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Poster Presentations

Miyako Nakayama, Innov Ener Res 2018, Volume 7
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Evaluating onshore and offshore wind energy feasibility for State of Texas

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Due to the environmental concerns from the use of traditional fuels such as coals, the US Environmental Protection Agency (EPA) is currently requiring power plants to meet air pollution regulations, which could cause power shortages and even blackouts in the state of Texas. The purpose of this study is to evaluate the feasibility of using onshore and offshore wind turbines (WTs) in Texas based on levelized Cost of Energy (LCOE) analysis. This study is based on a scenario that multiple wind turbines can be installed in available onshore lands and offshore seas of the state of Texas. A commercial WT is selected for both onshore and offshore situations and the corresponding LCOEs were analyzed. Secondly, the maximum number of WTs which can be installed in the available areas was determined based on a spatial distance criterion. Lastly, the maximum annual energy output and the maximum average power output for both situations in Texas was estimated. Although offshore WTs are considered to be more promising technology which can produce more energy and power these days, our results showed that the selection of the two wind turbine types may vary using different indices and number of turbines.

1. In terms of LCOE, onshore WT is more economical due to the lower LCOE.

2. In terms of Capacity Factor, offshore WT is more power-efficient due to the higher capacity factor.

3. In terms of Annual/Average energy and power output
   A. For a single WT, an offshore WT produces more power and energy than onshore WT.
   B. For WT farm, onshore WTs produce more power due to more number of turbines that can be installed in available windy land.

Biography

Miyako Nakayama obtained her business bachelor degree in Hosei University in Japan in March 2015. Since 2015 fall, he has been majoring in Mechanical Engineering to seek a second bachelor in the University of Idaho. In summer 2017, as a sophomore student, he had completed comprehensive research on Wind Energy based on extensive literature reviews, which covers both technological and business perspectives and has been on the process to publish her research paper.

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Hiroshi Nishiyama, Innov Ener Res 2018, Volume 7
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Photoelectrochemical materials for sunlight-driven water splitting devices

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Photocatalysis or photoelectrochemistry are attractive developing fields of engineering for building free-running sunlight-driven water splitting to generate H_2 and O_2. We are surveying solar-spectrum-responding semiconductive materials as the candidates for the visible light absorbers in the H_2+O_2 harvesting devices. We have been fabricating and testing water photo-splitting devices composed of a pair of photocathode (p-type, for H_2) and photoanode (n-type, for O_2) both decorated with catalysts for evolving those gases. As for photocathode, we developed H_2 evolving flat layered sheets based on chalcopyrite Cu(In, Ga)Se_2 (CIGS, the cutoff wavelength of absorption ~ 1100 nm) and its doped versions with Zn, S, etc. The photocurrent obtained by the solar simulator (AM 1.5G) can afford more than 10% of solar hydrogen conversion efficiency. The photoanode material is the remaining problem to solve. $BiVO_4$ (~540 nm), paired with CIGS, realized a stable operation for the stoichiometric faradaic evolution of H_2 and O_2, however, the maximum solar-to-H_2 efficiency has been below 4 %. Obviously, we need n-type light absorbers with longer cutoff wavelength. We are also developing transition metal nitrides and oxynitrides for the sunlight absorbers. Ta_3N_5 (~600 nm) has been the most intensively investigated, as particles embedded on metal layers (particle transferred sheets) and flat layered thin films, both of which can serve as photoanodes. Foreign materials can be assembled as the background layer or capping layer for the Ta_3N_5 layer to improve the electronic properties and robustness as an electrode immersed in the electrolytic solution. We will discuss the best performance for Ta_3N_5 and oxynitrides as O_2-evolving photoelectrodes energized by solar irradiation.

Biography

Hiroshi Nishiyama completed his Ph.D. at Nagaoka University of Technology, Japan in 2005. In 1998–2013, he was an assistant professor at the Analysis and Instrumentation Center at Nagaoka University of Technology. He is currently a principal project researcher in the R&D Laboratory of Artificial Photosynthetic Chemical Process (ARPChem) at The University of Tokyo. His research focuses on the development of high-performance photoanode electrodes and high-performance PEC systems.

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Yousif M Makeen et al., Innov Ener Res 2018, Volume 7
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Hydrocarbon source potential of tertiary carbonaceous shale, shale and siltstone of eastern Chenor, Penyu basins, Pahang, Malaysia

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Malaysia and Asian region have a number of petroleum-bearing sedimentary basins commonly associated with coal and carbonaceous shale strata. Shales are the common source rocks of conventional petroleum resources whilst coal although a source for conventional liquid hydrocarbons is more widespread as unconventional resources, such as cannel coal and coal bed methane (CBM). Coals within the oil & gas producing provinces of Malaysia and SE Asian region, in general, are known to be oil-prone. However, with the inevitable decline in conventional petroleum, remaining hydrocarbons will be more difficult to find and more expensive to develop. Set against the backdrop of world energy consumption projected to increase by 49% by 2035, alternative sources of energy are being sought. Petroleum geoscientists are exploring unconventional source/reservoir systems such as the carbonaceous shale, oil shale, tight sand, coal bed methane and fractured basement. In this study, shale, and siltstone which are an importance sedimentary faces for hydrocarbon exploration in the eastern Chenor, Pahang has been investigated using organic geochemical and petrological methods as well as Micro-CT, SEM (Scanning Electron Microscope). The Tertiary sediments of eastern Chenor show a general trend of low thermal maturity based on vitrinite reflectance measurements (<0.5 %Ro) and Tmax (<435°C). Organic petrological studies revealed that analyzed carbonaceous shale and shales are rich in liptinite macerals (>20 vol. %) such as aliginite (*Botryococcus* algae), sporinite, cutinite and amorphous organic matter indicating oil-prone Type I and Type II kerogens. Pyrolysis data also show a trend from predominant oil-prone Type I and II kerogens to a mixed oil and gas-prone Type II-III kerogens within the studied samples except for the siltstones samples which have low HI value indicating no potential for hydrocarbon generation. The EOM result shows that all the carbonaceous shale samples possess excellent values for the bitumen/EOM and hydrocarbon (HC) content. The studied shale samples have very good petroleum potential. However, analyzed siltstones show poor to fair petroleum potential based on for the bitumen/EOM and hydrocarbon (HC) content. This is supported by plots of TOC content versus extractable organic matter (EOM) and hydrocarbon yields versus TOC content commonly used in estimating the hydrocarbon generative potential of the source rocks.

Biography

Dr. Yousif Makeen began his geology studies in 2008 at the University of Malaya, Malaysia. In 2011 he received the BSc degree in Applied Geology from University of Malaya. His MSc was converted to PhD by the University Senate based on his excellent performance. His professional career began in 2015 when he received his PhD from University of Malaya. His research interests are in oil, Source rock Characterization and Petroleum Systems Modeling. Throughout the years he has presented his research work in Europe, the Middle East, and Southeast Asia. He has published 24 papers in ISI journals and conducted many consulting projects for major oil companies. He is currently a Postdoctoral Research Fellow at the University of Malaya.

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Najla Mohammed Khusayfan, Innov Ener Res 2018, Volume 7
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Study of structure and electro-optical characteristics of indium tin oxide thin films

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ITO thin films were prepared by electron beam evaporation of ceramic ITO target. The films were subsequently annealed in an air atmosphere at the temperatures 300 degrees C and 600 degrees C in order to improve their optical and electrical properties. The crystal structure and morphology of the films are investigated by X-ray diffraction and scanning electron microscope techniques, respectively. The films exhibited a cubic structure with the predominant orientation of growth along (222) direction and the crystallite size increases by rising annealing temperature. Transparency of the films, over the visible light region, is increased by annealing temperature. The resulting increase in the carrier concentration and in the carrier mobility decreases the resistivity of the films due to annealing. The absorption coefficient of the films is calculated and analyzed. The direct allowed optical band gap for as-deposited films is determined as 3.81 eV; this value is increased to 3.88 and 4.0 eV as a result of annealing at 300 degrees C and 600 degrees C, respectively. The electrical sheet resistance is significantly decreased by increasing annealing temperature, whereas the figure of merit is increased.

Biography

Najla Mohammed Khusayfan received her PhD in 2007 in Solid State Physics from King Abdulaziz University, and in 2016 she was Head of Physics Department at the University of Jeddah. In 2018, she obtained a degree as a professor in experimental solid state physics from King Abdulaziz University. She has published more than 21 papers in the field of Solid State Physics.

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Mymona Mohsen Abutalib, Innov Ener Res 2018, Volume 7
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Thermal, structural and optical investigation of the effect of gamma irradiation in PM-355 nuclear track detector

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Samples from PM-355 sheets were irradiated with gamma doses at levels between 10 and 120 kGy. The modifications in the irradiated samples have been studied as a function of dose using different characterization techniques such as thermo gravimetric analysis, differential thermal analysis, and X-ray diffraction, Fourier Transform Infrared Spectroscopy and color difference studies. The gamma irradiation of PM-355 in the dose range 20-80 kGy resulted in an improvement in its thermal stability with an increase in the activation energy of thermal decomposition. The melting temperature of the PM-355 polymer, Tm, was found to be a probe of the crystalline domains of the polymer. At the dose range 20-80 kGy, defect generated destroys the crystalline structure so reducing the melting temperature. In addition, structural property studies using X-ray diffraction and Fourier transform infrared spectroscopy were performed on irradiated and non-irradiated PM-355 samples. The results indicate that both the degree of ordering and the absorbance of the PM-355 polymer are dependent on the gamma dose. Further, the transmission of these samples in the wavelength range 200-2500 nm, as well as any color changes, was studied. The color intensity E was greatly increased with increasing the gamma dose, accompanied by a significant increase in the whiteness and yellow color components.

Biography

Mymona Mohsen Abutalib received her Ph.D. degree in Radiation Physics and Material Science in 2005, from King Abdulaziz University in Jeddah, Saudi Arabia. She got promoted to be a Professor of Radiation Physics and Material Science in 2016, and now is working in King Abulaziz University. She has worked in the Physics Laboratories in King Abulaziz 2 University, King Khaled University and Cairo University for Radiation and Material Science and Nano Materials for about 10 years. She has about 45 published research papers in the same scientific fields. Abutalib has won scientific awards for uniqueness in scientific researches for several years.

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Hasi Rani Barai, Innov Ener Res 2018, Volume 7
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K-doped mixed-phase 1D TiO_2 nanofibers on Ti foil for electrochemical supercapacitor: Annealing-free synthesis

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This study demonstrated the annealing-free synthesis of K-doped mixed-phase TiO_2 (anatase and rutile, AR) nanofibers (K-TNF) on Ti foil at 150ºC assisted by KOH(aq.)for electrochemical supercapacitors (ESCs) applications. The aggregated network and the average diameter of K-TNF have slightly decreased with the increase of KOH(aq.) concentrations from 1 to 3 M, while the amount of K-doping, Ti_3+ interstitials, and –OH functional groups was substantially increased. The TiO_2 phase was entirely mixed of rutile and anatase, AR phase. All the K-TNF modified Ti electrodes (K-TNF/Ti) exhibited quasi-rectangular shaped cyclic voltammograms (CVs) in a wide potential range and the specific capacitance (Cs) for the optimal electrode with mixed AR phase TiO_2 was ca. 70.30~95.18 mF/cm^2,obtained from the CV (scan rate, 5mV/s) and charge-discharge (CD, current density, 50μA/cm^2) measurements, respectively. The higher Cs for the optimal K-TNF/Ti electrode can be ascribed to the synergistic effect of mixed AR phase, a high percentage of K-doping (ca.20.20%), and Ti^{3+} interstitials (ca.18.20 %), respectively. The directional electron transport through the 1D channel as well as the –OH functional groups on the K-TNF surface is also contribute to enhancing Cs. The K-TNF/Ti electrode discovered excellent stability with the Cs retention of ca. 95% and a very small change of internal series resistance (Rs) and charge transfer resistance (Rct) at the electrode/electrolyte interface after 3000-CD cycles.

Biography

Prof Hasi Rani Barai is the assistant professor in the School of Mechanical and IT Engineering, Yeungnam University, Gyeongsan, Korea, from 2015. She worked as a postdoctoral research fellow in the dept. of Chemistry and Nanoscience, Ewha Woman's University, Seoul, Korea. She worked as a postdoctoral research fellow in KCAP(Korea center for artificial photosynthesis) in dept. of Chemistry, Sogang University, Seoul, Korea. She received her PhD in the dept. of Chemistry, Inha University, Korea, Master of Science (Physical organic chemistry) and BSc in Chemistry in Dhaka University, Bangladesh. She published about 41scientific journals.She did several invited speaker/oral/poster presentations at national/international conferences. Research interest in nanotechnology, nanomaterials, materials preprocess, energy storage devices, electrochemistry, and supercapacitors.

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Shanmuganathan Venkatesan et al., Innov Ener Res 2018, Volume 7
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Highly efficient nano composite electrolyte for quasi-solid-state dye-sensitized solar cells under room light conditions

Shanmuganathan Venkatesan, Chiao-wei Li, I-Ping Liu and **Yuh-Lang Lee**
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Statement of the problem: Dye-sensitized solar cells (DSSCs) are a promising technology owing to their high-power conversion efficiencies (PCEs) under room light conditions and low manufacturing cost with respect to conventional silicon solar cells. Nowadays, the internet of things (IoT) is attracting worldwide technological interest because it delineates associations between various small devices. However, the problems related to power these devices have become significant. Among the several power supply systems, indoor DSSCs will be the most promising for a continuous power supply to IoT devices. In the literature, only a few studies have been reported about the performance of liquid-state DSSCs using iodide electrolytes under room-light conditions. Since relatively few electrons are excited, the recombination of the excited electrons with electrolytes strongly affects the open circuit voltage (Voc) of the DSSCs. In addition, because of the notable decrease in excited holes, less iodide will be required to minimize the holes. These two effects significantly decrease the performance of DSSCs under room light illumination.

Methodology: To solve these problems, in this study, new nanocomposite electrolytes (NCEs) were prepared by mixing various metal oxides nanofillers (NFs) and cobalt poly (vinylidene fluoride-co-hexafluoropropylene) polymer gel electrolytes (PGEs). These NCEs were utilized to fabricate the quasi-solid-state DSSCs (QS-DSSCs). The performance of QS-DSSCs using MK-2 dye under 200 lux was studied and compared.

Findings: The PCE (20.11%) of the QS-DSSCs using 4 wt% ZnO NFs was higher than those of the liquid version (18.91%) and other DSSCs. This was mainly due to the decrease in the capacitance and increase in the recombination resistance of the QS-DSSCs using ZnO NFs that contributed to the high Voc of the related DSSC. This cell showed stable, long-term PCE at room temperature (~1000 h).

Conclusion: The ZnO/PVDF-HFP NCEs were proven to be efficient and stable for preparing high-performance indoor QS-DSSCs.

Biography

S Venkatesan received his PhD degree (2009) in chemistry from National Chung Hsing University, Taichung, Taiwan. He has expertise in preparation, characterization, and utilization of polymer-supported catalysts for efficient and selective organic functional group transformations in the presence of oxygen. He has been utilized these catalysts for the preparation of various chemically modified electrodes for electrochemical sensor and battery applications. In recent years, he has been focused on the fabrication of outdoor and indoor dye-sensitized laboratory and sub-module quasi-solid state dye-sensitized solar cells (DSSCs). He has successfully assembled these cells after his systematic research in iodide and cobalt-based liquid, polymer, polymer gel electrolytes with and without nanofillers such as nanosized metal oxides, metal carbides, and graphene oxide sponge. In further, he prepared printable electrolytes for DSSCs by altering the viscosity of the polymer electrolytes. These printable electrolytes are beneficial for the role-role-printing process and mass production of DSSCs.

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Low cost membrane for efficient microbial fuel cell: power generation and petroleum refinery wastewater treatment

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Electric energy generation from the association of organic materials in the wastewater by microbes using microbial fuel cell (MFC) is one of the developing techniques used to generate energy for some applications. The goal of this project was to construct low-cost, double-chambered MFCs that harvest electricity and produce reclaimed water from wastewater. MFCs were constructed from cheap alternatives to traditionally used expensive Nafion membranes and platinum cathodes. Low-Density Polyethylene, aluminum and graphite for membrane, cathode, and anode respectively were used to construct double chamber MFC. For power generation the double-chambered consist wastewater and salt solution at the anode and cathode sides respectively. The MFC produced about 0.087 mA/cm^2 of anode area at a potential of more than 842 mV. MFC efficiency 0.49%. A 3 MFCs series connected to produce 2.232 V and 67% fuel cell efficiency. There are enormous methods to treat petroleum refinery wastewaters (PRW) that contain water-soluble hydrocarbons which cannot be separated by physical methods. Using microbial fuel cell (MFC) is a new PRW treatment method. Potassium permanganate as cathodic electron acceptors in the cathode apartment of MFC with low-density polyethylene membrane instead of expensive Nafion was used in to treat PRW taken from Al Dura refinery, Iraq. The effects of potassium permanganate amount on the MFC performance and PRW treatment results were investigated. An electrochemical property of the cell was attained from empirical polarization curves. Maximum power production at the room temperature of 1.0032 W/m^2 using 0.125 g/L of permanganate concentration, the maximum COD removal efficiency was 71.24 % during 48 hours.

Biography

Shrok Allami is a scientific researcher in the ministry of science and technology/ renewable energy directory/ department of hydrogen and biofuel. She has completed her PhD in 2007 from University Technology, Iraq. She has published more than25 papers in reputed journals, participates at more than 16 national and international conferences as a researcher and at their comities, and has been serving as an editorial board member in Iraqi scientific journals.

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Ahmed Alshahrie, Innov Ener Res 2018, Volume 7
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Gaint Seebeck coefficient in the microwave synthesized β-Co (OH) 2 nanoplatelets for thermoelectric power generators

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Renewable energy is quite important for the future energy demands. It also can overcome the global warming and CO2 emissions created by fossil fuels combustion. Sunlight heat and other sources of heat are considered as a good sources for renewable energy. Thermoelectric materials (TE) are promising as energy generators, by means converting heat into electrical energy. In this work cobalt hydroxide (β-Co(OH)2) nanoplatelets were synthesized by the microwave chemical assisted route and studied for their thermoelectric properties. Uniform nanoplatelets were produced with a thickness and diameter around 8 and 100 nm, respectively. The TE measurements revealed a giant positive value for Seebeck coefficient, which is around 50,000 μV/K. This positive value indicating a p-type semiconductor. It was observed to slightly increase by increasing the temperature from room temperature to 400 K. The electrical conductivity of this nanostructure has a semiconductor behavior with a moderate value, which has been observed to increase from 0.4 to around 3 S/m by increasing the temperature in the above-mentioned range. The power factor value was calculated and found to strongly depend on the temperature. It drastically increased from 500 to 9000 μW/m.K2 by increasing the temperature from room temperature to 400 K. These preliminary results are quit promising for future TE materials and might be suitable for thermoelectric power generators.

Biography

Ahmed Salem Alshahrie is the director of the Nanotechnology center and head of the Physics department at King Abdulaziz University. He has BSc, in Physics in 2001, King Abdulaziz University; MPhil in Physics, 2007 University of Wales Swansea, Swansea UK. PhD, in Physics, Swansea University, Swansea UK. Teaching different courses in the Physics Department. He spent a good time at a well recognized research center. His research work is mainly focused on Photonic Nanomaterials, Raman Spectroscopy, nanostructure, Synthesis, Characterization applications. He has a good number of articles published in revered international journals.

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Highly flexible and scalable photo-rechargeable power unit based on symmetrical nanotube arrays

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Recently, the rapid development of the modern electronics gives rise to higher demands on the flexible and wearable energy resources1–3. It is urgently needed to develop energy devices which are lightweight, thin and flexible. In this regard, these years, many efforts have been made to integrate energy devices by combining solar cells and ESC or repeatedly rechargeable lithium-ion batteries4-7. Up to now, most of the work mainly focuses on the incorporation of a dye-sensitized solar cell (DSSC) with chemical battery power packs which based on different substrate materials and structure design. However, the sealing requirement of the DSSC devices made the fabrication very complex to prevent the electrolyte leakage and evaporation. In addition, the performance of the DSSC still could not meet the ideal requirement of energy storage devices, leading to a low overall energy conversion and storage efficiency. Here, we report an ultrathin flexible photo-charging power pack that integrates a perovskite solar cell (PSC) and electrochemical supercapacitor (ESC) on bi-polar TiO_2 nanotube arrays (TNARs)8. Instead of two independent components, the integrated sandwich-type device allows the direct injection of the electrons generated by the PSCs into the ESCs through shared highly ordered bi-polar TNARs. Meanwhile, the holes separated from the perovskite layer divert into a positive electrode of ESCs through an external circuit effectually. When the flexible photo-supercapacitor was illuminated with simulated solar light, the voltage of ESC was increased to 0.63 V within 30 s at the beginning of the charging period immediately. The optimized power pack exhibits a remarkable overall photoelectric conversion (4.9%) and storage efficiency up to 80%, with fast response and superior cycling capability. To meet applicable demands with a larger output voltage, these photo-supercapacitors are successfully woven into “bamboo slip” architecture, which can be folded, bent and allows tuning the open-circuit voltage (> 2.4 V) by charging the number of photo-supercapacitor strips.

Biography

Fayin Zhang is a PhD student in the State Key Laboratory for Modification of Chemical Fibers and Polymer Materials, College of Materials Science and Engineering at Donghua University. Now he is an exchange student in the Research Institute for Soft Matter and Biomimetics, Department of Physics, School of Physics and Mechanical & Electrical Engineering at Xiamen University. His research interests include flexible conductive electrode materials, perovskite solar cells and perovskite light emitting diodes.

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Detection and application of heavy metal ions in environment and biological cell imaging based on fluorescence probe testing technology

Gang Zhao, Gang Wei, Shanyi Guang, and **Hongyao Xu**
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During recent decades, Fluorescence sensing using small molecule probes has been one of the most powerful and popular tools to help us monitor and visualize amounts of samples in a biological system because of their simplicity, high sensitivity, as well as excellent spatiotemporal resolution. Aluminum ion is an essential trace prevalent element, an excessive amount of aluminum in the human body could be believed to cause health issues. We reported herein the design, synthesis, and environmental, biological evaluations of a novel bipyridine fluorescence sensor is used to recognize aluminum ions, which is induced by Al^{3+} lead to a highly selective fluorescence "turn-on" response toward Al^{3+} over other metal ions with micromolar sensitivity. The 1:1 stoichiometric structure between RhBD and Al^{3+} were supported through Job's plot, 1H NMR, FTIR, ESI-MS. The analytical results obtained through UV-vis and fluorescence spectrophotometry display that linear range and the limit the detection (LOD) of the present sensor for Al^{3+} are 0.8~70 μM and 0.33×10^{-7} M, respectively. The present probe was used to the detection of Al^{3+} in drinking water with the recoveries ranging from 99.2 to 100.7%, and fluorescence imaging for living HeLa cells.

Biography

Gang Zhao is a PhD candidate in the state key laboratory for modification of chemical fibers and polymer materials, college of materials science and engineering, Donghua University, Shanghai, China. Her main research direction investigated the organic-inorganic nanohybrid fluorescence chemosensor, and used to environmental and biological sample, in addition, which can trace cell morphology from time to time by a quantitative increase in the concentration of different metal ions. Has her expertise in evaluation and passion for improving the health and wellbeing. Her open and contextual evaluation model based on responsive constructivists creates new pathways for improving healthcare. She has built this model after years of experience in research, evaluation, teaching, and administration both in hospital and education institutions. The foundation is based on the fourth-generation evaluation (Guba& Lincoln, 1989) which is a methodology that utilizes the previous generations of evaluation: measurement, description, and judgment. It allows for value-pluralism. This approach is responsive to all stakeholders and has a different way of focusing.

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Synthesis of amphiphilic fluorescent probe and follow-up imaging of Hg^{2+} in living cells

Wei Gang, Gang Zhao, Shanyi Guang and **Hongyao Xu**
Donghua University, China

Transition metal ions have played a crucial role in the field of environment and biology, the traditional detection methods have some limitations, low detection limit, narrow linear range and single detection. A fluorescent probe has used on the biological and environmental analysis owning to extremely broad response range, high selectivity, real-time monitoring capability, anti-interference and low detection limit and so on. And design and synthesis of receptor molecules with selective recognition have attracted much attention in recent years. In this paper, rhodamine and phenyl isothiocyanate were used to design and synthesize fluorescent probes that can efficiently detect mercury ions. It was found that the probe (ACHL) was also able to selectively recognize Hg^{2+} in DMSO/water(v/v,7:3), and detection of Hg^{2+} does not disturb by the addition of other ions and show high selectivity. The probe possesses identification stability of Hg^{2+} about 3 min and displays very fast real-time detection performance. The linear range of the probe is 1-20 uM, and the detection limit of ACHL was 0.31 uM. Simultaneously, the probe was also applied to biological cell experiments for detection of imaging of Hg^{2+}. The probe shows good solubility in MDSO/water, lower detection limit, and well cell permeability. The cytotoxicity of the probe was measured, found that the probes have less cytotoxic in the concentration of probe was less than 100 μM. Therefore, the probes were able to trace intracellular Hg^{2+} by fluorescence imaging in living cells.

Biography

Wei Gang is a PhD candidate in the state key laboratory for modification of chemical fibers and polymer materials, college of materials science and engineering, Donghua University, Shanghai, China. My main research is about preparing amphipathic target fluorescent recognition molecules, and applied to specifically identify tumor cells and can track cell morphology from time to time. On the other hand, there are achievements in the field of fluorescent probes, a series of rhodamine and fluorescein fluorescent probes were prepared and synthesized, and the cations, anions and amino acids could be specifically identified.

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Pedro Sanchez-Camacho et al., Innov Ener Res 2018, Volume 7
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Development of new bi-functional dense ceramic-carbonate membrane reactors for CO oxidation and subsequent CO_2 permeation

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Gas separation processes have become one of the most promising strategies for different industrial applications; carbon dioxide (CO_2) and carbon monoxide (CO) separation among them. Within this context, syngas is composed of hydrogen and carbon oxides, and it is usually produced at high temperatures. Therefore, H_2 enrichment, through the carbon oxides separation is of great interest. On CO_2 separation, different membrane systems have been developed, including zeolites, polymers, and ceramics. Especially, the so-called dense dual-phase membranes have shown very interestingly CO_2 separation properties at high temperatures. This kind of membrane systems is produced by a porous solid support infiltrated with molten carbonates, where ceramic supports must ideally have oxygen ionic and electronic conductive properties. CO_2 permeation is performed by the reaction of oxygen ions from the ceramic oxide with the CO_2 present on the upstream side, producing carbonate ions, which diffuse through the molten carbonate phase due to CO_2 partial pressure gradients on both membrane sides. CO_2 is desorbed on the downstream side through the reversible decarbonation process and swept from the surface. Oxygen ions are reincorporated and diffused on the ceramic phase as a consequence of decarbonization. Since perovskites have good ionic-electronic conduction properties, some of them have been incorporated to dense ceramic-carbonate membranes, increasing CO_2 permeation. In this work, a composite (doped ceria and perovskite) was synthesized, sintered and infiltrated with molten carbonates, showing that it is able to perform both processes; the CO oxidation at the surface and subsequent CO_2 permeation through the molten carbonate phase. CO conversion and CO_2 recovery efficiencies were 39.6 and 64.6% at 900 °C, respectively. Moreover, results in evidence that the perovskite phase importantly improve the oxygen permeation from sweep to feed side (inverse permeation), enhancing CO oxidation and CO_3^{2-}formation, without releasing oxygen on the feed side.

Biography

Pedro Sanchez-Camacho received a Chemistry´s degree from the Universidad Nacional Autónoma de Mexico (UNAM) in 2012. Later, he obtained a master´s degree in Material Science and Engineering in same University. Nowadays, he studies a PhD in a Materials Science and Engineering focusing in the development of ceramic oxide membranes in order to separate CO2 from a gas mixture. He is especially interested in solid state chemistry, ceramic synthesis, sorption processes on ceramics, catalysis, inorganic membranes for gas separation and solid oxide fuel cells (SOFC´s). As part of his work, some papers have been published on referred journals such as Journal of Physical Chemistry and Journal of Energy Chemistry, among others.

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Diagnosis of membrane chemical degradation for a health management system of polymer electrolyte fuel cells

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Due to increasing global energy consumption and carbon emissions from using fossil fuels as a primary energy source, low carbon electricity generation is increasingly important as society is shifting towards a more sustainable and electrified future to reduce carbon emissions and its effect on the environment. Polymer electrolyte fuel cells are a promising technology which can provide efficient electricity generation with zero carbon emissions. However, their reliability and durability are one of the main challenges to widespread commercialization. Improving these aspects is necessary for achieving lifetime targets. Diagnostics and prognostics are key components in a strategy to improve reliability and durability. The challenge of current methods to accurately model degradation and predict lifetime is highly complex due to the multiple interrelated degradation mechanisms. This research presents a diagnostic fuzzy inference system approach for health management of polymer electrolyte fuel cells. The investigation focused on the diagnosis of membrane chemical degradation as this was identified as a top priority. The fuzzy inference system facilitates the connection between operating conditions and subsequent degradation modes. An inference calculation is performed based on rules developed from fuel cell degradation knowledge without the need for complex mathematical models. This fuzzy diagnostic approach enables enhanced health management allowing for proactive decision-making thereby improving fuel cell reliability and durability. This increases fuel cell availability and lifetime resulting in a more valuable product. Fuel cell testing was conducted under various operating conditions known to cause membrane chemical degradation. Results support the proposed rules for the diagnostic fuzzy inference system.

Biography

Derek has completed his BEng degree in Renewable Energy and Sustainable Technologies from Glyndwr University. He has also completed his MSc degree in Renewable Energy Systems from Loughborough University within the Centre for Renewable Energy Systems Technology (CREST). He is currently in the third year of a four year PhD with integrated studies. His PhD research is part of a wider project in the Centre for Doctoral Training in Fuel Cells and Their Fuels which includes four other partner universities including the University of Birmingham, University College London, Imperial College London and the University of Nottingham.

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Notes:

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Enhancement of biocatalytic conversion of carbon dioxide using methyl-functionalized silica nanoparticles

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As chemical methods to reduce carbon dioxide (CO_2), catalysis, electrocatalysis, and photocatalysis methods have been studied to obtain valuable products such as methanol, formic acid, and formaldehyde from CO_2. However, chemical catalytic reaction methods require high-temperature and high-pressure operating conditions and electric/photodynamic energy, with the drawbacks of a low selectivity and overall conversion yield. Biological CO_2 transformation technologies have been highlighted as an alternative, because they have shown a high selectivity and conversion yield under ambient operation conditions. However, in a biological reaction process using a gas substrate, the overall reaction rate is limited by the low gas solubility and slow gas–liquid mass transfer rate. In this study, methyl-functionalized magnetic silica nanoparticles (methyl-MSNs) were synthesized and applied to a CO_2–water system to evaluate gas–liquid mass transfer. The addition of methyl-MSNs increased the solubilized CO_2 concentration by 31.1% and the volumetric mass transfer coefficient was 78.3% higher than that in a control experiment without nanoparticles. The addition of methyl-MSNs in the formate dehydrogenase reaction resulted in a 12.0% increase in formic acid production and could decrease the reaction time required to finish the batch enzyme reaction from 1.5 h to 1.0 h. This result showed that the addition of methyl-MSNs could be useful for biological processes, including enzyme reactions, when using a gas substrate to improve productivity.

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Biography

Byung-Keun Oh received his Ph.D. degree in Chemical and Biomolecular Engineering at Sogang University for his work on protein chip for detection of pathogens existing in contaminated environment in 2003. He worked then as a postdoctoral fellow in Northwestern University from 2004 to 2006. In 2006, he joined the faculty as a professor in Department of Chemical and Biomolecular Engineering at Sogang University. His research interests mainly lie in the interdisciplinary area which can be termed as "biotechnology and bioenergy", especially the development of nanoparticle-based biodetection schemes and the enhancement of biological conversion efficiency in gas based fermentation.

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Waste to energy generating: An innovative breakthrough technology for generating electricity from low-potential waste heat energy

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SME with a strong R&D background and capacity developed an innovative technology to generate electrical energy from low-potential renewable and sustainable waste heat energy sources. Our company is IP-rich, high-growth-potential business with extremely high demand around the world. Our goal is to develop the most innovative breakthrough thermodynamic cycle that will allow using low-potential waste heat energy in the range from 122 to 392 degrees Fahrenheit or from 50 to 200 degrees Celsius for the generation of electricity and cold with an efficiency of at least 30%. The technology's operation is based on an innovative thermodynamic cycle with an ecologically friendly mixture composition of a refrigerating agent and an absorbent; it includes, unlike the known ones, a regulating the working fluid composition system that allows to expand additionally the cycle's temperature range and to significantly improve the efficiency of the electricity generation due to the users use for such generation even negative temperatures below the ambient level.

Expertise: Governmental and private Companies, Research Centers, investors interested in the development and commercialization of innovative breakthrough solutions for power generation from low-potential waste heat energy around the world.

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Ten years of advancing renewable energy in missouri and the midwest: Impacts and results

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For more than ten years, the issues surrounding renewable energy and how renewables can benefit the State of Missouri and greater Midwest have been discussed at a national meeting held annually in Columbia, MO. The conference began as a cooperative effort between Columbia Water and Light, the University of Missouri, the State of Missouri, and Renew Missouri. Today the conference is a two-day event that invites locally, nationally, and internationally known speakers to discuss cutting-edge issues in renewable and efficiency technologies, the economics of renewables, conservation, education, and the science of renewable energy and environment. Of late, more than two hundred people have attended the meeting from the public and private sectors, including utilities, energy providers, and vendors. The conference regularly provides continuing education for engineers. Since the first event in 2006 Missouri has made significant strides in adopting renewable energy as part of its energy mix. Solar interconnection laws, Renewable Portfolio Standards, Rate-based energy efficiency programs, and more, have resulted in over a hundred million megawatt-hours that are generated, or saved, annually through utility programs alone. Although the conference cannot directly claim credit for any specific accomplishments, it is more than coincidental that organizers of all the major renewable energy efforts in the state have been in attendance at the conference at one time or another. Rockport, Missouri, for instance, a small town close to the Iowa border, that in 2009 became the first city in the US to cover 100% of its energy use through wind power, was connected to the conference as the wind project developer that created that opportunity was a keynote speaker at the first event in 2006.

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Optimized use of renewable energies to realize nearly zero energy buildings

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The building sector is responsible for 40 % of the global energy consumption. At the same time, the usage of fossil fuels, e.g. oil or gas, comes along with a shortage of such resources, leading to a significant price increase in the future. The German government pursues the goal to cover 80% of the primary energy usage with renewable energies until 2050. This is a challenge for the operation, reorganization, and alteration of the energy supply concept. A fluctuating supply of energy from renewable energy sources needs appropriate, efficient and sustainable technologies to create a safe and constant energy supply system. The aim is to satisfy the demand by a maximized usage of renewable energies on the building to match energy supply and energy demand of a building. The utilization of simulation-based optimization tools permits an early estimation of the potentials of renewable energies at an early planning stage and the integration in an overall energy supply system. With the help of a thermal-energetic building simulation model, which will be simulated in TRNSYS and an external optimization tool (GenOpt) these potentials will be considered in detail to realize nearly zero energy buildings. The focus of this study is to compare different optimization algorithms regarding their potentials of the optimized usage of renewable energies and the numerical determination of a global minimum of the objective function. The goal of this project is to generate meaningful and resilient results by using a simplified building model and a general valid objective function.

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A Survey and some new results on machine learning methods for the estimation of the power curve of wind turbines

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In this work, we provide a comprehensive survey of recent machine learning approaches for wind turbine power curve (WTPC) estimation. Additionally, we revisit the classical polynomial model aiming at improving it by means of an automatic and more parsimonious design. For this purpose, we propose a methodology based on evolutionary computation which returns the optimal order of the polynomial as well as selects (by pruning) the relevant terms in this polynomial. A comprehensive performance comparison is carried out involving the proposed approach and the state of the art in estimating the power curve of wind turbines, such as the logistic models (with 4 and 5 parameters), artificial neural networks, Takagi-Sugeno fuzzy model, and weighted polynomial regression. The results clearly indicate that the proposed methodology consistently outperforms the state of the art methods.

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Performances and emissions characteristics of methanol blended with vegetable oils as alternative fuels in compression ignition engine

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In view of increasing pressure on crude oil reserves and environmental degradation as an outcome, fuels like Methanol blended with Apricot oil, Pogamia oil, Cottonseed oil may present a sustainable solution as it can be produced from a wide range of carbon-based feedstock. The present investigation evaluates Methanol blended with Apricot oil, Pogamia oil, Cottonseed oil as a diesel engine fuel. The objectives of this paper are to analyze the fuel consumption and the emission characteristic of a twin cylinder diesel engine that is using Methanol blended with Apricot oil, Pogamia oil, Cottonseed oil & compared to the usage of ordinary diesel that is available in the market. A Twin cylinder diesel engine was adopted to study the brake thermal efficiency, brake specific energy consumption, and emissions at zero load & full load with the fuel of Methanol. In this study, the diesel engine was tested using Methanol blended with Apricot oil, Pogamia oil, Cottonseed oil. By the end of the experiment, the success of the experiment has been started which is Diesel engine is able to run with Methanol blended with Apricot oil, Pogamia oil, Cottonseed oil but the engine needs to run by using diesel fuel first, then followed by Methanol blended with Apricot oil, Pogamia oil, Cottonseed oil and finished with diesel fuel as the last fuel usage before the engine turned off. The performance of the engine using Methanol blended with Apricot oil, Pogamia oil, Cottonseed oil fuel compared to the performance of the engine with diesel fuel. Experimental results of Methanol blended with Apricot oil, Pogamia oil, Cottonseed oil and Diesel fuel are also compared.

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Nanostructured polymer-based hybrid systems for energy storage

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The current generation of high-energy-density secondary batteries and capacitors are mostly driven by advanced in inorganic materials such as lithium compounds, silicon nanostructures, and carbon nanostructures. Although they dominated the current research of electrode and electrolyte materials because of superior electrochemical properties including ion conductivity, cyclability, charge capacity, capacitance, etc., their disadvantages include difficult processing techniques, poor interfacial control, and limited mechanical properties. In this talk, we showcase our efforts in using polymer nanostructures to supplement or replace inorganic components in energy storage applications. Block copolymers and novel polymer nanocomposites can provide possibilities towards self-healing, mechanically tough, solid and safe, as well as high-performance batteries and capacitors.

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Towards a better EIA follow-up in Colombia

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The Environmental Impact Assessment (EIA), is a decisions making process about the execution of projects, works or activities (POA by its initials in Spanish), is based on the prediction of possible environmental impacts that these can generate, therefore, it is done before the projects, works or activities are executed, this situation added to the environment complexity creates uncertainties in the predictions. The follow-up and monitoring of the EIA aim to eliminate these uncertainties through review, evaluation, and adjustment of predictions when projects, jobs or activities are already in execution. This investigation evaluated the follow-up and monitoring process in Colombia in aspects such as the sources of uncertainty, their influence on EIA feedback and the strengthening opportunities for this tool, trhu a survey based on the sources of uncertainty identified at the international level for the EIA, which was applied to 21 applications for Environmental Licenses, filed at the National Authority of Environmental Licenses of Colombia during 2013. This review allowed to identify gaps in existing regulations, high subjectivity during follow-up, scarce resources for its execution, methodological errors and weak processes of participation and communication of results, concluding that the weakest aspect in the process is related to methodological aspects. From where is proposed some guidelines to improve the follow-up od the EIA in Colombia.

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Design considerations and field performance of wind turbine foundations

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Foundations for wind turbine generation systems come in various designs, allowing for reliable and robust foundations. This paper highlights structural field performance and areas of concerns of existing wind turbine foundations, based on field inspections performed on hundreds of foundations. Also, an overview of the various design considerations for wind turbine foundations is provided while highlighting different code and design guidelines requirements. The paper addresses in particular design of raft foundations for new construction and for those existing ones intended for reuse with upgraded turbines. One of the critical factors controlling the serviceability of wind turbine foundations is fatigue resistance to wind loading.

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The effect of fabrication technique of thin film YSZ/GDC based bi-layer solid oxide fuel cell electrolyte

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Yttria stabilized zirconia (YSZ) and gadolinia doped ceria (GDC) have been reported to be ideal solid oxide fuel cell (SOFC) electrolyte materials due to their outstanding chemical stability and ionic conductivity properties respectively. Notwithstanding these properties, YSZ is known for its low ionic conductivity while GDC exhibit high electronic conductivity and vulnerable to chemical instability. In this study, Anode aluminium oxide-supported thin-film fuel cells having a bi-layered electrolyte consisting of a GDC layer and YSZ layer were fabricated using plasma enhanced atomic layer deposition (PEALD) technique and electrochemically characterized to investigate the effect of the fabrication technique. The result showed that the PEALD yielded pinhole-free and highly dense thin film YSZ/GDC electrolyte which inhibit electrical shortage and gas leakage. The resulting bi-layered thin-film fuel cell produced a considerably higher open circuit voltage compared with a thin-film fuel cell with a single-layered GDC or bi-layered YSZ/GDC electrolyte fabricated via other methods.

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Adoption of green technology to curb release of greenhouse gases emissions for climate change control in Nigeria: Hydrogen fuel cells technology

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The awareness of global climate change by emissions of greenhouse gases from fossil fuel combustion is widely known by current society. Polymer Electrolyte Fuel cell (PEFC) technology has been a very promising clean technology with high efficiency that has been used in a wide range of portable, automotive and stationary applications. The fuel cell research has been developing very rapidly and successfully in the last few years. However, some issues remain largely unresolved, namely water management and the high cost of the PEFC component. One of the efficient and cost-effective ways to improve the design of the PEFC and consequently resolve the above-mentioned issues is through modeling. However, the built PEFC models need to be fed with accurate transport coefficients to enhance their productivity. One of the most important transport coefficients is the gas permeability of the PEFC porous media which highly affects the convective flow. Therefore, experimental studies have been conducted to investigate the gas permeability of the gas diffusion media used in PEFCs. The focus has been on the effects of the following on the gas permeability of the gas diffusion layers (GDLs): (i) type of carbon black used in the microporous layers (MPL) attached to the GDL, (ii) carbon and polytetrafluoroethylene (PTFE) loading, and (iii) the thickness of the MPL. Further, a novel method has been proposed to estimate the penetration of the MPL into the carbon substrate (i.e. the GDL before being coated with the MPL ink). Also, the effect of sintering on the gas permeability of the MPL has been investigated for the first time.

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Hydrogen storage in Ti atoms decorated Boron-Nitrogen doped graphene: Effects of electric field on hydrogen adsorption and desorption

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In the last two decades, the significant efforts have been made to develop alternative energy sources instead of fossil fuels because of increasing CO_2 emissions and the environmental impacts. Besides; hydrogen has been concerned to be an ideal clean energy carrier among the other renewable energy sources because of its environmental friendliness. However, some challenges have to be addressed before hydrogen will become a conventional and commonly available energy carrier. Carbon-based materials such as graphene and carbon nanotubes have been designed for hydrogen storage due to their large surface area, lightweight, and tunable properties. Recently, we proposed a new strategy in which we considered three pure transition metal (TM) atoms or/and a combination of two TM atoms and one alkali earth metal atom (AEM) with high, medium and low hydrogen adsorption energies. These different metal atoms are used to decorate the Boron doped graphene sheet (BDG) and investigated their performance towards hydrogen storage capacity through the spillover mechanism using first-principles calculations. Our results indicate that that the activation energies for H atom diffusion are much smaller, indicating that a fast H diffusion on this proposed surface can be achieved. These TM and AEM atoms decorated BDG surface can have the maximum hydrogen gravimetric capacity of 6.4% for double-sided adsorptions. To further achieve higher gravimetric density, in this study, we have considered Ti atoms decorated on the Boron and Nitrogen co-doped graphene surface (BNDG) because B–N pair is isoelectronic to the C–C pair. However, controlling the binding strength of metal atoms with that of the BNDG surface is an important issue in the application of hydrogen storage. The recent studies have shown that the binding strength between the metal atom and the substrate can be controlled by means of applying an external electric field. Thus, the effects of the external electric field, as well as the effects of applying point charges on the designed medium towards its hydrogen storage capacity, will be discussed. We have also explored the stability of the decoration of metal atoms on BNDG sheet at higher temperatures using molecular dynamics simulations.

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New tools for selectively improving strains of sugar kelp for food and fuel

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As a part of ARPA-E's MARINER program, a team of scientists and entrepreneurs is pursuing a selective breeding program to improve the productivity and composition of sugar kelp, Saccharina latissimi, which could serve as feedstock for biofuels. ARPA-E's and our goal is to develop tools and a pathway toward low-cost (< $100/DWT) seaweed feedstock that could supply 10% of US transportation fuels. Current markets are human and animal foods. Our project will develop several complementary tools to reach this objective. To facilitate the high-throughput creation of family crosses, we are developing cell sorting methods to efficiently isolate and clone gametophytes. USDA/Cornell and others will employ PacBio and Illumina sequencing to create a deep-sequenced reference genome and establish a variant catalog for our founding populations and families. WHOI, UCONN and contract farmers will oversee field trials of 144 families (from 12 different 'strains') planted in triplicate plots on two farm sites (nearshore and offshore) over two growing seasons. The resulting family phenotypic data will be associated with genetic markers, and we will identify variants significantly associated with primary productivity and composition traits. A goal is to develop methods to predict offspring performance based upon genotype and breeding values of parents as a shortcut around extensive and expensive field testing. A separate ARPA-E project will test the potential labor-saving use of WHOI's autonomous underwater vehicles and sensors for conducting nutrient, acoustic, and optic measurements of macroalgae plots. These will be compared to conventional hands-on field measurements. Ultimately our goal is to develop sugar kelp with the improved composition for use as a bioenergy feedstock.

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Dimensionless dual phase model for thermocline energy storage behavior analysis

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Thermocline packed-bed single tank concept belongs to the category of sensible heat storage systems (SHS). It is currently presented as a promising and cost-effective technology to reach efficient thermal energy storage (TES) and sustainable management of the thermal process. However, this configuration still in a growth stage and need to be developed. Hence the necessity to investigate new thermal energy storage material (TESM) unexplored until now and determines their characteristics and their storage performances. In other words, one of the key factors to make this concept more attractive is the wise choice of TESM. In fact, it is well known by the most researchers that TESM must satisfy several requirements based mainly on the thermophysical properties such as low density, high thermal capacity, high thermal conductivity, thermal stability, etc. But it is often found that the choice of storage materials based on these criteria, which are intrinsic to the TESM, sometimes gives, under certain operating conditions and depending on the heat transfer fluid, inverse results concerning the thermal performance thermocline storage system. Because on the one hand even if the physicochemical adequacy between the TESM and the HTF is well taken into account in these studies, the adequacy between the thermophysical properties of the TESM and the HTF is habitually ignored. On the other hand, the compensation between certain intrinsic properties of the TESM makes the problem more ambiguous. For example, the choice of a material with high heat capacity is intuitively beneficial for the storage as the choice of a material of high thermal conductivity, which makes it possible to homogenize the temperature inside the same solid particle. But by analyzing the macroscopic participation of these properties in a thermocline storage system, it is easy to see that these coefficients have an opposite effect because the heat transfer in the porous bed is driven by the effective thermal diffusivity of the TESM (among other parameters). In this context, the aim of this work is to propose a dimensionless model that allows a clear analysis of the general thermal behavior of thermocline system by reducing the number of parameters. For this purpose, we have introduced dimensionless groups of parameter specific for this kind of system. The model proposed is based on a dual phase model describing heat and mass transfer inside the porous packed-bed contained in the storage tank. After validation, the developed model is used to simulate the behavior of charging and discharging the system. Subsequently, a parametric study revealed the information concerning the influence of each 2 dimensionless group on the discharge efficiency of the system. The results obtained made it possible to determine in a clear-cut the TESM choice criteria according to the HTF and the operating conditions of the thermocline.

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The studies of oxygen reduction reaction for the direct carbon fuel cell

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The direct carbon fuel cell (DCFC) is a energy generation system converting the chemical energy of carbon directly into electricity by an electrochemical reaction of DCFC. There are three basic families of direct carbon fuel cells under development, distinguished by the type of electrolyte used (molten hydroxide, molten carbonate or solid oxygen ion conducting ceramic) as described. Molten hydroxide direct carbon fuel cell (MHDCFC) has some advantages such as low temperature, high ionic conductivity and so on. Oxygen reduction reaction for MHDCFC is very complicated, so we have researched it.The process of oxygen reduction reaction generates O^{2-}, O^{22-}, O^{-} and OH^{-} which are difficult to search so that we must do some inferences. The reaction of the cathode for ORR is and its balance electrode potential is 1.23V. Learning the oxygen reduction reaction mechanism for MHDCFC and looking for an excellent catalyst is very important at present. Pt is the best catalyst for oxygen reduction reaction but it is expensive. Now our work electrode is monel alloy (Cu-Ni) that is high temperature and corrosion resistance. I will do some further researches in this area. We will use density functional theory and electrochemical test method to explore oxygen reduction reaction. I believe that the direct carbon fuel cell will have more space for development and benefit to a human in the near future.

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