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(19) INDIA

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(21) Application No.202331084176 A

(43) Publication Date : 12/01/2024

(54) Title of the invention : HEALTH MONITORING SMART HANDBAND

(51) International classification :A61B0005000000, A61B0005021000, G16H0040670000, A61B0005145000, A44C0005000000
(86) International Application No :NA
Filing Date :NA
(87) International Publication No : NA
(61) Patent of Addition to Application Number :NA
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(57) Abstract :

Nowadays, the health and security of elderly people are a concern because no one has the time to spend with them due to commitment to jobs or other things. We are proposing the health-monitoring smart band. This smart band would continuously keep an eye on an elder's health and the smart band sends all information to the concerned person and central health database as it is connected to the nearest hospital. This band would work as a digital diary for the person wearing it, collecting all their health information. Also, add sensors, like one that checks your pulse and another that keeps tabs on your blood pressure. This smart band would be like a mini-computer equipped with a sensor and RFID. Program it with the regular health data and the movement around during the day. Then, the band would keep an eye on your health and your daily routine.

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(12) PATENT APPLICATION PUBLICATION

(21) Application No.202441011966 A

(19) INDIA

(22) Date of filing of Application :21/02/2024

(43) Publication Date : 08/03/2024

(54) Title of the invention : INCREMENTAL FORMING OF AL 6014

(51) International classification :B21D0031000000, C21D0009460000, G01N0003280000, B21D0022020000, G06F0113240000

(86) International Application No :NA
Filing Date :NA

(87) International Publication No : NA

(61) Patent of Addition to Application Number :NA
Filing Date :NA

(62) Divisional to Application Number :NA
Filing Date :NA

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(57) Abstract :

Single Point Incremental Forming (SPIF) is steel sheet forming process in three-dimensional shapes. It is likely to be used for prototyping rapidly and minimum volume production of metal sheet parts. The recompenses of SPIF process is low cost tooling, less product lead time, and high flexibility. While abundant research have been conceded out to fit the method for industrial function, still they still stumble upon insufficient forming qualities in the sheet metal products. Since the major researches are mainly done only on the hemispherical tool. This research mainly focuses on the development of single point incremental forming process using roller ball tool at room temperature. A group of polymer materials with high industrial potential applications are opted for the single point incremental forming process. The application mainly encloses automobile components, medical components and electrical components. Previous researches were done on the conical shape, but square geometry has been attempted for the study. In evaluating the early formability, the Erichsen cupping test is performed for all materials. Moreover, Forming Limit Diagram (FLD) for materials in single point incrementally forming is performed experimentally to identify the forming limit of individual materials. The results obtained are deliberated with dissimilar process parameters and the belongings are identified as (i) Process formability (ii) Forming forces (iii) Microstructure analysis and (iv) Surface roughness. The work explores a number of aspects of single point incremental forming on polymers, although the most important contribution aims on optimization of process parameters and its validation. It improves the process formability and obtains maximum uniform thickness distribution of the formed parts. This gives an considerate into supplementary progress and the purpose of single point incremental forming technology in the production.

No. of Pages : 16 No. of Claims : 6

(54) Title of the invention : LIGHT WEIGHT DEEP LEARNING BASED TRUST MANAGEMENT MODEL FOR CLOUD ASSISTED FOG SYSTEMS

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(86) International Application No	:NA	
Filing Date	:NA	
(87) International Publication No	: NA	
(61) Patent of Addition to Application Number	:NA	
Filing Date	:NA	
(62) Divisional to Application Number	:NA	
Filing Date	:NA	

(57) Abstract :
This work focuses on addressing the challenge of managing massive heterogeneous traffic in IoT networks, particularly in dense deployment scenarios under 5G integration. A novel AI-based framework is proposed for predicting traffic, aiming to enhance network efficiency and prevent congestion. The framework utilizes a lightweight deep learning model based on convolutional neural networks, suitable for implementation on distributed edge computing nodes like fog nodes with limited computing resources. By leveraging distributed edge computing, the model aims to improve network availability, reliability, energy efficiency, and reduce communication latency in dense IoT deployments. The framework's performance has been evaluated, and the results confirm the effectiveness of the proposed traffic prediction model.

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(12) PATENT APPLICATION PUBLICATION

(21) Application No.202441033503 A

(19) INDIA

(22) Date of filing of Application :26/04/2024

(43) Publication Date : 03/05/2024

(54) Title of the invention : ARTIFICIAL INTELLIGENCE-BASED HUMAN DETECTION SYSTEM INTEGRATING PIR SENSOR, IR CAMERA, AND ULTRASONIC SENSOR

(51) International classification :G06N0003040000, G06K0009620000, G06N0003080000, G16H0050200000, G01J0005000000

(86) International Application No :NA
Filing Date :NA

(87) International Publication No : NA

(61) Patent of Addition to Application Number :NA
Filing Date :NA

(62) Divisional to Application Number :NA
Filing Date :NA

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(57) Abstract :

Automated human detection system that harnesses the power of artificial intelligence (AI) in conjunction with a fusion of sensor technologies, namely Passive Infrared (PIR), Infrared (IR) camera, and Ultrasonic sensors. The integration of these sensors enhances the accuracy, reliability, and versatility of human presence detection in various environments. The system employs a multi-modal approach to capture and analyse data from the PIR sensor, IR camera, and Ultrasonic sensor simultaneously. The PIR sensor detects body heat signatures, the IR camera captures visual information, and the Ultrasonic sensor measures distance. These inputs are then fed into an advanced AI-based processing unit, utilizing deep learning algorithms and neural networks. Through comprehensive training on diverse datasets, the AI model learns to differentiate between human subjects and non-human elements in real-time. The incorporation of multiple sensors allows the system to overcome limitations associated with individual sensor technologies, providing a more robust and context-aware human detection capability. Key features of the invention include synchronized data fusion, dynamic adaptability to varying environmental conditions, and the ability to discriminate between humans and other objects accurately. The system's applications span across security systems, smart homes, industrial automation, and public spaces, where precise and prompt human detection is paramount.

No. of Pages : 6 No. of Claims : 4

(12) PATENT APPLICATION PUBLICATION

(21) Application No.202441034346 A

(19) INDIA

(22) Date of filing of Application :30/04/2024

(43) Publication Date : 10/05/2024

(54) Title of the invention : THE DYNAMICS OF HEAT WITH DIFFERENTIAL EQUATIONS MODELS FOR PREDICTING TEMPERATURE DISTRIBUTION IN COMPLEX SYSTEMS

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(86) International Application No	:NA	
Filing Date	:NA	
(87) International Publication No	: NA	
(61) Patent of Addition to Application Number	:NA	
Filing Date	:NA	
(62) Divisional to Application Number	:NA	
Filing Date	:NA	

(57) Abstract :
Abstract The presented research contributes to the development and validation of a differential equation model that comprehensively describes temperature distribution in challenging multi-material systems. We used several advanced numerical methods, such as the Finite Element Method and Finite Volume Method, to account for conduction, convection, and radiation, then integrated and simulated these interactions within a single model framework. It is tested and validated the model using experimental data from a multi-material system that included polymers, metals, and other relevant distinguishable materials. Temporary results indicated that, on average, the model deviated from the measurements by approximately $\pm 2^{\circ}\text{C}$ observed 24 hours a day for a high level of environmental realism. Moreover, the experimentally implemented model validated the heat flux prediction in four critical locations, showing a deviation from -5 to +3 arbitrary units, thereby reinforcing the above statement. Finally, the presented error analysis of the model's predictions demonstrated the least developed regression residual, which is less than 10% of the observed values. Therefore, the model's benefits extend beyond its original understanding, potentially aiding engineers and designers in the development of optimal thermal management solutions.

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(12) PATENT APPLICATION PUBLICATION

(19) INDIA

(22) Date of filing of Application :20/06/2024

(21) Application No.202441047654 A

(43) Publication Date : 28/06/2024

(54) Title of the invention : ENHANCING COMMERCIAL BANK PROFITABILITY AND CUSTOMER SATISFACTION WITH A MULTIFACETED APPROACH THROUGH MARKETING STRATEGIES AND CUSTOMER-CENTRIC PRACTICES

(51) International classification :G06Q0030020000, G06Q0010060000, G06Q0030060000, G06Q0040020000, G09F0023060000

(86) International Application No :NA
Filing Date :NA

(87) International Publication No : NA

(61) Patent of Addition to Application Number :NA
Filing Date :NA

(62) Divisional to Application Number :NA
Filing Date :NA

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(57) Abstract :

Abstract The purpose of this paper is to discuss the marketing concepts in the banking industry with a special actualization on factors such as; the advertisements, and sale promotions, and special offers which are critical factors in winning and maintaining the customer. They explore the impact of digital marketing communication on the performance of the bank besides analyzing the impact of brand management and cross selling through customer segmentation. Among the significant topics, the research focuses on how diminished service costs, as well as different forms of deposit services, affect customer satisfaction. This paper employs the marketing mix tool, namely the 6Ps which include the Product, Price, Place, Promotion, People, and Process in an assessment of the connection and effects of all these factors within the banking sector. It expands on how efficient marketing communication not only gains attention of new consumers but also increases commitment from the current consumers, resulting to increased business revenue and competitive superiority for the banks.

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(12) PATENT APPLICATION PUBLICATION

(19) INDIA

(22) Date of filing of Application :02/08/2024

(21) Application No.202441058552 A

(43) Publication Date : 09/08/2024

(54) Title of the invention : AI OPERATED SMART HYBRID TWO-WHEELER

(51) International classification :B60L50/60, B60L50/61, B60W10/26,
H02J7/14, B60K6/20
(86) International Application No :NA
Filing Date :NA
(87) International Publication No : NA
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(62) Divisional to Application
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(57) Abstract :

The Development of automobiles for transportation has been intimately associated with the advancement of civilization. The automobiles of today are the result of the accumulation of many years of pioneering for research and development. In the modern trend automobiles have certain disadvantages such as fuel cost relative to mileage, pollution and less efficiency. We are introducing an advanced Hybrid two-wheeler project incorporating an innovation within in the vehicle. Hybrid electric vehicles (HEVs) powered by more than one power source. Electric machines and an internal combustion engine (ICE) are a promising mean of reducing emissions and fuel consumption without compromising vehicle functionality and driving performances. It diminishes the production of emissions and the use of fuel. The goal of this project is to increase the efficiency of IC engine. Regenerative system is also incorporated in our hybrid two-wheeler, where the energy produced by rotation of wheel due to IC engine is used to store the energy with the help of dynamometer, and then the stored energy is reused to run the vehicle, then there will be a change in working from normal vehicle to E-Vehicle.

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(12) PATENT APPLICATION PUBLICATION

(19) INDIA

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(54) Title of the invention : ADJUSTABLE FOOT REST

(51) International classification :B62J25/00, B62J25/06
(86) International Application No :NA
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(87) International Publication No :NA
(61) Patent of Addition to Application Number :NA
Filing Date :NA
(62) Divisional to Application Number :NA
Filing Date :NA

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(57) Abstract :

The present invention relates to an adjustable footrest (2) system designed for two-wheelers, including a casing (1) enclosing essential components. The system includes a locking box (4) situated within the casing (1), housing a spring-loaded locking rod (5) attached to a knob (6) on the footrest (2). This configuration enables users to adjust the footrest (2) height by pressing a button (7) on the knob (6) to release the locking rod (5) from the locking box (4), thereby allowing movement of the footrest (2) within the casing (1). Once adjusted to the desired height, releasing the knob (106) secures the footrest (2) through engagement with the locking mechanism, ensuring stability and safety during use. Additionally, the footrest (2) incorporates a swivel mechanism (104) for horizontal adjustment, enhancing rider comfort by accommodating various riding styles and ergonomic preferences. The invention aims to provide ergonomic support, reduce rider fatigue, and enhance safety through its robust locking and adjustment features.

No. of Pages : 23 No. of Claims : 9

(12) PATENT APPLICATION PUBLICATION		(21) Application No.202431076408 A	
(19) INDIA			
(22) Date of filing of Application :08/10/2024		(43) Publication Date : 18/10/2024	
(54) Title of the invention : Compact CPU Cooling System			
(51) International classification (86) International Application No Filing Date (87) International Publication No (61) Patent of Addition to Application Number Filing Date (62) Divisional to Application Number Filing Date		(71)Name of Applicant : 1)National Institute of Technology Jamshedpur Address of Applicant :National Institute of Technology Jamshedpur, Adityapur, Jamshedpur, Jharkhand 831014 India ----- Name of Applicant : NA Address of Applicant : NA (72)Name of Inventor : 1)KAR, Dr. Vishesh Ranjan Address of Applicant :Department of Mechanical Engineering, National Institute of Technology Jamshedpur, Adityapur, Jamshedpur, Jharkhand 831014 India ----- 2)REDDY, Mr. Bonepally Sahith Address of Applicant :Malla Reddy College of Engineering & Technology, Maisammaguda, Bahadurpally, Hyderabad, Telangana - 500100 ----- 3)NEELAM, Mr. Karthik Address of Applicant :Malla Reddy College of Engineering & Technology, Maisammaguda, Bahadurpally, Hyderabad, Telangana - 500100 ----- 4)THIPPARTHI, Mr. Raja Gopala Chary Address of Applicant :Malla Reddy College of Engineering & Technology, Maisammaguda, Bahadurpally, Hyderabad, Telangana - 500100 ----- 5)RATHORE, Mr. Souvik Singh Address of Applicant :ARKA JAIN University, Mohanpur, Gamharia, Distt-Seraikela-Kharsawan Jharkhand India 832108 ----- 6)SANJAY, Prof. Sanjay Address of Applicant :Department of Mechanical Engineering, National Institute of Technology Jamshedpur, Adityapur, Jamshedpur, Jharkhand 831014 India ----- 7)TRIPATHY, Dr. Padmaja Address of Applicant :B-2, National Institute of Technology Jamshedpur, Adityapur, Jamshedpur, Jharkhand 831014 India ----- 8)MAHTO, Mr. Nivedan Address of Applicant :Department of Mechanical Engineering, National Institute of Technology Jamshedpur, Adityapur, Jamshedpur, Jharkhand 831014 India ----- 9)SEKHAR, Mr. Chandra Address of Applicant :Malla Reddy College of Engineering & Technology, Maisammaguda, Bahadurpally, Hyderabad, Telangana - 500100 ----- 10)S, Mrs. Deepthi Address of Applicant :Malla Reddy College of Engineering & Technology, Maisammaguda, Bahadurpally, Hyderabad, Telangana - 500100 ----- 11)REDDY, Mr. Damodara Address of Applicant :Malla Reddy College of Engineering & Technology, Maisammaguda, Bahadurpally, Hyderabad, Telangana - 500100 ----- 12)POTNURU, Mr. Srikar Address of Applicant :Malla Reddy College of Engineering & Technology, Maisammaguda, Bahadurpally, Hyderabad, Telangana - 500100 ----- 13)BHADRI, Mrs. Indraje Address of Applicant :Malla Reddy College of Engineering & Technology, Maisammaguda, Bahadurpally, Hyderabad, Telangana - 500100 ----- 14)VEMURI, Mr. Sai Srikanth Address of Applicant :Malla Reddy College of Engineering & Technology, Maisammaguda, Bahadurpally, Hyderabad, Telangana - 500100 -----	

(57) Abstract :

The present invention discloses a compact CPU cooling system (101) designed to address the challenges of efficient heat dissipation and space constraints in CPU cooling processes. The compact CPU cooling system (101) comprises an aluminum fins (1), a copper pipes (2), a fan (3), an aluminum heat exchanger block (4), and screws (5), all working together to ensure optimal heat transfer away from the CPU. The heat exchanger block (4) mounts directly onto the CPU processor, eliminating the need for rubber or plastic pipes, thus simplifying assembly and reducing overall space requirements. Optimized pipe (2) routing within the system ensures efficient heat dissipation while maintaining a compact form factor, making it suitable for devices with limited space. The system incorporates materials such as aluminum and copper, which enhance corrosion resistance and overall efficiency. The effectiveness of the proposed system with the use of nanofluids such as SWCNT, MWCNT, Graphene Oxide, and CuO, making present invention proposed model more compact. Hence, proposed model enhances the overall cooling effectiveness while using water and also further by using nanofluid by 10% to 30%. Additionally, the design reduces noise levels, ensuring quiet operation. The method for assembling the system involves straightforward steps to maintain the CPU within safe operating temperatures by efficiently dissipating heat.

No. of Pages : 20 No. of Claims : 7

(12) PATENT APPLICATION PUBLICATION

(19) INDIA

(22) Date of filing of Application :30/10/2024

(21) Application No.202441083026 A

(43) Publication Date : 08/11/2024

(54) Title of the invention : Smart Weight Estimation Using Load Cells: Enhancing Accuracy in Measurement Systems

(51) International classification :A61B0005000000, G01G0023010000, G01G0023370000, G01G0019440000, A61B0005010000

(86) International Application No :NA
Filing Date :NA

(87) International Publication No : NA

(61) Patent of Addition to Application Number :NA
Filing Date :NA

(62) Divisional to Application Number :NA
Filing Date :NA

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(57) Abstract :

"Smart Weight Estimation Using Load Cells: "Learning Enhancing Accuracy in Measurement Systems" introduces an innovative way to improve weight measurement systems through load cell technology and digital processing. Conventional weighing systems, normally based on mechanical levers and counterweights, tend to be too imprecise and are not able to generate real-time data. This system overcomes the above limitations by utilizing load cells to convert applied force to electrical signals. The HX711 sensor module amplifies these signals, and the Arduino microcontroller processes them to perform highly accurate and reliable weight estimation. The system can be run in automatic or manual calibration, and calibration is simply a push-button affair. This system can measure weights up to 40 kilograms and is intended for high-precision applications. A real-time view is provided via an LCD display that shows measured weight in grams, thus making it user-friendly and efficient. Incorporation of load cell technology significantly increases the accuracy of weight measurements by adding much higher resolution in performance and usability. This system is appropriate for a broad spectrum of industries where fine weight estimation is of prime concern, i.e., manufacturing, logistics, and scientific research. The major advance achieved is not only the real-time data processing but also the ease of operation.

No. of Pages : 10 No. of Claims : 7

(12) PATENT APPLICATION PUBLICATION

(19) INDIA

(22) Date of filing of Application :04/11/2024

(21) Application No.202441084168 A

(43) Publication Date : 15/11/2024

(54) Title of the invention : Narratives of Inclusion: The Impact of Diverse Characters on Reader Engagement in Contemporary Literature

(51) International classification :G06F0003010000, G09B0019000000, G06Q0050000000, G16H0010200000, A61K0049000000

(86) International Application No :NA
Filing Date :NA

(87) International Publication No : NA

(61) Patent of Addition to Application Number :NA
Filing Date :NA

(62) Divisional to Application Number :NA
Filing Date :NA

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(57) Abstract :

We Claim 1. The visibility of different characters greatly increased emotional connection, with 75% saying that they felt more empathetic towards the person portrayed. 2. Diverse characters led to 60% of participants reflecting on the themes more and understanding diverse life experiences better. 3. 70% of readers said they were even more likely to talk about the narratives and share their opinions with peers, essentially creating a community. 4. 55% said ensuring diverse characters are accurately represented meaning they need to be authentic and culturally sensitive was important in terms of being able to relate to or engage with those people referenced. 5. As half of the readers suggest that future research on plural representation in literature should be validated and extended to a broader segment.

No. of Pages : 12 No. of Claims : 5

(12) PATENT APPLICATION PUBLICATION	(21) Application No.202441087351 A
(19) INDIA	
(22) Date of filing of Application :12/11/2024	(43) Publication Date : 22/11/2024
(54) Title of the invention : Real-Time AI-Powered Image Processing Framework for Remote Healthcare Diagnostics over 5G	
(51) International classification :G16H0040670000, G06F0021620000, G06N0020000000, G16H0080000000, G16H0010600000	(71)Name of Applicant : 1)Malla Reddy College of Engineering & Technology Address of Applicant :Department of Information Technology, Malla Reddy College of Engineering & Technology (UGC-Autonomous), Maisammaguda, Dhulapally, Secunderabad, Telangana, India. Pin Code:500100 ----- Name of Applicant : NA Address of Applicant : NA (72)Name of Inventor : 1)Dr. G. Sharada Address of Applicant :Professor & HoD, Department of Information Technology, Malla Reddy College of Engineering & Technology (UGC-Autonomous), Maisammaguda, Dhulapally, Secunderabad, Telangana, India. Pin Code:500100 ----- 2)Dr. K. Suresh Address of Applicant :Associate Professor, Department of Information Technology, Malla Reddy College of Engineering & Technology (UGC-Autonomous), Maisammaguda, Dhulapally, Secunderabad, Telangana, India. Pin Code:500100 ----- 3)Dr. A. Mummamorthy Address of Applicant :Associate Professor, Department of Information Technology, Malla Reddy College of Engineering & Technology (UGC-Autonomous), Maisammaguda, Dhulapally, Secunderabad, Telangana, India. Pin Code:500100 ----- 4)Dr. A. Lakshman Address of Applicant :Associate Professor, Department of Information Technology, Malla Reddy College of Engineering & Technology (UGC-Autonomous), Maisammaguda, Dhulapally, Secunderabad, Telangana, India. Pin Code:500100 ----- 5)Mr. M. Vazralu Address of Applicant :Associate Professor, Department of Information Technology, Malla Reddy College of Engineering & Technology (UGC-Autonomous), Maisammaguda, Dhulapally, Secunderabad, Telangana, India. Pin Code:500100 ----- 6)Mr. I. Uma Maheswara Rao Address of Applicant :Associate Professor, Department of Information Technology, Malla Reddy College of Engineering & Technology (UGC-Autonomous), Maisammaguda, Dhulapally, Secunderabad, Telangana, India. Pin Code:500100 ----- 7)Ms. K. Swetha Address of Applicant :Associate Professor, Department of Information Technology, Malla Reddy College of Engineering & Technology (UGC-Autonomous), Maisammaguda, Dhulapally, Secunderabad, Telangana, India. Pin Code:500100 ----- 8)Mr. P. Harikrishna Address of Applicant :Associate Professor, Department of Information Technology, Malla Reddy College of Engineering & Technology (UGC-Autonomous), Maisammaguda, Dhulapally, Secunderabad, Telangana, India. Pin Code:500100 ----- 9)Mr. R. Chandra Shekhar Address of Applicant :Associate Professor, Department of Information Technology, Malla Reddy College of Engineering & Technology (UGC-Autonomous), Maisammaguda, Dhulapally, Secunderabad, Telangana, India. Pin Code:500100 -----
(86) International Application No :NA Filing Date :NA (87) International Publication No : NA (61) Patent of Addition to Application Number :NA Filing Date :NA (62) Divisional to Application Number :NA Filing Date :NA	
(57) Abstract : This invention presents a Real-Time AI-Powered Image Processing Framework for Remote Healthcare Diagnostics over 5G. The Distributed AI-Based Imaging Assistant (DABIA) is a real-time diagnostic system that leverages AI-powered image processing, federated learning, and 5G connectivity for remote healthcare applications. It introduces an adaptive diagnostic feedback loop, allowing healthcare providers to receive real-time, patient-specific diagnostic insights based on individual profiles and environmental factors. DABIA's edge-to-cloud synchronization reduces latency, enabling time-sensitive diagnostics in mobile and rural healthcare environments. Privacy-preserving federated learning ensures data security, making DABIA a scalable, regulatory-compliant solution for telemedicine and remote diagnostics. Accompanied Drawing [FIG. 1]	
No. of Pages : 17 No. of Claims : 6	

(54) Title of the invention : Polyoxometalates As Versatile Green Catalyst with Innovations In Sustainable C-C Bond Formation

(51) International classification :B01J0027180000, B01J0031220000, C07C0001320000,
B01J0031160000, C07B0037040000
(86) International Application No :NA
Filing Date :NA
(87) International Publication No :NA
(61) Patent of Addition to Application Number :NA
Filing Date :NA
(62) Divisional to Application Number :NA
Filing Date :NA

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(57) Abstract :

Abstract To address domain challenges in the rising demand for sustainable chemical processes, sustainable catalytic systems will need to be developed. The present work emphasizes the potential of polyoxometalates (POMs), in particular functionalized Keggin-type POMs, as effective green catalysts for carbon-carbon (C-C) bond-forming reactions, which constitute a common key reaction step in organic synthesis. This work tackles conventional catalysts with inflexibility in terms of efficiency, reusability, and environmental impact by them utilizing their distinct tunable characteristics. Phosphotungstic acid-exchanged vanadium-containing POMs were synthesized and characterized using FTIR, XRD, and NMR to confirm the high level of structural integrity and active sites. In particular, Suzuki-Miyaura and Heck coupling reactions were located on model systems where the full catalytic performance was mapped across multiple dimensions (temperature, solvent, catalyst loading). Ethanol-water was the optimal solvent system, providing yields and conversions of 92% and 90%, respectively. Green chemistry standards meeting: recyclability tests of the fifth cycle display similar catalytic activity and slight structural deactivation. Although the study underscores the great potential of POMs for sustainable catalysis, there are also some limitations, such as the necessity of scalability and further development concerning comprehensive reaction scopes. Future studies may further explore the optimization of functionalization strategies as well as broaden their industrial applications. These findings provide essential guidance for the further development of sustainable chemical processes by novel catalyst design.

No. of Pages : 13 No. of Claims : 5

(12) PATENT APPLICATION PUBLICATION

(19) INDIA

(22) Date of filing of Application :11/12/2024

(21) Application No.202441097918 A

(43) Publication Date : 20/12/2024

(54) Title of the invention : Thermoresponsive Polymers in Smart Packaging with Adaptive Solutions for Food Safety and Quality Control

(51) International classification :A63B0069340000, A23L0003346300, G01N0033020000, C12N0015820000, B65D0081240000

(86) International Application No :NA
Filing Date :NA

(87) International Publication No : NA

(61) Patent of Addition to Application Number :NA
Filing Date :NA

(62) Divisional to Application Number :NA
Filing Date :NA

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(57) Abstract :

Abstract Thermoresponsive polymers have attracted considerable interest as a new generation of packaging materials since the demand for innovative packaging solutions that enhance food safety and quality under diverse and dynamic conditions is at its peak. Such materials are described to display temperature-dependent phase transitions that give them adaptive insulation and spoilage prevention properties. The aim of this research is to study the specific incorporation of thermoresponsive polymers such as PNIPAM, PEO-PPO-PEO, and PVME in smart packaging, allowing tackling some relevant disadvantages associated with common package material. The study assessed thermal transitions, mechanical durability, and response efficiency via differential scanning calorimetry, stress-strain testing, and temperature cycling experiments. Highlights PNIPAM transitions at 32°C Internal temperatures unchanged $\pm 2^\circ\text{C}$ during temperature change Shelf-life comparisons reveal thermoresponsive polymers extend the storage life of packaged products up to 25 days, drastically decreasing spoilage rates by a factor of two compared with conventional packaging. Although the scalability and cost are challenges, these results prove that these polymers would be a game changer for food packaging where adaptive behaviour together with longer shelf life is inevitable. Future studies should focus on bio-based alternatives and IoT integration for better monitoring and sustainability.

No. of Pages : 13 No. of Claims : 4