VATIS UPDATE

New and Renewable Energy

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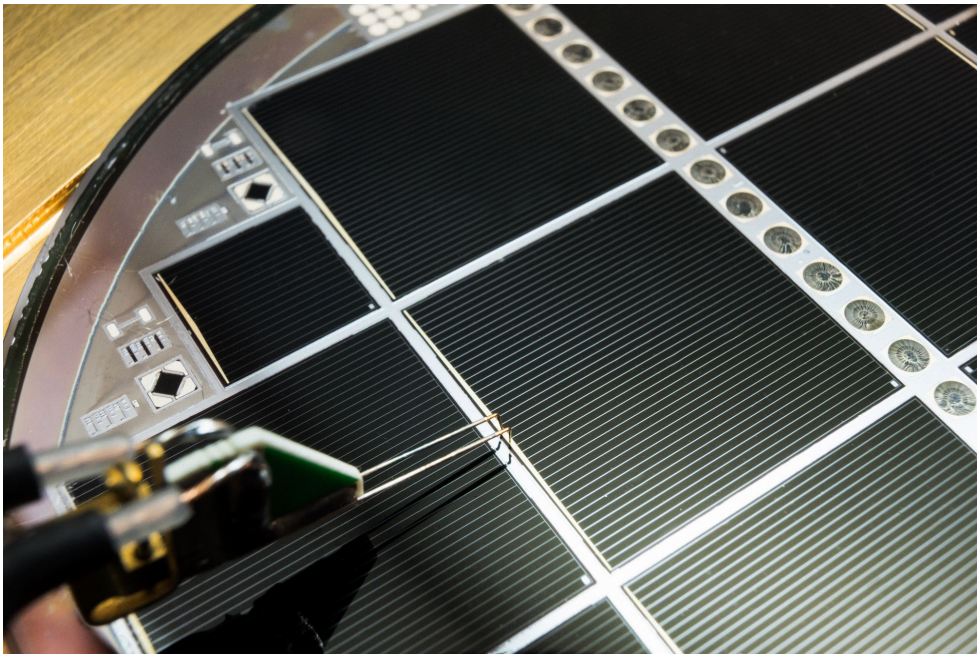
Apprise yourself with the latest technological innovations

Highlights

- New type of perovskite solar cell
- Residential wind turbine design
- Tidal energy project in Philippines
- Platinum-based catalysts for fuel cells
- Hydrogen at much lower temperature
- Waste gas into biofuel



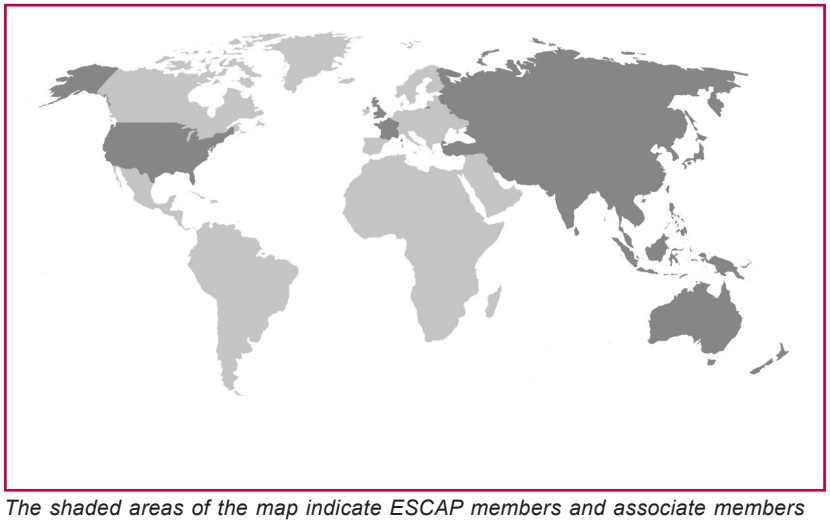
APCTT
Asian and Pacific Centre for Transfer of Technology

UNITED NATIONS ESCAP
Economic and Social Commission for Asia and the Pacific

The **Asian and Pacific Centre for Transfer of Technology (APCTT)**, a subsidiary body of ESCAP, was established on 16 July 1977 with the objectives: to assist the members and associate members of ESCAP through strengthening their capabilities to develop and manage national innovation systems; develop, transfer, adapt and apply technology; improve the terms of transfer of technology; and identify and promote the development and transfer of technologies relevant to the region.

The Centre will achieve the above objectives by undertaking such functions as:

- Research and analysis of trends, conditions and opportunities;
- Advisory services;
- Dissemination of information and good practices;
- Networking and partnership with international organizations and key stakeholders; and
- Training of national personnel, particularly national scientists and policy analysts.



The shaded areas of the map indicate ESCAP members and associate members

Cover Photo

Wafer-bonded III-V/Si multi-junction solar cell with 30.2 percent efficiency

(Credit: Fraunhofer ISE/A. Wekkeli, Germany)

VATIS* Update
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CONTENTS

Vol. 2 No. 132 Jan-Mar 2017

Renewable energy investments in India

According to the India's power minister Mr. Piyush Goyal, more than US$250 billion will be invested in renewable power eneration and transmission in India over the next five years, a figure that could reach $1 trillion by 2030. "By 2022 India plans to have added 225 gigawatts of generating capacity from renewable energy sources, including solar, wind, hydro and biomass. Largely it will be financed through a mix of debt and equity through commercial banks, but we do believe that the developed world has obligations to fulfil," said Mr. Goyal.

Over the past two years foreign direct investment in India's electricity sector was $1.32bn, but Mr. Goyal said that the cost of these projects cannot fall entirely on the private sector. He said the public sector must also "play a proactive role to bring down the cost of financing". The Indian government has approved infrastructure investments trusts (invITs) and is working with the state-owned Power Grid Corporation to divest assets in order to shore up capital for expansion.

InvITs are a type of income trust that is created to finance, construct, own and operate and maintain infrastructure projects."Once that comes into play, we could look easily at $10bn coming into the infrastructure investment trusts on the transmission side," said Mr. Goyal. The UAE in 2014 signed a memorandum of understanding to help spread solar and wind power in India. Firms including Masdar, Abu Dhabi, are looking to go in this year.

Source: http://www.thenational.ae

East Timor villages lit up by solar

The Alternative Technology Association (ATA), Australia, has installed hundreds of household solar lighting systems across 12 villages in East Timor. The two-year project was completed in partnership with two local partners, CNFP and Natiles, and with funding from the Google Impact Challenge 2014, four East Timor Friendship Groups and public donations. After pilot projects in 2015, now 607 solar systems have been installed in villages in the districts of Aileau, Viqueque and Baucau, affecting 4,000 people.

In each village, Natiles liaised with the community, providing training to a management committee and helping it set up its own maintenance fund, while CNEFP trained 30 local technicians to install, maintain and repair the systems. Participating villagers pay a US$10 installation fee, followed by a monthly subscription of US$2, which will be held by the management committee to fund ongoing maintenance and repairs. This monthly payment is less than the cost of candles and kerosene for a month, said the ATA.

Lighting was installed inside and outside the front of each house, and each household also received a USB-rechargeable torch on a wristband. The systems are designed to be easy to fix and tamper-proof. The solar systems allow villagers to charge mobile phones via the USB port and to work or study in the evenings. The ATA has worked closely with the East Timor Government and the United Nations Development Program on the future of the country's renewable energy rollout.

Source: http://www.pv-tech.org

ADB support for clean energy in India

The Asian Development Bank (ADB) has approved a new $390 million financing package for ReNew Power to develop renewable energy projects in India. According to ADB, The financing will assist 7 special purpose vehicles owned by ReNew Power, the first of which has also been signed. This is the first transaction to include in its financing plans resources from ADB as well as Leading Asia's Private Sector Infrastructure Fund (LEAP). LEAP is a funding arrangement provided by Japan International Cooperation Agency (JICA) and is administered by ADB.

With the financing, ReNew Power will develop photovoltaic solar power projects with combined capacity of 398 megawatts (MW) in Jharkhand and Telangana, and wind power projects with combined capacity of 311 MW in Andhra Pradesh, Gujarat, Karnataka and Madhya Pradesh. Combined, the projects are expected to generate 1,400 gigawatt hours of electricity and help avoid nearly 1.2 million tons of carbon dioxide (CO_2) emissions per year. The plants will be commissioned by December 2017.

The generated electricity will be supplied to respective state power distribution companies under long term power purchase agreements. ReNew Power, an independent power producer (IPP) company, generates reliable and efficient non-conventional power through over 3,000 MW of commissioned and under-construction clean energy projects across 15 states in India. ADB has been supporting the development of renewable energy in India since 2007, when it financed the first set of wind projects.

Source: http://www.finchannel.com

Pakistan received UNIDO support for renewables

The United Nations Industrial Development Organization (UNIDO) has presented priority renewable energy and energy efficiency interventions for five industries sectors in Pakistan. This project is funded by the Global Environment Facility and is being implemented under "Sustainable Energy Initiative for Industries" project. At a workshop Country Representative Esam Alqararah, stressed upon the importance of a sectoral study for promoting renewable energy and energy efficiency in Pakistan.

The workshop findings gave insight into the energy resource consumptions for each sector, benchmarks comparisons on regional levels, as well as the economic value of energy efficiency savings for each sector. The finding also gave the potential of renewable energy applications for each sector in economic and technological terms.

Source: http://www.pakobserver.net

Iran plans growth in renewables

The Islamic Republic of Iran plans to produce 5GW of renewable energy by 2020, as the country welcomes international investment for the first time in a decade. Following the removal of sanctions on Iran, energy demands are starting to increase, particularly from heavy industry, and this means output from renewables is expected to grow. The country's renewables body is looking to attract $10bn of direct private investment by 2018 and $60bn by 2025.

It has attractive subsidy rates that it hopes will be a factor in bringing in investors from Europe. The country has a GDP of $406.3bn, making it the second largest in the MENA region. International trade with the region is now a possibility after the recent lifting of the nuclear sanctions that were placed on Iran by the UN, EU and USA in 2006. The country has since then changed administration. Iran now has access to billions of dollars of frozen assets in foreign banks.

They will also be delisted from the blacklists of banks and financial institutions, which will allow more freedom for Iranian and some international banks to do business. As a result, Iran is now able to benefit from the renewable energy sector that could grow rapidly in coming years. Output from renewables currently stands at less than 0.2% of total power generated in Iran. However the country plans to dramatically improve that amount as the government has reduced subsidies for fossil fuels in recent years.

Source: http://www.renewableenergyfocus.com

China launches certificates for renewable power

The National Development and Reform Commission (NDRC), China, will launch the trading of green certificates for solar and wind power on July 1 in a bid to help reduce government subsidies to the renewables sector. In a pilot program, the NDRC said solar and wind producers would be issued tradeable certificates, proving that electricity has been generated through renewable energy sources. Renewable energy users such as private and state businesses would be encouraged to buy the certificates, which would then entitle them to an unspecified payment.

Each certificate would represent 1 megawatt hour of power, the NDRC said. Solar and wind power producers who had sold their certificates would no longer receive a direct subsidy for electricity production, it said, without giving further details. The NDRC said it would monitor the pilot program and could launch a mandatory green certificate scheme in 2018. Renewable energy makes up about 11 percent of China's energy consumption, with producers granted heavy subsidies.

Source: http://www.reuters.com

China to invest £291bn in renewable energy

The National Energy Administration (NEA), China, has announced it will invest 2.5 trillion yuan (£291bn) in renewable energy by 2020 as it continues with its plan to move away from burning coal. According to a blueprint document which aims to increase the country's wind, hydro, solar and nuclear power industries, the investment by NEA is set to create over 13 million jobs in the sector. The extra investment would fund around half of new electricity generation by 2020.

The announcement comes after China's National Development and Reform Commission (NDRC) said that solar power would receive a trillion yuan in funding – the equivalent of 1,000 major solar power plants, according to experts' estimates. The cost of building large-scale solar plants has fallen by as much as 40 per cent in just six years. China, regarded as the world's largest energy market, has moved heavily towards renewable energy in the past few years as its increasingly

wealthier population has called for better standards of living.

Source: http://www.independent.co.uk

Bangladesh aims 700 mw renewable energy

The Bangladesh government has targeted generating 697 megawatt (mw) of electricity from renewable energy sources by 2019 aimed at joining the path to Sustainable Development Goals (SDGs) in the country. "Besides, the government fixed another target for 10 per cent power to be procured from the renewable energy sources by 2020 and onward by following the Renewable Energy Policy," said Nasrul Hamid, State Minister for Power. As much as 433 MW of electricity is now being generated from the renewable energy sources in the country.

"The present government has already brought around 20 million people under electricity facility by installing 5.0 million Solar Home Systems across the country, the largest in the world," said Nasrul Hamid. According to data from various stakeholders, some 5,000,000 solar systems, solar irrigation 441, solar drinking water system 122, biogas plant 45,070, improved cook stoves 3,022,213, improved rice parboiling system 75 have been installed in the country.

Besides, the government took up project to install solar panel having 145 mw of power by 2018, while other renewable energy initiatives would generate 552 mw of electricity within 2019. The present renewable energy and energy efficiency scenario of Bangladesh is 423 mw and renewable energy share reached 3.45 per cent. The energy efficiency master plan targeted saving power by 15 per cent by 2021 and 20 per cent by 2030 and the SREDA will play a pivotal role in achieving these targets.

Source: http://www.thefinancialexpress-bd.com

Indonesia to use of B20 biodiesel fuel

The Indonesian Energy and Mineral Resource Ministry has finished a road trial for B20, a type of biodiesel containing 20 percent fatty acid methyl ether that could pave the way for the government's plan to have all diesel-engine vehicles use the fuel next year. "The trial concluded that B20 is 3.97 percent less efficient compared to existing diesel fuel and that it increases fuel consumption by up to 3 percent," said Dadan Kusdiana, at the ministry.

"B20 also clogged the engine after 7,500 kilometers of use, but that can be fixed by changing the fuel filter. Heavy machinery would have an increase in zinc deposits in the engine after prolonged use of B20, and the ministry recommends producers to change parts of the machinery to contain less zinc," added Dadan. The government does not consider the issues to be significant to cancel its plan to impose mandatory use of B20 in 2016, and the government urged all vehicle producers to be prepared to follow any recommendation as a result of the trial.

Source: http://www.jakartaglobe.id

Korea to invest heavily in renewable energy

Republic of Korea's six large utilities associated with the Korea Electric Power Corp., will be investing some $3.06 billion in renewable energy in 2017 and 2018. This money is meant to add more momentum to Republic of Korea's efforts to embrace clean energy and technology. The money will aid in the exploration of new renewable energy sources and develop new energy systems in order to aid Republic of Korea in becoming more environmentally friendly and combat the effects of climate change.

Through their new investment, the utilities will be supporting various forms of clean power and technology. Approximately 38.6% of the $3.06 billion being invested will be committed to solar power, with wind accounting for 35% of the investment. The utilities will devote 17.9% of the investment to fuel cells, which have become quite popular in the transportation sector. Republic of Korea is already home to a very attractive fuel cell market and government support has heightened this by a significant margin in recent years.

Republic of Korea has been investing quite heavily in renewable energy recently. The country is set to have a new wind energy system in operation within the near future, with a maximum capacity of 45.1 megawatts. The wind energy system will be able to generate 155.5 gigawatt-hours per year. Another fuel cell project is currently under development, as well, where 50 megawatts worth of fuel cells will be used to generate electricity from the hydrogen produced by Hanwha Total Petrochemical.

Source: http://www.hydrogenfuelnews.com

Clean Energy Info Portal - reegle

http://www.reegle.info

New type of perovskite solar cell

Researchers from the University of Göttingen, Germany, the Max Planck Institute for biophysical Chemistry (MPIPBC), Germany, and the Technical University of Clausthal-Zellerfeld, Germany, have developed a new type of solar cell that uses infrared energy to generate polaron excitations in perovskite materials. The researchers have shown that polarons – the coupled excitation of electrons and a crystal lattice – can be used to generate current.

"In conventional solar cells, the interaction between the electrons and the lattice vibrations can lead to unwanted losses, causing substantial problems, whereas the polaron excitations in the perovskite solar cell can be created with a fractal structure at certain operating temperatures and last long enough for a pronounced photovoltaic effect to occur," said Dirk Raiser, at MPIPBC.

The perovskite solar cells developed by the team had to be cooled in the laboratory to around -35ºC for the effect to take place. "The measurements so far were made in a carefully characterised reference material, in order to demonstrate the principle of the effect. For this purpose, the low transition temperature was accepted," said Prof Simone Techert, at the University of Göttingen.

Source: http://www.power-eetimes.com

Organic photovoltaics

Developed by researchers at the Georgia Institute of Technology (Georgia Tech), the United States, and colleagues from three other institutions, the technique provides a new way of inducing p-type electrical doping in organic semiconductor films. The process involves briefly immersing the films in a solution at room temperature, and would replace a more complex technique that requires vacuum processing. "We believe this technique is likely to impact many other device platforms in areas such as organic printed electronics, sensors, photodetectors and light-emitting diodes," said Bernard Kippelen, at Georgia Tech.

The research also involved scientists from the University of California, the United States, Kyushu University, Japan, and the Eindhoven University of Technology, The Netherlands. The technique consists of immersing thin films of organic semiconductors and their blends in polyoxometalate (PMA and PTA) solutions in nitromethane for a brief time – on the order of minutes. The diffusion of the dopant molecules into the films during immersion leads to efficient p-type electrical doping over a limited depth of 10 to 20 nanometers from the surface of the film.

The p-doped regions show increased electrical conductivity and high work function, reduced solubility in the processing solvent, and improved photo-oxidation stability in air. This new method provides a simpler alternative to air-sensitive molybdenum oxide layers used in the most efficient polymer solar cells that are generally processed using expensive vacuum equipment. For the first time, single-layer polymer solar cells were demonstrated by combining this new method with spontaneous vertical phase separation of amine-containing polymers that leads to efficient electron collection at the opposing electrode.

Source: https://www.phys.org

Ultra-efficient solar cells

Developed by Hong Kong Polytechnic University, China, a new type of solar cell is drawing attention in Hong Kong, with a possible application to wearable devices and other equipment. A group of researchers led by Charles Chee Surya, invented perovskite-silicon tandem solar cells. With the perovskite solar cell functioning as the top layer, it can harvest the short-wavelength light, while the bottom layer coated with silicon is designed to absorb the long wavelength light. The two layers enabled the module to achieve the "world's highest" power conversion efficiency of 25.5%.

Previously, the Swiss team's 22.8% was the highest. In addition to the usability of the material, the group estimates that power generation costs will be about 30% lower than with conventional silicon cells. "The market for perovskite solar cells is going to grow quite substantially in the future," said Surya. He explained that perovskite cells can be applied to a wide range of products, such as wearable devices and sensors for home appliances.

That said, there are safety and durability problems in putting perovskite solar cells into practical use. The use of lead, on which regulations have tightened around the globe, is raising concerns, and the power conversion efficiency, which declines in a few days, will also become a barrier to application. A joint effort between industry and academia will likely be the key to establishing mass production technology.

Source: http://www.asia.nikkei.com

Solar cell record

Solar engineers at the University of New South Wales (UNSW), Australia, have scored the world's highest efficiency rating with the largest perovskite solar cells to date – a level of efficiency the team believes it can double within another 12 months.

The UNSW team has achieved 12.1 per cent efficiency for a 16 cm^2 cell. This gives UNSW claim to the largest single perovskite photovoltaic cell, at least 10 times bigger than the current certified high-efficiency perovskite solar cells on record, certified with the highest energy conversion efficiency.

The team – which is part of a multi-university collaboration funded by a $3.5 million annual grant from ARENA – has also achieved an 18 per cent efficiency rating on a 1.2 cm^2 single perovskite cell, and an 11.5 per cent for a 16 cm^2 four-cell perovskite mini-module, both independently certified. Perovskite – named after the Russian mineralogist who discovered it, Lev Perovski – is a red hot area of solar research, and moving at a break-neck speed, largely because the crystal-like compound is cheap to produce and simple to manufacture.

Source: http://www.reneweconomy.com.au

More efficient solar cell

A team of researchers at the Technion-Israel Institute of Technology, Israel, has developed a method to improve solar cell efficiency by almost 70%. This might be a major breakthrough in overcoming the limitations of actual methods. The team, led by Professor Carmel Rotschild, developed a photoluminescent material (PL) in which both photonic and thermal excitations are generated. The full paper has been published in the *Nature Communication*.

When the material absorbs solar radiation it converts the heat and light into an "ideal" radiation, which in turn impinges on the PV cell and enables higher conversion efficiency. Testing found that the cell's efficiency improved to more than 50%. "Solar radiation, on its way to the photovoltaic cells, hits a dedicated material that we developed for this purpose, and the material is heated by the unused part of the spectrum," said Assaf Manor.

Source: http://www.electronics360.globalspec.com

Perovskite solar films

Solar cells made with films mimicking the structure of the mineral perovskite are the focus of worldwide research. But only now have researchers at Case Western Reserve University (CWRU), the United States, directly shown the films bear a key property allowing them to efficiently convert sunlight into electricity. Identifying that attribute could lead to more efficient solar panels. Electrons generated when light strikes the film are unrestricted by grain boundaries – the edges of crystalline subunits within the film – and travel long distances without deteriorating.

That means electric charge carriers that become trapped and decay in other materials are instead available to be drawn off as current. The scientists directly measured the distance traveled – called diffusion length – for the first time by using the technique called "spatially scanned photocurrent imaging microscopy." Diffusion length within a well-oriented perovskite film measured up to 20 micrometers. "The findings indicate that solar cells could be made thicker without harming their efficiency," said Xuan Gao, at CWRU.

In this research, Gao's lab performed spatially scanned photocurrent image measurements on films made in the lab of CWRU professor Clemens Burda. Perovskite minerals found in nature are oxides of certain metals, but Burda's lab made organo-metallic films with the same crystalline structure using methyl ammonium lead tri-iodide (CH3NH3PBI3), a three-dimensional lead halide surrounded by small organic methyl ammonium molecules that hold the lattice structure together.

Source: http://www.energyharvestingjournal.com

Printable solar cells

A University of Toronto Faculty of Applied Science & Engineering innovation could make printing solar cells as easy and inexpensive as printing a newspaper. Dr. Hairen Tan and his team have cleared a critical manufacturing hurdle in the development of a relatively new class of solar devices called perovskite solar cells. This alternative solar technology could lead to low-cost, printable solar panels capable of turning nearly any surface into a power generator.

Tan and his colleagues developed a new chemical reaction than enables them to grow an ESL made of nanoparticles in solution, directly on top of the electrode. While heat is still required, the process always stays below 150 degrees C, much lower than the melting point of many plastics. The new nanoparticles are coated with a layer of chlorine atoms, which helps them bind to the perovskite layer on top – this strong binding allows for efficient extraction of electrons. In a paper recently published in *Science*, Tan and his colleagues report the efficiency of solar cells made using the new method at 20.1 per cent.

"This is the best ever reported for low-temperature processing techniques," said Tan. He adds that perovskite solar cells using the older, high-temperature method are only marginally better at 22.1 per cent, and even the best silicon solar cells can only reach 26.3 per cent. Another advantage is stability.

Source: https://www.sciencedaily.com

Residential wind turbine design

Developed by Tyer Wind, Tunisia, a flapping machine is on the far edge of quirky. Employing dual oscillating blades that mimic the figure-8 motion of the wings of a hovering hummingbird, the turbine's relatively compact design make it a potential fit for residential use. Constructed of carbon fiber, the two vertical axis wings of the Tyer Wind turbine are 5.25 feet in length (1.6m) for a total sweep area of 11.7 feet (3.56m).

This relatively compact size is less than the sweep area for typical three-blade horizontal-axis wind turbines made for residential use. Though the Tyer turbine's rated power output of 1 kW is also less. The turbine is said to give off less noise pollution compared to conventional wind turbines, be safer for migrating birds, less visually obtrusive, and allow for a higher density of turbines in a wind farm configuration. The company has plans for a large-scale version of the turbine, for use in either onshore or offshore wind farms.

The Tyer Wind turbine is still in the testing phase, gathering data on such things as power efficiency, aerodynamic behavior, material resistance and stress over the mast, so no word yet from the company on a number of key specs, including real world performance capabilities or price and release date. If it even gets to that point given that Aouini's Saphonian turbine has yet to hit the market. *Contact: TYER Wind, 3, Impasse n°3, Avenue Azouz, Rebaï, El Manar 2, PO Box 2092, Tunis, Tunisia. Tel: +216-71-886-808; Fax: +216-71-887-068; E-mail: info@tyerwind.com.*

Source: http://www.newatlas.com

Megawatt wind turbine

MHI Vestas Offshore Wind, Denmark, has unveiled its new 9 megawatt wind turbine which, in testing at the company's Østerild broke the energy generation record over a 24 hour period. The continued development of offshore wind turbines continues apace, with the unveiling of MHI Vestas Offshore Wind's latest offering. The uprated V164 8 megawatt (MW) wind turbine has been reworked so that it is able to reach 9 MW "at specific site conditions," said the company.

Further, the new 9 MW turbine smashed the energy generation record for a commercially available offshore wind turbine, producing 215,999.1 kilowatt-hours (kWh) over a 24 hour period. "We are committed to delivering turbine technology that is in line with the development of our industry, based on our 20+ years of offshore experience. Reliability remains a key enabler, and our approach to developing our existing platform supports this strategy," said Torben Hvid Larsen, at MHI Vestas.

Source: https://www.cleantechnica.com

Offshore wind turbine

DNV GL, Germany, has assessed the market's new offshore turbine in development and awarded Siemens Wind Power with the Prototype Certificate for its 8 megawatt (MW) offshore wind turbine SWT-8.0-154. The prototype certification confirms all relevant safety features on the turbine according to the Danish Executive Order BEK 73:2013 and IEC 61400-22, allowing installation of the prototype to demonstrate its performance.

By erecting the turbine at the test centre for wind turbines in Østerild, Denmark, Siemens is able to perform the measurement campaign for the next phase of the type certification process which is crucial to bring the turbine to the market. "We are proud to have received the prototype certificate at this early stage, allowing us to install our SWT-8.0-154 prototype according to plan. The third evolution on the Offshore Direct Drive platform truly marks the move towards industrializing offshore wind power," said Morten Rasmussen, at Siemens Wind Power Technology.

The SWT-8.0-154 turbine is an evolution of the SWT-6.0-154 and the SWT-7.0-154 turbines. The main changes going from SWT-7.0-154 to the SWT-8.0-154 turbine consist of an upgraded generator including the adjacent electrical system and an advanced control system. The upgrade of the offshore direct drive wind turbine to eight megawatts is made possible through the introduction of new magnet technology with an even higher grade than that introduced in the SWT-7.0-154. This enables a rated power increase of more than 14% from 7.0 to 8.0 MW.

Source: http://www.powermag.com

Electricity generator that mimics trees

Scientists at Iowa State University (ISU), the United States, have built a device that mimics the branches and leaves of a cottonwood tree and generates electricity when its artificial leaves sway in the wind. The researchers think such technology may help people charge household appliances without the need for large wind turbines. "The concept won't replace wind turbines, but the technology could spawn a niche market for small and visually unobtrusive machines that turn wind into electricity. The

possible advantages here are aesthetics and its smaller scale," said Michael McCloskey, at ISU.

"We set out to answer the question of whether you can get useful amounts of electrical power out of something that looks like a plant. The answer is 'possibly,' but the idea will require further development," added McCloskey. The ISU research team delves into the world of biomimetics, or the use of artificial means to mimic natural processes. The concept has inspired new ways of approaching fields as varied as computer science, manufacturing and nanotechnology. It's unlikely that many people would mistake the prototype in McCloskey's laboratory for a real tree.

The device features a metallic trellis, from which hang a dozen plastic flaps in the shape of cottonwood leaves. Small strips of specialized plastic inside the leaf stalks release an electrical charge when bent by moving air. Such processes are known as piezoelectric effects. Cottonwood leaves were modeled because their flattened leaf stalks compel blades to oscillate in a regular pattern that optimizes energy generation by flexible piezoelectric strips.

Source: https://www.sciencedaily.com

Containerized mobile wind energy systems

TwingTec, Switzerland, is developing the next generation of wind energy technology 'TwingPower'. By using a Twing, short for tethered wing, wind energy up to 300 meters above the ground can be efficiently harnessed. No tower or foundation is required, so more than 90% of the material of a conventional wind turbine can be saved. A unique launching and landing solution using onboard propulsion has been demonstrated that enables a compact and mobile system to be realized.

The culmination of more than 5 years of R&D in leading academic and research institutes in Switzerland, TwingPower offers a flexible and scalable mobile wind energy system for off-grid power supply applications. The company has introduced the TT100, a containerized mobile wind energy system, aimed at harnessing wind energy in remote, hard to reach areas in combination with a diesel generator or other off-grid power source.

Fully autonomous and easily deployed, the TT100 offers significant diesel savings as well as uninterruptible power supply (UPS) functionality. Mobile renewable energy In comparison to other renewable energy systems, the TT100 is very compact and can be easily transported and installed without any special equipment. This is a major advantage for remote sites with difficult access or temporary applications.

Source: http://www.energyharvestingjournal.com

Smart grid control technique

Researchers at North China Electric Power University (NCEPU) in association with North China University of Science and Technology (NCUST) are developing a smart grid control technique to handle wind turbine contributions. "Reliable load frequency control is crucial to the operation and design of modern electric power systems. Due to the randomness and intermittence of the wind power, the controllability and availability of wind power significantly differs from conventional power generation," said Yi Zhang, at NCEPU.

Their method is a decentralised version of existing 'model predictive control' – where checkpoints across a power grid exchange information and adjust accordingly. The computer algorithm predicts the variables that influence the grid – demand and supply, for example – and applies those constraints for problems that parts of the system might encounter. According to the Universities, a traditionally controlled grid could, for example, redirect otherwise unused energy from sleeping citizens to a power-hungry hospital or some other entity.

In a decentralized system, like the one modelled by Zhang and her colleagues, the system works a similar way, except instead of having to clear the redirection with every checkpoint, the variables are assumed and the action is nearly immediate. To test their algorithm, the researchers compared volume output and dependability of a four-part system – four plants sharing responsibility for generating power in different areas – with and without the incorporation of wind power.

Source: http://www.electronicsweekly.com

Global Solar Atlas

The World Bank Group has provided the Global Solar Atlas in addition to a series of global, regional and country GIS data layers and poster maps, to support the scale-up of solar power in the client countries.

For more information, access: http://globalsolaratlas.info

Tidal energy project in Philippines

The Philippines National Oil Company (PNOC) unit responsible for promoting, developing and implementing new and renewable energy sources in the country – PNOC Renewables Corporation – has partnered with H&WB Asia Pacific (Pte Ltd) Corporation, Philippines, to develop the country's first tidal-energy project. According to H&WB, the project will utilize Tidal In-stream Energy Conversion (TISEC) technology.

It will be located in H&WB's three concession areas in San Bernardino Strait between Matnog, Sorsogon and Capul and Dalupiri both Northern Samar. French company Sabella SAS will be providing the technology. "The cohesive partnership aims to establish a special purpose company (SPC) in the first half of 2017 to commence project finance and engineering works, thereby, launching the first-ever TISEC power not only in the Philippines but in ASEAN as well," said H&WB.

"Sabella and H&WB have recently completed a detailed in situ bathymetry measurement, to move toward a full 3D current numerical model in order to locate the first demonstration project, which will consist of three to five turbines. PNOC RC's role is vital, and the MOU with H&WB and SABELLA is a pro-active strategy that can support the project's success, more so, when PNOC RC decides to invest into the SPC," said H&WB.

Source: http://www.update.ph

Tidal energy device

Minesto, Sweden, is working on an underwater kite that generates electricity from tidal and ocean currents. "Ocean energy is reliable, predictable energy, it has a lot of advantages," said Per Salomonsson, at Minesto. The kite operates at least 20 metres under the ocean surface where a cable steers it through the current in order to maximise the power generated by a turbine on its underside. The idea is to construct arrays of up to hundreds of individual kites.

The concept, known as Deep Green, was first invented by an engineer at the aerospace company Saab, Sweden, before developing into a stand-alone company – Minesto – 10 years ago. "Deep Green is the only known technology that exploits low-velocity tidal streams," added Salomonsson, explaining that this means it can be used much more widely than other tidal energy devices. The kite is one of several tidal energy technologies that engineers believe will become commercially viable in the next few years.

There is also a floating platform that is being trialled at the world's first marine energy test facility, the European Marine Energy Centre (EMEC), which was set up on the Scottish island of Orkney in 2003. The firm has developed the world's most powerful floating tidal platform called the SR2000. Two 1-megawatt turbines are mounted to its underside and can be tucked away when the platform is towed to and from site.

Source: https://www.horizon-magazine.eu

In-stream tidal energy

Cape Sharp Tidal, a partnership between Emera, Canada, and OpenHydro/DCNS, Canada, has deployed its two-megawatt turbine at the Fundy Ocean Research Center for Energy (FORCE) test site near Parrsboro. This milestone marks a turning point for Canada's renewable energy sector. It is the first time clean, renewable in-stream tidal power has successfully been generated from the Bay of Fundy, and the first time a turbine has been grid-connected at FORCE.

The demonstration open-centre turbine, designed and manufactured by OpenHydro, uses a fraction of the estimated 7,000 megawatt potential of the Minas Passage to power the equivalent of about 500 Nova Scotia homes with energy from tides. A second turbine, planned for deployment in 2017, will make Cape Sharp Tidal one of the largest generating arrays in the world.

The completed four-megawatt demonstration project will displace the need to burn about 2,000 tonnes of coal, and eliminate 6,000 tonnes of greenhouse gas emissions, the equivalent of taking 1,000 cars off the road each year. This achievement contributes to Nova Scotia's overachievement on national greenhouse gas reduction goals.

Source: http://www.fundyforce.ca

Pneumatic system for tidal energy conversion

A team of researchers from University of Sharjah, Sharjah, United Arab Emirates (UAE), and Australian College of Kuwait, has developed a new device for tidal energy conversion. They investigated the energy conversion of tidal energy into electrical one by building a small scale prototype

using a pneumatic system representing the energy conversion device. The tidal energy conversion device consists of a concrete in cylindrical shape, a moving base that moves inside the concrete cylindrical body and two single acting pistons connected to a power turbine.

The system specifications that mainly affect the amount of energy are the spring stiffness and hose diameter. It was found that there is a possibility to convert the tidal energy into electrical energy using the designed prototype. The maximum amount of electricity generated using the proposed prototype was about 5 Volts. The research has been published in the *Journal of Power and Energy Engineering*.

Source: http://www.scirp.org

Wave device generates power

Developed by Hann-Ocean Technology Pte Ltd, Singapore, the Ocean Energy's wave energy prototype Drakoo' has produced first power during trials conducted in a testing facility in Nantong, China. The Drakoo-B0010 wave energy converter started generating power on December 23, 2016, with the peak power output of 3.8kW at wave height of 0.6 meters, Hann-Ocean informed. It is installed in the twin wave flume at the newly built Han-Ocean's testing facility in Su-tong Science & Technology Park.

"The successful power generation is the result of combining eight years of continuous research and development efforts, and a full year of design and precision fabrication. The full-scale prototype will generate 10kW of energy at peak performance. The working principle of Drakoo, being a twin-chamber oscillating water column system, is to transform waves into a continuous water flow which drives a hydro turbine generator," said Hann.

Source: http://www.tidalenergytoday.com

Validation of wave energy conversion device

The National Wind Technology Center (NWTC) at the Energy Department's National Renewable Energy Laboratory (NREL), the United States, has begun validation work on the first water power technology ever tested in an NREL dynamometer facility. "Though designed to benefit the wind industry, the NWTC's large dynamometer facility is being leveraged to help advance new ocean energy technology," said Daniel Laird, at NWTC.

NREL is working with US- based Columbia Power Technologies' StingRAY wave energy converter. Designed to deliver electricity at a competitive cost while having a low environmental impact, its floats and generators convert the energy in ocean waves into electricity. "We are testing the StingRAY at the NWTC because the core design is similar to a wind turbine-it is direct drive, but with a very large diameter," said Reenst Lesemann, at Columbia Power Technologies.

Source: http://www.nrel.gov

New tidal energy turbine

Atlantis Resources, the United Kingdom, has deployed the 1.5MW AR1500 tidal energy turbine off the coast of Scotland. The installation is the latest development in MeyGen tidal energy project, which has been designed to harness the tides motion for powering up to 175,000 homes in Scotland. MeyGen's site is located in Pentland Firth, 2km from Scotland's north-east tip.

Designed by Lockheed Martin (LM) in partnership with Atlantis, the new turbine is equipped with LM developed subsystems, yaw drive system (YDS) and a variable pitch system (VPS). With these two solutions, the turbine can rotate autonomously around its base and always faces the tidal flow. As the pitch angle of the turbine blades also adjusts, the power generation can be optimised in a particular tidal stream.

Lockheed Martin Energy vice-president Frank Armijo said: "Tidal turbines must be highly reliable and resilient to withstand and operate within the tough environment of a sea floor. "With innovations in advanced manufacturing and materials, and experiences gained in the design and production of undersea systems, space projects and aeronautics, we're now helping to make tidal energy more reliable and effective."

Atlantis aims to deploy nearly 270 turbines to generate about 400MW of energy. Lockheed Martin and Atlantis collaborated in 2013 to develop technology, components and projects in the tidal power sector on a global basis, beginning with the AR1500 turbine.

Source: http://www.power-technology.com

New biofuel cell with energy storage

Researchers at the Ruhr-Universität Bochum, Germany, and the Swedish Malmö University, Sweden, have developed a hybrid of a fuel cell and capacitor on a biocatalytic basis. With the aid of enzymatic processes, what's known as a biosupercapacitor efficiently generates and stores energy. The trick: the enzymes are embedded in a stable polymer gel, which can store a large amount of energy. Generating energy and saving it with as little loss as possible is one of the major challenges for today's society.

Energy production and storage usually take place in different systems – which is inefficient. This is different in the new biosupercapacitor, which combines both processes. "Such a technology could, for instance, be interesting for miniaturised devices, which should even supply themselves with energy wirelessly. This is particularly important for implantable miniaturised sensors," said Dr. Wolfgang Schuhmann, from the Bochum Institute for Analytical Chemistry.

With the aid of an enzyme, the biosupercapacitor burns glucose as a fuel at one electrode. At the other electrode, an enzyme converts oxygen into water. Both enzymes must be embedded in an electron-conducting gel in order to establish the electrical contact to the electrodes. For the first time, the team used the same gel, also called a redox polymer, for both electrodes. When charging up and storing the energy, this redox polymer at one electrode gives off electrons and is thus positively charged.

Source: https://www.sciencedaily.com

Platinum-based catalysts for fuel cells

Scientists from the U.S. Department of Energy's (DOE) Brookhaven National Laboratory (BNL), California State University (CSU), the United States, Soochow University, China, Peking University, China, and Shanghai Institute of Applied Physics (SINAP), China, have developed catalysts that can undergo 50,000 voltage cycles with a negligible decay in their catalytic activity and no apparent changes in their structure or elemental composition. The catalysts are "nanoplates" that contain an atomically ordered Pt and lead (Pb) core surrounded by a thick uniform shell of four Pt layers.

To date, the most successful catalysts for boosting the activity of the oxygen reduction reaction (ORR) – a very slow reaction that significantly limits fuel cell efficiency – have been of the Pt-based core-shell structure. However, these catalysts typically have a thin and incomplete shell (owing to their difficult synthesis), which over time allows the acid from the fuel cell environment to leach into the core and react with the other metals inside, resulting in poor long-term stability and a short catalyst lifetime.

"The goal is to make the ORR as fast as possible with catalysts that have the least amount of platinum and the most stable operation over time. Our PtPb/Pt catalysts show high ORR activity and stability – two parameters that are key to enabling a hydrogen economy – placing them among the most efficient and stable bimetallic catalysts reported for ORR," said Dong Su, at BNL, who led the electron microscopy work to characterize the nanoplates.

Source: https://www.bnl.gov

Researchers optimize fuel cells

Researchers at Amirkabir University of Technology (AUT), Islamic Republic of Iran, have developed a kind of nano membrane that considerably improves the performance of direct-methanol fuel cells (DMFCs). Direct-methanol fuel cells or DMFCs are a recent addition to fuel cell technologies which convert methanol into electrical energy directly and without combustion and with virtually no pollution. DMFCs are widely used in mobile electronic devices, chargers and portable power packs. One key component in DMFC is the proton exchange membrane (PEM).

"The study was an attempt to improve the efficiency of the PEMs through the use of magnetic iron oxide nanoparticles. One of the important factors for improving the efficiency of membranes used in the DMFC was the improvement of proton channels in these membranes," said Hossein Beighadi, at AUT. According to Beighadi, the modification of the surface of sulfonated graphene nanosheets by the use of magnetic iron oxide nanoparticles and application of a magnetic field led to the orientation of these nanosheets.

"Results of the research show the membrane containing oriented nanosheets has a better proton conductivity, as well as a higher mechanical and thermal strength compared to a random membrane," Beighadi said. These membranes have an extensive application in fuel cell industry, and thus can be used in all fields related to energy and electricity generation for cities, industries, military, transport and portable devices such as cellular phones and laptops.

Source: http://www.en.mehrnews.com

Graphene-based catalyst for fuel cells

Researchers at CSIR-Central Electrochemical Research Institute (CSIR-CECRI), Tamil Nadu, India and Mahatma Gandhi University, Kerala, India, have developed a graphene catalyst which has potential for making fuel cells. The silver-nanowire-decorated boron-doped graphene catalyst that helps convert electrochemical energy to electricity. An important reaction in fuel cells is the oxygen reduction reaction, which is often slow. The need for platinum-based catalysts also makes fuel cells expensive.

To prepare a cheap and efficient catalyst, scientists deposited silver nanowire on boron-doped graphene sheets. They then tested its efficiency in speeding oxygen reduction reaction in fuel cells. The catalyst-incorporated fuel cells showed a very high onset potential and current density. Its efficiency was comparable to that of commercially available platinum-based catalysts. The catalyst contained porous channels which allowed the transport of oxygen gas and hydroxyl ions during the reaction.

It also exhibited stability over a period of seven hours with a low yield of hydrogen peroxide known to disrupt oxygen reduction reaction in fuel cells. "The method provides a way to develop a low-cost and thermally stable catalyst as an efficient alternative to platinum-based fuel-cell catalysts," said Subbiah Alwarappan from the CSIR-CECRI.

Source: http://www.natureasia.com

New fuel-cell membranes

A research team led by Professor Lee Young-moo, at Hanyang University, Republic of Korea, has developed fuel-cell membranes that can operate in high-temperatures and low-humidifying conditions. This groundbreaking development is projected to change the currently stagnant fuel-cell membrane research paradigm. When subsequently commercialised, the new fuel-cell membrane is expected to drastically lower the current price of hydrogen fuel-cell membranes, a main component of hydrogen fuel-cell cars, to one-tenth of what it is today.

In addition, this fuel-cell membrane is anticipated to be applied to reverse electrodialysis, a technology that harvests energy from the sea. During the research, researchers applied intermediate temperature plasma on the membrane surface, where fluorinated oligomer hydrocarbon molecules are transported, to form nanocracks. The interest lies in that the researchers developed the world's first membrane that even under high temperatures (120 ˚C) and low-humidifying (35%) conditions, hydro ion conductivity is higher and fuel-cell function lasts longer.

Source: http://www.qswownews.com

Alternative fuel cell technology

Scientist Yushan Yan from the University of Delaware, the United States, believes that fuel-cell vehicles are the way to go, because they best preserve the advantages of gasoline automobiles: low upfront cost, long driving range and fast refueling. But he also believes that a new fuel-cell technology may be necessary. For Yan, that approach is a new twist on traditional fuel cells, known as proton exchange membrane fuel cells, or PEMFCs, which rely on costly platinum-based catalysts.

Yan and his research team are pursuing an alternative technology, the hydroxide exchange membrane fuel cell (HEMFC), because of its inherent cost advantages. He sees the rationale for this proposed switch as a matter of very simple arithmetic. Yan views as a roadmap to a unified strategy for HEMFC zero-emission cars based on three arguments.

"First, to become a commercial reality, fuel-cell engines have to be at cost parity with their gasoline counterparts and moving from an acid platform with the PEMFC to a base system with the HEMFC will enable a collateral benefit in bringing down all of the associated costs, said," said Yan. Finally, Yan warns that it is insufficient just to have a lower cost.

Source: https://www.sciencedaily.com

Bacteria-fueled power cell

Researchers at Binghamton University and State University of New York, the United States, have developed the next step in microbial fuel cells (MFCs) with the first micro-scale self-sustaining cell, which generated power for 13 straight days through symbiotic interactions of two types of bacteria. In a cell chamber about one-fifth the size of a teaspoon – 90 microliters – researchers placed a mixed culture of phototrophic and heterotrophic bacteria. Phototrophic bacteria uses sunlight, carbon dioxide, and water to make its own energy, while heterotrophic bacteria must "feed" on provided organic matter or phototrophic bacteria to survive. While the cell was exposed to sunlight, an initial dose of "food" was added to the chamber to stimulate growth of the heterotrophic bacteria. Through cellular respiration, the heterotrophic bacteria produced carbon dioxide waste, which was used by the phototrophic bacteria to kickstart the symbiotic cycle.

Source: https://www.sciencedaily.com

Efficient way to generate hydrogen

Professors Jae Sung Lee, and Ji-Wook Jang, at Ulsan National Institute of Science and Technology (UNIST), Republic of Korea, in collaboration with Dr. Roel van de Krol, at the Helmholtz-Zentrum Berlin, Germany, has developed a new method using an artificial leaf to efficiently convert sunlight into fuel in a move that could help reduce carbon emissions. The new method does not generate carbon dioxide (CO_2) emissions by using the hydrogen produced by the artificial leaf.

"We aim to achieve 10 percent enhanced light harvesting efficiency within three years. This technology will greatly contribute to the establishment of the renewable-energy-type hydrogen refueling station by supplying cheap fuel for hydrogen fuel cell vehicles," said Lee. In the study, the researchers presented a hetero-type dual photoelectrodes, where two photoanodes of different bandgaps are connected in parallel for extended light harvesting. The study has been published in *Nature Communications*.

The new artificial leaf will mimic the natural process of underwater photosynthesis of aquatic plants to split water into hydrogen and oxygen, which can be harvested for fuel. The groundbreaking technique is expected to contribute to several countries in continued efforts to reduce carbon emissions in accordance with the Paris Agreement on climate change. The hydrogen produced could also be used as a cheap and stable hydrogen fuel for hydrogen fuel cell vehicles.

Source: http://www.rdmag.com

Hydrogen at much lower temperature

Researchers at Waseda University, Japan, have developed a new method for producing hydrogen, which is fast, irreversible, and takes place at much lower temperature using less energy. This innovation is expected to contribute to the spread of fuel cell systems for automobiles and homes. The group led by Professor Yasushi Sekine, at Waseda University, developed a method which allows hydrogen extraction at temperatures as low as 150~200°C.

This shift greatly reduces energy input needed to produce hydrogen fuel, extends catalyst life, reduces the cost of construction materials, and reduces complexity of heat-management (cooling) systems. Although the research group had already seen that a fast reaction would be possible even in the range of 150~200°C by applying a weak electric field (surface protonics), the mechanism had not been fully understood.

In this research, the group is the first to explain the mechanism by observing the catalyst during reaction. Protons move quickly through water adsorbed on the catalyst's surface, and protons' surface "hopping" allows reaction to proceed at low temperatures. Furthermore, the collision of the protons and the adsorbates prevents reversal of the reaction. As momentum grows for the commercialization of hydrogen, this research is not only applicable to hydrogen production, but also to many consumer products.

Source: https://www.sciencedaily.com

Safe and inexpensive hydrogen production

A research team led by Kiyotomi Kaneda and Takato Mitsudome at Osaka University, Japan, have now developed a catalyst that realizes efficient environmentally friendly hydrogen production from organosilanes. The catalyst is composed of gold nanoparticles with a diameter of around 2 nm supported on hydroxyapatite. The catalyst was synthesized from chloroauric acid using glutathione as a capping agent to prevent nanoparticle aggregation, resulting the formation of small size of gold nanoparticles.

Glutathione-capped gold nanoparticles were then adsorbed on hydroxyapatite and glutathione was removed by subsequent calcination. The team then added the nanoparticle catalyst to solutions of different organosilanes to measure its ability to induce hydrogen production. The nanoparticle catalyst displayed the highest turnover frequency and number attained to date for hydrogen production catalysts from organosilanes.

For example, the nanoparticle catalyst converted 99% of dimethylphenylsilane to the corresponding silanol in just 9 min at room temperature, releasing an equimolar amount of hydrogen gas at the same time. Importantly, the catalyst was recyclable without loss of activity. On/off switching of hydrogen production was achieved using the nanoparticle catalyst because it could be easily separated from its organosilane substrate by filtration. The activity of the catalyst increased as the nanoparticle size decreased.

Source: https://www.sciencedaily.com

Better way to make renewable hydrogen

Scientists at the U.S. Department of Energy's National Renewable Energy Laboratory (NREL) have developed a method which boosts the longevity of high-efficiency photocathodes in photoelectrochemical

water-splitting devices. Using a photoelectrochemical (PEC) device is a promising way to produce hydrogen. A PEC cell absorbs sunlight and converts that energy into hydrogen and oxygen by splitting water molecules.

Unfortunately, high efficiency devices developed to date quickly degrade in the acidic solution to which the cell is exposed. The challenge of making a more durable cell must be overcome before renewable hydrogen from PEC devices can become commercially viable. The concept of using an integrated tandem cell based on the NREL high-efficiency tandem solar cell to split water and produce hydrogen was developed 18 years ago by John Turner, who has been with the laboratory since 1979.

Turner designed a tandem solar cell containing layers of gallium indium phosphide (GaInP2) and gallium arsenide (GaAs) semiconductors to absorb the sunlight and produce the power necessary for the photoelectrochemical water-splitting reaction. This describes how NREL researchers determined that greater photocathode stability and high catalytic activity can be achieved by depositing and annealing a bilayer of amorphous titanium dioxide (TiOx) and molybdenum sulfide (MoSx) onto GaInP2.

Source: https://www.eurekalert.org

Solar powered hydrogen production

Researchers have developed an artificial leaf that mimics underwater photosynthesis of aquatic plants to split water into hydrogen and oxygen. Their findings, bring the efficiency of metal oxide-based hydrogen generation one step closer to practical applications. Led by Professors Lee Jae Sung and Jang Ji-Wook of the Ulsan National Institute of Science and Technology (UNIST), Republic of Korea, the team used two photoanodes of different bandgaps connected in parallel for extended light harvesting.

This design was inspired by marine plants which do not receive the full spectrum of sunlight under the sea. The dual photoanode silicon solar cell had a water splitting efficiency of 7.7 percent, close to the 10 percent target required for solar-powered hydrogen production to be practical. “We aim to achieve ten percent enhanced light harvesting efficiency within three years. This technology will greatly contribute to the establishment of the renewable-energy-type hydrogen refueling station by supplying cheap fuel for hydrogen fuel cell vehicles,” said Lee.

Source: https://www.asianscientist.com

Material to better store hydrogen fuel

A researcher at Florida State University (FSU), the United States, has designed new materials that could be used to store hydrogen fuel more efficiently in vehicles or other devices that use clean energy. Using complex mathematical equations and computer simulations, Jose Mendoza-Cortes, at FSU, designed porous materials of transition metals – compounds involving cobalt, iron or nickel – that cause hydrogen to bond with it.

This next-generation design could then be placed in a tank of a car that uses hydrogen for fuel. These new materials are made of Earth abundant elements and therefore are easily available. Mendoza-Cortes designed 270 compounds through these simulations and then tested their performance for hydrogen storage.

The idea is that since hydrogen will bind to the actual device, more hydrogen could be packed in and condensed into a tank. Because the hydrogen easily sticks to the device, the tank would never actually reach empty. Additionally, he found it would take a smaller energy expenditure to fill up the tank. “In other words, more hydrogen can be stored at lower pressures and room temperature, making some of these materials good for practical use,” said Mendoza-Cortes.

Source: https://www.phys.org

Hydrogen from ammonia

A team of researchers with Princeton University, the United States, has found a way to weaken the strong bonds between the nitrogen and hydrogen atoms in ammonia molecules while simultaneously releasing a single hydrogen atom to create hydrogen gas. In their paper published in the journal *Science*, Máté Bezdek, Sheng Guo and Paul Chirik describe the process and the likelihood of using it as a new hydrogen source.

In this new effort, the researchers have found an efficient means for doing so that not only weakens the bond, but also causes the release of one of the hydrogen atoms making it available to bond with another to create hydrogen gas. The new process involves using an ammonia-bound terpyridine bis(phosphine) molybdenum(I) cation, because it is both electron rich and positively charged. In so doing, the nitrogen–hydrogen bond is cleaved homolytically, resulting in a lone hydrogen atom and an M–N bond

Source: https://www.phys.org

Solid catalysts for biodiesel production

Researchers at PolyU, China, have thus adopted precise surface chemistry engineering to develop a new class of solid catalyst for use in biodiesel production. This new catalyst for green biodiesel can be synthesized in one step from low-grade unrefined feedstock such as waste cooking oil, with no aqueous treatment steps required.

Ethanol or propanol extracted from plants can also be used to replace methanol in the synthesis to avoid the usual intense reliance on petroleum. With high catalytic activity, the catalyst can operate at significantly lower temperatures and pressures than existing solid biodiesel catalysts, and be reused more than 30 times.

Source: http://www.biofuelsdigest.com

Waste gas into biofuel

Researchers at Ulsan National Institute of Science and Technology (UNIST), Republic of Korea, have developed a new way to turn captured carbon dioxide (CO_2) into liquid biofuel capable of powering vehicles. The new catalyst is derived from delafossite, an abundant copper iron oxide mineral. Adoption of the catalyst allowed scientist to convert CO_2 and H_2 into fuel in a single step. Researchers have detailed their newly developed process in the journal *Applied Catalysis B: Environmental*.

"Diesel fuels have longer chain of carbon and hydrogen atoms, compared to mathanol and methane. Using delafossite-$CuFeO_2$ as the catalyst precursor, we can create longer carbon chains and this would allow for the production of diesel," said Yo Han Choi, at UNIST. Researchers derived their new conversion process from one developed by German carmaker Audi, and improves on a process called CO Fisher-Tropsch synthesis.

Scientists said that the new process can be used to clean the air and provide alternative fuel. The CO_2 can be provided by carbon capture technologies, while H_2 can be sourced from solar water splitting waste.

Source: http://www.upi.com

Biofuel from common aquatic weeds

Scientists at Indian Institute of Technology (IIT) – Kharagpur, India, have unlocked the secret to ramp up yields of biofuel sourced from commonly found aquatic weeds such as water hyacinths. In a new study published in *Nature Scientific Reports*, researchers have shown that this weed – which contains up to 50 percent hemicelluloses – can now be used as an economic and abundant source of biofuel. "We showed that the secret to rapidly producing soluble sugars from amorphous natural polymers such as hemicelluloses lies in their smallest scale-the pores," said Saikat Chakraborty, at IIT – Kharagpur.

Chakraborty and Sajal Kanti Dutta have uncovered the pore-scale phenomena that result in "fourfold increase in the yields of fermentable sugars and bioethanol" from hemicelluloses. "It turns out that three quarters of the soluble sugars we obtain for generation of bioethanol are produced from the pore-scale reactions. So increasing the polymer's porosity and degree of swelling will enhance the deconstruction of hemicelluloses from plant cell walls, thus increasing bioethanol," added Chakraborty.

Source: http://www.tech.firstpost.com

Sewage into biofuel

According to a new research conducted at the Department of Energy's Pacific Northwest National Laboratory (PNNL), the United States, wastewater treatment plants across the US may one day turn ordinary sewage into biocrude oil. The technology, hydrothermal liquefaction, mimics the geological conditions the Earth uses to create crude oil, using high pressure and temperature to achieve in minutes something that takes Mother Nature millions of years.

The resulting material is similar to petroleum pumped out of the ground, with a small amount of water and oxygen mixed in. This biocrude can then be refined using conventional petroleum refining operations. The approach being studied by PNNL eliminates the need for drying required in a majority of current thermal technologies which historically has made wastewater to fuel conversion too energy intensive and expensive. HTL may also be used to make fuel from other types of wet organic feedstock, such as agricultural waste.

Using hydrothermal liquefaction, organic matter such as human waste can be broken down to simpler chemical compounds. The material is pressurized to 3,000 pounds per square inch—nearly 100 times that of a car tire. Pressurized sludge then goes into a reactor system operating at about 660 degrees Fahrenheit. The heat and pressure cause the cells of the waste material to break down into different fractions – biocrude and an aqueous liquid phase.

Source: http://www.biomassmagazine.com

RECENT PUBLICATIONS

Levelised Cost of Electricity of Selected Renewable Technologies in the ASEAN Member States

The study analyses levelised cost of electricity (LCOE) of selected renewable energy (RE) technologies in several ASEAN Member States (AMS), and advises necessary policies to reach a significant competitive level of those selected RE technologies, i.e. solar photovoltaic, biomass, hydropower.

Renewable Energy Outlook for ASEAN: A REmap Analysis

The Joint Report (developed by ASEAN Centre for Energy & IRENA with the support of GIZ on behalf of BMZ) looks at ASEAN's renewable energy potentials by applying IRENA's REmap analytical methodology and tools at a country level.

For the above two publications, contact: The ASEAN-German Energy Programme (AGEP), ASEAN Centre for Energy, ACE Building, 6th Fl., Jl. HR. Rasuna Said Block X-2, Kav. 07-08, Jakarta 12950 Indonesia. Tel: +62-21-527-8027; Fax: +62-21-529-6382; E-mail: nandafebriani@aseanenergy.org

Medium-Term Renewable Energy Market Report 2016

This report examines these questions in detail, looking closely at how renewable energy in the power, heat and transportation sectors will evolve over the next five years in the face of lower fossil fuel prices. It explores recent renewable deployment and policy trends across different regions and countries, particularly as costs for wind and solar PV continue to fall.

Renewables Information 2016

This report provides a comprehensive review of historical and current market trends in OECD countries, including 2015 provisional data. It provides an overview of the development of renewables and waste in the world over the 1990 to 2014 period. The publication encompasses energy indicators, generating capacity, electricity and heat production from renewable and waste sources, as well as production and consumption of renewables and waste.

For the above two publications, contact: International Energy Agency Bookshop, 31-35 rue de la Fédération, 75739 Paris Cedex 15, France. Tel: +33-1-4057-6690; Fax: +33-1-4057-6775; E-mail: books@iea.org

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International Photovoltaic Power Generation Conference & Exhibition
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Shanghai 200235, China
Tel: +86-21-6427-6991
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5-7 Apr
Daegu,
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16-18 May
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