Al-Mustaqbal University College
Department of Air Conditioning
and Refrigeration Techniques

Al-Mustaqbal's Forum for Sustainable and CleanEnergy Innovations

2022

(Al-Mustaqbal's Forum for Sustainable and Clean Energy Innovations)

1. About the Forum

On the occasion of World Energy Day, Al-Mustaqbal University College organizes in cooperation with the Scientific Society for Energy Studies and Research, organized its scientific forum under the slogan (Investing clean energy is our way to sustainable development). In celebration of the World Energy Day, which falls on October 22, which represents an opportunity to raise awareness of energy and its importance, to discuss the challenges facing the energy sector, to ensure the provision of safe and sustainable energy for all, and to identify the need to develop national policies that reflect the global perspective on energy.

A number of personalities from the Ministry of Oil, Electricity and Environment, researchers and academics from various Iraqi universities, owners of companies and organizations specialized in the field of energy participated in the forum.

1.1. Vision

The world and Iraq are witnessing great climatic and environmental challenges such as rising temperatures, water stress and high demand for food. These challenges are accompanied by an increase in population growth and a change in consumption patterns, especially energy consumption. Energy issues are at the core of many of these challenges as a result of the increased domestic demand for energy generated from non-environmentally friendly sources such as oil, natural gas and coal to meet this demand. The transformation to renewable and clean energy systems that are generated from non-thermal sources and are free of carbon emissions that pollute the environment, is a promising way to meet the growing energy needs. The seventh goal of the United Nations Sustainable Development Goals (Clean and Affordable Energy) seeks to promote broader access to energy. It also ensures universal access to modern, reliable and sustainable energy services at affordable cost and energy efficiency. This is done through a number of ways, including enhancing cooperation to facilitate access to clean energy technology research and studies, including those related to technologies to reduce the use of advanced fossil fuels, and encouraging investment in energy infrastructure and clean energy technology.

In order to address and reduce energy challenges and to achieve the optimal transformation to clean energy, Al-Mustaqbal's Forum for Sustainable and Clean Energy Innovations, which is held at the Al-Mustaqbal University College, comes to be a scientific and research platform for the distribution and exchange of the latest information, innovations and products of renewable energy technologies among researchers, academics, government institutions and research centres as well as specialized technical firms and infrastructure for renewable and clean energy.

الرؤية

يشهد العالم والعراق تحديات مناخية وبيئية كبيرة كارتفاع درجات الحرارة والاجهاد المائي وارتفاع الطلب على الغذاء. ترافق هذه التحديات زيادة في النمو السكاني وتغير في أنماط الاستهلاك وخاصة استهلاك الطاقة بكل أنواعها. حيث تقع قضايا الطاقة في صلب الكثير من هذه التحديات نتيجة زيادة الطلب المحلي على الطاقة المتولدة من مصادر غير صديقة للبيئة كالنفط والغاز الطبيعي والفحم لتلبية هذا الطلب. يعد التحول الى أنظمة الطاقة المتجددة والنظيفة التي تنتج من مصادر غير حرارية وخالية من الانبعاثات الكربونية الملوثة للبيئة، طريقة واعدة لتلبية احتياجات الطاقة المتزايدة. يسعى الهدف السابع من اهداف التنمية المستدامة الخاصة بالأمم المتحدة (طاقة نظيفة وبأسعار معقولة) إلى تعزيز الحصول الأوسع على الطاقة. كذلك ضمان حصول الجميع على خدمات الطاقة الحديثة الموثوقة والمستدامة بتكلفة ميسورة وكفاءة استخدام الطاقة. يتم ذلك عن طريق عدة سبل منها تعزيز التعاون من أجل تيسير الوصول إلى بحوث ودراسات تكنولوجيا الطاقة النظيفة، بما في ذلك تلك المتعلقة بتقنيات تقليل استخدام الوقود الأحفوري المتقدمة، وتشجيع الاستثمار في البنى التحتية للطاقة وتكنولوجيا الطاقة النظيفة.

من أجل معالجة وتقليل تحديات الطاقة والتحول الامثل للطاقة النظيفة، يأتي ملتقى المستقبل لبحوث ودراسات الطاقة المستدامة والبديلة والذي يقام في رحاب كلية المستقبل الجامعة، ليكون منصة علمية وبحثية لنشر وتبادل أحدث المعلومات والابتكارات ومنتجات تقنيات الطاقة المتجددة بين الباحثين

والأكاديميين والمؤسسات الحكومية والمراكز البحثية وكذلك الشركات المتخصصة بالتقنيات والبنى التحتية الخاصة بالطاقة المتجددة والنظيفة.

1.2. Objectives

• Presenting the latest innovations, inventions and research developments interested in sustainable renewable energy for the purpose of benefiting from these innovations and developing them in broader areas.

• Identifying the types of renewable and sustainable energies and the possibility of benefiting from them in the fields of research and publication.

• Exchanging clean energy knowledge between academics, researchers and specialists for the aim of applying these technologies in community and local institutions.

- Attracting distinguished professors and researchers in the field of renewable and sustainable energy engineering locally and regionally to share their experiences in the field of research in renewable energy in their universities and the possibility to apply the latest findings in their academic fields to meet local energy requirements.

• Providing creative solutions to overcome the obstacles that stand in the way of sustainable development goals in the field of energy.

• Learn about renewable and sustainable energy strategies, policies, and methods.

• Spreading culture and awareness of the necessity transform to the use of clean alternative energy that is harmful to the environment among university students and members of the local community in Babil Governorate and in Iraq in general.

1.3. Forum topics:

1. Renewable and clean energy technologies

- solar energy
- Wind Energy
- Hydropower
- Hydrogen fuel

2. Energy conservation solutions

3. Techniques to reduce the fossil fuel

4. Preserving the environment and tackling climate change

5. Rationalizing the consumption of water resources

6. Carbon footprint and harmful emissions

7. Electronic sensors and remote sensing systems in energy systems.

1.4. Contribution type:

The contributions within the forum's topics are as follows:

• Scientific research/applicable study/report/scientific project: so It can be presented in the forum as a scientific lecture or a discussion workshop within the forum's program.

• Innovations, products and posters for display during the forum's activities.

• Lectures and presentations on clean energy and other topics of the forum.

Contributions are to be submitted via the website:<<<<<<<<<<<<<<<<<

contributions are accepted in PDF, PPT, DOCX format only.

2. Keynote speakers

2.1. First Session

The first session is on the challenges and the future of utilizing renewable energy in Iraq. Various experts from different affiliation present presentation on this area as tabulated below;

Session 1: Challenges and the Future of Renewable Energy in Iraq	
Session Dialogue Management: Asst. Prof. Dr. Azhar M. Abed / Head of Air Conditioning and Refrigeration Techniques Engineering Department, Al-Mustaqbal University College	
Title of Presentation	Affiliation
Iraqi Patents in Renewable Energy and Their Role in Supporting the National Grid of Electrical Power Keynote Speaker: **Prof. Dr. Ali Abdulabbas Al-Bakri**	Expert in the field of energy and Chairman of the Iraqi Council for Accreditation of Technical Engineering Education
Usage of solar energy in Iraq and its Challenges Keynote Speaker: **Eng. Majid Al-Jabiry**	Iraqi-British Centre of Solar Energy
The economic feasibility of using renewable energy in Iraqi oil fields Keynote Speaker: **Dr. Rana Rassol Jaleel and Eng. Hashim J. Mohammad**	Ministry of Oil - Petroleum Research and Development Centre
The Challenges of Transformation Towards Renewable Sustainable Energy for Green Cities in Iraq Keynote Speaker: **Eng. Hayder Al-Kufaishy**	Smart Green Cities Organization
The Internet of Things is the future of renewable energy in Iraq Keynote Speaker: **Asst. Lecturer Zaher F. Raham**	Al-Nahrain University / Research Center nano renewable energy

2.2. Second Session

The crisis of energy and electrical power in Iraq is matter. So, this session focuses on this area through presentations by experts as tabulated;

Session 2: The Reality of Energy in Iraq and The Electrical Power Crisis	
Session management: Asst. Prof. Dr. Wael Jabbar Abdel Bishara / Head of the Computer Techniques Engineering Department	
Prospects and Future of Electric Power Generation in Iraq Keynote Speaker: **Prof. Dr. Haroun A.K. Shahad**	University of Babylon – College of Engineering – Mechanical Engineering Department
Energy, its transformations and its impact on Iraq Keynote Speaker: **Dr. Mohammed Nasir Hussain**	Ministry of Oil - Petroleum Research and Development Centre
An introduction to the national initiative to support energy and reduce emissions Keynote Speaker: **Eng. Muhannad S. Mahmood**	Ministry of Electricity / Quality Department Central
Rationalization of electrical energy consumption within the buildings Keynote Speakers: **Asst. Prof. Dr. Essam Kamel Saleh, Dr. Emad Jalil Mahdi, Dr. Hussein Tabinah Kazem**	Scientific Society for Energy Studies and Research
Electricity supplied from private generators: reality and solutions Keynote Speakers: **Samah S. Ouda**	Energy researcher and trainer in renewable energy

2.3. Third Session

The contribution of different sectors to increases the usage of renewable energy and the pollution affairs had been discuss in the third session

Session 3: An overview of the promising national efforts to produce clean energy and preserve the environment	
Session management: Asst. Prof. Dr. Issam Kamel Saleh / The Scientific Society for Energy Studies and Research	
Using biogas to produce clean energy from landfills Keynote Speaker: **Dr. Maithem Abdullah Sultan**	Ministry of Science and Technology / Department of Environment and Water
Nanotechnology applications in the fields of renewable energy (green hydrogen and fuel cells) Keynote Speaker: **Dr. Halima Jaber Mohammed**	Ministry of Science and Technology / Renewable Energy Department - Hydrogen Division
The possibility of producing electric power from irregular landfill gas Keynote Speaker: **Eng. Taha M. Lefta**	Ministry of Science and Technology / Renewable Energy Department - Hydrogen Division
Technological pathways for converting waste into energy Keynote Speaker: **Kefah Abdulhussein Alimara**	Ministry of Science and Technology / Renewable Energy Department - Hydrogen Division

3. Projects Related to Energy Conversion and Management

3.1. Solar Dish Collector: Case Study in Iraqi Climate

Ammar Abdulkadhim*[1], Azher M. Abed[1], Ahmed Salah Al-Shati[2], Ahmed M. Hussein[1], Sameer M. Farhan[1], Hayder A. Abbud[1], Mohaned O. Abdul-Abbas[1], Diaa H. Mubder[1], Salam J. Kadhim[1]

[1]Air Conditioning and Refrigeration Techniques Engineering Department, Al-Mustaqbal University College, Babylon Province, Iraq

[2] Chemical Engineering and Petroleum Industries Department, Al-Mustaqbal College University

The present work examines experimentally the heating water through utilizing solar dish collectors. The systems consist of reflector, heat exchanger (radiator), water tank, pump, expansion valve in addition to the measurements instruments such as solar power meter, thermocouples and temperature recorder. The results are presented in terms of temperatures and the collector efficiency. Solar tracking systems had been installed in order to get as high as possible of the absorbed solar radiation. The results showed that it's possible to use the solar dish collector in heating purposes

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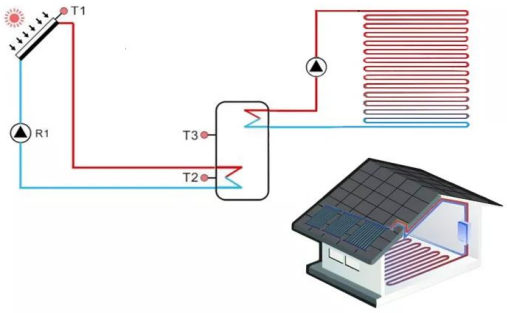
3.2. SFBF solar heating for radiant floor heating systems

Fatimah Malek Mohsen, Azher M. Abed

Abstract

Overview: It is a complete system that uses solar energy to heat the floor (radiant floor heating systems for solar heating). The Hybrid Radiant Heating System is a complete solar heater assembly that works with any floor heating circuit or radiant floor system. The solar system can be combined with any energy source such as gas or heat pump and electricity to form a hybrid heating system that works around the clock and reduces the cost of use.



The floor heating system heats by circulating hot water in a closed tube underground, and provides heat to the room through radiant conduction and convection conduction across the floor, and the entire floor is a radiator conducted from the bottom up under the law of heat storage and thermal radiation of the earth, and heats the room evenly. Solar ground heating can save 25% to 40% of the energy

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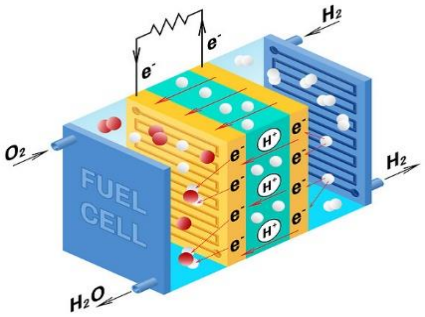
3.3. Sustainable hydrocarbon fuels with renewable energy

Fatimah Malek Mohsen, Azher M. Abed

Abstract

One of the other solutions for future clean energy systems is hydrogen fuel cell technology. This essay examines the distinctive properties of hydrogen energy and suggests that it be used as a clean energy source to power stationary applications. The review's objectives were to give a general overview of sustainability factors, explore the potential of using hydrogen as an alternative energy source for stationary applications, and determine ways to potentially increase the proportion of hydrogen energy used in stationary applications.



3.4. Studying and calculating the efficiency of solar photovoltaic power system using solar panels made from Waste materials

Assist. Lecturer. Mortada Mohsin, Eng. Rusul Abbas Alwan

Abstract

As the local and national clamor for foreign energy independent continues to grow unabated; renewable energy has been receiving increased focus and it's widely believed that it's not only the answer to ever increasing demand for energy, but also the environmentally friendly means of meeting such demand. This project involved designing and building solar panels and associated accessories like the solar array mounts, Solar Inverter system and etc. One of the key issues we ran into during the initial stage of the project was how to select efficient solar cells for panel building at a reasonable cost. While we were able to purchase good solar cells within our allocated budget, the issue of design for efficiency was not fully understood, not just in the contest of solar cells performance, but also in the overall system efficiency of the whole solar power system, hence the door was opened for this study. This project explored and expanded beyond the scope of the aforementioned project to research different avenues for improving the efficiency of solar photovoltaic power system from the solar cell level to the solar array mounting.

3.5. Experimental investigation of Heat Transfer Enhancement by using AL2O3 Nanofluid in rectangular duct with Compound Turbulator

Asst. Lecturer. Fatimah Malik Mohsin

Abstract

The fluid flow within conduits had outstanding applications in the engineering industry like refrigeration systems, air conditioning systems, heat exchangers, solar collectors, cooling of the reactor of the nuclear power plant, cooling of electronic derives, etc. In the present work, an introduction to the basics of heat transfer and fluid flow concepts related to the present work will be presented. internal flow is a flow for which the fluid is confined by a surface of the pipes as illustrated below in Figure 1.1. Hence the boundary layer is unable to develop without eventually being constrained. The internal flow configuration represents a convenient geometry for heating and cooling fluids used in chemical processing. The fluid flow within conduits had outstanding applications in engineering industry like refrigeration systems, air conditioning systems, heat exchangers, solar collectors, cooling of the reactor of nuclear power plant, cooling of electronic derives etc.. We used temperature recorder, rotameter, water tank for study the present work. Eight thermocouples had been installed as indicated below:

- 3 thermocouples in the top surface of the ribs,
- another 2 thermocouples on the bottom surface
- In addition to two thermocouples in the inlet and exit section of the rectangular channel.

This will help us in determination of Nusselt number experimentally.

as shown in figure below

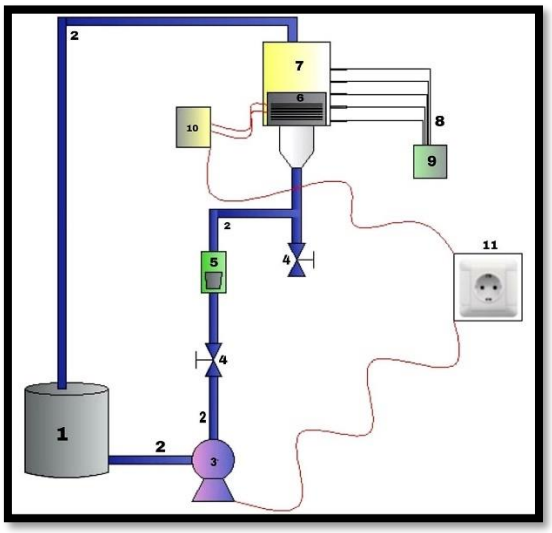


Figure: Schematic diagram of experimental set-up 1- Nanofluid Tank 2- pipes 3- Motor 4- Non-return Valve 5- Flow Meter

6- Heater 7- Rectangular Duct 8- Thermocouples 9- Temperature recorder

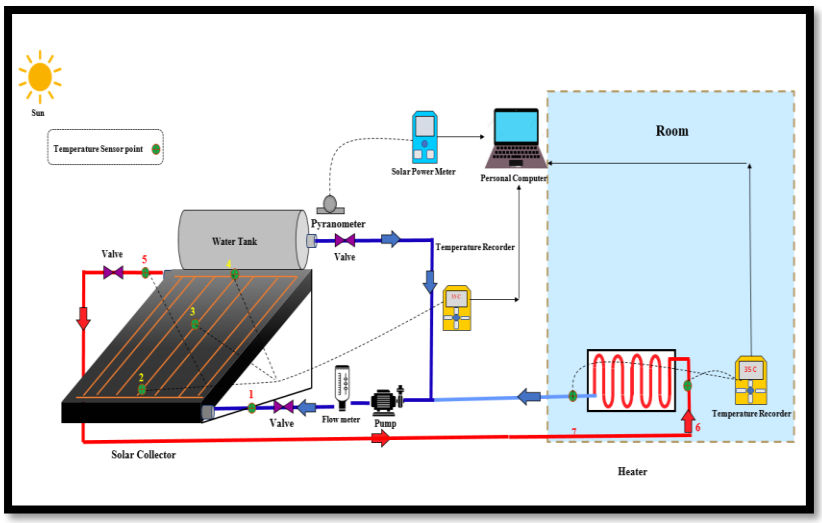
10- Voltage regulator 11- power source

3.6. An Experimental Study into Thermal Performance of Heating System Combined with Solar Heater

Assist. Lect. Hawraa Tayyeh Gatea, Assist. Lect. Asmaa Khudair Yaagoop

Abstract

The main objective of this project is Study the performance of the parallel flat plate solar collector by replacing the electrical source in the heating system with the thermal solar energy source, and use the hot water that is coming from the solar collector instead of the oil. Study the performance of the heating system after using thermal solar system as an energy source for operating it. The experimental rig involves two parts, the first on is the solar water heater system, which is consisted of flat plate solar collector, storage tank, pump, flowmeter. The second prat is the heating system and the test room. The solar water heater combined with heating system, the case study is carried out in Al- Mustaqbal-College University, Babil, Iraq. The result show that the coefficient of the solar water is good during winter season but the coefficient of performance of the heating system is not as expected.



3.7. A Comparison Study of the performance of Parabolic Trough Solar Collector using oil and water liquid

Supervisors: Asst Lecture Zahra F. Hussain

Abstract

This work presents the design, construction and investigation of experimental study of a Parabolic Trough Solar Collector (PTSC). A small scale model has been designed, constructed and tested in the open area of the Solar Energy Center on the roof of the a AL - Mustaqbal university college Iraq -Babylon. This model consisted of the mechanical unit (metal support

frame), reflecting parts assembly, heat collection element, tracking and control system they are aligned by a laser beam. Solar tracker has been constructed (using one-axis) to track PTSC according to the direction of solar radiation. Water and oil are used as a heat transfer medium. The storage tank has been fabricated of stainless steel of size 50 liter with two loads. Four types of experimental tests. The experimental tests have been carried out in Babil with climatic conditions (32.3o N, 44o E) during selected days of the month of January and February. The performance of PTSC is evaluated by using outdoor experimental measurements including the useful heat gain, the thermal instantaneous efficiency and the energy gained by the storage tank fluid. The value of each of these parameters is observed to be maximum, whenever evacuation is used. The storage tank oil temperature is increased from 18 ^{o}C at 9 am to be 82 ^{o}C at 13:30 pm .and the storage tank water temperature is increased from 20 ^{o}C at 9 am to be 53 ^{o}C at 13:30 pm .and the most heat losses occur through storage tank. The average thermal efficiency for the collector is approximately 65% .The heat losses which occurred at high temperatures which, decreased the average thermal efficiencies to 55% . Generally, the performance results of this collector which is fairly acceptable, considering that it is the first attempt to fabricate such collector locally and evaluated in Iraq environment. The final results establish the technical feasibility of using PTSC for applications requiring thermal energy at temperatures up to 150 ^{o}C.

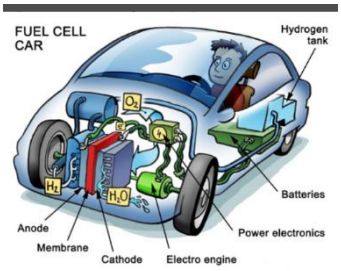
3.8. Fuel Cell

Alaa Dhari Jawad Al-Bayati

Chemical Engineering and Petroleum Industries Department, Al-Mustaqbal College University

Abstract

Fuel cells are a type of energy conversion technology which take the chemical energy contained within a fuel and transform it into electricity along with certain by-products (depending on the fuel used). [1] It's important to note that fuel cells are not heat engines, so they can have incredibly high efficiencies. However, when a heat engine is used to power a fuel cell, the heat engine still has a limiting thermal efficiency. Fuel cells can be seen as an energy storage device, as energy can be input to create hydrogen and oxygen, which can remain in the cell until its use is needed at a later time. In this sense they work much like a battery. There are



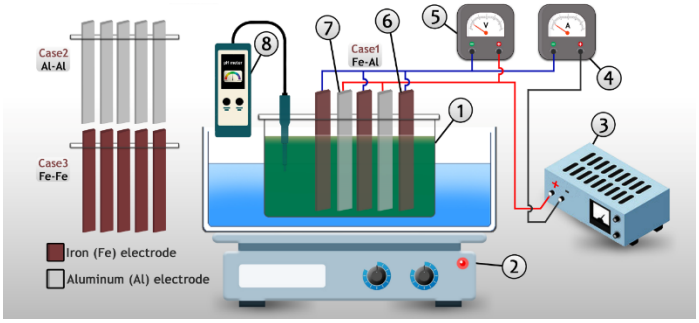
multiple types of fuel cells, but two common types are the solid oxide fuel cell (SOFC) and the polymer electrolyte membrane fuel cell (PEMFC).

3.9. The Treatment of Wastewater Using Electrocoagulation process: Analysis by Response Surface Methodology

Khalid O.Alabboodi, Ahmed Salah Al-Shati, Hassan A.Shamkhi

Abstract

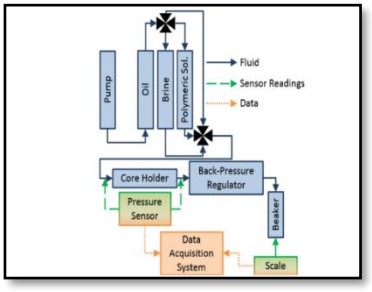
Electrocoagulation (EC) can be defined as a method utilized to remove pollutants from wastewater by applying an electric current to sacrificial electrodes. Many experimental variables like NaCl content(0–4g/l), current density(5–25mA/cm2), time (30–90mins), and pH (4–10) that influence the removal efficiency regarding COD were considered. In the presented research, three distinct configurations related to electrodes Al-Al, Fe-Al, and Fe-Fe have been utilized to determine which was the most effective. RSM depending on BBD was utilized for optimizing various operational parameters with regard to HWW by use of EC. Maximum COD removal(97.95%)was reached at Fe-Al electrodes, NaCl (3.242)g/l, current density (24.701mA/cm2) ,time(81.708mins), and pH (7.4101). COD removal(91.37%)was while achieved at Al-Al electrodes, NaCl (3.847 g/l),current density(23.503 mA/cm2),time-86.317 min, and Ph(7.717).At Fe-Fe electrodes obtained removal of COD(89.58%) at NaCl (2.359 g/l), current density (24.65mA /cm2) ,pH 8.525,and time(86.993mins).



3.10. Experimental and modelling study of hydrophobic associative polyacrylamide for enhanced oil recovery in carbonate reservoir

Saja Haider Mohammed, Nizar jawad Hadi

Abstract



As oil productivity rises, the need for water injection drops, and output rises, EOR techniques are gaining favor. In spite of its widespread use, water flooding loses its efficiency as a mobility ratio is unfavorable and a displacement efficiency is low; this is especially true when the oil has already been partially recovered. Production wells in the field are prematurely economically restricted due to high volumes of produced and injected water .The goal of EOR is to reduce the quantity of oil that is left behind in reservoirs after they have been flooded with water or gas .It is estimated that only one-third of the oil in a specified reservoir is extracted using traditional methods, making the other two-thirds an attractive target for EOR techniques .Chemically enhanced oil recovery (CEOR) stands for a common technique for EOR that includes using a polymer, surfactant, or alkaline flooding .

3.11. Desulfurization of liquid fuel oil by catalytic oxidation

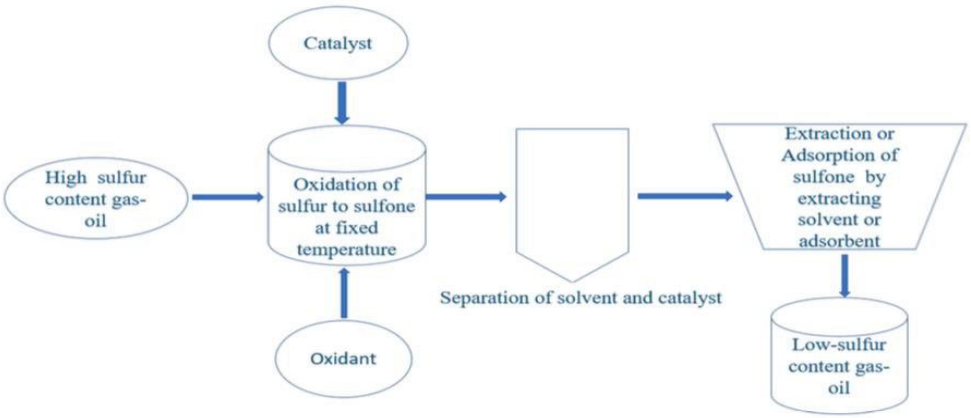
Zahraa Nadhum

Abstract

The production of green fuel oil is of the utmost importance for maintaining a healthy life and environment in the current world. Effective and complete removal of sulfur refractory compounds from fuel oil is essential to meet the new requirements of sulfur standards. Several techniques have been proposed for desulfurization of fuel oil, such as hydrodesulfurization (HDS), selective adsorption, extractive distillation, biodesulfurization, and oxidative desulfurization (ODS). The removal of sulfur by the HDS process requires higher investment costs, high reaction temperature, and high pressure reactors. On the other hand, studies have shown that the ODS process is remarkably successful in the removal of sulfur under mild reaction conditions.

3.12. The oxidative desulfurization reaction

The oxidative desulfurization reaction is a two-step process .In the first step, the sulfur containing compounds in fuel oil are oxidized to their respective sulfones or sulfoxides in the presence M of oxidizing agents. In the second step, these oxidized sulfur compounds are removed from the reaction mixtures by adsorption or liquid/liquid extraction method.



3.13. Zero-Carbon or Low-Carbon Energy

Rand Fadhil Kadhim, Maryam Jawad Abdulhasan

Low-Carbon Energy

Energy that is generated using lower amounts of carbon emissions such as, wind, solar, hydro or nuclear power. These alternative methods of producing energy are better for the planet as they release less carbon into the atmosphere.

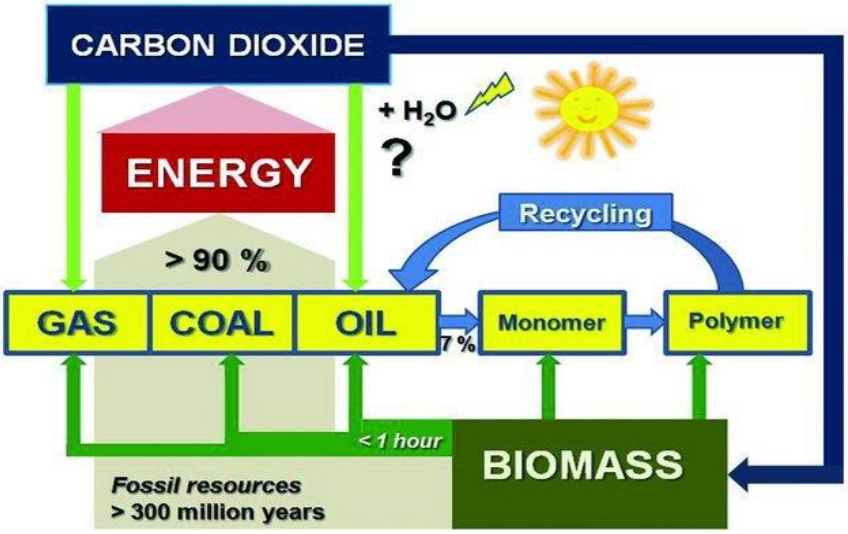
3.14. Renewable Plastics

Sara Ibrahim Mohammed Emeen, Doaa Abdulridha Mousa

Overview: In principle, there are three different strategies towards renewable plastics that are useful in a green economy. In strategy (i), biorefining of biomass and chemical conversion of carbon dioxide are employed to produce synthetic crude oil ("renewable oil") and green monomers for highly resource- and energy-effective polymer manufacturing processes without impairing established recycling technologies. In strategy (ii), which goes well beyond the green routes of polymers, living cells are converted into solar-powered chemical reactors, exploiting genetic engineering and biotechnology routes to produce biopolymers as well as bio-based polymers. In strategy (iii), carbon dioxide is activated and polymerized. The basic strategies and material flow cycles are shown in Figure 1 and discussed below. Whereas Nature needs more than 300 million years to convert biomass into oil, there are several options for producing synthetic bio-based renewable oil and even "green coal" on a large scale that require only a few minutes.

Biopolymers and Bio-based Polymers: renewable polymers are obtained either from natural biopolymers or by polymerization of bio-based monomers. As shown in Figure 2, carbohydrates, terpenes, proteins, and polyesters are prominent representatives of biomaterials that are chemically modified in manifold ways to meet the demands of polymer processing and

applications. Recent progress in preparing and processing renewable polymers was reviewed by Gandini, Mittal, Rieger and co-workers

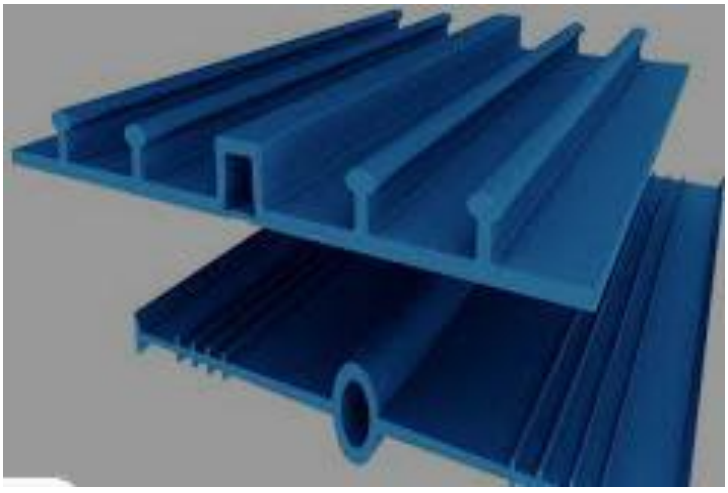


3.15. Protecting The Environment from The Polluted Cement Dust Fly Ash, Which Produced as a by-product of Cement Factories

Doaa Abdulridha Mousa, Sara Ibrahim Mohammed

A B S T R A C T

Overview: This research includes the preparation of combined rubbery recipe supported by the secondary products of cement factories which are contributing factors to environmental pollution, that's to improve the mechanical features of the recipe and make it compatible with the ASTM (Water Stop Rubber Composite).



SBR rubber and Reclaim rubber have been used in different percentages. The first step was adding dust (0,10,20,30,40,50)pphr to the blend . Mechanical properties have been tested such as tensile strength, modulus, tear resistance, elongation, hardness, compression, density, specific gravity and swelling.

The results shows that the recipe with the weight percentage of (85 SBR, 15 Reclaim,50 Dust)pphrhas given the best properties.

The second step was adding silica SiO_2(5,10,15,20) pphr to the best recipe and testing the mechanical properties as well . It shows improvement in mechanical properties .Finally, we have chosen the recipe which contains 20pphr silica to be the one that is used to produce water stop as it shows better and more wanted properties.

3.16. Low-Cost and Eco-Friendly Hydroxyapatite Nanoparticles from Eggshell Waste for Cephalexin Removal

Zahraa H. Athab[a]*, Ahmed F. Halbus[b], Gillian M. Greenway [c] and Jia Min Chin[c]

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[b] Department of Chemistry, College of Science, University of Babylon, Hilla, Iraq,

[c] School of Mathematics and Physical Sciences (Chemistry), University of Hull, UK

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Abstract

In light of the growing environmental effects of oil-based materials, we have focused on the use renewable resources such as cellulose for the preparation of hydrogel materials. Cellulose based hydrogel was successfully synthesized by using hydroxypropyl cellulose (HPC). HPC hydrogel was crosslinked with divinyl sulfone (DVS) during temperature induced phase separation (TIPS).1 Cryo-scanning electron microscopy (SEM), Fourier transform infrared spectroscopy (FTIR) and mechanical tests were used to characterize these materials. HPC hydrogels demonstrated impact absorption without breakage during compression tests. In addition, they showed substantial shape recovery properties upon adsorption of water. Finally, we use hydroxypropyl cellulose hydrogel to form reusable columns for the adsorptive removal of cationic methylene blue dye from aqueous solutions .The hydrogels showed high selectivity for cationic methylene blue over anionic sodium fluorescein dye, allowing facile separation of the two dyes from aqueous solutions of dye mixtures by simple gravity filtration. The hydrogel columns were also reusable for dye separation, showing only a 13% drop in separation efficiency after ten cycles.

3.17. Tips to be more eco-friendly person

Huda S. Alhasan, Lubna A. AlShalah, Jasim M.Salman , Layla M. AlKatrani, Hind M.Ewadh, Shymaa Satee, Zahraa H.Obaid and Sura A. Hamza

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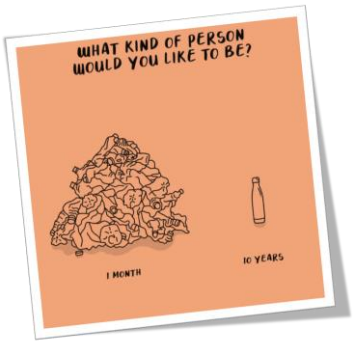
SUSTAINABLE LIFE



3.18. How to fight climate change

Lubna A. AlShalah, Huda S. Alhasan, Jasim M.Salman, Zahraa H. Athab, Mohammed J. Altaee, Sarab A. Juda and Ansaf N. Jasim

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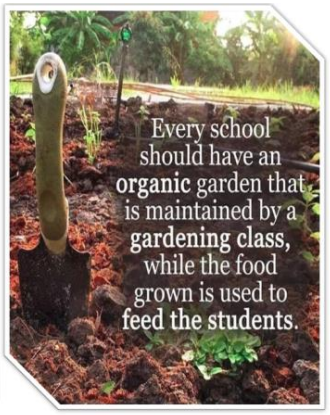
More Green With The 6R



4. Patents

4.1. Design of Cooling System for an Automotive Using Exhaust Gasses of Turbocharged Diesel Engine

Air conditioning and cooling in cars is a necessity in current life. As it is known, the VCR system is used in modern cars and works inside the car as a closed room. The car air conditioner uses the motor shaft to move the mechanical compressor. The mechanical operation of the compressor leads to a power draw from the engine equivalent to 4 horsepower, meaning an increase in the load on the engine by 8-10% in the case of normal power car and from 40 to 60% in the case of idling and thus reduces the engine life and increases fuel consumption and emissions of exhaust gases and also increases in engine operating temperature. Although engines cars have developed a lot, but until now their engine efficiency is still low, ranging between 20-30%, and this means that one third of the heat energy generated in the combustion chamber is converted into brake energy. The remaining energy is lost through both exhaust gas and engine cooling. To solve the problem of energy loss, we can exploit the energy of exhaust gas that was previously wasted to improve the thermal efficiency of the engine by using a thermal system consisting of a turbocharger and a turbine connected with the reciprocating compressor of the refrigeration system. In this way, the thermal efficiency of the motor will be greatly improved. Economically speaking, the fuel consumption decreases and thus leads to the possibility of improving emissions reduction. Based on the above, the goal of the present invention is to design an automobile air conditioning system that works with exhaust gases from a diesel engine. Through this design the energy generated due to expansion of exhaust gas was invested to circulate the turbine impeller driving the compressor of the refrigeration cycle system. The results showed an improvement in engine efficiency through a reduction factor in several variables such as the rate of fuel consumption, the temperature of the exhaust gases, and the amount of heat rejection from the engine by 5.6%, 8.2% and 22%, respectively. On the other hand, the results also showed that the coefficient of performance of the proposed cooling system increases by 5.18% when compared to the conventional system. Based on these results, we were able to find a solution to the energy waste problems of the air conditioning system in a cycle vapor compression vehicle.

4.2. Composite Material As Bulletproof Shield

Asst. Prof. Luay Hashem Abbud, Prof. Dr Ali Al-Bakri, Asst. Prof. Dr. Hayder Hassan Abed, Asst. Prof. Riyad J. Telfah

The present invention relates to military technology that falls under the category of ballistic composite armor in the patent classification. The invention presented here is used as equipment in the military's military operations, to provide protection against projectiles that penetrate body armor. Protection equipment against penetration and perforation of projectiles in targets of military applications must have excellent mechanical properties. The use of advanced compounds to substitute for metallic materials is an excellent choice due to their light weight, high mechanical properties and withstand the shock of high-velocity projectiles. So, over the past two years, our team has created a new group of composite materials consisting of

aluminum oxide powder (A2O3) with epoxy and woven fiber Kevlar29, and I use this new composite material in the manufacture of protective shields to protect people. The current experimental method focused on studying the behavior of the ballistic boundary, energy absorption, and final velocity of flat, conical and semi-spherical shells. The results concluded that a 30 cm * 30 cm plate of the new mixture of composite materials with a weight of 3 kg to a thickness of 18 mm can bear the maximum velocity of the projectile which is 400 ± 7 m / s. The experimental results showed the acceptability of the ballistic performance compared to what is currently available in conventional armor and what other researchers have achieved.

The Recommendations

1- Encouraging cooperation in conducting studies and research in the fields of energy, environment, and water by multidisciplinary research teams.

2 - Spreading awareness among members of Iraqi society by organizing intensive campaigns dealing with energy conservation and environmental sustainability.

3 - Supporting creative ideas in the areas of using renewable energy by state institutions and the private sector.

4 - Seeking to reduce the gap between research activities and applications by investing research results, patents and supplying the local market with materials or equipment recommended for use in a manner that serves the Iraqi economy.

5 - Reducing energy consumption in buildings and homes through the application of modern energy systems and controlling daily behaviours in rationalizing energy consumption.

6- Encouraging investment in renewable energy projects of an economic nature that contribute to the sustainable development process.

7- Encouraging the use of solar energy systems in rural and agricultural areas through cooperation between the Ministry of Agriculture and the Agricultural Bank in granting loans to farmers for this purpose.

8 - Unifying the reference of data and information on energy and renewable energy and making it electronic and available to researchers to facilitate the task of carrying out research and studies.

9 - Seeking the success of the National Initiative for Energy Support and Reducing Emissions, which was launched on 3/8/2021 with the approval and support of the General Secretariat of the Council of Ministers through the implementation of all plans and procedures adopted by government institutions by the initiative.

10 - Organising conferences, seminars, exhibitions, and forums concerning the field of renewable energy, periodically, in cooperation between universities, research centres, relevant government institutions and private sector companies.

11 - Focusing on student’s projects on renewable energy and providing the necessary support for them to carry out practical applications in this regard.

12 - Supporting university programs concerned with entrepreneurship considering climate changes, especially renewable energy projects.

13 - Establishing voluntary work groups that promote mitigating and adapting to climate changes by developing policies, studies and proposals that serves this regard.

14 - Seeking voluntary technological transfer for the purpose of mitigating the impact of climate change and achieving sustainable development goals.

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