ICSEEC: SUSTAINABLE ENERGY AND ENERGY CALCULATIONS

Abstracts of International 2nd Conference on Sustainable Energy and Energy Calculations

Online Live Conference | 4-5 SEPTEMBER 2020

Energy & Calculations, Self-Assembly of Systems
Photovoltaics, Nanotechnology in Energy, Hydrogen Energy & Fuel Cells
Energy Modelling, Modelling in Energy, Energy in Biosystems, Bioenergy & Biomass
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DEPARTMENT OF ENERGY SCIENCE AND TECHNOLOGIES

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PREFACE

The second conference of Sustainable Energy and Energy Calculation was held on 4th and 5th of September 2020. The conference was planned to be held in May 2020 in the city of Burhaniye, Balikesir. We still must thank to the mayorship of Burhaniye Municipality, because they offered many services for the conference. Unfortunately we could not have the conference in their friendly hosting, because of the fact of the pandemic. In this difficult case, the conference was held as an online conference. The conference still attracted many very valuable presentations from abroad and local institutions.

The conference served as a fruitful platform for the participants, so that the participants had the opportunity to share the newest outcomes of their works. Furthermore the participants had the chance to think about the possible improvements for the recent problems in the covered subjects.

We hope that the world will recover from the difficult days of corona virus. Today, one understands that fundamental research and engineering play an important role for the health and security of the human beings, not only entertainment and pleasure. Through fundamental research and engineering, we can have a bigger chance to solve our problems related to the energy demand, energy planning, energy storage and new materials for energy.

The rector of Turkish-German University, Prof. Dr. Halil Akkanat, supported the conference, we thank him also. The conference organisation is always motivated by Prof. Dr. Idris Adnan Gumus, who was the honoured speaker of the conference. The online conference software was offered by Mevasis. We acknowledge this fundamental unit of the conference. We do thank to all the participants of the conference.

Furthermore, we, as all participants to this event, acknowledge the EU Project titled "Green Energy Skills for Youth (Green4U)".

September 2020

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Contents

A New Hybrid System Integrating A Solar Parabolic Trough Collector with A Cylindrical Thermoelectric Generator

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Nowadays, exploitation and production of maximum energy from the solar spectrum is a major concern. For this reason, several researches have been carried out related to parabolic trough concentrator and photovoltaic systems in order to convert the maximum of solar energy to thermal and electrical energy. In the same way, researchers have improved the solar systems' performance by coupling them to the thermoelectric module. Consequently, these solar systems become multi-functional (Co-generation, tri-generation...)[1]. Likewise, in the present paper, a numerical study of a new hybrid system consisting of a solar parabolic trough concentrator coupled with thermoelectric modules is performed using the Gauss-Seidel iterative method. The thermoelectric generator is located within collector forms coaxial tube, which has two channels. The first is annular assigned to the heat transfer fluid while the second is ring-shaped associated with the cooling fluid. A realistic climatic condition is used (Sun irradiation and ambient temperature). The effect of thermoelectric generator thickness on the temperature difference is analysed in order to improve the thermal and electrical thermoelectric performance, including the effect of the two fluids flow-rates and load resistance. It is found that an optimum value of the hot and cold fluids flow-rates of 0.25 Kg/s result in a maximum thermal device efficiency of 60.646%, along with an electrical efficiency of 9.72% producing of an additional power output of 273.15 W.

Keywords: Parabolic Trough collector, Thermoelectric modules, power output, Efficiency, Mass flow rate.

References

1 Sundarraj P, Maity D, Roy SS, Taylor RA. Recent advances in thermoelectric materials and solar thermoelectric generators – a critical review. RSC Adv 2014;4:46860–74.

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Investigation of physical characteristics of thermoelectric $CuAlO_2$

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Among the reusable energy materials, thermoelectric materials have the potential of use in our daily life. Because of thermoelectric materials' efficiency is 15%, they still need to be improved for more efficiency. $CuAlO_2$ is one of the candidates and well-known thermoelectric material which needs to be improved. In this research, we synthesized delafossite $CuAlO_2$ using a solid-state reaction method. Phase definition of the sample was provided by X-ray diffraction. We obtain the desired crystalline phase that belonged to the $CuAlO_2$. Scanning Electron Microscope and its in-situ attachment Energy Dispersive Spectroscopy techniques were used to define the morphological and stoichiometric properties. For a detailed elemental composition analysis, X-ray photoelectron spectroscopy measurements were done, and the existence of the core level of 4 electron spaces Cu2p, Al2p, and O1s was observed. Optical details of the sample were investigated by Photoluminescence measurements. The nature of the magnetic properties of $CuAlO_2$ sample was also defined by PPMS.

Keywords: $CuAlO_2$, Magnetic and optical properties.

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Performance Comparison of Pitch Angle Controllers for 2 MW Wind Turbine

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As wind energy is becoming more and more significant for renewable energy, effectiveness of pitch angle controller plays crucial role to achieve higher performance and optimized turbine designs. Aerodynamic performance of wind turbine rotor and consecutively electrical power production of turbine depend on the efficiency of pitch controller design. The conventional pitch control strategy uses PI and PID controllers to regulate the rotor speed and consecutively generator power output. In the full load region, pitch controller is activated to regulate the power output and speed according to their reference values. This work presents the effects of two different pitch angle controllers on a 2 MW DFIG type wind turbine under Matlab Simulink environment. PI and PID control methodologies were used to design pitch controller of the turbine. Through the controller design iterations, settling time, overshoot value, error values and power output values are decided for comparison parameters. Both controller performances in terms of transient and steady state are evaluated.

Keywords: Wind Energy, Pitch Angle Controller, Speed Regulation, Power Output.

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Genetic Algorithm Optimization of PID Pitch Angle Controller for a 2 MW Wind Turbine

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Speed regulation of wind turbine rotors are controlled by pitch angle controllers that affect the life expectancy of wind turbines, reliability and power quality. Optimization of wind turbine pitch angle controllers perform crucial effect on the wind turbine dynamics where the speed stability is achieved. In today's modern and commercial wind turbines, blade pitch angle controllers are generally implemented with PI and PID techniques. Determining the controller gain coefficients are one of the most significant problems in order to show a more stable rotor dynamics that eventually leads to better wind turbine performance in terms of both mechanical and electrical qualities. [1] Hence, PID controller was designed and optimized with genetic algorithm technique for a 2 MW DFIG type wind turbine under Matlab-Simulink environment. Gain parameters were optimized for a given wind speed profile from third zone and optimized gain coefficients were achieved within the optimization study. A controller with an optimum gain coefficients shows the superior performance than the regular PID performance.

Keywords: Genetic Algorithm, Pitch Angle Controller, Speed Regulation, Wind Energy.

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Examining the Distribution of Primary Energy Resources in the World and Turkey

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Renewable energy sectors, which determine the development levels of countries, are growing in our country by gaining serious momentum as in the whole world. Renewable energy sources are the second most preferred energy sources of many countries in the world and contribute to global electricity. In this study, the change in the total energy supply in Turkey and in the world will be compared. According to the development of primary energy sources installed capacity in the world and Turkey will be examined.

As in developing countries, in Turkey also widely used in coal and bio fuels are the largest source of energy by far. The second largest resource is hydroelectricity. Liquid biofuels constitute the rest of wind energy, geothermal, solar and tidal renewable energy sources. The world's fuel supply shares are 26.9% coal, 31.5% oil, 22.8% natural gas, 4.9% nuclear, 0.3% other energy and 13.5% renewable energy sources, respectively. Turkey's share in the energy supply of respectively 21.49% coal, 6.3% petroleum, 24.26% natural gas, 23.19% hydroelectric, 24.57% in the form of renewable energy sources.

Renewable energy sources in the world and Turkey has so different in themselves. 18.8% hydroelectricity, 5.7% wind, 4.4% solar energy, 4.8% geothermal, 66.4% biofuels constitute the percentages of renewable energy sources in the world. Referring to Turkey distribution of renewable energy sources, biomass 0.70%, wind 57.91%, solar 5.72%, hydropower 23.19%, lakes and rivers 8.76%, geothermal energy is shown as 1.45%.

As a result, diversification of renewable energy demand has been in question in OECD countries. The growth of total renewable energy sources in OECD is higher than in non-OECD countries. As for the use of new renewable energy sources, the growth rate in non-OECD countries is higher than in OECD countries.

Keywords: Energy Sources, Renewable Energy Sources, Distribution of Renewable Energy Sources.

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Parametric Energy Analysis of the Performances of Various Refrigerants on a Multistage Refrigeration System

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In low temperature applications or in cases where the difference between the evaporation temperature and the condensation temperature is 40 K or more, a number of constraints and difficulties arise during the operation of single-stage vapour compression refrigeration cycles. In cases where these restrictions occur, multi-stage cooling systems are preferred. In multi-stage systems, energy need is high in order to reach high compression rates. In this study, energy analysis of a multi-stage cooling system was performed in the case of using different refrigerants. In the study, four different refrigerant subjects were taken. These are R22, R1234yf, R227ea and R600. Analyses were made under condensation temperature 37 °C, evaporation temperature -3 °C, 82% compressor efficiency and 20 °C outdoor temperature. By changing the condensation temperature and evaporation temperature parametrically, compressor work and cooling capacities were determined as well as performance coefficients of the cycle for each refrigerant. As a result of the analyses, it was observed that the refrigerant with the highest coefficient of performance is R600. Although R1234yf and R22 are available at alternative levels, it has been observed that the refrigerant R227ea has the lowest performance coefficient. The lowest compressor job was also observed in the refrigerant R600.

Keywords: Multistage Compression Refrigeration, Energy analysis, Coefficient of Performance.

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Investigation of Burhaniye Wind Energy Potential

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With the growing population and developing industry, increasing energy need every day has brought the search for energy that is less likely to be exhausted and environmentally safe in its train. Today, wind energy, which is an alternative energy source, has gained importance. Balikesir province takes place in the top in the wind energy field in Turkey. Many power plants have been established in the province and continue to be established. In this study, after giving information about wind energy potential and production in Turkey, wind energy potential of Burhaniye, one of Balikesir's districts, was investigated. By analysing wind data, monthly speed and direction distribution were investigated in detail. Wind power density was received monthly. Weibull parameters and wind speed data for different heights were calculated using the extrapolation method. Data of 2011-2018 years taken from the Turkish State Meteorological Service were used. Annual average wind speed was obtained as 2.80 m/s and wind power density was 32 W/m^2. The region was determined as a poor location according to the classification made in terms of power potential.

Keywords: Burhaniye, renewable energy, wind energy.

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The Potential Applications of Magnetic Mesoporous Nanocomposites for Catalytic Conversions of Methyl Propionate/Methyl Oleate

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Catalysis is a phenomenon implementing the principles of green chemistry. Because in the presence of catalysts, reactions are realized more efficiently under mild conditions, so they subdue the formation of by-products, dispense with waste compounds and additional raw materials. Especially solid acid catalysts are the most important for industrial applications due to the low corrosion activity, safety issues, less waste generation and easy preparation and recovery. Although nevertheless tend to aggregate into large clusters, Fe_3O_4 nanoparticles are the most promising catalyst supports because of their superparamagnetic, low toxic and easy modification properties. The presence of silica atoms on the surface of the Fe_3O_4 nanoparticles can prevent their aggregation, since Si-O functions as a bridge between magnetic core and functional groups, and SiO_2 has biocompatibility and protection effects. Moreover, if the SiO_2 layer consists of a well-known mesoporous material such as MCM-41 and SBA-15 with p6mm hexagonal mesostructured, it is possible to obtain high surface area and selective catalyst due to adjustable pore size.

In this study, magnetite nanoparticles were synthesized by co-precipitation method. The outer shell could be prepared with the addition of silicon source and the different structure-directing agents for MCM-41 and SBA-15, which influences the pores morphology, mainly diameter. After calcination step, nanocomposites were functionalized with chlorosulfonic acid and tested for the esterification of methyl propionate and methyl oleate. Although catalytic conversions of these nanocomposites are almost the same for methyl propionate esterification, methyl oleate esterification happened faster with SBA-15 coated nanocomposite. According to the structural and magnetic results proven by BET/BJH, XRD, and VSM analyses, it can be reasonably supposed that both SBA-15 and MCM-41 mesoporous silicas have the same surface property. The reaction rate difference especially in methyl oleate esterification can be attributed to the influences of pore structure.

Keywords: Heterogeneous catalyst, SBA-15, MCM-41, Esterification, Magnetic nanocomposite.

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Effect of Mixing Ratio of Binary Mixtures on Heat Transfer Characteristics of a Pulsating Heat Pipe

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Presented study deals with heat transfer investigation and flow analysis of an asymmetrical PHP charged by binary mixtures with different mixing ratios. The PHP has sixteen parallel rectangular channels, in other words, it consists of eight turns. One of the channels in the turns has 2 mm x 2 mm; while the neighbouring one has 1 mm x 2 mm cross section. In the mixture, ethanol (E) and hexane (H) are used as fluids. The experiments are conducted at a constant filling ratio of 40%; but different mixing ratios (E:H = 1:1, 1:4 and 4:1) and inclination angles are studied, too. It should be noted that in every test condition, heating power gradually increases up to reaching an evaporator temperature of nearly 110 °C. Flow images are also taken; and they are used in the discussion of the results (as flow patterns, and dynamics of flow components). Several important conclusions are obtained through the study. Increasing volume ratio of ethanol in the mixture adversely affects the thermal performance at both the inclination angles. As a general evaluation, dependence of thermal resistance trend on the inclination angle is not significant; this dependence is relatively more obvious for E:H = 1:1 mixture compared to the other mixing ratios. However, in terms of heat input range, it may be stated that thermal performance in the case of vertical position is better than the horizontal one since the maximum available heating power is higher in the vertical position.

Keywords: Heat transfer, mixing ratio, pulsating heat pipe, binary mixture.

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Synthesis of Thiophene-Based Hole Transport Material for Perovskite Solar Cells

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Organic semiconducting materials are very attractive as a low-cost alternative to conventional silicon transistors for various electronic applications due to their high mobility and stability. Thiophene-based materials have been considered as promising candidates for organic semiconductors, and they have been successfully used as key cores in organic field effect transistors (OFETs), organic light-emitting diodes (OLEDs), and photovoltaic cells. The performance of fused-thiophene is associated with the role of sulfur d-orbitals, which mix well with aromatic π-orbitals, such that electron-transfer across the π-center to the acceptor unit is facilitated, thereby enabling prolonged injection efficiency. Furthermore, fused thiophene derivatives exhibit excellent photo and thermal stability, affording improved performance as photosentitizers. Because of the potential applications and various properties of thiophene derivatives, such as unique chemical stability, excellent electronic configuration, and incredible synthetic versatility, they have been employed as hole transporting materials (HTMs) in perovskite solar cells (PSCs).

Dithienothiophene derivatives (DTT) are also important building blocks of a wide variety of materials for electronic and optical applications due to their considerable mobility [1]. From this point of view, we report herein the synthesis and characterization of 2,6-disubstituted dithienothiophene. The HOMO-LUMO energy levels, and thin film properties of DTT derivative will be investigated for possible application in PSCs as HTM.

Keywords: Thiophene, dithienothiophene, hole-transport material, perovskite.

Acknowledgements: This work was supported by TUBITAK (Project No: 218M110).

References

1 Yi W., Zhao S., Sun H., Kan Y., Shi J., Wan S., Lia C., Wang H., "Isomers of organic semiconductors based on dithienothiophenes: the effect of sulphur atoms positions on the intermolecular interactions and field-effect performances", J. Mater. Chem. C, 3, 10856-10861, 2015.

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Synthesis of Boron Doped Cathode Catalyst for Hydrogen-Bromine Flow Batteries

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The integration of an energy storage unit is essential to meet the demands of intermittent energy generating systems such as solar and wind in the grid scale. Performance improvement studies was carried out for the H_2/Br_2 flow battery system, which is an energy storage system and can store electrical energy as in the form of chemical energy. Loading heteroatoms such as boron and nitrogen into carbon materials is one of the techniques used to improve the electrical and chemical properties of carbon. Electron deficient boron is considered a potential atom for chemical additives to carbon materials [1]. This is because the doping of the boron atom to carbon materials activates chemically inert electrons, improving the carbon structure for electrochemical applications. In this study, carbon material with boron additive was synthesized by hydrothermal method. The effect of boron-containing carbon catalyst on the Hydrogen-Bromine flow cell was investigated. Boric acid was used as boron source. Hydrothermal process was used for boron loading to Vulcan XC-72. Boric acid (99% H_3BO_3, Merck®) and Vulcan XC-72 was added to the ethanol-water mixture (volumetric ratio 3/1). The mixture was stirred in a magnetic stirrer for one hour and then taken into a teflon coated stainless steel autoclave for hydrothermal reaction. The hydrothermal reaction was carried out at 180 °C for 12 hours. XRD and SEM was used for the structural characterization of the synthesized boron doped Vulcan XC-72. Cyclic voltammetry (CV) technique was used for electrochemical analysis of boron doped Vulcan XC-72. In addition, a single cell hydrogen-bromine flow cell was used for performance testing of the synthesized cathode catalyst. The maximum power density of the synthesized boron doped Vulcan XC-72 is 0.43 W cm^{-2}. Findings regarding the electrical and structural properties of electrocatalyst was presented at the congress.

Keywords: Hydrogen-bromine flow battery, boron doping, cathode catalyst

References

1 Xu, C., Zhou, H., Fu, C., Huang, Y., Chen, L., Yang, L., & Kuang, Y. (2017). Hydrothermal synthesis of boron-doped unzipped carbon nanotubes/sulfur composite for high-performance lithium-sulfur batteries. Electrochimica Acta, 232, 156-163.

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A Novel Hybrid System For Boron Removal And Eco-Electricity Production

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Plant-based waste water treatment systems (PWTS) are thought to play crucial potential to clean and improve the quality of various waste water types. The desire to explore waste water treatment technologies using eco-friendly and green energy systems led to the integration of plant-based waste water treatment systems and electro-coagulation systems (EC), leading to the emergence of new hybrid technology. In this study, the treatment and eco-electricity performance of PWTS-EC were evaluated for 4 days to remove boron (B) from synthetic waste water. The systems are designed in 7 different combinations using sludge (S), Lemna gibba (L), and presence oxygen (O) parameters. Treatment and eco-electric power generation performance of the systems (SLO, LO, LS, SO, L, S, O) were compared with a control system. The average B treatment performances were recorded as 48.47%, 33.59%, 35.04%, 30.62%, 29.6%, 26.46%, 22.43%, 16.61% for SLO, LO, LS, SO, L, S, O, and control, respectively. In addition, eco-electrical generation performances were varied between 1.20 and 0.7 V with an open-circuit connection. According to the present results, the SLO system was found as a more efficient system comparing the systems in terms of B treatment and eco-electricity production performance. The results of this experiment prove that PWTS-EC can be used as an alternative and low cost, low energy and renewable alternative treatment method for B contaminated waste water treatment and eco-electricity production.

Keywords: Plant-based electro-coagulation system, Lemna gibba, Boron treatment, Eco-electricity production

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Investigation of high T_c Superconductor Materials and Their Physical Properties

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Consuming the energy sources in the world makes the researches on this subject very important. It requires energy consumption in our society to be optimized or to use existing types of energy resources more efficiently. In this field of study, super conductive materials have the potential to improve the usage in our daily life and still need more research on them to reach the highest critical temperature (T_c). With this motivation, we concentrated on depositing the epitaxial thin films of $Ba_{1-x}La_xFe_2As_2$ (x = 0.08, 0.13, and 0.18) using a pulse laser deposition (PLD) technique. The T_c parameters of these samples were also studied. Based on our magnetic measurements, we revealed an important result that each domain (as a disconnected superconducting island) has its own bulk superconducting properties separately.

Keywords: FeAs-based superconductors, PLD technique.

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Analysis of the Seasonal Energy Production of a Sample Wind Turbine

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Wind energy offers many advantages as one of the fastest growing energy sources in the world. Research efforts are aimed at solving the challenges to greater use of wind energy. In order to ensure the widespread use of wind energy, which is one of the renewable energy resources, it is necessary to research, areas with high wind potential and to encourage the use of wind energy in these areas.

In this study, one-year energy production data of a sample turbine is analysed depending on wind speeds. Energy production data were collected for each month and the annual energy production graph was created using the wind speed data collected from site. As a result of these investigations, it was determined that the most efficient period is winter.

Keywords: Wind energy, wind turbine, energy analysis.

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Performance Analysis and Investment Cost Account Calculation of Building Integrated Photovoltaic Systems

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Population growth in developing countries, industrialization and rapid advancement of technology cause the increase of energy demand day by day. Fossil energy sources, which are frequently used to produce energy, are also rapidly depleting with this demand. In addition, the trend towards renewable energy sources is increasing in the context of the damage caused by the usage of fossil resources and the strategies developed by countries to supply their own energy demands. Buildings have a big role in total energy consumption and are among the important elements of environmental pollution caused by energy consumption. Solar energy is one of the important energy sources with its clean, local and renewable features. It can be used with today's photovoltaic system technologies, for building energy needs. The aim of the study is to determine the efficiency and cost analysis of a photovoltaic system which was later integrated into an existing building. For this purpose, a glass factory building in Afyonkarahisar / Turkey was used. By integrating the photovoltaic system on the roof of this building, the system's energy analysis, initial investment cost and payback period were calculated. The performance analysis of the system was performed with PVsyst V6.7.8 simulation. On the roof, 5184 piece 265 v si-mono PV modules with a total area of 7014 m^2 and inverter with a total power of 1025 kWac were used. According to the results, it is concluded that the grid-connected photovoltaic system can generate 1723 MWh of energy annually, thus 64% of the annual energy need can be supply from the system and the efficiency of the system is 84.49%. It can repay the initial investment cost in about 7 years. It is appropriate to perform the study according to the net present value calculation.

Keywords: Solar energy, Photovoltaic system, PVsyst, Building integrated photovoltaics

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Artificial Neural Network Regression Model for Non-Invasive Blood Glucose Monitoring

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This paper deals to improve the performance of blood glucose measuring devices. The best method to increase the predictive capacity of blood glucose concentration measurement is using artificial intelligence. This work aims at building an artificial neural network regression model to estimate more precisely glucose level through a non invasive glucometer based on near infrared spectroscopy. A total of 300 humans serums are used in validation step. Based on Clarke Error Grid Analysis, experimental results show that 97.33% of the measured concentrations fall within the clinically acceptable region A. Also, the proposed method was compared with other linear and non-linear regression models. Results, the proposed model shows its effectiveness with correlation coefficient 0.99. These experimental results prove that artificial neural network regression model can open a new path to a non-invasive glucose monitoring.

Keywords: Blood Glucose concentration, Non-invasive, Artificial intelligence, Artificial neural network, Regression Analysis.

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Experimental and Computational Study of Acridine-1,8-dione Derivative in EtOH as a Fluorescent Sensor for Fe(III)

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Synthesized acridine-1,8-dione derivative was examined to detect Fe^{+3} ions by fluorescent. The sensor displayed high selectivity and sensitivity toward Fe^{+3} in the presence of the other ions in the solution of EtOH/H_2O (1:99, v/v). The progress in fluorescence intensity was related linearly to the concentration of Fe^{+3} with a detection limit of 5.3×10^{-7} M. The synthesized compound had a unique blue color in the fluorescent irritation, which was highly intensive. As a result, this chemosensor afforded a different manner for selectivity of Fe^{3+} ions, among other ions. DFT results indicate that in the preferred conformer of 1,8-dione the Cl atom points out the acridine plane with HC1C2C3 dihedral angle $\theta = 2.92^{o}$. The complexes stabilize due to the donation of electron density from lone pairs of oxygen atoms or CC σ orbitals to the empty LP* of transition metals (Figure 1) [1].

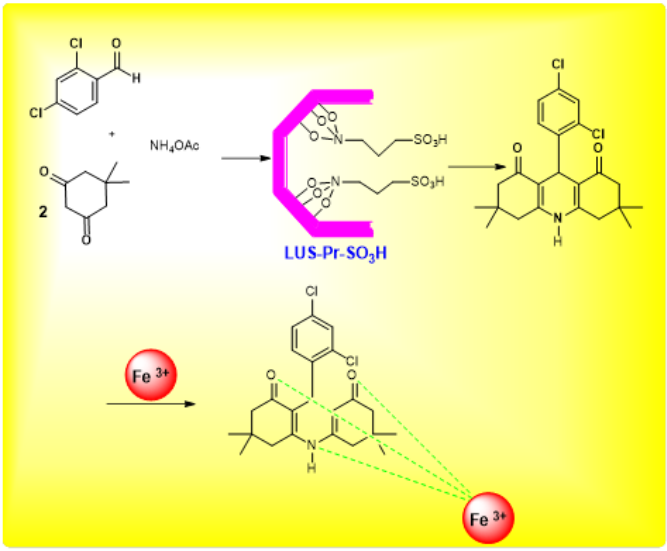

Figure 1: The procedure for preparation of chemosensor.

Keywords: Fluorescent sensor, Iron ion (III), Acridine-1,8-dione derivatives, Nanocatalyst LUS-Pr-SO_3H, Computational study of DFT.

References

1 Mohammadi Ziarani G., Rahimifard M., Badiei A., Soorki C. 2016. Fast one-pot synthesis of 1,8-dioxo-decahydroacridine derivatives using sulfonic acid functionalized LUS-1 and the study on their antimicrobial activities. J. Iran. Chem. 6(4), 369-375.

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Towards Digitalization in Maritime Transportation: Reflections on Marine Technology, Safety, Environment and Energy

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To understand why the maritime is very important for nations, some important milestones in the development of world maritime trade and ship technology should be known. Since the geographical discoveries by seaway in the 14^{th} and 15^{th} centuries, there have been very important fundamental changes in the world maritime trade and ship technology. On the other hand, today's 21^{st} century world is pregnant with new very important technological developments due to global digitalization efforts in maritime industry as well. For example; the International Maritime Organization (IMO) that is a specialized agency of the United Nations (UN) promotes the use of renewable and alternative energy sources on-board ships, rather than fossil fuels, and has been carrying out a regulatory scoping exercise studies for the use of autonomous ships since the last few years. Therefore, this paper aims to present a systematic analysis and emphasize some new technological developments dealing with digitalization in maritime and its reflections on marine technology, safety, environment and energy, such as autonomous ships without seamen, autonomous sea ports integrated with autonomous ships, electrical (battery) powered ships without greenhouse gas emission, green and smart shipyards etc. Additionally, some interesting examples of R&D studies being recently conducted in maritime industry on energy alternatives for "zero emission ship" concept, such as electricity, wind and wave power, hydrogen fuel cells/pannels, photovoltaic systems, solar and LNG cells, methane fuel (biogas) etc. will be presented. It is expected that this paper will contribute to provide a future perspective and to gain some potential research topics for researchers and stakeholders who are interested in energy as well as in maritime, transportation and logistics.

Keywords: Digitalization in Maritime, Energy in Maritime, Ship Technology, Maritime Safety, Marine Environment, Maritime Business Administration

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Boundary Layer Stability Impact on Wind Power

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Turbulence calculation is important in terms of the amount of energy the turbines will produce and the resistance of the turbines to extreme loads. Turbulence is the deviations of regular flow. Friction faced by flow and chaotic changes in velocity and pressure cause turbulence. There are many theorems and methods used for turbulence calculation. Some of these are K-theory (Eddy Diffusivity), Reynolds decomposition, Monin-Obukhov similarity theory, and turbulent kinetic energy. Calculation of turbulence is of great importance in order to improve wind forecasts. Thus, the amount of energy obtained from the wind can be calculated with higher accuracy and the regions where the wind energy farm will be established can be determined more precisely. Along with this study, wind turbulence calculation was carried out by wind data obtained from MILRES (National Wind Power Plant) turbine in Terkos, Istanbul region at different heights. In the light of these data, the distribution of energy output, wind speed, and wind direction was calculated both mathematically and by simulation. Based on the National Wind Power Plant (MILRES) turbine data, turbulence calculation was performed using Eddy Diffusivity, Monin-Obukhov similarity theory, turbulence kinetic energy, and Reynolds decomposition methods. The results obtained were compared and the atmospheric stability of the region was examined using these results. The distribution of wind speeds was calculated by experimental methods and simulation methods. Power outputs were obtained using The Wind Atlas Analysis and Application Program (WAsP) program and these outputs were compared with the wind power calculated from wind speed measurement results. Daily, monthly and seasonal deviations and changes were determined.

Keywords: Eddy Diffusivity, Reynolds Decomposition, Monin-Obukhov Similarity Theory, Boundary Layer.

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Synthesis of Poly (methyl methacrylate) with Borax Decahydrate Adition for Energy Applications

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The modified polymer composites can be included as the substrate for the utilization at the photovoltaic-thermal collectors to generate solar electricity and heat in solar energy systems. Poly (methyl methacrylate) seems a suitable thermoplastic polymer due to high strength, high heat and abrasion resistance, and good mechanical properties. Chemical and physical properties of the poly (methyl methacrylate) can be improved by adding different filler materials. Borax decahydrate known as sodium tetraborate decahydrate is a soft, alkaline salt with excellent buffering and flow properties.

In this study, the synthesis of polymer composite was performed by Atom Transfer Radical Polymerization for its use as a substrate at solar energy systems. Two different types of borax decahydrate ($Na_2B_4O_7.10H_2O$) (refined in both powder and crystal form from tincal ore) were used to increase the usage area of borax decahydrate in this study. Hence, borax decahydrate was added in poly (methyl methacrylate) as the filler material to improve surface properties with the enhancement of self-cleaning feature at composite surfaces, disposal of heavy contamination, removal of oil stains on polymer composite surface.

Keywords: Thermoplastic, Poly (methyl methacrylate), Sodium Tetraborate Decahydrate, Borax decahydrate, Atom Transfer Radical Polymerization, Polymer composite.

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Production and Characterization of Biochar from Nutshell Biomass - A Parametric Study

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Biomass energy is one of the promising resources to reduce fossil fuel reliance for reducing GHG emissions. Biomass can be transformed into gas or liquid fuels via a variety of methods including anaerobic digestion, transesterification gasification and pyrolysis. However, biomass is characterized by its high moisture content, low calorific value, hygroscopic nature and large volume or low bulk density, which result in a low conversion efficiency as well as difficulties in its collection, grinding, storage and transportation. Torrefaction, has been developed as a thermal pretreatment method to address these limitations of biomass, carried out at 200-300 °C in an oxygen-free environment at atmospheric pressure.

This study aims to determine the fuel properties of biochars produced from nutshells and define optimum process parameters. Nutshell feedstocks were torrefied at 260 °C, 280 °C, 300 °C with 30- and 60-minutes residence time in a muffle furnace. The moisture contents, elemental compositions, higher and lower calorific values and ash contents of raw and torrefied biomasses were determined. Energy yields, mass yields and energy density of torrefied biomasses were calculated mathematically. It concluded that the temperature was more effective than the retention time in nutshell torrefection. Considering the fuel properties of nutshells, it was concluded that 300 °C and 60 minutes residence time would be the most suitable production conditions [1].

Keywords: Torrefaction, biomass, biochar, nutshells, biofuel.

References

1 Devekiran, G. (2019): Investigation of Biochar Production Process from Pine Shavings and Nut Shells and Determination of Optimum Process Parameters. MSc Thesis, Ege University, Izmir.

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Convective Heat Transfer Modelling Of Nanofluid Flows: Single-Phase vs Two-Phase Models

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The aim of this study is to compare the single-phase and two-phase convective heat transfer modelling of water-based Al_2O_3 nanofluid's laminar flow in a circular straight pipe exposed to constant heat flux. The effects of nanoparticle diameter, particle volume fraction, and Reynolds number were investigated in detail through 3-dimensional finite volume based numerical simulations. The ultimate simulations were carried out after a comprehensive grid convergence study. Then, the results of the numerical simulations conducted using the single-phase and two-phase models under the same conditions were compared with the experimental data available in the literature to compare the modeling capabilities of the single-phase and multi-phase models in simulating convective heat transfer of nanofluid flows. Finally, a guideline for convective heat transfer modeling of water-based Al_2O_3 and nanofluid's flow in a pipe was presented. It is expected that the methodology proposed for this study and the modeling guideline presented here help engineers and scientists to select a suitable model for their study.

Keywords: Nanofluid, Heat transfer, Two-phase modelling, Single-phase modelling

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A Study on Energy Audit and Project to Increase Energy Efficieny for a University Campus Buildings

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Energy Audit is very important to determine energy saving potentials and also of great importance to create a road map in terms of energy efficiency investments in both buildings and industry.

Energy Audit study of the Istanbul Commerce University campus building in Kucukyali is established by evaluating the natural gas and electricity bills and 3 years of energy consumption data and the required costs.

Energy invoices for three years have been analysed for the study of energy audit of Istanbul Commerce University Kucukyali Campus. By converting natural gas and electrical energy consumption values into TEP values in these invoices, heat and electrical energy are combined under a single unit. In terms of being an example as an educational institution, necessary tables and statistical tables and graphs were prepared for the university campus.

In this campus, energy consumption related to heating, cooling, ventilation and lighting systems in buildings are examined in details. Required measurements and calculations were made in this university campus.

The heating, cooling, illumination systems and the related energy consumption rates are investigated in this study. Measurement and calculations of the current uninsulated state of the campus buildings are accomplished. The required investment costs are calculated by re-evaluating the fuel and electricity consumption values for the conditions of utilization of variable frequency drivers, energy efficient systems for the illumination systems and the other efficiency oriented approaches; then CO_2 emissions rates for the both conditions are compared; annual energy savings rates computed for each of specific consumptions per m^2 and m^3 utilization spaces; the payback period of the required investments and in house profitability rates are also computed and also required comparisons are conducted. It is established that the annual energy consumption of the campus buildings without the revisions are less than 250 TEP; however the inner-space-area is larger than 10.000 m^2.

Keywords: Building Energy Performance; Energy Audit; Energy Saving Project; Energy Efficiency

References

1 Kedici, O., "Enerji Yonetimi" Elektrik Isleri Etut Idaresi Genel Mudurlugu Enerji Kaynaklari Etut Dairesi Baskanligi, 1993, Ankara

Preparation of Effective Ni-Ti-B Triple Catalysts for Hydrolysis Reaction of Sodium Boron Hydride and Investigation of Kinetic Properties

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Hydrogen is a promising energy source because it can be obtained from renewable sources and has a high heat value. Chemical hydrides, such as sodium borohydride ($NaBH_4$), used as hydrogen resources thanks to their relatively high hydrogen content and recyclability. In this study, Ni-B catalysts with Ti metal addition will be prepared for the hydrolysis reaction of sodium borohydride. In the preparation of Ni-Ti-B catalysts, the chemical reduction technique will be used [1]. $NiCl_2$ salt will be used as the nickel source and $TiCl_4$ metal salt will be used as Ti source and the variations of the activities of the catalysts will be determined by the reasons. With the evaluation of the results obtained from the experiments, subsequent studies will continue with the most effective Ti metal salt concentration. The effect of catalysts in different Ti/(Ni+Ti) molar ratios will be examined according to the temperature, the amount of catalyst loaded, $NaBH_4$ and NaOH concentrations. The structure and surface properties of each catalyst will be explained by XRD and SEM analysis. After determining the highest performance Ti/(Ni+Ti) molar ratio, calcination process will be performed at different temperatures. Then, the changes in the structure of catalysts and their effect on performance will be examined. Thus, the mentioned study will reveal the relationship between the structure of the catalysts and their catalytic performance.

Keywords: Sodium boron hydride, Hydrolysis, Ni-Ti-B, Catalysts

References

1 Aydin, M., Hasimoglu, A., Ozdemir, O.K. (2016). Kinetic properties of Cobalt-Titanium-Boride (Co-Ti-B) catalysts for sodium borohydride hydrolysis reaction. Internatıonal Journal Of Hydrogen Energy, 41(1), 239-248.

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Electrochemical Activation Of Carbon Papers And Investigation Of The Effect On The Properties Of Pt Catalysts

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Polymer electrolyte membrane (PEM) type fuel cells are a promising eco-friendly and efficiently energy sources. For this reason, increasing the catalytic activity and efficiency of fuel cells is an important subject that is frequently researched today. In this study, commercially available carbon papers will be subjected to activation in different acid solutions at different currents and times. After the activation, capacitive properties of the carbon papers will be examined by cyclic voltammetry method. The platinum catalysts on activated carbon papers will then be electrochemically reduced by pulse galvanostatic method [1]. Coating process will be carried out with constant current and constant load. The amount of catalyst coated will be calculated by measuring the weights with precision scales before and after the coating of the each carbon papers. For the investigation of the electrochemical properties of reduced platinum catalysts, cyclic voltammetry, linear voltammetry and impedance methods will be used. Thus, the effect of the different acid solutions on the performance of the catalysts will be determined.

Keywords: Electrochemical, Carbon paper, Platinum, Catalysts.

References

1 Yilmaz, I., Gelir, A., Yargi, O., Sahinturk, U., Ozdemir, O.K. (2020). Electrodeposition of zinc and reduced graphene oxide on porous nickel electrodes for high performance supercapacitors. Journal of Physics and Chemistry of Solids. 138, 109307.

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Exergy and Exergoeconomic Analysis of a Diesel Engine

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Compression ignition engines are commonly used in the industry owing to their high thermal performance, durability and reliability. However, reducing the exhaust emissions of CI engines is still a topic of research due to environmental pollution concerns. On the other hand, exergy analysis is an advantageous technique to measure the useful energy capability of a system. This study is second part of the long term research aims at investigating the effect of piston bowl design on the exergy and exergoeconomic characteristic of a CI engine. The analysis considered a full load condition with constant engine speed. The fuel was n-heptane. The exergy efficiency and cost per exergy product of a CI engine were compared for six different piston bowl designs. The results showed that the piston bowl design has a considerable effect on the exergy efficiency of a CI engine. The piston bowl design leading to better mixing of the fuel consequently improved combustion performance exhibited better exergy efficiency. Moreover, it is found that the cost per exergy product is not affected significantly from piston bowl design for a CI engine.

Keywords: Exergy analysis, exergoeconomic analysis, CI engine.

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Potential Applications and Characterization of Rice Husk

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Rice husk (RH) is an agricultural waste available widely in rice producing countries worldwide. In recent years, this low-cost and environmentally friendly waste has been commonly used as a biomass for an alternative source of energy generation. Moreover, the ash product formed by the combustion of RH has potential applications in various industries [1].

In this study, the structure of the RH was identified by using FTIR, SEM, XRD, XPS, and DTA-TGA techniques. As well, the characterization of rice husk ash (RHA) was studied. The functional groups of RH and RHA were determined by FTIR. The organic part of RH was composed of cellulose, lignin, and hemicellulose. FTIR and DTA-TGA results indicated that lignin is thermally more stable than cellulose and hemicellulose. The characteristic of amorphous silica band was detected in XRD diffractogram of RH.

Keywords: Rice husk, rice husk ash, biomass, XRD.

References

1 Pode R., "Potential applications of rice husk ash waste from rice husk biomass power plant", Renewable and Sustainable Energy Reviews, 53, 1468-1485, 2016.

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Using of Renewable Energy System to Heat a Private Swimming Pool in Gaziantep

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Swimming pools are considered as high energy demand sport facilities. The development of new heating systems to reduce the energy consumption of the heated swimming pools is important (i.e. using of renewable energy). The present work illustrates the thermal analysis of heating system for a private swimming pool located in Gaziantep, Turkey. The heating system consists of solar collector, energy storage tank, heat pump and swimming pool. The swimming pool heating system is suggested to be worked the four seasons of the year. Based on computer simulation, an analytical model is introduced to predict the performance of heating operation for several years. The analysed results show that the system can attain an annually periodic operating condition. Furthermore, the coefficient of performance (COP) of heat pump significantly influenced by collector area and TES tank volume.

Keywords: Swimming pool, heat pump, solar energy, thermal energy storage tank.

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An Optimized Grey Rolling Model for Forecasting Transportation Energy Demand in Turkey

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Economic growth, increasing population, and innovations in technology have caused an increase in the demand for transportation energy. The transportation sector consumes about 25% of total energy sources in Turkey. Therefore, an accurate and reliable forecast of energy demand is necessary to determine an appropriate energy strategy. The classical time series models require large historical datasets to obtain accurate predictions. The grey model GM (1,1) is widely used in time series prediction due to its ability to characterize an uncertain system with small sample size data. However, this model often results in poor prediction as it ignores the importance of parameter optimization and the use of recent data.

In this study, a hybrid optimized grey prediction model (namely Grey Modelling (1,1) optimized by particle swarm optimization with Rolling mechanism, abbreviated as Rolling-PSO-GM (1,1)) is used to estimate annual transportation energy demand of Turkey. The parameters of GM (1,1) are optimized by particle swarm optimization algorithm, which is a population-based stochastic optimization technique. Besides, the rolling mechanism has been used, which increases the prediction accuracy by taking the recent data into account. Results indicate that the Rolling-PSO-GM (1,1) model performs well compared with the single basic models such as GM (1,1), Rolling-GM (1,1), and PSO-GM (1,1). The hybrid model has achieved a high accuracy to estimate the transportation-related energy demand of Turkey using the limited data. The results of the study have the potential to assist policy-makers in establishing a better policy framework in future energy planning.

Keywords: Transportation energy demand, PSO, GM (1,1), rolling mechanism, prediction.

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The Effect Of Gamma Irradiation On The Optical Properties Of CdS Coated Glass/ITO Thin Films

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In this work cadmium sulphide (CdS) thin films deposited on the glass and ITO coated glass by chemical bath deposition (CBD) method by using cadmium chloride, thiourea, ammonia solution and sodium hydroxide. Then the effect of gamma irradiation in the range of 10-30 kGy doses on the optical properties of CdS thin films were investigated. UV-Vis spectroscopy before and after gamma irradiation was studied and changes in optical properties such as absorption, transition, band gap energy, extinction coefficient in the range of 300-1100 nm were studied. The mean band gap energy for CdS coated glass and glass/ITO substrate before irradiation obtained 2.41 and 2.37 eV that is similar to typical value reported in the literature. From SEM analysis after gamma ray we saw that grain sizes had changed and some cracked lines were observed. Results show that gamma ray at different doses dramatically changes the optical properties.

Keywords: Gamma irradiation, optical properties, cadmium sulphide, chemical bath deposition, thin films.

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Structural, Electrical And Optical Properties of Fe Doped CdS Thin Films Prepared By Chemical Bath Deposition

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Fe doped Cadmium sulfide (CdS) nanostructure thin films have been deposited on glass substrates successfully by the low cost and simple method of chemical bath deposition using cadmium chloride, thiourea, iron(II) chloride and ammonia. The effect of different iron concentrations on morphological, optical and electrical properties of CdS thin films have been investigated. Optical properties, including absorption coefficient, band gap, photoluminescence. UV-VIS spectrophotometric measurementsh as studied and the change in absorption and photoluminescence in the visible wavelength ranges (300-1100) have investigated. The band-gap energy of the samples has measured in the range of 2.41-2.31 eV and according to the V-I results we obseverd that with increase in iron concentration, the current decreases linearly.

Keywords: Nano-structured thin films, electrical properties, optical properties, photoluminescence, Fe doped CdS.

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Nanotechnology-Empowered Adaptable and Biocompatible Sum Up of Energy

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The improvement of a technique for proficiently reaping vitality from the human body could empower remarkable advances in biomedical gadgets and versatile hardware. Being electro-mechanically coupled, nanopiezoelectrics speak to a promising new materials world-view for searching in any case squandered vitality, with a definitive objective of supplanting or expanding batteries. Specifically compelling is creating biomechanical vitality nanogenerators that are exceptionally effective, yet with adaptable structure factors for wearable or implantable applications. This viewpoint exhibits an outline of the chances, advances, and difficulties in the quickly quickening field of nanopiezoelectrics. The mix of new nanomaterial properties, novel get together techniques, and leap forward gadget execution measurements proposes a rich stage for a large group of energizing roads in essential research and novel applications.

Keywords: Nanotechnology, Energy, Harvest, Empower, Nanogenerators

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Energy Storage Performance Analysis of Fuel Cells and Supercapacitors with Material Characteristics

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This study provides better knowledge to understand the energy storage performance analysis of fuel cells and supercapacitors with material characteristics. In today's world, certain forms of energy are utilized everywhere such as in lighting, heating, running of machines and storing of appliances, etc. Energy demand increases gradually with increasing the human population. Therefore, energy supplying and energy storing are significant processes pertinent to each other. One of the most important parameters for energy storage issue is the examination and development of material properties used energy storage devices. Developments and investments in energy storage process must keep pace with the energy demands. There are many problems which are faced by fuel cells and supercapacitors such as low energy density, production cost, low voltage per cell and high self-discharge, etc. [1]. To overcome these types of problems, novel materials need to be improved for them. In order to improve their performances and efficiencies, electrochemical properties must be scrutinized in terms of electrode materials and designed by following some technological processes.

Keywords: Energy Storage, Material Characteristics, Fuel Cells, Supercapacitors

References

1 Kim, B. K., Sy, S., Yu, A., Zhang, J. (2015). Electrochemical Supercapacitors for Energy Storage and Conversion. Handbook of Clean Energy Systems, Volume:6, 2775-2800.

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