

Technology Roundup

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Characterization of Functional Ceramics
& Composites

International Conference on
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FineTech
Water Treatment Technologies



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NITB to Introduce New Version of E-office in Divisions and Organizations

E-office aims to cater to the need for effectiveness and transparency in the Governmental processes and services delivery mechanisms. E-Office, an app developed by NITB, is helping the Government departments to go paperless. It is aimed at improving internal efficiencies in an organization through electronic administration.

The physical file movement of official files and documents consumes a lot of time and requires continuous monitoring from desk to the desk before the final decision is made by the senior officials. Consequently, many crucial decisions get delayed due to the slow movement of files and/or unavailability or absence of the senior officials in the government offices. In addition, the hazard of theft and missing of files is also common in most of the government offices.

The immediate need in such a scenario is to have a system in place where an authorized employee could locate the required documents and/or files in the shortest possible time. E-Office is a step forward into an era of paperless administration in the government offices. It is a digital workplace solution that replaces the existing method of manual handling of files and documents with an efficient electronic system.

The app can update and share files with other relevant users and eventually store them with proper references. The electronic system has its inherent advantages such as data stored digitally with audit trails for every transaction being done. Regular backups and Disaster Recovery systems (DRS) are in place which ensures that the Government files are not damaged in case of any mishap. Key Performance Indicators (KPI's) of E-Office include up to Rs. 300 million savings on stationary, up to 80% operating time-saving and up to 80% increase in efficiency.



Source and image credit:

<https://nitb.gov.pk/ProjectDetail/YTZhM2Q5ZDEtNzAzNy00MjJlWlZNGYtM2ZhM2VkOTFhNDk2>

Chinese Company to Establish Model for Seed Cooperation With Pakistani partner

Chinese seed company is looking forward to establishing a technology transfer-product process-export model for seed cooperation with Pakistani partners. “Under this model, we grow crops in Pakistan utilizing Chinese technology together with local companies and then sell the processed products back to China”, said Zhou Xusheng from Wuhan Qingfa Hesheng Seed Co., Ltd in an interview following a recent salon on market access organized by the National South Asian Standardization (Chengdu) Research Center of China and attended by participants from both Pakistan and China. Take hybrid rice as an example. Pakistan, once the world’s seventh-largest rice exporter, became the fourth-largest after the introduction of hybrid rice from China, which improves production by 50-80% and enhances the process quality by 10%. By doing so, local farmers benefit from rice of higher quality and more production, local enterprises become more competitive in the global market, and huge revenue can be brought, Zhou told China Economic Net (CEN).

The seed company, with nearly two decades experience in promoting hybrid rice in Pakistan, has contributed to the examination of the first Chinese hybrid rice variety QY0413 in Pakistan’s history and developed Komal, the first hybrid rice variety with long growth period in Pakistan. Currently, the company is providing the seeds of hybrid rice, rape, tomato, pepper, and watermelon in Pakistan. Research is also underway in Sindh for heat- and alkaline- resistant rice varieties. But to set up a complete ‘technology transfer-product process-export’ chain, more needs to be done. According to Zhou, to build the model well, first there should be high-quality selected varieties that can be adapted to local conditions in Pakistan. In this regard, Zhou recommends more R&D investment on varieties with good quality, high production, and resilience to local climate. In addition, according to Zhou, a complete rice grading mechanism that distinguishes rice of different quality for different purposes, as well as enhanced awareness of the value of high-quality rice throughout the planting, purchasing, processing, and exporting process are also in need.



Source and photo credit: <https://dailytimes.com.pk/919401/chinese-company-to-establish-model-for-seed-cooperation-with-pakistani-partner/>

Al-Shifa Trust brings latest Technology for Eye treatment

Rawalpindi: Al-Shifa Trust Eye Hospital has introduced a new revolutionary Swiss technology for eye treatment, which will benefit many in Pakistan. Al-Shifa has become the first facility in Asia to use a Femtosecond Laser developed by a Swiss company to carry out Bowmann Layer Transplant for the treatment of Keratoconus, an eye disease that affects the cornea, said Professor Dr. Wajid Ali Khan, Chief of Medical Services of the trust. He said that the latest technology will not only empower our ophthalmologists to deliver better vision care to their patients, but we will also train doctors working in other facilities.

He said that about two hundred thousand people need this procedure but the trust can conduct 800 surgeries annually because of limited supply. With the help of this latest technology, layers of one cornea can be used to treat two to three patients, he said. Senior Engineer of Ziemer Ophthalmic Systems AG Fritz Meyer who was on a visit to Pakistan informed that this treatment takes a very thin layer of the donor's cornea and is placed in a pocket in the patient's diseased cornea suffering. This procedure strengthens the weak cornea, hence avoiding the need for a full cornea transplant. So far, twenty patients have been treated with this technique successfully at Al Shifa Eye hospital, which is encouraging, he added.



Source and photo credit: <https://dailytimes.com.pk/913621/al-shifa-introduces-revolutionary-technology-for-eye-treatment/>

Intercropping-Specific Planter first Applied in Pakistan's Spring sowing

Under the National Research Center for Intercropping jointly established by Sichuan Agricultural Universities and the Islamia University of Bahawalpur, spring sowing in the demonstrative plots of maize-soybean strip intercropping technology was completed.

This season, besides the skyrocketing demonstration area of 400 acres, there's a breakthrough in machinery as well. Planters specifically for intercropping were used and tested for the first time in Pakistan, which will greatly relieve sowing burden faced by local farmers in the future.

This is the fourth year since China's maize-soybean strip intercropping technology was introduced in Pakistan in 2018. This technology makes better use of available space to increase the amount of crops that can be harvested on the same area of land as soybean production is like an added 'bonus', which is helping Pakistan ease soybean shortage and cut soybean imports.

According to Muhammad Ali Raza, Director of National Research Center for Intercropping, post-doc of Sichuan Agricultural University, now the total demonstrative area has surged to over 400 acres, about 2.67 times that of last autumn. More types of crops are being included in the intercropping system. This season, the demonstration of wheat-soybean strip intercropping also has started.

"We have more than 20 demonstrations of 400 acres in Pakistan now, and over 20 farmers have adopted our technology as we know it," Dr. Ali said. Notably, 22 acres of the demonstrative plots were sowed with the newly invented intercropping-specific planter. "Sowing two crops with intercropping technology is always a problem, but now it's not. It is the first-ever intercropping-specific planter in Pakistan, which can adjust or change row distance between intercrops as well as fertilizer application rate," Dr. Ali said.



Source and photo credit: <https://islamabadpost.com.pk/intercropping-specific-planter-first-applied-in-pakistans-spring-sowing/>

PCRWR declares 17 Brands of Mineral Water as Unsafe for Human consumption

The poor quality of drinking water has forced a large cross-section of citizens to buy bottled water. However, many of the mineral water companies were found selling contaminated water. To monitor and improve the quality of bottled water, the government of Pakistan through Ministry of Science and Technology has designated the task for quarterly monitoring of bottled/mineral water brands to PCRWR.

Pakistan Council of Research in Water Resources (PCRWR) in its quarterly water monitoring report declared 17 brands of mineral/bottled water as unsafe for human consumption. For the last quarter (January to March, 2022), 170 samples of Mineral/Bottled water brands were collected from different cities of Pakistan.

Comparison of test results with the permissible limits of Pakistan Standards and Quality Control Authority (PSQCA) has revealed that 17 brands were unsafe for human consumption. Ten brands (City Spring, Aab-e-Noor, ATCO, Doctor, VOLVO Water, Evians Safe Life, Ab-e- Haram, Blue Plus, Blue Ice, ALPHA) were found to be unsafe due to presence of higher levels of sodium. One brand (i.e. Nation Pure Water) was found unsafe due to presence of high level of Arsenic.

Two brands (IMPERIAL, More Plus) were found unsafe due to presence of high level of Potassium than the permissible limit, while, five brands (Hi-Fresh, Supreme Natural, DYLAN Natural, Lasani, Blue Ice) were found microbiologically contaminated and thus were unsafe for drinking purpose.

Sr. No	Contaminant	Diseases Impacts
1.	Bacteriological Contamination	Cholera, Diarrhea, Dysentery, Hepatitis, Typhoid and Gastroenteritis
2.	Sodium	Hypertension, Kidney problem
3.	Potassium	Hyper kalmia
4.	Arsenic	Keratosiis, Hyperkeratosis and Cancer of Skins, Bladder Lung

Diseases caused by the contaminants found in unsafe brands declared by PCRWR.

Source (for present and previous PCRWR bottled water reports):

<https://pcrwr.gov.pk/bottled-water/>

Meta Introduces Special Initiatives for Online Safety of Women in Pakistan

Meta has launched two new initiatives in Pakistan, focused on women's safety online that includes the Online Safety Guide and StopNCII (Non consensual intimate images) to help users to safely navigate cyberspace.

The critical safety advisory available in English and Urdu is expected to boost digital literacy and responsible online behaviour amongst users, thereby creating safer online spaces for women to connect and express themselves without restraints.

The safety guide, now available at Meta's Safety Centre, is part of the company's efforts to equip and prepare users for the challenges of the modern digital world. Millions of people in Pakistan use Meta platforms to connect and pursue shared interests. However, it is always good to update oneself on issues around online harassment, unwanted messages and a range of fraudulent and criminal activities in the online space.

Meta has policies and systems in place to tackle online violence against women, aided by awareness programs to enable and empower them to defend themselves against unscrupulous elements online.

Meta has localised StopNCII into an Urdu portal as well that can be used by users concerned for their online safety and privacy to initiate a case. Once the case is initiated, Meta can proactively block the spread of the compromising images and videos before they can spread online. The technology doesn't require the images to leave the person's device, instead only the hash or numerical code is shared with the platform.

Meta's partner organisation in Pakistan, Digital Rights Foundation (DRF) organised an online roundtable in connection with the launch of the StopNCII portal in Urdu. The participants of the roundtable included representatives from civil society organizations,, regional experts from Meta, digital experts and rights activists.



Source and photo credit: <https://www.techjuice.pk/meta-introduces-special-initiatives-for-online-safety-of-women-in-pakistan/>

Honey Holds Potential for Making Brain-like Computer Chips

Washington State University (WSU) engineers have demonstrated one way to make them more organic too. In a study published in Journal of Physics D, the researchers show that honey can be used to make a memristor, a component similar to a transistor that can not only process but also store data in memory. “This is a very small device with a simple structure, but it has very similar functionalities to a human neuron,” said Feng Zhao, associate professor of WSU’s School of Engineering and Computer Science and corresponding author on the study. “This means if we can integrate millions or billions of these honey memristors together, then they can be made into a neuromorphic system that functions much like a human brain.” For the study, Zhao and first author Brandon Sueoka, a WSU graduate student in Zhao’s lab, created memristors by processing honey into a solid form and sandwiching it between two metal electrodes, making a structure similar to a human synapse. They then tested the honey memristors’ ability to mimic the work of synapses with high switching on and off speeds of 100 and 500 nanoseconds respectively. The memristors also emulated the synapse functions known as spike-timing dependent plasticity and spike-rate dependent plasticity, which are responsible for learning processes in human brains and retaining new information in neurons.

The honey memristor chips developed at WSU should tolerate the lower levels of heat generated by neuromorphic systems which do not get as hot as traditional computers. The honey memristors will also cut down on electronic waste.



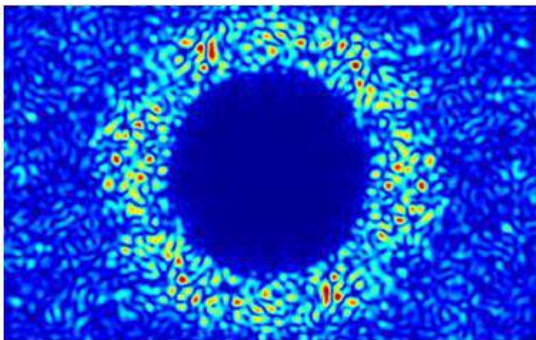
Photo credit: Mariana Ibanez on Unsplash

Source: <https://news.wsu.edu/press-release/2022/04/05/honey-holds-potential-for-making-brain-like-computer-chips/>

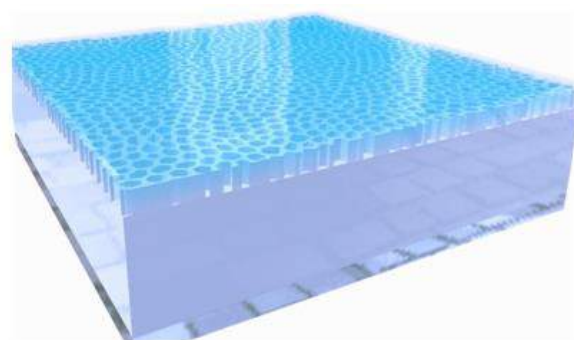
Scientists Achieve Record Efficiency for Ultra-thin Solar Panels

A team co-led by the University of Surrey has successfully increased the levels of energy absorbed by wafer-thin photovoltaic panels by 25%.

Their solar panels, just one micrometer thick ($1\mu\text{m}$), convert light into electricity more efficiently than others as thin and pave the way to make it easier to generate more clean, green energy. In a paper published in the American Chemical Society's Photonics journal, the team detail how they used characteristics of sunlight to design a disordered honeycomb layer which lies on top of a wafer of silicon. Their approach is echoed in nature in the design of butterfly wings and bird eyes. The innovative honeycomb design enables light absorption from any angle and traps light inside the solar cell, enabling more energy to be generated. Dr Marian Florescu from the University of Surrey's Advanced Technology Institute (ATI) said, "One of the challenges of working with silicon is that nearly a third of light bounces straight off it without being absorbed and the energy harnessed. A textured layer across the silicon helps tackle this and our disordered, yet hyperuniform, honeycomb design is particularly successful."



A



B

A: Light scattering from a thin silicon membrane absorbing 65% of sunlight. B: The thin silicon membrane uses a disordered honeycomb layer to maximize the absorption of sunlight (Credit: University of Surrey)

In the laboratory, they achieved absorption rates of 26.3 mA/cm^2 , a 25% increase on the previous record of 19.72 mA/cm^2 achieved in 2017. They secured an efficiency of 21% but anticipate that further improvements will push the figure higher, resulting in efficiencies that are significantly better than many commercially available photovoltaics. As well as benefiting solar power generation, the findings could also benefit other industries where light management and surface engineering are crucial, for example, photo-electrochemistry, solid-state light emission and photodetectors.

Source and photo credit: <https://www.surrey.ac.uk/news/scientists-achieve-record-efficiency-ultra-thin-solar-panels>

Researchers have made Tiny ‘Skyscrapers’ for Communities of Bacteria, Helping them to Generate Electricity from just Sunlight and Water

The researchers, from the University of Cambridge, used 3D printing to create grids of high-rise ‘nano-housing’ where sun-loving bacteria can grow quickly. The researchers were then able to extract the bacteria’s waste electrons, left over from photosynthesis, which could be used to power small electronics. Other research teams have extracted energy from photosynthetic bacteria, but the Cambridge researchers have found that providing them with the right kind of home increases the amount of energy they can extract by over an order of magnitude. The approach is competitive against traditional methods of renewable bioenergy generation and has already reached solar conversion efficiencies that can outcompete many current methods of biofuel generation. Current renewable technologies, such as silicon-based solar cells and biofuels, are far superior to fossil fuels in terms of carbon emissions, but they also have limitations, such as a reliance on mining, challenges in recycling, and a reliance on farming and land use, which results in biodiversity loss.

“Our approach is a step towards making even more sustainable renewable energy devices for the future,” said Dr Jenny Zhang from the Yusuf Hamied Department of Chemistry, who led the research. Zhang and her colleagues from the Department of Biochemistry and the Department of Materials Science and Metallurgy are working to rethink bioenergy into something that is sustainable and scalable. Photosynthetic bacteria, or cyanobacteria, are the most abundant life form on Earth. For several years, researchers have been attempting to ‘re-wire’ the photosynthesis mechanisms of cyanobacteria in order to extract energy from them.

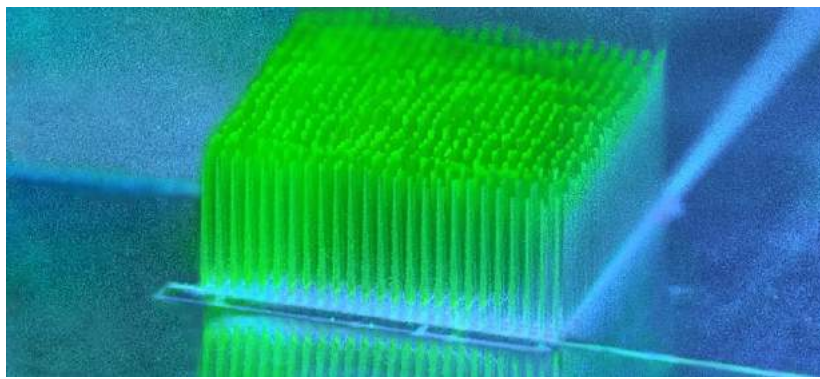


Image credit: (<https://www.cam.ac.uk/research/news/tiny-skyscrapers-help-bacteria-convert-sunlight-into-electricity>)

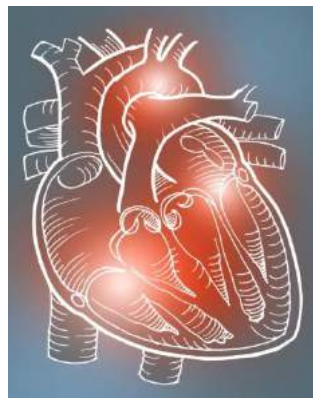
Source: <https://www.cam.ac.uk/research/news/tiny-skyscrapers-help-bacteria-convert-sunlight-into-electricity>

AI Predicts If And When Someone will Experience Cardiac Arrest

An algorithm built to assess scar patterns in patient heart tissue can predict potentially life-threatening arrhythmias more accurately than doctors can.

A new artificial intelligence-based approach can predict if and when a patient could die of cardiac arrest. The technology, built on raw images of patient's diseased hearts and patient backgrounds, significantly improves on doctor's predictions and stands to revolutionize clinical decision making and increase survival from sudden and lethal cardiac arrhythmias, one of medicine's deadliest and most puzzling conditions. "Sudden cardiac death caused by arrhythmia accounts for as many as 20% of all deaths worldwide and we know little about why it's happening or how to tell who's at risk," said senior author Natalia Trayanova, a professor of biomedical engineering and medicine. "There are patients who may be at low risk of sudden cardiac death getting defibrillators that they might not need and then there are high-risk patients that aren't getting the treatment they need and could die in the prime of their life. What our algorithm can do is determine who is at risk for cardiac death and when it will occur, allowing doctors to decide exactly what needs to be done."

The deep learning technology is called Survival Study of Cardiac Arrhythmia Risk, or SSCAR. The name alludes to cardiac scarring caused by heart disease that often results in lethal arrhythmias, and the key to the algorithm's predictions. The team used contrast-enhanced cardiac images that visualize scar distribution from hundreds of real patients at Johns Hopkins Hospital with cardiac scarring to train an algorithm to detect patterns and relationships not visible to the naked eye. Current clinical cardiac image analysis extracts only simple scar features like volume and mass, severely underutilizing what's demonstrated in this work to be critical data.



Source and image credit: <https://hub.jhu.edu/2022/04/07/trayanova-artificial-intelligence-cardiac-arrhythmia/>

Bacteria Generate Electricity from Methane

Generating power while purifying the environment of greenhouse gases should be achievable using bacteria. In a new publication, microbiologists from Radboud University have demonstrated that it is possible to make methane-consuming bacteria generate power in the lab.

The bacteria, *Candidatus Methanoperedens*, use methane to grow and naturally occur in fresh water such as ditches and lakes. In the Netherlands, the bacteria mostly thrive in locations where the surface and groundwater are contaminated with nitrogen, as they require nitrate to break down methane.

The researchers initially wanted to know more about the conversion processes occurring in the microorganism. In addition, they were also curious whether it would be possible to use it to generate power. "This could be very useful for the energy sector," says microbiologist and author Cornelia Welte. "In the current biogas installations, methane is produced by microorganisms and subsequently burnt, which drives a turbine, thus generating power. Less than half of the biogas is converted into power, and this is the maximum achievable capacity. We want to evaluate whether we can do better using microorganisms."

Fellow microbiologists from Nijmegen have previously shown that it is possible to generate power using anammox bacteria that use ammonium during the process instead of methane. "The process in these bacteria is basically the same," says microbiologist Heleen Ouboter. "We create a kind of battery with two terminals, where one of these is a biological terminal and the other one is a chemical terminal. We grow the bacteria on one of the electrodes, to which the bacteria donate electrons resulting from the conversion of methane."



Source and image credit:

<https://www.ru.nl/english/news-agenda/news/vm/iwvr/2022/bacteria-generate-electricity-from-methane/>

New type of Ultraviolet Light Makes Indoor Air as Safe as Outdoors

A new type of ultraviolet light that is safe for people took less than five minutes to reduce the level of indoor airborne microbes by more than 98%, a joint study by scientists at Columbia University Vagelos College of Physicians and Surgeons and in the U.K. has found. Even as microbes continued to be sprayed into the room, the level remained very low as long as the lights were on. The study suggests that far-UVC light from lamps installed in the ceiling could be a highly effective passive technology for reducing person-to-person transmission of airborne-mediated diseases such as COVID and influenza indoors, and lowering the risk of the next pandemic. "Far-UVC rapidly reduces the amount of active microbes in the indoor air to almost zero, making indoor air essentially as safe as outdoor air," says David Brenner, PhD, director of the Center for Radiological Research at Columbia University Vagelos College of Physicians and Surgeons and co-author of the study. Using this technology in locations where people gather together indoors could prevent the next potential pandemic.

"Far-UVC light is simple to install, it's inexpensive, it doesn't need people to change their behavior, and above all it's a safe way to prevent the transmission of any virus, including the COVID virus and its variants, as well as influenza and also any potential future pandemic viruses," Brenner says.



A: Problem

B: Solution

When indoor, people produce virus in the air that others can breathe in (A). Far-UVC light in the ceiling can safely and quickly inactivate almost all the airborne virus (B).

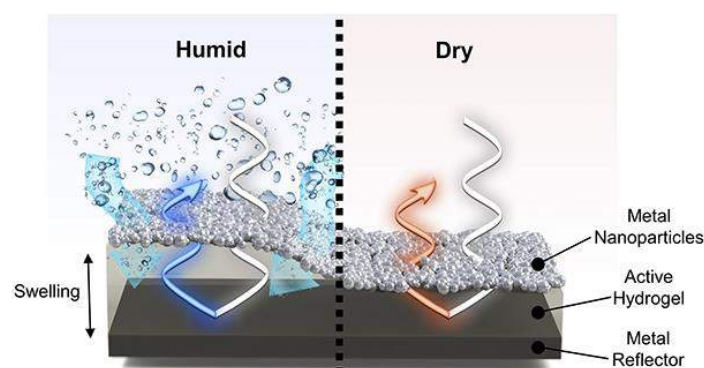
Source and photo credit: <https://www.cuimc.columbia.edu/news/new-type-ultraviolet-light-makes-indoor-air-safe-outdoors>

Real-time Ultrafast Humidity Sensing Optical Sensor

A research team develops a real-time humidity sensing optical sensor. The response time of the new sensor is 10,000 times faster than the conventional sensors and can be mass-produced at low cost. The Hercules beetle native to South America has a fascinating trait of changing its shell colors depending on the external humidity conditions. This is because the inside of the beetle's shell consists of porous lattice structure with square holes. When light of particular wavelengths hits the shell, it reflects them and displays different colors; and these wavelengths change depending on the humidity. Recently, a sensor that changes colors depending on the humidity like this beetle with 10,000 times faster speed than the conventional optical sensors has been proposed.

A POSTECH research team led by Professor Junsuk Rho (Department of Chemical Engineering and Department of Mechanical Engineering) and Ph.D. candidates Chunghwan Jung and Jaehyuck Jang (Department of Chemical Engineering) with others has developed an ultrafast humidity-responsive colorimetric sensor.

Sensors using light are already being used in our daily lives, for electrocardiogram and air quality measurement. These sensors use light to detect changes in their surroundings and convert them into digital signals. "This new humidity sensor is special in that it allows scalability of production at low cost even though nanomaterials and nanostructures were used," explained Professor Rho who led the study. "Introducing the humidity-responsive color pixels into security codes enables application toward security tags for humidity-sensitive electronic devices, banknotes, passports, and ID cards. This study was conducted with the support from the Samsung Research Funding & Incubation Center for Future Technology.



Schematic diagram and the principle behind ultrafast full-color colorimetric humidity sensor.

Source and photo credit: <https://www.postech.ac.kr/eng/real-time-ultrafast-humidity-sensing-optical-sensor/#post-24034>

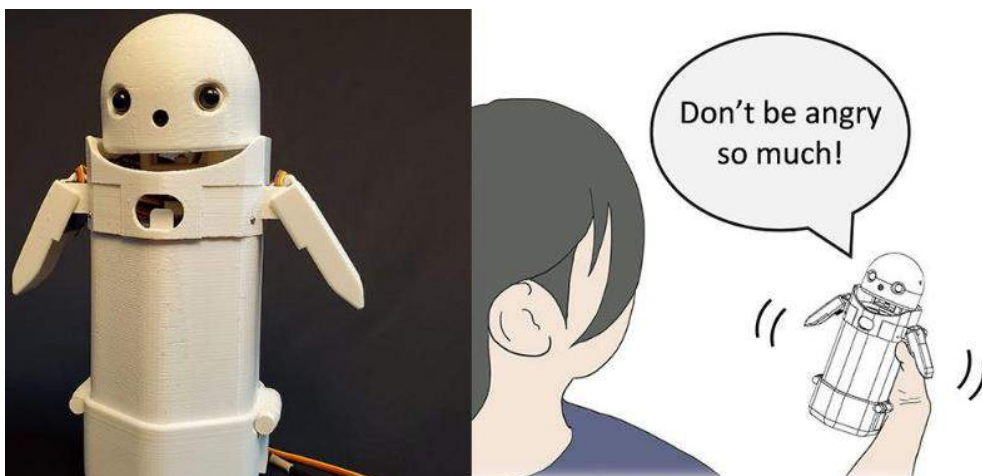
Robot that Seems to Convey Emotion While Reading

Researchers at the University of Tsukuba create a handheld social robot that can appear to convey emotions by shifting an internal weight while reading out text messages, which may help improve digital interpersonal interactions.

Tsukuba, Japan—Scientists from the Faculty of Engineering, Information and Systems at the University of Tsukuba devised a text message mediation robot that can help users control their anger when receiving upsetting news. This device may help improve social interactions as we move towards a world with increasingly digital communications.

While a quick text message apology is a fast and easy way for friends to let us know they are going to be late for a planned meet up, it is often missing the human element that would accompany an explanation face-to-face, or even over the phone. It is likely to be more upsetting when we are not able to perceive the emotional weight behind our friends' regret at making us wait. Now, researchers at the University of Tsukuba have built a handheld robot they called OMOY, which was equipped with a movable weight actuated by mechanical components inside its body.

By shifting the internal weight, the robot could express simulated emotions. The robot was deployed as a mediator for reading text messages. A text with unwelcome or frustrating news could be followed by an exhortation by OMOY to not get upset, or even sympathy for the user. "With the medium of written digital communication, the lack of social feedback redirect focus from the sender and onto the content of the message itself," author Professor Fumihide Tanaka says. The mediator robot was designed so that it can suppress the user's anger and other negative interpersonal motivations, such as thoughts of revenge, and instead fostered forgiveness.



Schematic working demonstration of OMOY

Source and photo credit: <https://www.tsukuba.ac.jp/en/research-news/20220301141500.html>

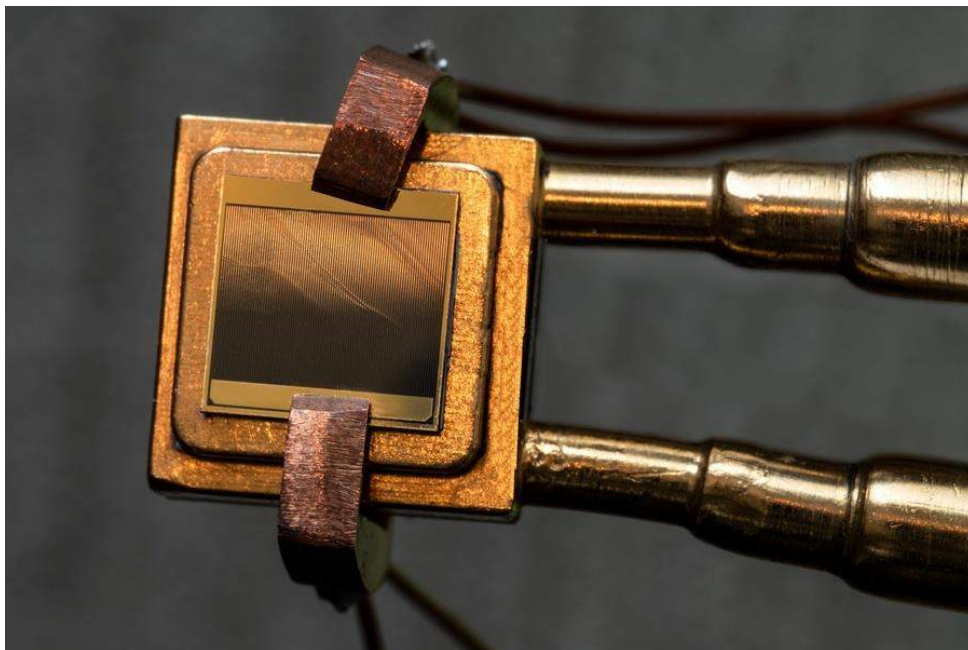
A New Heat Engine with no Moving parts is as Efficient as a Steam Turbine

Engineers at Massachusetts Institute of Technology (MIT) and the National Renewable Energy Laboratory (NREL) have designed a heat engine with no moving parts. Their new demonstrations show that it converts heat to electricity with over 40 percent efficiency — a performance better than that of traditional steam turbines.

The heat engine is a thermophotovoltaic (TPV) cell, similar to a solar panel's photovoltaic cells, that passively captures high-energy photons from a white-hot heat source and converts them into electricity. The team's design can generate electricity from a heat source of between 1,900 to 2,400 degrees Celsius, or up to about 4,300 degrees Fahrenheit.

The researchers plan to incorporate the TPV cell into a grid-scale thermal battery. The system would absorb excess energy from renewable sources such as the sun and store that energy in heavily insulated banks of hot graphite. When the energy is needed, such as on overcast days, TPV cells would convert the heat into electricity, and dispatch the energy to a power grid.

With the new TPV cell, the team has now successfully demonstrated the main parts of the system in separate, small-scale experiments. They are working to integrate the parts to demonstrate a fully operational system. From there, they hope to scale up the system to replace fossil-fuel-driven power plants and enable a fully decarbonized power grid, supplied entirely by renewable energy.



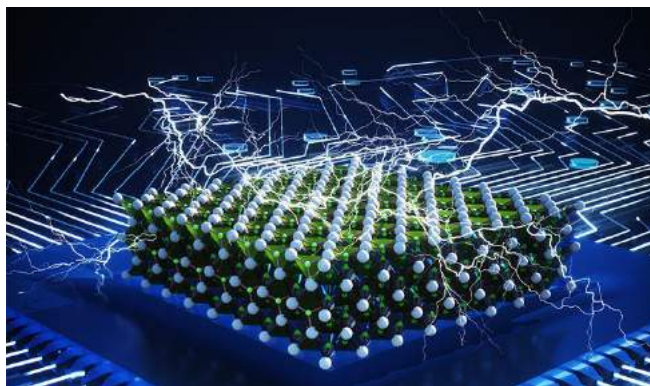
A thermophotovoltaic (TPV) cell (size 1 cm x 1 cm) mounted on a heat sink designed to measure the TPV cell efficiency. To measure the efficiency, the cell is exposed to an emitter and simultaneous measurements of electric power and heat flow through the device are taken.

Source and photo credit: <https://news.mit.edu/2022/thermal-heat-engine-0413>

Engineered Crystals could Help Computers Run on Less Power

Computers may be growing smaller and more powerful, but they require a great deal of energy to operate. The total amount of energy the U.S. dedicates to computing has risen dramatically over the last decade and is quickly approaching that of other major sectors, like transportation. In a study published online this week the journal *Nature*, University of California, Berkeley, engineers describe a major breakthrough in the design of a component of transistors -- the tiny electrical switches that form the building blocks of computers -- that could significantly reduce their energy consumption without sacrificing speed, size or performance. The component, called the gate oxide, plays a key role in switching the transistor on and off.

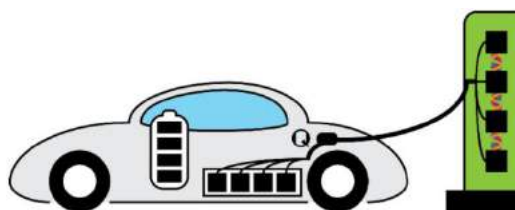
"We have been able to show that our gate-oxide technology is better than commercially available transistors: What the trillion-dollar semiconductor industry can do today -- we can essentially beat them," said study senior author Sayeef Salahuddin, the TSMC Distinguished professor of Electrical Engineering and Computer Sciences at UC Berkeley. This boost in efficiency is made possible by an effect called negative capacitance, which helps reduce the amount of voltage that is needed to store charge in a material. Salahuddin theoretically predicted the existence of negative capacitance in 2008 and first demonstrated the effect in a ferroelectric crystal in 2011. "In the last 10 years, the energy used for computing has increased exponentially, already accounting for single digit percentages of the world's energy production, which grows only linearly, without an end in sight," Salahuddin said. "Usually, when we are using our computers and our cell phones, we don't think about how much energy we are using. But it is a huge amount, and it is only going to go up. Our goal is to reduce the energy needs of this basic building block of computing, because that brings down the energy needs for the entire system."



Source and photo credit: <https://news.berkeley.edu/2022/04/07/engineered-crystals-could-help-computers-run-on-less-power/>

New Technology to Make Charging Electric Cars as Fast as Pumping Gas

Unlike traditional cars which derive energy from the combustion of hydrocarbon fuels, electric vehicles rely on batteries as the storage medium for their energy. Gradual improvement in battery technologies eventually allowed the drive ranges of electric cars to be within acceptable levels in comparison to gasoline-burning cars. Despite the vast improvements in battery technology, today consumers of electric vehicles face another difficulty – slow battery charging speed. This creates additional costs and inconvenience to the customers. To address this problem, scientists looked for answers in the mysterious field of quantum physics. Their search has led to the discovery that quantum technologies may promise new mechanisms to charge batteries at a faster rate. This is particularly exciting as modern large-capacity batteries can contain numerous cells. Such collective charging is not possible in classical batteries, where the cells are charged in parallel independently of one another. The advantage of this collective versus parallel charging can be measured by the ratio called the ‘quantum charging advantage’. Recently, scientists from the Center for Theoretical Physics of Complex Systems within the Institute for Basic Science (IBS) further explored these questions. The group went further to pinpoint the exact source of this advantage while ruling out any other possibilities and even provided an explicit way of designing such batteries. In addition, the group was able to precisely quantify how much charging speed can be achieved in this scheme. While the maximum charging speed increases linearly with the number of cells in classical batteries, the study showed that quantum batteries employing global operation can achieve quadratic scaling in charging speed. To illustrate this, we will consider a typical electric vehicle with a battery that contains about 200 cells. Employing this quantum charging would lead to a 200 times speedup over classical batteries, which means that at home charging time would be cut from 10 hours to about 3 minutes. At high-speed charging stations, the charge time would be cut from 30 minutes to mere seconds.



Source and photo credit:

https://www.ibs.re.kr/cop/bbs/BBSMSTR_000000000738/selectBoardArticle.do?nttId=21132&pageIndex=1&searchCnd=&searchWrd

FORTHCOMING TECH EVENTS**PAKISTAN**

- 2nd International Conference on Physics
May 17-18, 2022, Air University, Islamabad
<https://portals.au.edu.pk/ICP>
- One day International Conference on Chemical and Material Sciences
May 21st 2022, Lahore
<https://uol.edu.pk/event/international-conference-on-chemical-and-material-sciences/>
- 7th International Conference on Climate Smart Agriculture: Innovations and Adaptations
June 15-17, 2022, Rawalakot
<https://upr.edu.pk/csa7/>
- Workshop on Synthesis & Characterization of Functional Ceramics & Composites
June 27-29, 2022, Islamabad
<https://web.uettaxila.edu.pk/downloadFiles/Workshop%20on%20Synthesis%20and%20Charac%20terization%20of%20Functional%20Ceramics%20and%20Composites.pdf>

INTERNATIONAL

- International Conference on Engineering & Technology (ICET-22)
26th May, 2022, Chicago, USA.
<https://iser.org.in/conf/index.php?id=1528752>
- 4th International Conference on Research in Engineering, Technology and Science (ICRETS)
July 01 - 04, 2022, Baku, Azerbaijan
<https://www.2022.icrets.net/>
- The 22nd International Conference on Computational Science and its Applications
July 4-7, 2022, Malaga, Spain.
<https://iccsa.org/>
- Improving Evaluations of R&D in STEM Education 2022
July 11-15, 2022, Chicago, USA.
<https://www.ipr.northwestern.edu/events/workshops-training/improving-evaluations-2022.html>
- 1st European Conference on Engineering & Technology
July 25-30, 2022, Paris, France.
<https://ecetech.org/>
- 23rd IEEE International Conference on Industrial Technology
August 22-25, 2022, Shanghai, China.
<https://2022.ieee-icit.org/#:~:text=IEEE%20ICIT%202022%20will%20be,Huangpu%20River%20flowing%20through%20it.>
- DevRes 2022 Transforming Development Research for Sustainability
August 22-25, 2022, Sweden.
<https://www.devres2022.org/>

TECH AND TRADE OFFERS

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