanofiller materials, including those utilizing carbon nanotubes, nano-clays, ceramics, metals, and graphene nano-fillers, are

notably greater compared to basic matrix materials[1]. To overcome these and other constraints and shortcomings, recent trends have piqued the interest of researchers and scientists worldwide in the development of bio-based nanomaterials.

Nanocellulose is one of the most important biopolymers and has sparked a lot of interest in the nanocomposite field due to its unique properties. These properties include environmental sustainability, high aspect ratio, strength, ready availability, lightweight, and corrosive resistance option to replace synthetic fillers [2,3]. Several investigations have been successfully performed to extract nanocellulose from various parts of plants such as fibers, peels, seeds, and lignocellulosic waste materials with nano cellulose systems having been used as a major

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Synthesis, characterization and non-isothermal degradation kinetics of rose Bengal end capped poly(aniline)/Cr₂O₃ nanocomposite

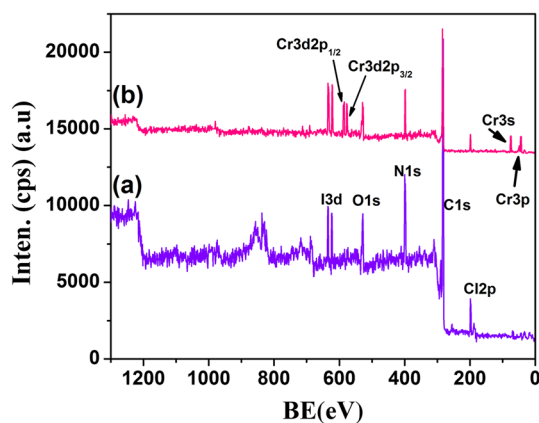
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Abstract

Solution polymerization of Ani was carried out in the presence of peroxydisulfate as a free radical initiator under N₂ atmosphere at 0–5 °C for 2 h both in the presence and absence of Cr₂O_{3(bulk)} material under vigorous stirring condition. During the polymerization reaction, the Rose Bengal dye was added as an end capping agent. The above synthesized polymers were characterized by FTIR, UV–visible, fluorescence emission, XPS, XRD, DSC, TGA, SEM, HR-TEM, viscosity and conductivity measurements. The added Cr₂O_{3(bulk)} controlled the structure of poly(aniline) (PANI) and the same can be confirmed by FTIR spectroscopy. The *T_g* of Cr₂O₃ mediated PANI showed somewhat higher value than the pristine PANI. The XPS showed the presence of Cr3d_{2p_{3/2}} and Cr3d_{2p_{1/2}} peaks and this confirmed the nano-sized crystalline Cr₂O₃. Further, its thermal degradation was studied by non-isothermal degradation kinetics and their thermodynamic parameters were determined. The experimental data were compared with the available literature data.

Graphical abstract



Keywords Synthesis of PANI/Cr₂O₃ · Characterization of nanocomposites · HR-TEM · XPS · Non-isothermal degradation kinetics · Thermodynamic parameters

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Cellulosic fiber extraction and characterization from derris scandens (Roxb.) benth root for polymer composite reinforcements

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Abstract

The utilization of natural lignocellulosic fibers as reinforcements in polymer composites has become increasingly popular in recent years. This research focuses on investigating the potential of *Derris scandens* (Roxb.) benth root fiber (DSBFs) as a reinforcing material in thermosetting polymer composites. The study begins by analyzing the properties and composition of DSBFs, using standardized testing methods. The single fiber tensile strength of DSBFs is determined to be 423 Pa at a strain rate of 4.01%, and they exhibit a Young's modulus of 79.45 GPa. Chemical analysis reveals that DSBFs are composed of helically coiled cellulose microfibrils, constituting 72.59 wt.%, held together by an amorphous lignin matrix and contain 9.69 wt.% hemicellulose and a low wax content of 0.3 wt.%. Thermal stability (TGA) analysis demonstrates that the fibers exhibit stability up to 340 °C, with a mass loss of 43.78%. X-ray diffraction analysis confirms the crystalline index of 18.16 nm and a crystalline size of 49.28%. ¹³C (CP-MAS) NMR spectroscopy yields the evidence for the presence of cellulose, hemicellulose, and lignin in DSBFs. Fourier-transform infrared spectroscopy (FTIR) identify functional groups and elemental composition of DSBFs. Surface morphology is analysed by atomic force microscopy (AFM) and optical microscopy. These findings suggest that DSBFs can find applications beyond their traditional use in Thai medicine.

Keywords *Derris scandens* (Roxb.) benth root fiber · Characterization · AFM · NMR · Optical microscopy · FTIR

1 Introduction

At present, there is a high demand for natural fiber-oriented materials due to their renewability and problem-free disposal. Although natural fibers show some lack of repeatability, they are more ecological and offers various other benefits when compared to synthetic fibers [1]. As such, natural fibers are being proposed as an appropriate alternative to synthetic fibers for many end products [2]. Natural

fibers have significant features such as being low cost, biodegradable, light in weight, having a high strength-to-weight ratio, abundant availability, lower energy requirements for processing, low density, recyclability, non-corrosiveness, eco-friendliness, ease of handling, and lack of health-hazard components compared to synthetic fibers [2, 3]. Owing to these factors, natural fiber-based polymer composites have found major applications in the automobile, industrial, packaging, home appliances, construction, aeronautics, and naval industries [4] (Singh et al. 2018).

Natural fibers can be extracted from different parts of plants like barks, stems, leaves, roots, fruits, flowers, and seeds. Some previously experimented examples of plants from which fibers extracted are *Azadirachta indica*, *Cordia dichotoma*, *Sida Cordifolia*, *Grewia optiva*, *Grewia tiliifolia*, *Prosopis juliflora*, *Sansevieria ehrenbergii*, *Luffa cylindrica*, and *Furcraea foetida* [5]. These fibers have been found to be of great strength in polymer composites from various studies [6].

The length, diameter, and arrangement of cellulose in natural fibers from plants with longer lifespans are usually have a low spiral angle [7]. These plants grow

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RESEARCH ARTICLE

Optimum design of planar quasi-Yagi antenna for wearable Internet of Things (IoT) applications

Ruby Dass, Gopalakrishnan Thirumoorthy, Gayathri Ananthakrishnan, Anusha Kannan, Sureshbabu Rajendran, Manikandan Narayanan , Kannan Arputharaj

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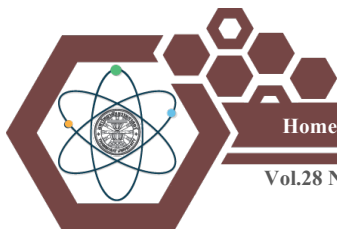
[Correction added on 3 August 2023, after first publication: Author has updated the affiliation 1 and 5]

Abstract

This paper presents the design of a novel dual-band quasi-Yagi antenna for on-body communications. The proposed antenna is designed on 0.05 mm thin microwave laminate and is designed to cover the 2.45 and 3.5 GHz spectrum to meet the needs of on-body Internet of Things networks. Microstrip to slot-line transition is used for the excitation of the feeder element. The conventional feeder of the quasi-Yagi is replaced with F-shaped radiators to obtain a dual-band response. In addition, a pair of directors are used to enhance the antenna gain. The proposed quasi-Yagi antenna is optimized using the spider monkey algorithm. The chosen algorithm is used to synthesize the dimensions of the dual-band radiator and is preferred to obtain quick convergence, unlike the traditional optimization algorithms. The optimized planar quasi antenna offers 5% bandwidth in both operating bands with a measured gain of 5.7 and 5.8 dBi, respectively. The optimization time is also considerably reduced in comparison with traditional optimization algorithms. The simulated and optimized antenna is fabricated and tested.

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DATA AVAILABILITY STATEMENT



Investigation of Larvicidal Activity and Histopathological Variations of Brown Algae *Spatoglossum asperum* J. Agardh against *Aedes aegypti*, *Culex quinquefasciatus*, and *Anopheles stephensi*

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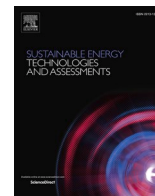
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ABSTRACT

The purpose of the current study was to determine whether the methanolic extract of *Spatoglossum asperum* has larvicidal properties against *Aedes aegypti*, *Culex quinquefasciatus*, and *Anopheles stephensi*. Various doses of methanolic seaweed extract (50, 100, 150, and 200 ppm) were applied to chosen larvae in the early 4th instar. Each test was carried out in triplicate, with a control group present simultaneously. The mortality rate was observed at regular 24 hr intervals. FTIR and GC-MS studies analyzed the methanolic extract's functional groups and phytochemical compounds. The standard plate procedure was used to test the antibacterial capacity using clinically isolated pathogens; the extract effectively killed bacteria of all types, according to findings. FTIR peaks confirmed the presence of carbonyl groups, amino acids, hydroxyl groups, and alkynes. The GC-MS study of the seaweed extract found 14 major bioactive compounds, such as citronellol and diethyl phthalate, found to have insecticidal, nematocidal, antibacterial, antioxidant, cytotoxic, antifungal, and hepatoprotective properties. DPPH radical scavenging and nitric oxide assays showed that the efficacy grew as the extract level was raised. Total phenol and flavonoid content of the methanol extract was estimated at 73.2±02 µg/mL and 89.1±0.03 µg/mL, respectively. Against 4th instar *Ae. aegypti*, *Cx. quinquefasciatus*, and *An. stephensi* larvae,



Maximum power enhancement in solar PV modules through modified TCT interconnection method

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ARTICLE INFO

Keywords:

Partial shading
PV module
Solar PV cell
TCT

ABSTRACT

This article presents a narrativemove towards for maximal power augmentation in poly-crystalline solar photovoltaic (PV) modules through the modified Total Cross Tied (TCT) interlinkconnection method. Worldwide, the cost of coal has increased after a pandemic rebound in industrial activity and it leads to demand for electricity. The maximum power extraction from sustainable energy sources plays a vital role as they are ample, eco-friendly, harmless, and won't run out. Due to shading effects like the transition of clouds and tree shadows, the output power generated from the solar photovoltaic array is reduced uptill 60%. Several methodologies of array formation and reconfiguration strategies were developed to overcome the partial shading effects. In this proposed method, PV cells in modules are tied via modified TCT fashion with a bypass diode through each row. Real-time experimental analysis is performed with 4×4 cell connections. The current (I)-(V)voltage and Power(P)-(V) voltage characteristics are obtained under normal and various partial shading conditions. According to our proposed method, the percentage power enhancement achieved by row-wise partial shading increases from 10% to 60%, approximately 83.64, 82%, 80%, 74.29%, 70%, and 64%. According to the conventional topology, the maximum fill factor is 0.28 in columnwise 25% shading ratio, whereas the proposed modified TCT PV array has a fill factor of 0.53, 89% higher. Compared to the proposed pattern, which has a maximum performance ratio of 0.86 for 10% shading condition. The modified TCT interconnected PV module connection extracts a maximum of 50% increased output power when compared to conventional PV modules. The performance of the projected modules is also examined in a one kW PV array.

Introduction

Inexhaustible energy resources played a vital part in power generation after the covid-19 pandemic rebound in industrial activities. Electricity demand increases day by day worldwide. In the modern world, everyone is moving with electronic gadgets like cell phones, laptops, smartwatches, electric scooters, electric cars, etc. To meet these electricity demands, renewable energy sources like solar PV, hydroelectricity, wind, ocean, geothermal, biomass, and hydrogen types are widely used to generate power. As India is gifted with vast solar energy potential power generation using solar PV requires very less human maintenance compared with other power generations. Without depending upon conventional power plants, the day-to-day demand can be met using solar PV plants. In 2050, the share of electricity generated from clean, renewable resources is predicted to increase from 25% in 2017 to 85% if global efforts are made to increase their use. According to the International Renewable Energy Agency, (approximately) 104 GW

of solar PV capacity are mounted in North America. The US is responsible for (approx) 90% of that (93.7 GW), pursued by Mexico with (approx) 7 GW and Canada with 3.6 GW. Presently, Europe and Asia are top on the list of countries with the highest solar PV capacity, but by 2030, North America is forecast to have the 2nd largest solar PV capacity (430 Gigawatts) [1].

The irradiation that falls on the PV cells generates power. The main problem with solar energy is less efficiency, partial shading, and high initial cost [2]. Four types of solar PV modules manufactured in the market are mono-crystalline solar PV modules, polycrystalline solar PV modules, amorphous modules, and concentrated solar PV modules. In this research, Polycrystalline solar cells are taken for analysis and validation because they are inexpensive and widely used. It appeared like a blue hue color. The main advantage of this material is its high-temperature coefficient and heat tolerance. The main drawback in power generation using polycrystalline solar PV arrays is partial shading and it has a typical efficiency of below 16%. Partial shading is the reduction in the occurrence of irradiance on PV array modules, which in

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Performance evaluation of natural *Olea europaea* (olive oil)-based blended esters with butylated hydroxyanisole and butylated hydroxytoluene: optimization using response surface methodology

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Abstract

For power transformer applications, this study explores an alternative insulating liquid. With this aim, edible natural esters such as refined *Olea europaea* (olive oil), rice bran oil, soya bean oil, sunflower oil, and corn oil are investigated as suitable replacements for the mineral oil (MO) used in the transformer. In addition, olive oil and other natural esters are incorporated into the blend for further analysis to obtain a better insulating medium. Blended natural esters were also tested for performance enrichment by antioxidant inclusion. Butylated hydroxyanisole (BHA) and butylated hydroxytoluene (BHT) were chosen as antioxidants for this study. In this study, we aimed to investigate the role of key input factors [A-speed, B-time, and C-temperature] on the output response [Y-breakdown voltage]. It was determined that the optimal conditions for [Y] are [A-699.91 rpm, B-49.95 min, and C-88.75 °C]. In order to ensure the desirable properties, the natural esters were subjected to certain experimentations such as breakdown voltage

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Original Research

Properties of Binary and Ternary Blended Cement Containing Pond Ash and Ground Granulated Blast Furnace Slag

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Abstract

Fly ash is a fine powdery particle collected from the unit operations of coal combustion furnaces in thermal power plants. Retained fly ash at bottom of hopper has been mixed with water and dumped in lagoons in form of slurry as pond ash (PA) or lagoon ash. Ground Granulated Blast Furnace Slag (GGBS) is a by-product obtained from steel industry. In this study, three phase of concrete specimens were prepared. In first phase, the specimens were prepared using 100% cement with various water-to-cementitious ratios. In second phase, specimens were prepared with varying water-to-cementitious ratios and PA contents ranging from 0 to 20%. Finally, the third phase, specimens were prepared to determine the optimal PA content, with GGBS ranging from 0 to 25%. The mechanical and rheological properties of different proportions of PA and GGBS have been experimentally investigated at 28 days. In addition, the flow ability and packing density of different proportions of PA and GGBS various mixes were tested. The test results revealed that combination of PA and GGBS up to 27% would enhance the fresh and harden properties of cementitious material. The rheological behaviour of optimal PA and GGBS concrete were tested at 28 days using scanning electron microscope (SEM). The results confirmed that the addition of PA and GGBS resulting in a denser, less porous, and more compact CSH microstructure in concrete.

Keywords: cementitious material, flow ability, packing density, strength properties, Rheology properties



Formation damage and improved recovery in kaolinitic high enthalpy gas fields with fabric geological settings

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ARTICLE INFO

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Porous media
Rock fabric
Heat transfer fluid
Fines migration
Thermal expansion coefficient
Gas recovery

ABSTRACT

This paper investigates the fines migration and transport in natural gas reservoirs as a function of porous rocks with fabric geological settings. So, an analytical and surface thermodynamic model was developed for high temperature permeable media. Two sets of core flood experiments were conducted under normal (50 °C) and high temperature (150 °C) fluid flow, where the major results revealed that there is an increase in the rock core thermal expansion of 57 (10⁻⁶ °C⁻¹) and 192 (10⁻⁶ °C⁻¹) at 50 °C and 150 °C. The rock core underwent a thermal strain to 0.36% and 0.86% under normal and higher temperature conditions. At 50 °C the pressure stabilized to 20 psi and 50 psi was recorded as the peak pressure under 150 °C rock temperature. The fines concentration under higher temperature is significantly higher than the normal rock temperature and yielded maximum up to 77.28 ppm. The rock permeability exhibited a linear and stabilized decline, but at higher temperature new surface energies was created in the rock core and as a result, the reservoir permeability begun to rebound. Microstructural images revealed that the kaolinite clay fine particle under 50 °C has a platelet structure and has multiple straining mechanism. Whereas, under higher temperature the clay fines have transcended to compaction over the rock surface fabrics. Exponential gas recovery of 15% and 25% was observed for both 50 °C and 150 °C cases. In the former case, a linear growth rate to 25% was noted and then gradually it fell to 12.9%. While, in the latter case the gas recovery rate climbed to 33.7% and stabilized, which indicates that the gas recovery rate was monotonous. The experimental and analytical models have been verified using multiple linear regression method and the model's outcome revealed an excellent agreement whose R² values were found to be 0.9997 and 0.9995.

1. Introduction

The world is still relying on the fossil fuels for fulfilling their energy needs even after global pandemic Covid-19 (Erias and Iglesias, 2022). Specifically, the natural gas demand is in the exponential growth and this stimulate the natural gas producing companies to explore and produce gas in enormous quantity unlike before from existing and new fields across the globe (Safiyari et al., 2022), and as a result, there is an expansion and optimization of global natural gas supply chain network (Sharma et al., 2021). Moreover, Karakurt and Aydin (2023), analysed

the fossil fuels demand and supply in BRICS and MINT nations, and their CO₂ emissions forecasting using Regression Models. Their modelling outcomes indicated that BRICS and MINT countries will dominate the world economy in fossil fuels, especially the natural gas business and they will be the largest emitter of CO₂. Hence, there is a strong outlook for worldwide natural gas demand and it is essential to explore, extract, store, and utilize the existing and new gas reserves for meeting the global energy demand. Enhancing the gas production should be the primary criteria for energy companies and governments. But gas fields containing clay minerals deposits, particularly kaolinite often induce

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Experimental studies on automated DC pulsed MIG welding of Monel 400 sheets

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ABSTRACT

Hot-rolled Monel 400 sheets of 2 mm thickness were effectively welded by the automated DC-pulsed gas metal arc welding (DC-pulsed GMAW) process using ERNiCu-7 (NA60) filler. An L9 array has been used in this work to obtain optimal robotic welding parameters to achieve better weld quality. The weldments was subjected to microstructural examinations using optical microscopy. The chemical compounds and elements of the weldments were determined using X-ray diffraction and energy-dispersive analyses. The microhardness and tensile properties of the weldments were evaluated. The corrosion behavior of the base metal and weldments was estimated in service environments by exposing them to a 3.5% NaCl solution using a potentiodynamic polarization method. The weld zone has the highest microhardness value of 154 HV. Monel 400 weldments have lower joint strength and elongation than the base metal. In addition, weldments have a higher corrosion rate (201.1 mm/yr) than base metal (55.64 mm/yr).

ARTICLE HISTORY

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KEYWORDS

Monel400; GMAW; tensile, corrosion

Introduction

Nickel-based superalloys are mainly used to make parts for the marine and aerospace industries due to their high strength and excellent corrosion resistance in acidic environments.^[1] Monel Alloy is one of the nickel-based superalloys utilized in the various industrial sectors for its excellent strength and corrosion resistance.^[2] Monel 400 is a nickel – copper alloy with excellent ductility, fatigue strength, and corrosion resistance at high temperatures. It can withstand high-temperature steam, salt water, and caustic solutions.^[3] Metal inert gas welding is a seamless technic for assembling and renewing both surface and interior of any structure.^[4] ASTM A 106 Grade B pipes were welded using an automated MIG method to assess metallurgical and mechanical weld quality by varying the control factors such as input voltage, feed rate of filler wire, and CO₂ gas flow rate.^[5] The effects of the DP-GMAW and P-GMAW procedures on the mechanical and metallurgical characteristics of a thin sheet of AA6061 aluminum alloy were evaluated.^[6] The selection of proper welding parameters is essential for achieving higher mechanical strength while reducing weld defects.^[7,8] It was necessary to improve welding parameters such as weld current, wire feed rate, and welding speed to achieve defect-free weldments with complete depth penetration. The mechanical properties and pitting corrosion behavior of gas tungsten arc (GTA) welded Monel 400 weldments were studied.^[9] AISI 304 and Monel 400 dissimilar joints are commonly used in marine and offshore conditions, as well as in oil and gasification plants.^[10] Monel 400 and AISI 316 dissimilar weldments established by two fillers were studied and compared.^[11] Cherish Mani et al. (2019) studied the corrosion resistance of a Monel 400 tube welded to an SS 316 tube using the GTAW process. Weld region

on both specimens exhibited better corrosion resistance when compared to other zones. The results showed that the heat-affected zone of Monel 400 and SS316 had lower corrosion rate because of higher amounts of chromium than SS 316.^[12] The mechanical properties of the friction stir welded Monel 400 and Inconel 600 dissimilar weldments were investigated.^[13] The mechanisms influencing the microstructure and mechanical properties of Monel during friction stir welding (FSW) at various heat inputs were investigated.^[14] Welding consumables for dissimilar metal combinations such as Monel 400 and Inconel 600 were explored.^[15] Monel 400/Nb bilayer used a laser to join 304 SS and TC4 Ti alloy. It was possible to make a joint that could hold up to 258 MPa of tension.^[16] The tensile properties of gas tungsten arc welded 316 L stainless steel/Monel 400 joints were investigated. The break happened when the Monel 400-Nb interface and the joint showed the brittle mode. Also, the numerical solution and the experimental data were compared.^[17] Different filler wires, such as SS 316 L, Monel 400, and ENiCrFe-5, have been employed under various welding conditions in Gas Tungsten Arc Welding for welding SS 316 L and Monel 400 alloys.^[18] Bi-metallic welds of AISI 304 and Monel 400 have been made using welding procedures such as GTAW and GMAW welding, both of which have proven to be effective.^[19] A new strategy established by merging fuzzy-regression with Enhanced Teaching Learning-Based Optimization (ETLBO) algorithm logic has been utilized to acquire optimal robotic welding parameter settings for achieving the best weld quality measurements.^[20]

Despite these studies, a greater understanding of the mechanical properties of MIG-welded Monel 400 joints is required. The pulsed-metal inert gas (pulsed-MIG) welding procedure was used

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Weighted Moth-Flame Optimization Algorithm for Edible Oil Quality Detection Using Microwave Technologies

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Abstract

Edible oil acts as an essential part in diet and nutrition, and it is important for a healthy life. Edible oils are susceptible to quality degradation, due to decomposition and microbial decay, which causes nutritional loss and undesirable effects. Consumption of unhealthy edible oil creates hazardous health effects such as dementia, heart-related disorders, cancer, Alzheimer's, and Parkinsons diseases. The food safety concern has increased globally, and there is a need for food quality analyzing system. Chemical methods have been widely used to measure the quality of edible oils but the chemical methods consume more time for evaluating the quality of edible oil, and the oil ingredients are changed, due to chemical reactions. This research work proposes a non-destructive technique, which is based on microwave technologies and deep learning methods to measure the quality of edible oil. The waveguide method at 8-12 GHz frequency to measure the microwave parameters such as attenuation constant, dielectric

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Development and Characterization of Sustainable Bioplastic Films Using Cellulose Extracted from *Prosopis juliflora*

Marichelvam M K^a, Manimaran P^b, Anish Khan^c, Geetha M^d, Kandakodeeswaran K^a, Ahmed H. Abduljabbar^e, Edi Syafri^f, Mohammad A. Wazzan^e, Huda Wazzan^g, and Waseem Khan^e

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ABSTRACT

To diminish the environmental impacts instigated by plastics, investigators recommended bioplastics. In the current work, an attempt is made to develop sustainable bioplastics from waste plants. Cellulose was extracted from the wood of *Prosopis juliflora*. The *Prosopis juliflora* wood was cut and ground into powder. The powder was washed with water and subjected to several chemical treatments to extract the cellulose. The bioplastic film samples were produced using it. Six different samples were prepared by varying the composition of cellulose, gelatin, citric acid, and glycerol. Several tests were carried out on samples developed as per ASTM standards, and the results were compared with the existing bioplastics. The test results indicated that sample 1 has a maximum tensile strength of 7.73 MPa. The average bursting strength of the bioplastic film is 12.44 kg/cm², which is better than the other bioplastics reported in the literature. The average biodegradability of developed bioplastic films is approximately 59.43%. The results revealed that the *Prosopis juliflora* cellulose-based bioplastics would be a better substitute for conventional plastics.

摘要


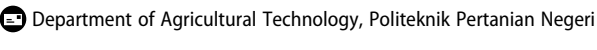
为了减少塑料对环境的影响, 研究人员推荐使用生物塑料。在目前的工作中, 试图从废物工厂中开发可持续的生物塑料。从胡萝卜的木材中提取纤维素。普罗索匹斯的*juliflora*木材被切割并研磨成粉末。用水洗涤该粉末并进行若干化学处理以提取纤维素。使用它生产生物塑料薄膜样品。通过改变纤维素、明胶、柠檬酸和甘油的组成制备了六种不同的样品。对根据ASTM标准开发的样品进行了几项测试, 并将结果与现有的生物塑料进行了比较。试验结果表明, 样品1的最大抗拉强度为7.73MPa。生物塑料薄膜的平均爆裂强度为12.44 kg/cm², 比文献中报道的其他生物塑料要好。已开发的生物塑料薄膜的平均生物降解性约为59.43%。研究结果表明, 基于*Prosopis juliflora*纤维素的生物塑料将是传统塑料的更好替代品。

KEYWORDS

Plastics; bioplastics; starch; cellulose; biodegradability; *Prosopis juliflora*

关键词

塑料; 生物塑料; 淀粉; 纤维素; 生物降解性

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Solar Photovoltaic System Performance Improvement Using a New Fault Identification Technique

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[Abstract](#)[Author keywords](#)[Indexed keywords](#)[Sustainable Development Goals](#)[SciVal Topics](#)[Metrics](#)**Abstract**

Identifying faults in the photovoltaic (PV) arrays is very much essential in improving the PV system's safety and reliability. Solar PV arrays operate with non-linear characteristics, installed with maximum power point trackers (MPPT's), and blocking diodes cause mismatch levels. Line-to-line and line-to-ground faults are identified, and the faulted circuits are isolated by means of over current protection devices (OCPD) and ground fault protection devices (GFPD). In order to improve the accuracy of fault detection, artificial intelligence (AI)-based techniques like Fuzzy inference, wavelet, support vector machine, and k-nearest neighbors are used. The drawback of AI-based techniques are (1) requirement of large dataset for effective fault identification and also show incompatibility if there is low irradiation and (2) require a larger number of voltage and current sensors. An experimental setup of 160 W, 4 × 4 solar PV array having PV modules (SPB) is subjected to different fault conditions (CS), and the faults are identified using the minimum number of sensors. The faults that are not detected by the conventional methods are detected using this proposed method, and the power gain due to the fault identification is around 152% which is 97 W in the PV array. © 2023 Taylor & Francis Group, LLC.

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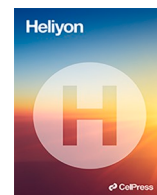
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A Diode-Based Fault Detection, Classification, and Localization Method for Photovoltaic Array

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Multi-analytical investigation of the physical, chemical, morphological, tensile, and structural properties of Indian mulberry (*Morinda tinctoria*) bark fibers

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ARTICLE INFO

Keywords:

Morinda tinctoria fiber
Cellulose
Microfiber
Zeta potential
Structural characterization

ABSTRACT

In this study, micro-cellulosic fibers were isolated from the bark of *Morinda tinctoria* (MT) and characterized for the first time. The anatomical, physical, chemical, thermal, and mechanical properties of the *M. tinctoria* bark fiber (MTBF) were investigated. The mean diameter and density values were determined to be $32.013 \pm 1.43 \mu\text{m}$ and 1.4875 g/cm^3 , respectively. Zeta potential analysis and particle size measurements provided the evidence of enhanced micro-particle behavior on the fiber's surface. Various structural characterizations confirmed the presence of polysaccharide structures, monosaccharide compositions, glycosidic residues (sugar linkages), and cohesive reactions of TMSA (Trimethylsilyl alditol) derivatives, indicating the fiber's potential for strong surface absorption properties. X-ray diffraction analysis revealed a crystallinity index of 51 % and a crystallite size of 3.086 nm for MTBF. Fourier transform infrared analysis indicated the presence of cellulose, hemicellulose, and lignin constituents, along with their corresponding functional groups. The calculated values of Young's modulus and tensile strength were determined to be 75.7 GPa and 746.77 MPa, respectively. Thermogravimetric analysis demonstrated the thermal stability of the extracted MTBF up to 240 °C. Based on these findings, the MT microfibrils derived from the bark can be considered as potential substitutes for existing synthetic composites, offering reinforcement for novel bio composites.

1. Introduction

Over the last few decades, concepts based on sustainability, ecology, and green manufacturing steered to the generation of new bio-based polymer composite materials [1]. Requirement for green polymer cellulosic bio-composites based on bark fibers have a great

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Fumarate metal organic frameworks as reactive and curing reaction alternant in hydrophobic bispropargyl ether based matrix resin system

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Abstract

Acetylene terminated polymers are gaining interest due to the need for easily processable thermally stable networks. The Metal Organic Frameworks (MOFs)—aluminum fumarate (Al_FA_A) and copper fumarate (Cu_FA_A) MOFs were synthesized and blended with bispropargyl ether (bis (4-propargyloxyphenyl) sulfone—SPE). The (SPE + 1% MOFs) blends were characterized and thermally polymerized to give P(SPE + MOFs). The synthesized materials were characterized using FTIR, DSC, TG and TG-FTIR. The addition of both MOFs decreased the enthalpy of fusion and enthalpy of curing by 60%. The addition of copper MOF to SPE drastically reduced the temperature at which the thermal curing was maximum (300 °C to 252 °C). The 2-H chromenes were formed from bispropargyl ethers by Claisen-type sigmatropic rearrangement. Compared to pure SPE, the polymers resulting from hybrid systems show a slower thermal degradation rate. The sulfone as a swivel group in SPE and the involvement of fumarate π -bonds of MOFs during polymerization make the material more versatile. The investigation concluded that these novel inorganic–organic hybrid blends may be a good start for low-temperature curable sufficiently thermally stable matrix resin systems having a wide scope of applicability in the field of filler-reinforced composites.

Keywords Metal organic framework (MOF) · Functionalization · Bispropargyl ether · Claisen rearrangement · Low-temperature curable

Highlights

- The synthetic procedure of aluminum and copper fumarate Metal Organic Frameworks (MOFs) was optimized and characterized.
- Studies were done on the influence of MOFs on the random or bulk polymerization of bispropargyl ether composites.
- The effect of copper salt and copper fumarate MOF in bispropargyl resin.
- Achievement of low-temperature processability in bispropargyl monomer by addition of copper fumarate MOF.

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Introduction

High-performance thermosets containing acetylene terminated resins (ATR) are created and applied in hot humid conditions. Due to its simple structural makeup and strong reactivity, acetylene chemistry is significant in many ways [1]. The ATR resins have high thermal resistance, heat resistance, low moisture uptake and high strength. The polymerization of the acetylene terminated group leads to the formation of polyene with π -conjugated backbones. Polyene also extends its application in the biomedical field [2]. The crosslinking nature, additional rigid ring structures and the swivel group become the base concept of high-temperature thermosets. One of the important ATR resins is propargyl terminated (PT) resin with good thermal stability, low moisture absorption, low dielectric constant and excellent adhesion. The auxiliary advantage is the formation of void-free materials without high pressure [3]. Even though propargyl-terminated resins have excellent properties, it needs modifications to suit industrial applications. Hence blending the resin is one of the best choices to improve the resin and/or enhance the final product performance. Several bispropargyl ethers were studied

Fabrication and Testing of Crop Waste *Ceiba pentandra* Shell Powder Reinforced Biodegradable Composite Films

Kaliraj Medadurai, Narayanasamy Pandiarajan,* Balavairavan Balasubramanian, and Balasundar Pandiarajan



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ABSTRACT: *Ceiba pentandra* shell powder (CPSP) biowaste is chosen as a biofiller combined with poly(vinyl alcohol) (PVA) as a matrix to make biofilms to increase the exploitation of biowaste materials and reduce the use of plastic materials. FTIR plots indicated no significant chemical reaction or formation of new functional groups during interaction between PVA and CPSP. XRD diffractograms showed that the crystallinity index (35.3, 38.6, 42.3, 46.4, and 48.5%) and crystalline size (18.14, 20.89, 23.23, 24.87, and 26.34 nm) of biofilms increased with CPSP loading (5–25 wt %). The PVA/CPSP films are thermally stable up to 322 °C. The peak highs of AFM images showed that the films' surface roughness gradually increased from 94.75 nm (5 wt % CPSP) to 320.17 nm (25 wt % CPSP). The FESEM micrographs clarify the homogeneous distribution of CPSP in the PVA matrix. Tensile strength and tensile modulus are noticeably increased by 26.32 and 37.92%, respectively, as a result of the loading of CPSP from 5 to 20 wt % in the PVA matrix. The PVA/CPSP films outperform pure PVA films in UV shielding (350–450 nm). The 59% weight loss of films was estimated during 60 days of burial. The fabricated biofilms maintained their suitable structural, thermal, morphological, and mechanical properties. Additionally, they exhibited consistent performance in ultraviolet (UV) barrier, opacity, water absorption, water vapor permeability, soil burial, and antimicrobial characteristics over time. Overall, PVA/CPSP (5–25 wt %) films are biodegradable and have promising applications as good packaging materials.



INTRODUCTION

Plastics are now becoming a core component for many applications such as automobiles, packaging, furniture, house appliances, etc. Because we produce and discard so many plastics, our necessity for plastic has another grave drawback.¹ In the 9 billion tonnes of plastic produced around the world as of 2010, 6.9 billion metric tons have been wasted, and just 9% have been recycled. The remaining plastic garbage is disposed of in landfills and waterways around the globe, where it causes pollution that harms species.^{2,3} Ineffective packaging plastics comprise about 40% of the garbage. The development of environmentally friendly products has received a lot of attention recently, with ecofriendly materials being used as a probable replacement in lieu of plastic (derived from petroleum hydrocarbons) packaging materials.⁴ The various benefits of biocomposite materials include their relative affordability, increased environmental friendliness, and inherent biodegradability.⁵

The production of biofilms with synthetic polymers that can provide high mechanical properties and are nonvenomous as an alternative to packaging plastics will be suitable for food packaging, biomedical, and enclosing applications.^{6,7} In various fields, poly(vinyl alcohol) (PVA) is overtaking other non-biological polymers like polyethylene, polypropylene, HDPE, etc., because it has the properties of biodegradability,

nontoxicity, hydrophilicity, film-forming, and higher tensile strength.^{8,9} Specifically, PVA is acknowledged as one of the most promising biodegradable polymers in mulch films.¹⁰ PVA has some downsides, including a high degree of hydrophilicity due to PVA originating with more hydroxyl groups in its carbon chains and a sluggish decomposition rate in an anaerobic environment.¹¹ To improve the mechanical properties, biodegradation rate, and hydrophilic nature of PVA-based composites, combining them with organic fillers extracted from plant wastes may be viable.¹² Crop scum, farming rubbish, and byproducts are suitable biological reinforcement fillers for biocomposites.¹³ Combining plant leftovers with polymeric materials results in a composite material with enhanced properties.

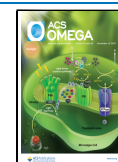
The Malvaceae tree family includes the genus *Ceiba* indigenous to tropical and subtropical regions of the Americas and tropical West Africa. The *Ceiba pentandra* (kapok) plant yields a strong and lightweight fiber used to stuff dolls, pillows,

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CYBER ATTACKS DETECTION USING GoogleNet MODEL FOR ENVIRONMENTAL AWARE SMART CITY APPLICATIONS

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Abstract

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Abstract

With the exponential rise in cybersecurity assaults, it is more important than ever to develop more accurate prediction models and strategies for sensor systems and IoT-based settings. This problem is currently unsolved since current attack forecasting techniques are unable to maintain up with the enormous volume and diversity of attacks. Deep learning approaches in particular have lately attracted a lot of attention from academics because to their unrivaled efficacy in various predictionbased areas. This study examines how deep learning algorithms may be used in this environment to foresee cybersecurity attacks. The cybersecurity research sector has free public access to many intrusion detection datasets for additional investigation. However, no prior study has thoroughly investigated the suggested model's performance on a range of publicly available datasets. The publicly available intrusion dataset must be refreshed and benchmarked often due to the changing character of the assault and its quickly evolving attack tactics. This type of study makes it possible to determine the best effective algorithm for predicting upcoming cyberattacks. We suggested a cutting-edge deep learning method called GoogleNet for identifying threats. The ideal network settings for the suggested LSTM-AE (Long Short-Term Memory-Autoencode) are chosen using the new version data set of the KDD'99 (NSL-KDD) dataset. The investigational findings demonstrate the viability and applicability of the suggested hybrid model for identifying assaults in contemporary circumstances. © 2023, Scibulcom Ltd. All rights reserved.

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Research Article

Study on the Behavior of Self-Cleaning Impregnated Photocatalyst (TiO₂) with Cement Mortar

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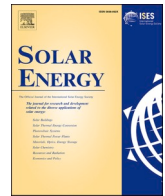
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Cement-based materials are increasingly and widely employed in infrastructure development; however, they pollute our environment by generating carbon dioxide, which is detrimental to our civilization. In self-cleaning concrete, photocatalysts accelerate the decomposition of organic particles; thus, photocatalytic degradation of gaseous pollutants could reduce pollution. The incorporation of photocatalytic components enhanced the mechanical self-cleaning properties of cement mortar. In this study, 4–6 percent by weight of rutile TiO₂ was added to mortar, and the results were compared to those of a control sample. On the proposed mortar cubes, both fresh mortar and hardening mortar experiments were conducted. Because the initial and final setting times of TiO₂ differ from those of conventional cement mortar, the surplus TiO₂water-cement ratio had to be modified. The adaptability of the sol-gel method enables the use of various process parameters to influence the properties of the produced TiO₂ nanoparticles. The compressive strength was calculated for 7, 14, 21, and 28 days, and an ultrasonic velocity test was performed after 28 days. On mortar samples, acid and sulfate attack experiments were performed. The M-3 mortar mixture containing 5% rutile exhibited the highest level of strength compared to the other mixtures. The M-3 exhibits a strength that is 10.96% greater than that of the control mix. The impact of acid and sulfate attack on the strength of mix M-2 is relatively modest in comparison to other mixtures. Using RhB (rhodamine color) discoloration under UV light, such as sunlight, the photocatalytic mortar is concentrated; a typical test for self-cleaning cementitious materials reveals the presence of more photocatalytic material, which yields the best results.



Comparative analysis of Hybrid, conventional and staircase static reconfiguration methods to mitigate partial shading effects: Unveiling the superiority of two-step staircase (2SS) reconfiguration

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ARTICLE INFO

Keywords:

Partial shading
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ABSTRACT

Partial shading of solar PV panels can significantly impact the performance of a solar PV array. However, a new reconfiguration method called Staircase Static Reconfiguration (SS) has been proposed to mitigate these losses. This study presents a comparative analysis of various staircase methods, including Single-Step SS (1SS), Two-Step SS (2SS), Three-Step SS (3SS), and Four-Step SS (4SS), for a 5×5 solar PV array. The results indicate that 2SS is the most effective staircase reconfiguration method. In this research, 18 shading patterns are divided into two groups and compared with different hybrid interconnections, including Total-Cross-Tie (TCT), Series-Parallel TCT (SP-TCT), Honey Comb TCT (HC-TCT), Bridge-Link TCT (BL-TCT), and Bridge Link Honey Comb (BL-HC). The analysis reveals an average improvement of 16.8 %, ranging from 5.4 % to 37.6 %, when using the 2SS method compared to hybrid interconnections. The proposed 2SS method demonstrates significant maximum power improvements for specific shading patterns (20.13 %, 25.4 %, 29.52 %, 38.69 %, 45.99 %, 38.69 %, 22.62 %, 34.67 %, and 20.52 %) when compared to existing static reconfiguration methods such as Su-Do-Ku (SDK), Futoshiki (FUT), Cross Diagonal (CD), Competence Square (CS), Dominance Square (DS), Latin Square (LS), Ken-Ken (KK), Skyscraper (SKY), and Index-based number system (IBN). The performance analysis of the solar PV array is conducted using MATLAB Simulink, and all static reconfigurations are ranked based on their maximum output power (P_{max}). Additionally, the 2SS method is easy to implement and does not require complex mathematical formulas. It is a versatile solution to mitigate the effects of partial shading and enhance overall system performance.

1. Introduction

The journey of Photovoltaic (PV) technology has been a remarkable tale of innovation and progress. It all began in the mid-19th century when Alexandre-Edmond Becquerel first observed the photovoltaic effect. Since then, scientists and engineers have been dedicated to unlocking the potential of this phenomenon, leading to the development of the first practical silicon solar cell in the 1950s. From its modest origins, PV technology has undergone rapid advancements driven by the growing need for clean and sustainable energy solutions. Breakthroughs in materials, manufacturing techniques, and system integration have played a pivotal role in enhancing the efficiency and affordability of PV systems. Moreover, the introduction of thin-film solar cells, multi-junction solar cells, and emerging technologies like perovskite cells

have further expanded the horizons of possibility. Today, PV technology has emerged as a key player in the global energy landscape. Large-scale solar farms and rooftop installations are now powering homes, businesses, and even entire cities. The continuous efforts of researchers and industry experts aim to improve the efficiency, durability, and cost-effectiveness of PV systems, paving the way for a future dominated by renewable energy. Ongoing research focuses on evaluating reconfiguration methods for solar PV arrays, including Series Parallel (SP), Honey-Comb (HC), Bridge-Link (BL), and Total Cross-Tie (TCT). These methods mitigate partial shading effects, ensuring optimal energy generation. SP divides the array into sub-arrays connected in series and parallel, HC enhances tolerance to shading through strategic interconnections, BL redirects current around shaded modules, and Cross-Tie forms a grid-like network for current flow. Evaluating their performance aids in advancing solar PV technology and optimizing system

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Full Paper

Effect of Reducing Agent on The Electrochemical Performance of The Ag_xO/PVA Nanocomposite

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Abstract- In the present work, different concentrations of citrate (reducing agent) were used to reduce the silver precursor, and Poly Vinyl Alcohol (PVA) was used as a capping agent. The electrochemical performance of the synthesized multivalent silver oxide (Ag_xO)/PVA nanocomposite has been carefully examined. The well-crystalline, spherical, and aggregate-free Ag_xO/PVA nanocomposite was synthesized. The present findings were strengthened by structural, elemental, and morphological studies. The Ag_xO/PVA nanocomposite showed Surface Plasmon Resonance (SPR) and defect-related band gap mechanisms. The two oxidoreduction peaks in the cyclic voltammogram were observed for the graphite electrode coated with the as-prepared samples. The Ag_xO/PVA-loaded electrodes showed a maximum specific capacitance of 269 Fg⁻¹ at a scan rate of 10 mVs⁻¹. It was observed that the citrate can be used to produce silver oxide nanoparticles and to improve the electrochemical functionality of the silver oxide nanoparticles blended with PVA. There are potential uses for this type of nanocomposite-coated electrode in supercapacitors and high-performance energy storage systems.

Keywords- Silver oxide nanocrystal; Poly vinyl alcohol; Electrochemical property; Citrate reduction

1. INTRODUCTION

Due to the combined features of electronic charge transport properties of metal oxide along with the properties of polymeric materials, the polymer blended metal oxide nanocomposites



Development and Characterization of a Polylactic Acid/Sesame Husk Powder–Based Biocomposite Film for Packaging Application

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Abstract

In this study, a polylactic acid (PLA)/sesame husk powder (SSHP) biocomposite film was fabricated by solution-casting process with varied levels of SSHP in packaging applications (5–25wt%). Analysis of properties of PLA/SSHP-based bio composite films was done using scanning electron microscopy (SEM), Fourier transform infrared spectrum (FTIR), X-ray diffraction (XRD), thermogravimetric analysis, atomic force microscopy, tensile testing, water absorption, degradation test, and film transmittance testing. The SSHP filler was found to be dispersed uniformly across the matrix upto 20% of SSHP, reveled by SEM results. Filler-rich bio composites were more tensile (22.46 MPa) at 20% SSHP and thermally stable at 355 °C, according to the results of differential thermogravimetric analysis. Biofilms had a significantly higher crystallinity index value (49.22%) than PLA, according to the XRD analysis. The PLA/SSHP (25 wt%) biofilm had a light transmittance of 32% in the visible region. Biofilm water absorption enhanced as the amount of SSHP was increased. The hydrophilic character of SSHP in the PLA matrix was mainly responsible for the maximum loose of 48wt% (25 wt% SSHP) seen in the biodegradation test findings. It was found that these films could be used in packaging applications in the future because of their exceptional tensile and thermal properties.

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Association rule hiding using enhanced elephant herding optimization algorithm

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ABSTRACT

Association rule hiding is an efficient solution that helps organizations to avoid the risk caused by sensitive knowledge leakage when sharing data in their collaborations. Cuckoo Optimization Algorithm (COA) sanitizes the transaction database but this method has limitation due to its slow convergence and exploitation capabilities. Hence in this paper, Enhanced Elephant Herding Optimization Algorithm for Association Rule Hiding (EEHOA4ARH) is proposed for association rule hiding. In EEHOA, two core functions such as clan updating operator and separating operator are used for association rule hiding that also realizes the fast convergence and exploitation capabilities. Moreover, the searching strategy in COA4ARH for the selection of best solution is highly time consuming. To reduce the time consumption for the selection of best solution, a Crowding Distance (CD) concept is combined with EEHOA4ARH. By continuously updating the best elephant and replacing the worst elephant in the population, EEHOA4ARH-CD sanitizes the transaction database effectively. Thus the proposed EEHOA4ARH achieves the less computation time, fast convergence and better exploitation capabilities by using crowding distance. The experimental results prove the effectiveness of the proposed EEHOA4ARH-CD method in terms of hiding failure, lost rule and execution time with 44.66 s.

ARTICLE HISTORY

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KEYWORDS

Association rule hiding; evolutionary algorithm; cuckoo optimization algorithm; enhanced elephant optimization algorithm; crowding distance

1. Introduction

Data mining is the task of examining huge volume of data to identify the patterns and sensitive information in it. The data mining process is applied to huge volume of data in companies and business organizations to enable them for making appropriate decisions. Most of the companies and organizations have some sensitive information that should be secured against unauthorized access. Maintaining the privacy or confidentiality of this information is an essential goal for the research area of database security and government organizations. As a result, a key challenge is to find a trade-off between the user's requirements and privacy of information. The use of data mining techniques such as clustering, classification and association rule mining may endanger the database owner's security. Hence, a new research topic called Privacy Preserving Data Mining (PPDM) [1] was introduced.

Nowadays, PPDM has become an important issue since huge volume of personal information has been used by many companies and organizations. In many situations, users are unwilling to reveal their personal data without guaranteeing the protection of their confidential data. To prevent the disclosure of sensitive information, the algorithms in this research area make some modifications in the database (data modifications)

and alter amount of data (data distortion) [2] in the database. However, data modification and data distortion protect the confidentiality of sensitive information is not much perfect and has some side effects. Association Rule Hiding (ARH) [3] is a subfield of PPDM that analyses the side effects of data mining methods created from the sensitive information belong to individuals or organizations. The main intention of ARH is to find a sanitized database such that when a mining technique is applied on it, all sensitive rules will be hidden while all non-sensitive rules can be mined.

ARH sanitizes the original database in a way that at least one of the following goals is accomplished [4].

- All the non-sensitive rules that appear when mining the original database at pre-defined threshold of support and confidence can be successfully mined from the sanitized database at the same threshold or higher.
- No rule that is considered as sensitive from the owner's perspective and can be mined from the original database at pre-specified support and confidence, can be revealed from the sanitized database, when this database is mined at the same or at higher thresholds and



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Performance Analysis of Novel Solar PV Array Configurations with Reduced Tie Interconnection to Extract Maximum Power under Partial Shading

Pandian, Pandimuni^a; David, Prince Winston^a ; Murugesan, Palpandian^b; Murugesan, Pravin^a
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Abstract

The non-uniform irradiation pattern causes the partial shading effects and decreases the performance of the solar Photovoltaic (PV) array. The effect of uneven shading condition depends on its pattern and area. The PV array's performance is determined by the cross ties that are connected within the array. This research proposes eight different PV array tie interconnection configurations to obtain the maximum power output under uneven insolation conditions. Experimental analysis is done in the PV array consists of 16 numbers of 10 W PV panels which has a total capacity of 160 W. The practical results reveal that the losses due to partial shading are influenced by the shade pattern, shade area, and the placement of the cross ties. Overall, among the conventional configurations, the hybrid bridge link total cross tied interconnection pattern produced the best results, followed by the hybrid series parallel total cross tied and bridge link patterns. In the proposed configurations, the plus tie configuration outperformed the others in maximum of the partial shading scenarios. In general, the PLT configuration demonstrated an average

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ASSOCIATION RULE MINING BASED ON INTELLIGENT CRAVING HONEY BEE OPTIMISATION FOR PRIVACY PRESERVATION IN ENVIRONMENTAL APPLICATIONS

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Abstract

When used to the area of ecological environmental protection, big data technology facilitates the precise and exhaustive gathering, analysis, and mining of ecological data, the precise and exhaustive identification of ecological problems, and the efficient deployment of appropriate solutions. In this article, we provide an association rule mining technique that preserves user privacy while mining encrypted data via Advanced encryption standard (AES) in the cloud. We suggest using intelligent craving honey bee optimisation (ICHBO), which assures no data or information challenges and no unintentional effects on the information's usefulness. ICHBO offers confidential-ity throughout data collection and interaction. Data owners that encrypt their data and distribute it to clouds using a Data share allocator (DAS) technique are included in the suggested framework model. We assign our procedures to the test in large-scale tests to get approval for their display. The evaluation results revealed the mined data obtained using our systems are trustworthy compared to other existing techniques. According to the results of our performance evaluation, our approach is very effective and has a responsibly higher security level and convergence speed. © 2023, Scibulcom Ltd.. All rights reserved.

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DETECTION OF CYBER SECURITY ATTACK USING MACHINE LEARNING BASED MULTI-HEURISTIC CUCKOO SEARCH OPTIMISATION SCHEME FOR SMART CITY APPLICATIONS

[Meenakshi A.](#)^a ; [Rajasekaran M.](#)^b; [Kalpana V.](#)^c; [Selvarani, X. Ignatius](#)^b

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Abstract

Smart city ecosystems may provide well-planned, safe, and sustainable communities that offer comprehensive approaches to combating climate change and global warming via a variety of community-centred activities. These consist of intelligent governance, intelligent environment monitoring, and intelligent planning methods. Actionable insights may be provided by an air quality intelligence platform, which functions as a comprehensive measuring site for air quality monitoring and regulation. The proposed model focused on how to separate activity inside attacks from usual large data streams and to present a fresh vigorous random forest classifier for recognising cyber attacks within the (KDDs) dataset. To begin, network traffic information will be characterised and pre-processed; the cyber-attack will then be addressed using the Ensemble DBN-VGG (Deep belief network – Visual Geometry Group) classifier. The Discrete ICA (Independent component analysis) approach is used in the feature extraction process. The network parameters were optimised using Multi-Heuristic cuckoo search optimisation (MH-CSO) in this case. Finally, the proposed system ran a big data test to detect cyber security assaults. The recreation comes about appear

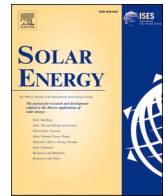
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One-step adaptive reconfiguration technique for partial shaded photovoltaic array

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ABSTRACT

The performance of a photovoltaic (PV) array greatly depends on partial shading conditions, which can be diminished by careful planning and positioning of PV modules during installation to avoid self-shading. However, partial shading caused by nearby buildings, dust, and snow cannot be completely avoided. One of the approaches to reduce the effects of partial shading is the reconfiguration technique. However, the reconfiguration increases the length of the wire and system complexity. This study proposes an adaptive reconfiguration technique for a 4x4 PV array with reduced complexity and better shade dispersion. The effectiveness of the proposed reconfiguration technique is implemented and tested on a 4x4 total-cross-tied PV array in a MATLAB Simulink environment. In the proposed configuration, the switching matrix connects the fixed and adaptive part of the PV array, in such a way that the switches can connect the PV module of the next column by shifting downwards and shifting upwards. A comprehensive analysis of proposed reconfiguration is carried out and its performance is compared with existing fixed and dynamic reconfiguration techniques in terms of performance parameters. The study result shows that the proposed reconfiguration technique delivers superior performance compared to existing fixed and dynamic reconfiguration techniques in terms of better shade dispersion, enhanced performance and reduced complexity. For the LC shade pattern, the proposed BSSU technique has obtained improved PE of 48%, 31%, 15% and 9% compared to CMA, TCT, ADR and SS configurations. Experimental verification is carried out to demonstrate the superiority of the proposed reconfiguration technique.

1. Introduction

The electricity demand has increased significantly because of the scarcity of fossil fuels and the growing population. Solar energy has emerged as a favourable solution owing to its pollution free and abundant in nature [1]. The progress of the solar PV system has increased significantly over the years due to subsidies and technical advancement [2]. The low conversion efficiency of the PV module is the major obstacle to its expansion. Furthermore, the efficiency of the PV system relies on environmental factors. This plays a vital role in determining the maximum power point and has a significant impact on the output power [3].

One of the prominent factors that dominantly affects the performance of PV systems is mismatch loss (ML). ML can occur due to

manufacturing defects and partial shading conditions (PSCs) [4]. Partial shading (PS) may occur and inter-row spacing has a considerable impact on the degradation of the performance of the PV system [5]. The occurrence of PS caused by the inter-row spacing can be avoided by improving the spacing between the modules. However, this may increase the wire length and land requirements. Therefore, it is essential to find out the optimal spacing between the modules to overcome the self-shading [6–7].

Even though the PV modules are carefully placed and positioned on cracks and PS can occur due to shading of trees, chimneys, dust and dirt [8]. This may lead to the mismatch of electrical characteristics between the modules leads to the ML and results in the reduction of performance. The impact of the ML relies on the location & position of the shade and interconnection scheme [9]. Hence, it is essential to find a suitable interconnection scheme to diminish the effects of the PS.

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Energy Monitoring for Renewable Energy System Using Machine Learning Algorithms

[Ramachandran, Muthu Eshwaran](#)^a ; [Singh, Ramya Ranjit](#)^a; [Balachandran, Gurukarthik Babu](#)^b; [Mohan, Devie Paramasivam](#)^b; [David, Prince Winston](#)^b; [Anantharaman, Meenakshi](#)^a; [Ganesan, Nirmala](#)^a

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Abstract

Background: Consumption of electricity always varies based on demand. The load cluster pattern aims at categorizing periodical changes over a specific time. Predicting the electric load was the initial goal of this study. Additionally, the outcomes of the load prediction were utilized as data for categorizing electrical loads using a descriptive-analytical method. Objective: The study has dealt with a matching of load-side electric demand with the electric supply. To ensure dependable power-generating stability, it is vital to anticipate and categorize loads. Thus, the research presented here has focused on electrical load forecasting and classification. Methods: Alternative algorithms, including Naive Bayes, decision tree, and support vector machine classifier, were employed to address the cluster pattern. The data used for this research presentation was collected from the D Block of the Kamaraj College of Engineering and Technology, K. Vellakulam, India, every 15 minutes. Multiple unsuitable loaded circumstances were ignored during the pre-processing of the dataset. Additionally, other algorithms, like Naive Bayes, decision tree, and support vector machine, were used to categorize the raw data. The processing of data was done by a feature selection approach. Results: The performance was predicted by comparing the entire machine

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Printing High-Strength High-Elongation Al4043 Alloy Using UNS A94043 Welding Wires through Wire Arc Additive Manufacturing

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Abstract

The wire arc additive manufacturing technology with excellent development potential in recent years in the field of huge engineering structures and aeronautical structures has various benefits. To ensure the safe application of these structures, it is vital to investigate the fatigue failure mechanism of wire arc additive-made aerospace aluminum components. In recent years, there has been some advancement in the use of wire arc additive manufacturing (WAAM) technology for the production of aluminum-based alloys. In this study, the insight of microstructure and mechanical properties of Al4043 (UNS A94043) wall fabricated using gas metal arc welding (GMAW)-based WAAM process. The insight microstructure characterization was examined using FE-SEM with energy dispersive spectroscopy (EDS). The tensile strength of the fabricated wall was examined with three different zones (top, middle,

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Extensive Energy, Exergy, Economic, Exergoeconomic, Enviroeconomic, and Energy Payback Time Analysis and Investigation on Bifacial Solar Photovoltaic Module with Nonbiodegradable Waste as Reflectors

[Thangaraj, Hariharasudhan^a](#); [David, Prince Winston^a](#) ; [Raj, Marshal^b](#); [Balachandran, Gurukarthik Babu^a](#) [Save all to author list](#)^a Department of Electrical and Electronics Engineering, Kamaraj College of Engineering and Technology, Madurai, 625701, India^b Indian Computer Emergency Response Team, Government of India, New Delhi, 110003, India4 86th percentile
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Abstract

The ability of bifacial photovoltaic (PV) to absorb solar radiation on either side increases the energy output. Reflectors increase the albedo and help to increase the performance. Reflectors face discoloration and degradation with time and they increase the overall implementation cost of bifacial PV systems. However, the cost of reflectors can be reduced by using nonbiodegradable waste as reflectors. They also increase the reusability of nonbiodegradable waste materials and reduce their impact on the environment and the cost of reflectors. To make a comprehensive analysis, an investigative approach of energy, exergy, economic, exergoeconomic, enviroeconomic, and energy payback time (6E) analysis is conducted for the bifacial PV module with nonbiodegradable waste, such as polyvinyl chloride (PVC) flex, polystyrene foam, and aluminum foil as reflectors in this study. The 6E analysis includes the analysis of energy, exergy, economic, exergoeconomic, enviroeconomic, and energy payback time

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Energy, Exergy, Economic, Environmental, Exergoenvironmental, Exergoeconomic, and Enviroeconomic Analysis of Photovoltaic/Thermal System with Double-Fan Arrangement for Effective Condensation and Evaporation: An Experimental Approach

Ravindran, Santhiya; Balachandran, Gurukarthik Babu; Murugesan, Pravin; David, Prince Winston

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Abstract

Water is one of the basic needs for all living and nonliving things. It is important to sustain the available water resources effectively for future generations. A lot of studies are employed already to improve the performance of solar desalination systems rather than conventional methods. Subsequently, an experimental approach is proposed with energy, exergy, economic, environmental, exergoenvironmental, exergoeconomic, and enviroeconomic performance of photovoltaic/Thermal (PV/T) solar distillation system using two methods to enhance the fresh water yield production at feasible cost. First is the conventional solar still (CSS) with PV and second is PV with double fan solar still (DFSS) with optimized running time of the double fan, which increases the productivity of the solar distillation system. The results show that average daily energy and exergy efficiency of the system improve with

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Synthesis and Structural Characterization of Selenium Nanoparticles–*Bacillus* sp. MKUST-01 Exopolysaccharide (SeNPs–EPS) Conjugate for Biomedical Applications

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Abstract: Exopolysaccharides (EPS) are exogenous microbial metabolites generated predominantly during the development of bacteria. They have several biological potentials, including antibacterial, antioxidant, and anticancer actions. Polysaccharide-coated nanoparticles have high biological activity and are used in treatments and diagnostics. In this research, selenium nanoparticles (SeNPs) are synthesized and conjugated with bacterial (*Bacillus* sp. MKUST-01) exopolysaccharide (EPS). Initially, the creation of SeNPs conjugates was verified through UV–Vis spectral examination, which exhibited a prominent peak at 264 nm. Additionally, X-ray diffraction (XRD) analysis further substantiated the existence of crystalline Se, as evidenced by a robust reflection at 29.78°. Another reflection observed at 23.76° indicated the presence of carbon originating from the EPS. Fourier transform infrared spectroscopy (FT-IR) analysis of the EPS capped with SeNPs displayed characteristic peaks at 3425 cm⁻¹, 2926 cm⁻¹, 1639 cm⁻¹, and 1411 cm⁻¹, corresponding to the presence of O–H, C–H, C=O, and COO–groups. The SeNPs themselves were found to possess elongated rod-shaped structures with lengths ranging from 250 to 550 nm and a diameter of less than 70 nm, as confirmed using scanning electron microscopy and particle size analysis. In contrast to the SeNPs, the SeNPs–EPS conjugates showed no hemolytic activity. The overall antioxidant activity of SeNPs–EPS conjugates outperformed 20% higher than SeNPs and EPS. Additionally, experimental observations involving gnotobiotic *Artemia nauplii* experiments were also recorded, such as the supplementation of EPS and SeNPs–EPS conjugates corresponding to enhanced growth and increased survival rates compared to *Artemia nauplii* fed with SeNPs and a microalgal diet.

Keywords: exopolysaccharide; selenium nanoparticles; SeNPs–EPS conjugate; antioxidant activity; gnotobiotic assay



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1. Introduction

The biological synthesis of nanoparticles has garnered significant attention over the last few decades due to their unique physical stability, biological attributes, and their promising applications in the field of biomedicine [1]. While rapid synthesis methods such as laser ablation, pyrolysis, lithography, chemical vapor deposition, sol–gel, and electrodeposition are efficient, they come with elevated expenses and the possibility of posing health risks to humans [2]. Conversely, the utilization of microorganisms, algae, and plant components for



Spectroscopic Investigation, DFT Calculations, anti-Inflammatory Activity and Molecular Dynamic Simulation Study on Fagaramide Alkaloid

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ABSTRACT

Fagaramide (FA) alkaloid was investigated experimentally using FT-IR, FT-Raman and NMR (¹H and ¹³C) spectra, also theoretically studied using density functional theory (DFT) calculations. To obtain the ground state geometry and vibrational frequencies of FA molecule, DFT calculations were performed at the B3LYP/6-31++G(d,p) level. The potential energy distribution (PED) analysis of the title molecule was obtained with the help of normal co-ordinate analysis (NCA) and these assignments were compared with the experimental FT-IR and FT-Raman spectrum. The natural bond orbital (NBO), reduced density gradient (RDG) and Hirshfeld surface analysis were applied to evaluate the relative strength of hydrogen bond interaction and to represent their effect on the stabilization of molecular arrangements. Electron localization function (ELF) and localized orbital locator (LOL) maps were generated to show electron delocalization in the molecule. The reactivity of the molecule was studied by the investigation of frontier molecular orbital analysis, density of states (DOS), molecular electrostatic potential (MEP) and chemical reactivity descriptors. Furthermore, through molecular docking, the anti-inflammatory activity of FA was studied and discussed. A molecular dynamic simulation (MDS) was employed to explore biomolecular stability.

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KEYWORDS

Fagaramide; FT-Raman; ELF; anti-inflammatory activity; MDS

1. Introduction

Fagaramide (3-(1,3-benzodioxol-5-yl)-N-(2-methylpropyl)-prop-2-enamide) is the major constituent of butylamide alkaloid in the plant *zanthoxylum gillettii* and *zanthoxylum zanthoxyloides* (Rutaceae).¹ The molecular formula of fagaramide (FA) is C₁₄H₁₇NO₃. It was possessing a wide spectrum of biological activity such as anti-inflammatory,² antiplasmodial,³ insecticidal⁴ and antiviral.⁵ It was also effective against the carrageenan-induced paw edema in rats and effective against the prostaglandin phase of acute inflammatory response.¹ Trans-fagaramide was showed significant antimycobacterial activity against the susceptible TB strain and MDR-TB strain.⁶ Proton affinity and bond energy of fagaramide and related amide alkaloids were observed by Fokoue et al.⁷ The crystal structure of fagaramide compound was reported by Scott Bohle et al.⁸ The literature review revealed that there was no complete description of experimental and computational techniques on fagaramide have been performed. This encouraged us to do the

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Harnessing the Potential of *Bellamyia eburnea* Shell-Derived Nanoparticles Through Electro-mechanical Optimization in the Performance of PCL Bio-composites: A Green Insulation Revolution

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Abstract

The world of insulators is widening in the quest of sustainable polymer composites prompting exploration in utilizing organic solid wastes for electrical appliances. This study presents a novel approach that discusses the utilization of organic green waste in developing bio-composite electrical insulation. Polycaprolactone (PCL) is considered one of the best biodegradable polyester fillers with greater electrical resistance and employed



Investigation under different particle size effects of chitin with vinyl ester on mechanical behavior

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Abstract

An alternative particle-reinforced composite has been developed using inexpensive waste prawn shell-derived chitin reinforced vinyl ester thermoset resin. The effects of different weight percentages of chitin particles and various particle sizes of chitin particles on the thermal, mechanical, and morphological characteristics of vinyl ester resins were investigated. Composites made of chitin with different weight percentages (0%, 10%, 20%, and 30%) and various particle sizes (300 μm , 425 μm , and 600 μm) were prepared by compression molding. This research evaluates the impact of particle size varying with weight percentages of filler particles influencing the strength such as tensile strength, flexural strength, impact strength, and hardness of composites. These properties increase with addition of the filler content while decreasing with increasing filler particle size. As an outcome of the work, the prepared composites showed that the mechanical properties of the composites had a maximum value at 20% loading of 300- μm filler in comparison to filler of 425 and 600 μm . The tensile strength of pure vinyl ester showed 65 MPa, and it increased to 99 MPa for 20% filler of 300- μm size. Similar observation was observed for other mechanical properties such as the tensile modulus, flexural strength, flexural modulus, and impact strength. After 20 wt% of filler, loading content causes the microparticles to aggregate, which reduces the composites' strength. This decrease in strength can be attributed to the reduced mechanical interlocking between vinyl ester chains and chitin particles due to smoothening of the chitin particle surface. At the same time, the entanglement between the vinyl ester chain moieties was insufficient to impart effective stress transfer at this high concentration of chitin particles. However, the elongation at break had dropped due to increasing in the filler content and size. The virgin vinyl ester resin had elongation at break of 4.0%, and it decreased to 2.6% when the particle size increased 600 μm of 30% loading of filler. It also observed that increasing the filler material and particle size of the filler affects the composites' ability to absorb water. While increasing the filler content, there is a drop in chemical resistance of the composites. Samples revealed that the higher chemical resistance nature of biocomposite in the order of $\text{CCl}_4 > \text{H}_2\text{SO}_4 > \text{NaOH}$ is noted due to the hydrophilic nature of filler. SEM analysis was done to study the composite morphological behavior of the particle distribution and agglomeration for vinyl ester containing 425 μm (20%) chitin filler. The developed vinyl ester/chitin filler biocomposite can be a potential source of sustainable composite products for a rapidly growing ecofriendly urban development.

Keywords Chitin · Biofiller · Vinyl ester resin · Composites · Compression molding · Mechanical properties · Chemical properties · Water absorption · Morphological properties

1 Introduction

Large research has been made in recent years to develop novel biocomposite materials used for various industrial applications owing to it being renewable, affordable, and biodegradable. Polymer composites are specifically designed based on properties such as being lightweight, biodegradability, availability, and excellent mechanical,

thermal, and sorption properties. The use of natural fillers has been part of the development process for a wide variety of composite materials for various applications. Researchers have used reinforcing materials such as many natural fillers like coconut shell, waste peanut shell, and chitosan in the preparation of composite materials. The bio-based composite materials are an emerging trend in the class of innovative composites that give a path to sustainable technology. The use of Bio based composites helps in lowering their environmental impacts compared

Extended author information available on the last page of the article

Further Results on (a, d) -total Edge Irregularity Strength of Graphs

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Abstract

Consider a simple graph $G = (V, E)$ on l vertices and m edges together with a total h -labeling $\rho: V(G) \cup E(G) \rightarrow \{1, 2, 3, \dots, h\}$. Then ρ is called (a, d) -total edge irregular labeling if there exists a one-to-one correspondence, say $\psi: E(G) \rightarrow \{a, a + d, a + 2d, \dots, a + (m - 1)d\}$ defined by $\psi(uv) = \rho(u) + \rho(v) + \rho(uv)$ for all $uv \in E(G)$, where $a \geq 3, d \geq 2$. Also, the value $\psi(uv)$ is said to be the edge weight of uv . The (a, d) -total edge irregularity strength of the graph G is indicated by (a, d) -tes(G) and is the least h for which G admits (a, d) -edge irregular h -labeling. In this article, (a, d) -tes(G) for some common graph families are examined. In addition, an open problem $(3, 2)$ -tes($K(m, n)$), $m, n > 2$ is solved affirmatively.

Keywords: (a, d) -Irregular labeling, Edge irregular labeling, Irregular labeling, Irregularity strength, Total edge irregular labeling.

Introduction

This paper considers finite simple undirected graphs. Under certain conditions, graph labeling refers to the assignment of numbers to graph elements such as vertices, edges, or both. These specifications are described by means of some evaluating function values (weights). Chartrand et al.¹ initially proposed irregular graph labeling as follows: Assume $G = (V, E)$ to be a connected graph of order $n \geq 3$ with an edge h -labeling $\alpha: E \rightarrow \{1, 2, \dots, h\}$ and weight of a vertex v to be defined as $w(v) = \sum_{v \in e} \alpha(e)$. When all the vertex weights are distinct, this is referred to as irregular labeling. The least positive integer h such that G admits an irregular graph labeling is known as irregularity strength $s(G)$. Irregular labeling of a graph was modified as the total vertex irregular labeling and the total edge irregular labeling by Baca et al.² Let $G = (V, E)$ be a connected graph of order

$n \geq 3$. Let $\beta: V \cup E \rightarrow \{1, 2, \dots, k\}$ be a function and let the weight of the edge $e = uv$ be defined by $\omega(e) = \beta(u) + \beta(v) + \beta(e)$. Then β is called a total edge irregular labeling if all the edge weights are distinct. The total edge irregularity strength $tes(G)$ is the smallest positive integer k such that there is a total edge irregular labeling $\beta: V \cup E \rightarrow \{1, 2, \dots, k\}$. For a polar grid graph, Salama³ computed the total edge irregularity strength. Susanti Y, et al.⁴ presented the exact value of total edge irregularity strength of staircase graphs, double staircase graphs, and mirror-staircase graphs. Ratnasari L, et al.⁵ determined the exact value of the total edge irregularity strength of ladder-related families of graphs. Muthu Guru Packiam⁶ introduced the concept of (a, d) -total edge irregularity strength of the graph G as follows: Consider a simple graph $G = (V, E)$ on l vertices and m edges



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ENSEMBLE DEEP TRANSFER LEARNING MODEL FOR NETWORK ATTACKS DETECTION IN INTERNET OF THINGS WITH SENSOR NETWORKS

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Abstract

The proliferation of cyberattacks in tandem with the Internet's rapid expansion makes intrusion detection crucial to maintaining a functional network. However, conventional approaches fall short of the network's requirements in the new big data environment, both in terms of flexibility and efficiency. This research developed a method for intrusion detection using deep learning, which may be used to address the issue to some degree. The suggested approach employs the widely-used deep learning technique of ensemble transfer learning, with the DenseNet 121 and ResNet-50 models serving as the basis for the proposed solution. Less-critical characteristics were compressed using the deep autoencoder's encoder, and salient features were extracted without the need for a decoder. The suggested method may be used to analyse the benchmarks NSL-KDD dataset in order to speed up the process of building networks and detecting assaults. © 2023, Scibelcom Ltd.. All rights reserved.

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and ensemble transfer learning; DenseNet 121; feature selection; intrusion detection system; NSL-KDD dataset; ResNet50

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DETECTION OF NETWORK INTRUSION FOR IoT BASED SMART ENVIRONMENTS BY OPTIMAL LEARNING MECHANISM AND BY USING DISCRETE ResNet CLASSIFIER

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Abstract

Enhancing the comfort and effectiveness of human existence is one of the objectives of smart settings. A technique for creating smart surroundings has recently emerged from the Internet of Things (IoT) paradigm. In any actual smart environment based on the IoT concept, security and privacy are seen as essential concerns. Applications for smart environments are threatened by security because of security flaws in IoT-based systems. Initially, the network traffic data are preprocessed and normalised, then modelled by optimising the Density-based Grey Level Co-occurrence Matrix (GLCM) feature extraction process with the use of the Iterative aspect Ant Lion optimisation (ALO) approach. The low-level traffic data intrusion is represented as a progressive feature theoretically. This in turn autonomously extracts the sample features, and thereby optimises the parameters using the Iterative aspect Ant Lion optimisation approach (to converge the model). The intrusion is detected by employing a Discrete ResNet-based classification approach to detect the occurrence of intrusions. Thus, the performance is estimated and the outcomes of the proposed method are related to existing techniques to prove the effectiveness of the proposed mechanism. The analysis shows that the proposed system offers a high rate of accuracy detection with true positives and a lower range of false positive rates. © 2023, Scibulcom Ltd.. All rights reserved.

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EFFECTIVE TRUST MANAGEMENT FRAMEWORK BASED ON REPTILE-MOTH FLY OPTIMISATION FOR WIRELESS SENSOR NETWORKS

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[Abstract](#)[Author keywords](#)[Indexed keywords](#)[Sustainable Development Goals](#)[SciVal Topics](#)[Metrics](#)**Abstract**

Modern security issues when developing the network of Wireless sensor networks (WSNs) include maximising energy efficiency and security. To reduce energy usage and enhance data delivery, the issue of harmful nodes must be solved. Due to the energy limitations of wireless sensor devices, the problem of unnecessary packet loss caused by malicious nodes should be resolved to improve network efficiency by reducing energy consumption and delay. In this study, Reptile-moth fly optimisation (RMFO) is suggested to execute secure transmission in Wireless Sensor Networks. The moth fly and reptile search optimisation (RSA) are combined to create the hybrid optimisation, which takes four different factors to consider while choosing a cluster head (CH) and generating a routing path, including "trust, distance, energy, and the number of hops". The distributed denial of service (DDoS) attack is protected from using the developed RMFO approach. The performance of the RMFO method is analysed in terms of Packet loss ratio, Routing load, Throughput, Delay, Detection rate, Energy, Packet delivery ratio, and Network lifetime. The existing methods such as "an energy-aware trust-based gravitational search approach (ETGSA), monarch-cat swarm optimisation (M-CSO), and secured QoS-aware energy-efficient routing (SQEER)" are used to evaluate the effectiveness of the proposed method. © 2023, Scibulcom Ltd.. All rights reserved.

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TOMATO MATURITY ENHANCEMENT AND CLASSIFICATION WITH SRGAN AND VGG-16: A HYBRID APPROACH

[Rajprabu R.^a](#) ; [Kavitha K.^b](#) [Save all to author list](#)^a Electronics and Communication Engineering, Kamaraj College of Engineering and Technology, Virudhunagar, India^b Department of ECE, Velammal College of Engineering and Technology, Madurai, India[Full text options](#) [Export](#) **Abstract**[Author keywords](#)[Indexed keywords](#)[Sustainable Development Goals](#)[SciVal Topics](#)[Metrics](#)**Abstract**

The most popular and economically significant vegetable worldwide is the tomato (*Solanum lycopersicum*). To ensure product quality, minimise post-harvest losses, and optimise harvest time, tomato maturity must be identified. Traditional methods of determining tomato maturity are frequently time-consuming and unreliable. Convolution neural networks (CNNs), a deep learning approach, have recently demonstrated significant promise for automating the tomato maturity categorisation process. This work examines the application of the VGG-16 architecture, a commonly used CNN model, for categorising the phases of tomato ripeness. The project intends to create a reliable VGG-16-based tomato maturity classification technique that can accurately differentiate between several maturity stages, including green, breaker, turning, pink, light red and red diseased conditions. Online databases of tomato images reflecting various stages of maturity were made in order to undertake this study. We use image Super-Resolution Generative Adversarial Network (SRGAN) methods to convert the low-resolution crop images into high-resolution (HR) images in order to ensure classification performance. A huge dataset of images was used to fine-tune and analyse the VGG-16 model's indices. The model's performance was thoroughly assessed using a variety of metrics, including accuracy, Precision, recall, F1-score, and kappa score. According to the findings, the

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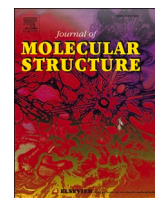
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Spectroscopic (FT-IR, FT-Raman, UV–Vis and NMR) and computational (DFT, MESP, NBO, NCI, LOL, ELF, RDG and QTAIM) profiling of 5-chloro-2-hydroxy-3-methoxybenzaldehyde: A promising antitumor agent

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ABSTRACT

In this study, the benzaldehyde derivative 5-chloro-2-hydroxy-3-methoxybenzaldehyde (5C2H3MB) was characterized using spectroscopic techniques. Geometric parameters and complete fundamental vibrational assignments were simulated using DFT/B3LYP/6-311++G(d,p). The ¹H and ¹³C chemical shifts, computed using the GIAO method, were in agreement with the experimental findings. The electronic properties of 5C2H3MB were analyzed using time-dependent density functional theory (TD-DFT) to determine various electronic parameters, including HOMO-LUMO energies. NBO analysis was performed to determine the numerous hyper-conjugative interactions responsible for the stability of the compound. In addition, Mulliken population analysis and Molecular Electrostatic Potential Surfaces (MESP) analysis were conducted to identify electron-rich, electron-poor, reactive sites, and bonding characteristics of the titled compound. The topological analyses ELF, LOL, NCI, QTAIM, and RDG were performed using Multiwfn software, and global reactivity parameters and Fukui functions were also predicted. Molecular docking studies were conducted to confirm the biological activity by simulating the binding orientation and affinity of 5C2H3MB against transferase inhibitor and human phosphorylated IRE1 alpha, showing a binding energy of -5.1, -5.3 and -5.9 kcal/mol, indicating its potential as an antagonist.

1. Introduction

In medicinal chemistry and the chemical industry, benzaldehyde derivatives, also known as aromatic aldehydes, are frequently used as intermediates for synthesizing textiles, dyes, agrochemicals, and flavoring agents. They can be naturally extracted from sources like

plants, cinnamon oil, and white rot fungi *Pleurotus sapidus* through the *de-novo* pathway. Substituted benzaldehydes can be engineered to enhance human hemoglobin's oxygen-carrying capacity while inhibiting sickle erythrocyte formation. Also, chalcones that have been replaced and produced by the use of benzaldehyde derivatives have qualities such as anti-proliferative, anti-inflammatory, anti-microbial,

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¹ A. Ram Kumar and S. Selvaraj contributed equally to this work.



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Experimental investigation of wire electrical discharge machining parameters on WE43 magnesium alloy

Solomon, Jebarajan Manickam Aswin Immanuel^a; Selvakumar, Gurusamy^a ;
Kumar, Shanmugakani Senthil^b; Narayanasamy, Pandiarajan^c[Save all to author list](#)^a Department of Mechanical Engineering, Sri Sivasubramaniya Nadar College of Engineering, Tamil Nadu, Kalavakkam, 603 110, India^b Department of Mechanical Engineering, SRM Institute of Science and Technology, Tiruchirappalli Campus, Tamil Nadu, Tiruchirappalli, 621 105, India^c Department of Mechanical Engineering, Kamaraj College of Engineering and Technology, Near Virudhunagar, Madurai, Tamilnadu, 625 701, India**3** 86th percentile
Citations in Scopus**2.18**
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Abstract

The influence of wire electrical discharge machining (WEDM) factors on the WE43 magnesium alloy is experimentally investigated in this work. Voltage, peak current, pulse-on time, and pulse-off time, are some of the factors taken into consideration in the study. The goal of the study is to understand how the output responses like material removal rate (MRR), surface roughness (SR), and development of recast layers are affected by the factors like voltage, peak current, pulse-on time and pulse-off time. The experimental set-up used a wire electrical discharge machine with a brass wire electrode and a workpiece made of the WE43 magnesium alloy. The L_{27} orthogonal array was used to alter the selected parameters through a series of experiments. The findings of the experimental investigation showed a strong link between the output responses and the electrical discharge machining (EDM) parameters. Peak current was discovered to have a direct correlation with the rate of material removal, with greater

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The effect of graphene solution on mixed powder electrical discharge milling of Ti6Al4V

Du, Y. , Gao, S. , Zhou, C.
(2024) *Materials Research Express*

Characterization of cast rare earth WE43 magnesium alloy and parameter optimization for wire electrical discharge machining using TOPSIS & COPRAS

Solomon Jebarajan Manickam, A.I. , Gurusamy, S. , Shanmugakani, S.K.
(2024) *Proceedings of the Institution of Mechanical Engineers, Part C: Journal of Mechanical Engineering Science*

Optimizing Wire Electrical Discharge Machining Parameters for Enhanced Gear Machining Performance: A Machine Learning Approach on 20MnCr5 Steel

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(2023) *Journal of Materials Research and Technology*

Transforming Pixels: Crafting a 3D Integer Discrete Cosine Transform for Advanced Image Compression

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Abstract—We propose an innovative technique for image compression based on the 3-dimensional Integer Discrete Cosine Transform (3D-Integer DCT), which will serve as an alternative to the existing DCT-based compression technique. If an image is encoded as cubes [row \times column \times temporal length] instead of blocks [row \times column], higher compression can be achieved. Here, the number of blocks is represented as the temporal length. To construct cubes, we use highly correlated blocks, and the correlation level is determined using the mean absolute difference (MAD). The suggested 3D-Integer DCT-based coder can achieve a higher compression ratio while maintaining the required image quality. It also needs fewer coefficients to encode an image than the usual Joint Photographic Expert Group (JPEG) coder. Adopting integer DCT further reduces the computational complexity of the proposed algorithm, given the abundance of methods available in the literature to determine equivalent integers for DCT. We choose an optimum integer group that minimizes mean squared error (MSE) and improves coding efficiency for computing 3D-Integer DCT. We also conducted a detailed analysis to examine the impact of implementing integer DCT in image compression. When we look at peak signal-to-noise ratio (PSNR), bits per pixel, and structural similarity index (SSIM), we see that the proposed algorithm does a better job than the standard real-value DCT-based compression algorithm like JPEG.

Keywords—Discrete cosine transform; 3D integer DCT; Image compression; JPEG algorithm

I. INTRODUCTION

The image compression algorithm finds its place almost everywhere where storage, retrieval, and image file transfer are required. People widely use the standards developed by the Joint Photographic Experts Group (JPEG) [1] to compress images [2] and [3]. In the earlier release of JPEG, they adopted DCT to achieve energy compaction [4]. Later, they started to adopt the discrete wavelet transform (DWT) [5] because of its higher compression efficiency compared to DCT. While DWT outperforms DCT in hardware implementation, JPEG prefers DCT. This is because DCT specifies faster computation structures [6] to [12].

Almost all video compression standards adopt DCT for the same reason [13] and [14]. If we replace the real values in the basic functions with their equivalent integer values, we can further improve the computational efficiency of DCT. In study [15] and [16], we state a few approximation methods to find the equivalent integer values, preserving the properties of the

basis function. Therefore, integer DCT greatly improves the computational efficiency for image compression. A standard DCT-based image compression technique computes the image block by block, with block sizes ranging from 8 \times 8 to 32 \times 32. We propose a new method based on 3D-IDCT, which promises a higher compression ratio than the current DCT-based compression technique. The proposed algorithm computes DCT using integers, thereby reducing computational complexity during implementation.

II. RELATED WORKS

Multi-carrier communication systems use the Discrete Cosine Transform Matrices [21], which contain the submatrix generated by the highest spark with mathematical concepts. Researchers have used the reconstruction of compressed functions to address compression-based sensing issues. This technique will solve the channel estimation-related issues, and it will be applied in both noise-based environments. The innovative image watermarking technique according to the 2-dimensional discrete cosine transform [22] has been implemented to recognize the copyright safety of the images. It has been implemented into the particular image blocks with a fixed coefficient to produce the watermark position by embedding and extracting functions within the frequency coefficients. The iterative sampling technique with the discrete cosine transform [23] has been constructed to minimize the dimensionality issue and also minimize the computational complexity. When applied to the amplitude-related angle, the Bayesian technique uses a set of coefficients with basic functions to quantify the trade-off within posterior uncertainty components. The Differential Evolution Markov Chain technique regenerates a similar level of coefficients with a reduced number of parameters.

The Quantum Discrete Cosine Transform model [24] demonstrates the capability of representing signals and images with a reduced number of coefficients. By developing the quantum compression methodology, we have reduced the computational complexity to allow for real-time applications. The complex, unstructured issue has been reduced to the identification of significant coefficients in an effective manner. The ant colony optimization algorithm utilizes the 2D-DCT [25] technique to minimize Gaussian noise and discover the useful frequency coefficient. The hybrid technique [26] has been constructed to implement the digital watermarking that is applied to images. The technique not only achieves robustness



Power enhancement in PV arrays under partial shaded conditions with different array configuration

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ARTICLE INFO

Keywords:

Photovoltaic array
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ABSTRACT

Solar Photovoltaic systems are used for electrical power generation, and they provide an alternative source to non-renewable energy sources like coal, oil, natural gas and nuclear energy. Photovoltaic arrays used in PV systems may be subjected to partial shading conditions, thereby affecting power generation because of higher power mismatch losses. Due to an uneven distribution of irradiation condition, some of the bypass diodes turned on and affect the power generation in a photovoltaic array. The mismatch losses are due to the output from PV panels subjected to different irradiances because of non-uniform partial shading conditions. The power loss can be reduced by uniformly distributing the partially shaded condition over the entire PV array. In this work different shaped 4×4 array configuration is proposed to overcome the effect of partial shading condition, thereby providing lower mismatch losses. Simulations under different partial shading conditions are carried out using MATLAB Simulink, and the experimental setup carried out for the proposed array configuration for 4×4 PV array and the results are discussed.

1. Introduction

In the globe, the electricity generating systems are changing continuously in order to meet out the increase in power demand and also much importance is given for the reduction in emission of greenhouse gases. Using renewable energy sources like solar energy and wind energy helps generate electrical power with lower carbon dioxide emissions [1]. Among the existing different renewable technologies in power generation, solar PV system has the capability of generating clean and reliable electrical power in future. In the world, government is taking several measures for power generation using solar energy by providing grants. Due to the tremendous improvement in PV technology, around 512 GW power is generated using solar energy in 2018. The installation cost of PV system is getting reduced day by day, demonstrating the commitment to the effective use of solar power [2].

Power generation from the PV panels mainly depends on atmospheric conditions and also non-linear characteristics makes it very difficult in increasing the overall efficiency. There are also several factors that reduce the power generation from PV arrays. One such factor is partial shading due to shadows from the building, dust, dropping from the bird and ageing of PV panels [3–6]. The partial

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Novel Active Battery Balancing Methodologies for Lithium Batteries: An Experimental Comparative Analysis

[Pandian, Pandimuni^a](#); [Winston David, Prince^a](#) ; [Murugesan, Palpandian^b](#); [Murugesan, Pravin^a](#) [Save all to author list](#)^a Department of Electrical and Electronics Engineering, Kamaraj College of Engineering and Technology, Tamil Nadu, Virudhunaga, 626001, India^b Department of Electrical Engineering, Annasaheb Dange College of Engineering and Technology, Ashta, Maharashtra, Sangli, 416301, India1 67th percentile
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Abstract

Inconsistency in the battery pack parameters results in an uneven state of charge (SoC). The active battery balancing method is an approach to equalize the SoC of the battery cells in a battery pack. In active balancing method, the battery having the highest SoC is made to equalize with the battery having the lowest SoC through the electronic circuits. However, it needs more cost and complex control circuits. To overcome this shortcoming, simple switching circuit-based dynamic battery balancing techniques and row interconnected techniques are proposed. The proposed techniques are compared and analyzed with various conventional techniques. The experiments are conducted with 4.4 V, 6 Ah, 0.5 C lithium ferro-phosphate battery cell and the battery pack consists of four cells. In the proposed techniques, the interconnections among the battery cells are altered using a switching matrix circuit. From the results, it is observed that the balanced row interconnected series–parallel dynamics and balanced row interconnected series–parallel have delivered superior performance under all the balancing conditions. Overall, the proposed technique enhances the battery storage capacity by 23.3% during the unbalanced SoC condition. The row interconnected series–parallel dynamics have achieved the average SoC of 96.14% under different balancing conditions. © 2023 Wiley-VCH GmbH.

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A selective cross-tied array configuration technique for partial shaded solar PV system

Pandian, Pandimuni^a; David, Prince Winston^a ; Murugesan, Pravin^a; Balachandran, Praveen Kumar^b

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[Abstract](#)[Author keywords](#)[Indexed keywords](#)[Sustainable Development Goals](#)[SciVal Topics](#)[Metrics](#)**Abstract**

Solar photovoltaic (PV) is an inevitable and promising technology in modern clean power generation. Fixed shading is a crucial phenomenon that degrades the performance of the solar PV array. To mitigate the partial shading effect, conventionally many configuration techniques were Series-Parallel (Se-P), Bridge Link (BL), Honey bee Comb (HC), and hybrid configurations are proposed. Most of the conventional configurations are complex to implement in real time because of more tie connection requirements between the PV strings. To resolve this issue, a selective cross-tied configuration (SCT) is proposed to increase the extracted power of the PV array during fixed shading conditions with the reduced number of ties. An algorithm is developed to select the optimal tie interconnection points between the solar PV modules in the array for the various partial shading conditions. The proposed work is validated in both simulations as well as in practical for the 160 W, 4 × 4 solar PV array. The proposed SCT configuration extracts a maximum of 209% more power when compared with the Se-P configured pattern. In experimentation with the SCT

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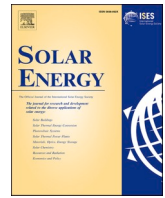
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Ramesh, T. , Rajani, K. , Panda, A.K.
(2021) *CSEE Journal of Power and Energy Systems*

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Shakthivel, S.K. , David, P.W. , Periya Backiyam, S.
(2022) *Energy Sources, Part A: Recovery, Utilization and Environmental Effects*

Critical Comprehensive Performance Analysis of Static BIPV Array Configurations to



Performance analysis of winnowing dynamic reconfiguration in partially shaded solar photovoltaic system

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ARTICLE INFO

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Dynamic reconfiguration
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ABSTRACT

To extract maximum power out of solar PV array when there is partial shadowing, a dynamic reconfiguration is required. Partial shade has significantly decreased output power, which lowers PV panel's efficiency. Numerous strategies have been put out to prevent power loss reduction when partial shade occurs. Existing techniques have not been able to provide better power extraction at extremely low irradiation. The proposed winnowing technique for dynamic reconfiguration is appropriate to get rid of power loss due to mismatch under very low irradiation. The suggested approach enhances the output power under partially shade condition in low-irradiation. Fifteen different shading scenarios and six reconfiguration switching patterns were investigated to confirm the proposed concept. The proposed winnowing technique increases the solar PV array output power up to 59.3% by effectively decreasing mismatch losses in the solar PV system.

1. Introduction

Recent years have seen a rise in the acceptance of renewable energies, which are gradually displacing most fossil fuels due to their sustainability and ineptitude. Out of all the renewable energy sources, solar radiation is thought to be the planet's primary energy source. The direct conversion of solar light into electrical energy is thus one of the most fundamental technologies in existence. With the help of photoelectric effect technology, photovoltaic (PV) arrays may achieve this crucial objective and convert solar energy into electrical energy. Solar energy is one of the most promising of these sources of energy because it requires no upkeep, no noise and is readily available in plenty [1,2]. The ability to install solar panels, which are used in many locations to generate electricity, is one benefit of this technology. Solar PV system growth has advanced dramatically over time as a result of grants and progress in technology [3]. As per IRENA statistics, Asia led in solar power generation, followed by Europe, North America, Africa, and South America also significantly contributed to the global solar energy output from renewable sources in 2021. India has witnessed remarkable growth in PV installations, boasting one of the largest solar capacities globally. The Ministry of New and Renewable Energy (MNRE) states that as of October 31, 2023, India had more than 72GW of solar installations.

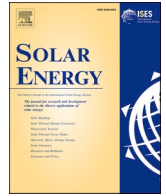
The solar photovoltaic (PV) array, however, confronts several significant difficulties due to dynamic environmental variables such as

partial shadowing, temperature gradients and insolation [4–7]. Partial shade, one of the factors mentioned above, significantly lowers the energy output of the PV array because of mismatch loss and power loss. The main causes of partial shade include cloud cover, the formation of shadows, angle and orientation, settling of dust and weather variability [4,7]. Shading is one of the most crucial elements in lowering the output power [8]. Partial shading conditions (PSCs) cause some modules to be exposed to less radiation than other modules. Tracking the PV array's maximum power during shaded situations is necessary to increase the efficiency of the overall power production. A multitude of techniques, such as Perturb & Observe [9], incremental conductance [10], Particle Swarm Optimisation [11], Genetic Algorithm [12], Cryptographic Fibonacci transformation [13] and Adaptive Neuro Fuzzy Inference System [14] were available to track the greatest power at the moment of irradiation and eventually maximise the output power.

Mismatch loss (ML), which can harm PV cells or modules, lowers an array's output current due to shaded PV modules. To overcome this problem, a number of PV array topologies have been developed, including series-parallel (SP), total-cross-tied (TCT), and bridge linked (BL). Under conditions of partial shade, it is confirmed that the TCT topology generates the most power out of the aforementioned topologies [15]. Based on the TCT topology, three fundamental strategies for the reconfiguration of the PV array were offered, including physical relocation, electrical array reconfiguration, and electrical rewiring [16,17].

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Performance of stand-alone bifacial photovoltaic module using non-biodegradable waste as reflectors for tropical climatic region of southern India: An experimental approach

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ARTICLE INFO

Keywords:

Bifacial photovoltaic module
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Performance ratio
Albedo
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ABSTRACT

Bifacial photovoltaic modules (Bi-FM) generate more power compared to mono-facial modules (Mo-FM) even in diffused light conditions. Deployment of reflectors in Bi-FM increases the cost of implementation. The unique feature of this proposed work is that it utilizes waste material as reflectors. The cost of the reflective material is 10% of the total module cost, and the proposed work is economically viable due to waste reusability. In this work, three different non-biodegradable materials (polyvinyl chloride flex, thermocol, and aluminium foil) are reused as reflectors to improve their generation using Bi-FM. A detailed study is made using the waste materials as reflectors and the performance ratio is computed for different irradiation conditions observed across a day. The average performance ratio of thermocol and polyvinyl chloride flex is 20% and 8% respectively, higher than that of aluminium foil. Using a reflector made of PVC flex has a 3.59-year lifespan as compared to Bi-FM by employing a reflector made of aluminium foil. The deployment of non-biodegradable materials reduces the cost requirements. The proposed setup also increases the reusability of non-biodegradable waste materials as reflectors and improves the power generation of Bi-FM.

1. Introduction

The availability of solar power and the robustness of solar-powered power production have the potential to address the environmental change and challenges created by fossil fuels. Solar energy reduces the dependence of underdeveloped and developing countries on other nations for fuel supply and has a considerable impact on the economy of all nations both directly as well as indirectly. The generation of energy using sunlight is carried out by using photovoltaic (PV) cells. The power generation efficiency of PV cells is dependent upon key factors namely, solar irradiation, temperature, and tilt angle [1–3].

Mo-FM is widely used in solar energy generation. Mo-FM generates energy only from the front side of the modules. The light absorbed by the module gets converted into electricity. However, the module absorbs a portion of the light, while the remaining part of the light is reflected by the module [4]. In order to utilize the power absorbed by the module, Bi-FM is introduced. Bi-FM has cells on both sides and the absorbed light is used to generate electricity from the other side of the module. Bi-FM can

generate more power and more efficient compared to Mo-FM. The increased power efficiency reduces the requirement of larger space. On the other hand, the Bi-FM are costlier compared to Mo-FM. However, they have many advantages such as, better performance in diffused light environments and reduced potential-induced-degradation compared to Mo-FM [5].

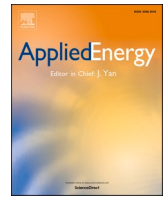
Equation (1) represent the output current for the Bi-FM.

$$I_{pv} = \left(\frac{G_{front}}{G_{STC}} (I_{mpp,n} + K_I T) \left(1 - \frac{SR_{front}}{100} \right) \right) + \left(\frac{G_{rear}}{G_{STC}} (I_{mpp,n} + K_I T) \phi_{lc} \left(1 - \frac{SR_{rear}}{100} \right) \right) \quad (1)$$

where, G_{front} represents the irradiation at the front area of the Bi-FM; G_{rear} represents the irradiation at the rear area of the Bi-FM; G_{STC} represents the irradiation at standard test condition; SR_{front} represents the shading ratio at the front side of the Bi-FM; SR_{rear} represents the shading

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Output power enhancement of a bifacial solar photovoltaic with upside down installation during module defects

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HIGHLIGHTS

- Bifacial solar PV module generates power through direct and reflected irradiances.
- The performance of the module degrades with faults that affect solar irradiance.
- Upside down installation is proposed to enhance its output power during faults.
- Faultless rear side faces upward and receives direct irradiance for better output.
- The proposed method enhances the output power by 16–67% for different cases.

ARTICLE INFO

Keywords:

Bifacial solar photovoltaic
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Bifaciality coefficient
Upside down installation
Output power enhancement

ABSTRACT

A bifacial solar photovoltaic (PV) module performs worse if it has any faults that reduce output power, shorten its lifetime, or raise safety and reliability issues. Since they work in constantly changing environments, the PV modules may have a variety of defects, including glass breakage, soiling, Ethylene Vinyl Acetate (EVA) delamination, discoloration, fractures, corrosion, and hotspots. Thermal stress, photo-thermal deterioration, aging, transportation, dust buildup, bird droppings, and partial shadowing by trees, tall structures, or objects are a few of the potential causes. It is necessary to employ appropriate diagnostic techniques or design modifications to eliminate the negative effects of these faults. In this work, the performance of an n-type passivated emitter rear totally diffused (PERT) module is analyzed during faults that reduce the transparency of front glass cover and restrict the level of solar irradiance. The faults such as dust accumulation, glass breakage, EVA delamination, discoloration, and micro cracks are taken into account for the analysis. To overcome the output power reduction brought on by these defects, a new installation method called upside down installation is proposed that enhances the output power. Overall, depending on the fault cases, the proposed upside down installation method enhances the output power by up to 67% when compared to the normal installation method.

1. Introduction

In the global electricity market, solar photovoltaic (PV) generation is the third-largest renewable electricity technology. With the growing concern about extracting more power per square meter area, attention is shifting to redesigning the structure of solar PV cells. Bifacial solar PV is one of the most recent additions, with a transparent glass backside as opposed to the aluminum back surface used in traditional PV modules. Thus, bifacial solar PV generates more power by utilizing rear diffuse irradiance and ground reflected irradiance (Albedo). Fig. 1 shows the

constructional details of the n-type PERT Bifacial PV cell. A bifacial module that collects photons through Albedo gives up to 50% more output power when compared with the monofacial counterpart [1]. With the improvement in design and performance, the Levelized cost of energy (LCOE) of large-scale solar PV is reduced below fossil fuel in some cases [2]. The rear side of the cell has silicon (n-type) spread across it, giving it a high tolerance for metallic impurities. In addition, it is less vulnerable to light-induced degradation (LID), which is a result of the development of boron-oxygen complexes. According to reports, n-type Silicon PV cells have improved dependability, longevity, and efficiency.

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Article

A Sequential Hybrid Optimization Algorithm (SHOA) to Solve the Hybrid Flow Shop Scheduling Problems to Minimize Carbon Footprint

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Abstract: In today's world, a situational awareness of sustainability is becoming increasingly important. Leaving a better world for future generations is becoming the main interest of many studies. It also puts pressure on managers to change production methods in most industries. Reducing carbon emissions in industry today is crucial to saving our planet. Theoretical research and practical industry requirements diverge, even though numerous researchers have tackled various strategies to handle carbon emission problems. Therefore, this work considers the carbon emission problem of the furniture manufacturing industry in Hosur, Tamilnadu, India. The case study company has a manufacturing system that resembles a hybrid flow shop (HFS) environment. As the HFS scheduling problems are NP-hard in nature, exact solution techniques could not be used to solve the problems. Hence, a sequential hybrid optimization algorithm (SHOA) has been developed in this paper to minimize the carbon footprint. In the SHOA, the pigeon-inspired optimization algorithm (PIOA) is hybridized sequentially with the firefly algorithm (FA). A computational experimental design is proposed to analyze the efficiency of the introduced strategy, and the solutions indicate that the developed approach could reduce the carbon footprint by up to 9.82%. The results motivate us to implement the proposed algorithm in the manufacturing industry to reduce the carbon footprint.

Keywords: carbon footprint; hybrid flow shop; scheduling; pigeon-inspired optimization algorithm (PIOA); firefly algorithm (FA)



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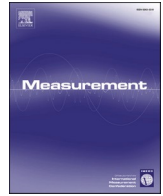


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1. Introduction

The main objective of any manufacturing or service industry is to make a profit. The latest technological developments and the concepts of industrial engineering help these industries maximize their profits. But, in recent times, managers seem to understand that profit is not the only real goal to achieve. Leaving a positive impact on future generations in a sustainable environment also turns out to be important [1]. Ongoing usage of resources without thinking about their environmental effects becomes the main problem in most manufacturing companies. Thus, today the scenario has changed due to the universal environmental rules and regulations. Although there are different strategies to lessen the impacts on our world, better utilization of resources or reducing the waste of production facilities become the main research topics of the literature [2]. One of the proper ways to achieve these goals should be by designing a better schedule in a workshop environment.

It is our collective responsibility to reduce carbon emissions to mitigate the effects of greenhouse gas emissions, global warming, and climate change. Environment-friendly



Comparative investigation of imaging techniques, pre-processing and visual fault diagnosis using artificial intelligence models for solar photovoltaic system – A comprehensive review

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ABSTRACT

Photovoltaic systems provide an eco-friendly key to meet our increasing energy demand while mitigating the adverse impacts of conventional fossil fuel-based energy generation. The effective power generation from PV systems can be obtained from fault-free systems. Detecting and correcting faults in solar photovoltaic (PV) systems is vital to ensure their best performance, safety and durability. In the existing literature, some have concentrated only on possible faults in PV, some on inspection techniques for monitoring, and some on Machine learning models applied in fault detection. In this work, a combined review of the types of possible PV system failures, image acquisition methodologies, preprocessing techniques, and artificial intelligence (AI) models could accurately localise and distinguish the faults in PV systems that are presented. This work discusses different literature on automatic fault detection methodologies. This enables readers to focus on critical aspects while developing a practical fault detection technique for Solar PV systems.

1. Introduction

The world is experiencing an extraordinary challenge at the intersection of rising population growth and surging energy demand. As global population statistics continue to increase, the stress on conventional energy sources and the environment strengthens. The authors [1] have stated that an increase of 1 % in the population density surges the electricity demand by 0.77 % and fuel consumption by 0.25 %. Meeting this swelling energy demand while mitigating the adverse effects of fossil fuels on our planet has become a chief concern. In response, the implementation and improvements of renewable technologies have been evolving as a promising solution to address these crucial issues.

Sustainable development seeks clean and accessible energy entirely, which can only be achieved with renewable energy as they are distributed largely across the globe [2]. Solar power remains a principal candidate as the finest among renewables for a brighter, cleaner, and more sustainable energy future. [3] It would support the energy prices to get balanced and provide abundant environmental and socio-economic profits. This could be indicated by the contribution of solar energy in

accomplishing sustainable development by fulfilling energy demands and then protecting the environment [4]. Solar energy, being the most significant energy source, presently experiences noteworthy evolution with a capacity of more than 940 GW installed globally in 2021, whereas the capacity of 70 GW only in 2011, which is represented in Fig. 1. Solar technology has experienced noteworthy evolution through innovations in materials and manufacturing processes. These technological progressions have not only expanded the range and applicability of solar energy but also have some complexities that require vigilant maintenance. Various faults and performance issues can be caused by the lack of maintenance that is in accordance with the effectiveness of solar systems.

Every year, solar panels struggle from the efficiency loss of 0.5 % – 1 % which results in the reduction of power generation. This loss arises from electrical and environmental faults [5]. [6] has analysed the mismatch faults of the PV system by considering the electrical parameters of voltage, resistance and temperature. Arduino controller is used for the analysis. Regardless of the material technology or its type, modules are also subjected to varied environmental conditions related to

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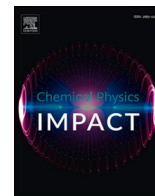
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Full Length Article

Insights into structural, vibrational, and chemical shift characteristics, solvents impact (polar and nonpolar) on electronic properties and reactive sites, ADMET predictions, and ligand-protein interactions for antiviral drugs safrole and isosafrole: An *in-silico* approach

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ABSTRACT

The safrole and isosafrole are constitutional isomers that have been theoretically characterized utilizing Density Functional Theory (DFT) employed with the B3LYP/6-311++G(d,p) basis set to simulate geometrical parameters, vibrational aspects, electronic properties, and chemical shifts and explored the solvent effect on electronic spectra of safrole and isosafrole in different solvents, including polar solvents such as acetone, Dimethyl sulfoxide (DMSO), and methanol, nonpolar solvents such as chloroform, cyclohexane, and toluene, and the gas phase using Time Dependent-Density Functional Theory (TD-DFT) methods. In addition, Natural Orbital (NBO), Mulliken population analysis, and Molecular Electrostatic Potential (MEP) surface have been simulated to understand better the reactive sites in the molecular structures of safrole and isosafrole. The frontier molecular orbitals (FMO) energy gaps of safrole and isosafrole were simulated in polar and nonpolar solvents, confirming the safrole and isosafrole kinetic stability and chemical reactivity. The *in-silico* ADMET indices were utilized to ascertain the probable pharmacokinetic and biological features of safrole and isosafrole. A molecular docking investigation was also conducted to investigate the potential biological activity of safrole and isosafrole against the SARS-CoV-2 spike protein, providing more support for its antiviral efficacy.

Introduction

In 2019, the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) was first identified in Wuhan, China, and characterized by Ribonucleic acid (RNA) as its genetic material, encompassing 30,000 nucleotides. The replication of genetic material is influenced by two key

enzymes, including RNA-dependent RNA polymerase and exoribonuclease [1,2]. The transmission of viral particles occurs through respiratory mechanisms, such as sneezing and coughing, wherein the angiotensin-converting enzyme 2 in the lungs acts as the receptor for the site of infection [3–6]. Presently, no specific therapeutic intervention has been established for either cure or transmission mitigation.

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RESEARCH PAPER

First report of betalain production from endolichenic *Bacillus* sp. LDAB-1 from *Dirinaria aegilita*: Insights from novel quantification methodology of image processing

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Abstract

Pigments are widely used in food supplements envisaging attractive colors along with health benefits. The desired advancements in the nutraceutical and antioxidant properties of pigments utilized in food products necessitate the search for novel additives. The present study is the first in the field to report the pigment-producing endolichenic bacteria, *Bacillus* sp. LDAB-1 from *Dirinaria aegilita*. Morphological, biochemical, and molecular characterization of the bacterium emphasizes that ideal pigment production occurs when utilizing sucrose and sodium nitrate. The pigment was salted out and dialyzed for further qualitative characterization using ultraviolet–visible, fluorescence, and Fourier transform infrared spectra and the results corroborated the presence of betalains. The antioxidant activity of betalain is closer to the efficiency of α -tocopherol, which confers the pigment properties for antioxidant and nutraceutical significance. An optimal methodology for pigment affirmation is an issue when using an alternative methodology. Hence, the present assessment employs a comparative analysis of findings from both a spectrophotometric method and image processing technology encompassing RGB, CMYK, YCbCr, and $L^*a^*b^*$ color space models. Amongst these, the $L^*a^*b^*$ model potentially provides an effective modality for determining the pigment concentration. Bland–Altman plot analysis indicates similar consistency levels in betalain quantification by both methods at 95% confidence intervals, affirming the integrity and consistency of color image processing technology. Consequently, the present study represents novelty and innovativeness in reporting endolichenic *Bacillus* sp. LDAB-1 from *D. aegilita* and a rational image optimization protocol for pigment elucidation characteristics.

KEYWORDS

Bacillus sp., betalains, *Dirinaria aegilita*, endolichenic bacteria, image processing

Abbreviations: CMYK, cyan, magenta, yellow, and black (color model); DBT, Department of Biotechnology; DPPH, 2,2-diphenyl-1-picrylhydrazyl; FDA, Food and Drug Administration; FT-IR, Fourier transform infrared spectroscopy; ID Card, identification card; $L^*a^*b^*$, color calculator; MALDI-TOF MS, matrix-assisted laser desorption ionization-time of flight-mass spectrometry; RGB, red, green, and blue; UV-Vis, ultraviolet–visible spectrophotometer; VITEK, bacterial identification system; WHO, World Health Organization; YCbCr, color space.



1 of 1

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Recent Advancements in Sealants Solutions for Surface Coatings: A Comprehensive Review

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Abstract

This review presents a novel and comprehensive analysis of various sealants used in diverse coating applications, focusing on their role in corrosion prevention. Sealants are crucial in shielding the coating materials from various environmental factors. This review categorizes the sealants into polymer, ceramic, inorganic chemical, and composite based. It delves into the significance of sealants in enhancing corrosion resistance and overall durability within coatings, drawing insights from an extensive literature analysis. By underscoring the pivotal role of sealants, this study serves as a unique and valuable resource for researchers and practitioners in coatings and materials science, emphasizing their significance in the ongoing battle against corrosion. © The Author(s), under exclusive licence to Springer Nature Switzerland AG 2024.

Author keywords

Corrosion; Sealants; Surface coatings

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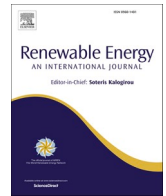
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Performance investigation of n-type PERT bifacial solar photovoltaic module installed at different elevations

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Bifacial solar photovoltaic
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ABSTRACT

In recent years, bifacial solar photovoltaic (bPV) cells have gained much interest in the solar PV market as they produce additional electrical energy at a marginally higher cost. Their ability to generate additional energy mainly depends on their rear side response. Module elevation, albedo, row spacing, and frame structure are the few factors that affect its rear side response and thus the overall efficiency. In this research work, the performance of a bPV module installed at the geographical location of latitude 9.673° N, and longitude 77.964° E is analyzed with different module elevations. Module elevation is one of the key installation parameters that causes the non-uniformity in the rear side irradiance. At low elevations, the non-uniformity is higher and starts reducing with the increase in elevation, reaching a negligible value at greater elevations. The experimental results showed that for the module elevation of above 1m, the non-uniformity is reduced to 5 % from 12 % at 0.25m. The peak power output for the elevation of above 1m is around 375W at which the bifaciality factor is about 25 %. Overall, it is observed that the bifacial solar PV module at a higher optimum elevation produces lesser non-uniformity and a higher energy yield.

1. Introduction

1.1. Background

As the third-largest renewable electricity technology, solar photovoltaic (PV) generation plays an important role in the worldwide energy market. Different types of solar cells have been developed as solar PV technology has advanced. One of these is bifacial solar PV technology, which increases output power per square meter area by allowing light energy to enter the cell from the rear side. Because of this quality, it is quickly replacing conventional monofacial solar PV technology in terms of market share. According to the International Technology Roadmap for PV (ITRPV), bifacial PV systems have a bright future scope for expansion. It is shown that these modules will acquire a higher portion of the worldwide market, and are expected to hold a 35 % market share by 2027.

1.2. Literature review

The performance of this bifacial solar photovoltaic PV system mainly

depends on geographical location and installation parameters such as albedo, tilt angle, elevation, orientation, row spacing, etc. The bPV module is best suitable for locations with high latitudes where the sun elevation angle is low. At higher ground reflectivity and higher elevation, this module performs well. The simulation results showed that >10 % was achievable for a bPV module with a bifaciality coefficient of 60 % [1]. A physical modeling approach presented by Ref. [2] estimated the rear side irradiance of a single bPV module. The measurements showed that the center portion of the module receives lesser solar irradiance due to the self-shading effect as compared to the top and bottom portions. The performance analysis of a bifacial solar photovoltaic module installed at different orientations is performed. The experimental results suggested that the module installed in an east-west orientation with a 13-degree angle delivers the shortest payback period, improved energy production capability, and greater conversion efficiency throughout its lifetime. This module earns more carbon credits when analyzed for its environmental and economic behaviors [3]. The experimental study investigated the importance of module elevation that affects the performance of the bPV module. The module installed at an elevation of at least 1m height produces better output power, especially at the higher

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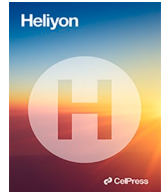
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Research article

Effect of Voltage and concentration of polyetherimide on surface morphology and corrosion properties of AZ91D by electro-spin coating

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ABSTRACT

Magnesium alloys, particularly AZ91D, exhibit promising mechanical properties but are susceptible to corrosion, limiting their widespread industrial applications. This manuscript investigates the impact of voltage and concentration of Polyetherimide (PEI) on surface morphology and corrosion characteristics of AZ91D through electro-spin coating. PEI, known for its high strength and corrosion resistance, is applied using an eco-friendly electro-spin coating method. The study optimizes polymer concentration and applied voltage to enhance the anticorrosive properties of AZ91D. Atomic force microscopy (AFM) and scanning electron microscopy (SEM) reveal the morphological alterations, while electrochemical corrosion tests provide insights into the corrosion resistance. The results show that a moderate PEI concentration (15 %) at 14 kV voltage exhibits the most favorable corrosion resistance, emphasizing the need to optimize both parameters for enhanced protection of AZ91D against corrosion. The results contribute to developing economical and effective corrosion protection techniques for magnesium alloys, mainly for automotive applications.

1. Introduction

Magnesium alloys possess numerous advantages over aluminum alloys and steels due to their high specific strength, low density, excellent castability and weldability, resistance to aging, superior electrical and thermal conductivity, recyclability, and widespread availability [1,2]. Magnesium alloys, particularly AZ91D, possess promising mechanical properties but are susceptible to corrosion, limiting their general industrial applications [3–5]. Mallick et al. [6] highlighted the complex nature of magnesium corrosion, influenced by various factors like microstructure, impurities, and environmental conditions. Many researchers have considered using the alloying technique to enhance Mg's corrosion resistance. However, alloying is a solution that is both difficult and expensive to implement [7].

The surface modification techniques have been recognized because simple alloying cannot protect magnesium alloys from extreme conditions. These include both chemical and physical anticorrosive coatings, which improve the material's surface properties to be used in a broad spectrum of applications [8–11]. CVD, PVD, and laser coating techniques are selected for applying coatings to increase

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Full Length Article



Insights into structural, vibrational, and chemical shift characteristics, solvents impact (polar and nonpolar) on electronic properties and reactive sites, ADMET predictions, and ligand-protein interactions for antiviral drugs safrole and isosafrole: An *in-silico* approach

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Isomers

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ABSTRACT

The safrole and isosafrole are constitutional isomers that have been theoretically characterized utilizing Density Functional Theory (DFT) employed with the B3LYP/6-311++G(d,p) basis set to simulate geometrical parameters, vibrational aspects, electronic properties, and chemical shifts and explored the solvent effect on electronic spectra of safrole and isosafrole in different solvents, including polar solvents such as acetone, Dimethyl sulfoxide (DMSO), and methanol, nonpolar solvents such as chloroform, cyclohexane, and toluene, and the gas phase using Time Dependent-Density Functional Theory (TD-DFT) methods. In addition, Natural Orbital (NBO), Mulliken population analysis, and Molecular Electrostatic Potential (MEP) surface have been simulated to understand better the reactive sites in the molecular structures of safrole and isosafrole. The frontier molecular orbitals (FMO) energy gaps of safrole and isosafrole were simulated in polar and nonpolar solvents, confirming the safrole and isosafrole kinetic stability and chemical reactivity. The *in-silico* ADMET indices were utilized to ascertain the probable pharmacokinetic and biological features of safrole and isosafrole. A molecular docking investigation was also conducted to investigate the potential biological activity of safrole and isosafrole against the SARS-CoV-2 spike protein, providing more support for its antiviral efficacy.

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Scrap steel mill scale as river sand replacement in cement concrete: effect on durability characteristics

[Parvathikumar, Ganeshprabhu^a](#) ; [Sahadevan, Brintha^b](#); [Palanisamy, Chandrasekaran^a](#)[Save all to author list](#)^a Department of Civil Engineering, Kamaraj College of Engineering and Technology, K. Vellakullam, Madurai District, Virudhunagar, India^b Department of Civil Engineering, Hindusthan College of Engineering and Technology, Valley Campus, Pollachi Highway, Coimbatore, India[Full text options](#) [Export](#) [Abstract](#)[Author keywords](#)[Indexed keywords](#)[Sustainable Development Goals](#)[SciVal Topics](#)[Metrics](#)

Abstract

Million tons of steel mill scale produced as a waste product by the steelmaking firm are dumped beside scrap. These steel mill scale must be treated to protect the environment so that the quick fix methodology must be invented for producing high-caliber construction material. We employed scrap steel mill scale produced during the hot roll milling steel process at the steel producing industry in Coimbatore, India, in this investigation. The focus of this investigation is to look into the durability of mixes of concrete holding steel mill scale as fine aggregates. Concrete mix designs are made to achieve sufficient structural strength and then steel mill scale fine aggregates are added at 20% replacement levels from 0 to 100% by weight of total content of fine aggregates. Tests for determination of physical, chemical properties of materials, workability of concrete, rapid chloride penetration, sorptivity, acid attack on concrete, examining microstructural features of the acid immersed specimens, and accelerated corrosion test were all conducted. According to the results of the testing, 60% of the replacements outperformed the originals. The outcomes of the study point to create sophisticated construction materials from scrap steel mill scale in order to improve environmentally friendly and sustainable construction practices. © The Author(s), under exclusive licence to Springer Nature Japan KK, part of Springer Nature 2024.

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Effect of alkali-treated *Putranjiva roxburghii* seed shell filler on physico-chemical, thermal, mechanical, and barrier properties of polyvinyl alcohol-based biofilms

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Abstract

Biopolymers and bio-fillers derived from natural, organic, and abundant resources have garnered more responsiveness owing to their affordability and degradability in the production of packaging plastics. This study explores the novel use of different proportions (5%, 10%, 15%, and 20%) of 5% alkali-treated *Putranjiva roxburghii* seed shell filler (PRSSF) as a bio-filler in combination with polyvinyl alcohol (PVA) for the first time. FTIR analysis showed the creation of robust hydrogen bonds and enhanced compatibility between the matrix and the alkalized PRSSF. The XRD results revealed that alkalized PRSSF strengthens the structural integrity of biofilms. The water absorption of the PVA/at PRSSF biofilm samples decreased by 88.38% at a higher composition (20%) of alkali-treated PRSSF due to their alkalized hydrophobic filler. Due to the effect of at-PRSSF into PVA, the resulting films demonstrated a degradation temperature and char residue of 334.8°C and 13.57%, respectively, and relatively better UV-barrier properties in a range of visible light. When compared with pure PVA films, the tensile strength and corresponding modulus of PVA/20% at-PRSSF films increased by 32.94% and 16.2%, respectively. Therefore, the PVA/at-PRSSF biofilms produced in this study are ideal materials for wrapping and folding applications.

Highlights


- PVA/at-PRSSF films outperform in multiple aspects as compared with pure PVA.
- Tensile strength of PVA/20%-PRSSF films increased by 32.94%.
- Elongation at break decreased with at-PRSSF loading.
- Water absorption in PVA/20% PRSSF biofilm decreased by 88.38%.
- Fractography showed voids and agglomerations at high filler levels.

KEYWORDS

alkalized PRSSF, hydrophobic filler, PVA, UV-barrier films



Modification of rice hull powder by in situ generation of silver nanoparticles for antibacterial composite filler applications

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Abstract

It is important to reduce environmental problems caused by biowaste materials. The large amount of biowaste generated causes serious problems on a global scale. The majority of waste produced is recycled, disposed of, or left untreated in landfills. Methane gas produced by organic waste in landfills contributes to the greenhouse impact and creates issues with leachate and odor. Furthermore, as these organic wastes decompose in landfills, toxic substances that produce unpleasant aromas and contaminate soil and aquatic habitats are discharged. The shortcomings of the traditional approach have put pressure on the waste management, farming, and industrial sectors to develop environmentally friendly ways to handle these biodegradable wastes with less pollution. According to the latest survey, the most generated biowaste was rice hull. Rice hull powder (RHP) needs some modifications for extensive applications as filler materials. By using a one-step hydrothermal process, the silver nanoparticles (AgNPs) were generated and mixed with rice hull powder. The modified rice hull powder (MRHP) was characterized by FTIR, XRD, FESEM, EDX, and thermal analysis. Through the FESEM image, the presence of small spherical-shaped particles clarifies the presence of in-situ generated AgNPs. FTIR study reveals that there is no chemical interaction between silver nanoparticles and RHP observed while generation of MRHP. The Xrd image signifies the presence of a broad hump along with a few sharp peaks clarifies that the semi-crystalline nature of MRHP. The MRHP records a slight increase in maximum inflection temperature at 365 °C due to the addition of thermally stable silver nanoparticles with 28.5 percent of the remaining residual mass. The addition of silver nanoparticles makes the MRHP has significantly improved the diameter of the zone of inhibition by 27.6 mm to 30.7 mm. This impressive change in properties suggests that the MRHP can be utilized as filler along with polymer matrices for high thermal applications.

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Optimal battery based electrical reconfiguration technique for partial shaded PV system

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HIGHLIGHTS:

- OBER introduces a solution for PV shading challenges.
- It strategically connects rows without gender alignment.
- The breakthrough involves an external battery boosting the array power.
- OBER outperforms traditional methods by 8.3% to 46.5% in MATLAB simulations.
- Effectiveness in diverse shading patterns showcases adaptability.

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Solar PV
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Dynamic reconfiguration

ABSTRACT

In tackling the challenges associated with partial shading scenarios in solar photovoltaic (PV) arrays, this study introduces a groundbreaking approach to dynamic reconfiguration: the Optimal Battery-based Electrical Reconfiguration (OBER). Unlike conventional methods like the Couple Matching (CM) algorithm, OBER directly addresses the impact of shading on PV performance. By strategically connecting the strongest and weakest rows of both genders, OBER aims to overcome performance disparities induced by shading. A key innovation in OBER is the use of an external battery to augment energy in the weakest row, resulting in a substantial increase in array current and overall power output. Using MATLAB simulation, this study compares OBER with traditional methods like the New Column Index Method (NCIM), Square Dynamic Reconfiguration (SDR), and CM across ten partial shading scenarios. The proposed OBER outperforms TCT, NCIM, SDR, and CM in P_{max} generation by 8.3% to 46.5%. OBER proves to be a transformative approach, promising efficiency enhancements and positioning itself as a key advancement in dynamically responsive solar PV systems. The experimental validation of OBER's performance reinforces its potential to significantly increase power output, providing a promising solution for optimizing solar PV arrays under challenging shading conditions.

1. Introduction

In the quest for sustainable energy solutions, solar power emerges as a promising force, tapping into the boundless energy bestowed by the sun to revolutionize our global energy landscape. Despite its potential, the practical implementation of solar energy grapples with obstacles, and a prominent challenge is the pervasive impact [1–5]. Partial shading, resulting from shadows cast on solar panels, poses a significant threat to the efficiency of these systems. With the increasing adoption of

solar installations, especially in urban environments where structures and greenery intermittently cast shadows, understanding and mitigating the consequences of partial shading become crucial. This study embarks on a detailed exploration of the intricate dynamics of solar energy, investigating both static and dynamic reconfiguration techniques aimed at optimizing performance. These techniques ensure that solar panels operate at peak efficiency, even when confronted with shading challenges. The landscape of solar panel configuration has undergone a transformative shift with the emergence of Static Reconfiguration, a meticulous arrangement of solar panels strategically designed to

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Hybrid $\beta\Omega$ -indexing based fractal antenna for multi-band wireless applications

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Abstract

This research revolves around the design challenge of creating a compact, low-profile slotted fractal antenna with the capability to resonate across multiple frequency bands, thereby fulfilling the diverse requirements of modern wireless applications. In this novel research, we introduce a compact and low-profile slotted fractal antenna design, employing an inset-fed $\beta\Omega$ -space-filling curve, tailored for multi-band wireless applications and narrow-band operations. Through comprehensive fabrication and testing, we demonstrate excellent agreement between measured results—comprising reflection coefficient and E-plane and H-plane gain radiation patterns—and corresponding simulations. The antenna resonates at five distinct frequencies, each falling within narrow bands: 1.91GHz, 3.12GHz, 5.56GHz, 10.75GHz, and 13.94GHz. This broad resonance spectrum makes the antenna well-suited for various applications, including PCS-1900, rail mobile radio, DCS-IMT gap, WCDMA, X-band, and Ku-band services. By halving the ground length, we significantly enhance antenna parameters such as gain, directivity, and efficiency. Our innovative design also achieves excellent impedance matching via inset feeding with a 50Ω port, particularly notable at the operating frequency of 3.1GHz, where the antenna achieves a gain of 2.94dBi. Notably, we employ a hybrid $\beta\Omega$ -space-filling curve, a novel approach in slotted fractal antenna design. Fabricated on FR4 substrate, the antenna boasts compact dimensions of 39.05mm x 32.25mm x 1.6mm, ensuring practicality and versatility across diverse wireless applications. © The Author(s), under exclusive licence to Springer Science+Business Media, LLC, part of Springer Nature 2024.

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