TECHNOLOGY ROUNDUP

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Tech & Trade Offers

ITTEHAD CHEMICALS LIMITED (ICL)

Forthcoming Tech Events

- Oil & Gas Asia Exhibition & Conference
- International Plastic, Packaging & Print Asia Exhibition
- Food Technology Asia
- 2nd All Pakistan DICE-Textile Innovation Event
- Dawn Pakistan Agri Expo
- MTA Manufacturing Technology Asia Singapore Expo, Singapore
- CIMT 2017 - China International Machine Tool Show, China
- EASTEC 2017, USA

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Indigenous Technology

Beneficiation Studies on Low-Grade Complex Polymetallic Lead-Zinc Ore of Duddar (Lasbela) Balochistan, Pakistan

A bench-scale beneficiation study was performed on low-grade complex lead-zinc ore of Duddar area, District Lasbela, Balochistan Province, Pakistan. The polymetallic ore under investigation contains galena and sphalerite as valuable minerals of lead and zinc. The low-grade ore was upgraded by selective sequential froth flotation technology to recover both minerals. An effort was made to investigate the effect of important variables on grade and recovery of concentrates and to design the process flow sheet. Different parameters of flotation process such as particle size of the feed, pH and % solids of the pulp, speed of impeller, type of reagents (collectors, frothers, regulators and modifiers) and their quantities, conditioning time and flotation time were optimized to attain maximum grade and recovery of respective concentrates. The rougher concentrates obtained were subjected to one regrinding and two cleaning operations to achieve higher-grade concentrates of both metals. Bench-scale flotation tests show that it is possible to obtain a lead concentrate assaying 65.24% Pb with recovery rate of 81.32% and a zinc concentrate containing 55.63% Zn content with recovery rate of 80.28%. Both the concentrates meet the specifications required for metallurgical and chemical grades.

Source:

Muhammad Arif Bhattia, Kamran Raza Kazmia , Abdul Ahadb , Anila Tabassumc , Rashid Mehmooda and Adnan Akram. Beneficiation Studies on Low-Grade Complex Polymetallic Lead-Zinc Ore of Duddar (Lasbela) Balochistan, Pakistan Pakistan Journal of Scientific and Industrial Research A: Physical Sciences, 2016 59(3): 130-143.

Indigenous Technology

Development of Indirect Spectrophotometric Method for Quantification of Cephalexin in Pure Form and Commercial Formulation Using Complexation Reaction

Simple, accurate and indirect spectrophotometric method was developed for the quantification of cephalexin in pure form and pharmaceutical products using complexation reaction. The developed method is based on the oxidation of the cephalexin with Fe3+ in acidic medium. Then 1, 10- phenanthroline reacts with Fe2+ and a red colored complex was formed. The absorbance of the complex was measured at 510 nm by spectrophotometer. Different experimental parameters affecting the complexation reactions were studied and optimized. Beer's law was obeyed in the concentration range 0.4 -10 μgmL^{-1} with a good correlation of 0.992. The limit of detection and limit of quantification were found to be 0.065 μgmL^{-1} and 0.218 µgmL-1, respectively. The method have good reproducibility with a relative standard deviation of 6.26 % (n = 6). The method was successfully applied for the determination of cephalexin in bulk powder and commercial formulation. Percent recoveries were found to range from 95.47 to 103.87 % for the pure form and 98.62 to 103.35 % for commercial formulations

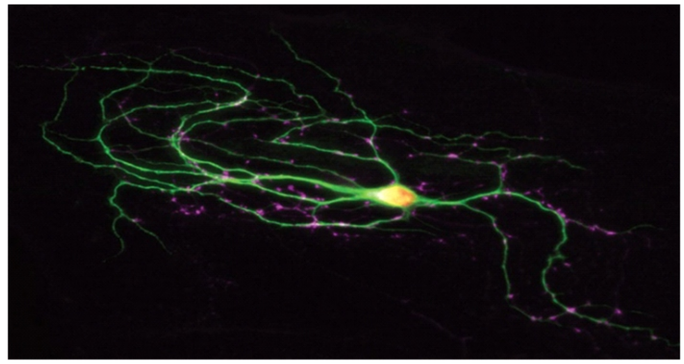
Source:

Muhammad Naeem Khan, Sundus Kalsoom, Rahana Hussain, Zarbad Shah and Muhammad Saadiq. Development of Indirect Spectrophotometric Method for Quantification of Cephalexin in Pure Form and Commercial Formulation Using Complexation Reaction Pakistan Journal of Analytical and Environmental Chemistry, 2016, 17 (2): 118-123

Discovery of New Genetic Disease Mechanism

Scientists at the Max Planck Institute for Experimental Medicine in Göttingen reveal that aberrant synapse protein can lead to neurological and psychiatric disorders. Noa Lipstein-Thoms scientist at the Max Planck Institute for Experimental Medicine in Göttingen has now discovered a new genetic disease mechanism that affects the strength and precise timing of neuronal signals and leads to movement disorders (dyskinesia), attention deficit hyperactivity disorder (ADHD) and autism.

Lipstein-Thoms studies the fundamental mechanisms of signal transmission between neurons. This process takes place at the synapses as they are known. A transmitting neuron triggers the release of a chemical messenger in response to an electrical stimulus. This chemical messenger is recognised by the recipient neuron and converted into an electric signal. A series of regulatory proteins guarantees that this signal transmission process, which is biologically extremely complex, operates with the necessary millisecond precision. The proteins control the release of the messenger at synapses. One of these proteins is known by the cryptic name of Munc13-1.



Our genetic research on mice has shown that Munc13-1 is vital for the transmission of signals at synapses," explains Lipstein-Thoms. "When it is missing, the brain does not function because the messenger is blocked and cannot be released at synapses. The affected mouse dies." Even minor changes to the Munc13-1 protein often has catastrophic consequences because the precise timing of the synaptic signals is lost.

while the changed transmission characteristics of the synapses are rather small, they can explain the complex symptoms in the affected patient," says Lipstein-Thoms, describing the state of her findings. Many neurological and psychiatric medications already target synapses. "We know which process in the patient's synapses is damaged and could even try to correct the hyperactivity of synapses that we have described using medications that are already licensed," explains Lipstein-Thoms. "That would be a wonderful example of how basic research is essential to medical application."

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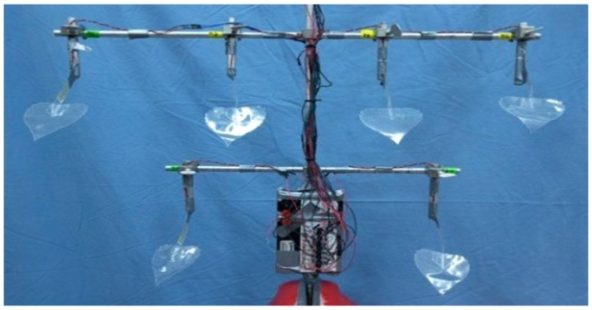
Electricity Generator that Mimics Trees

A prototype biomimetic tree has been built that generates electricity when wind blows through its artificial leaves. The researchers think such technology may help people charge household appliances without the need for large wind turbines. Iowa State University scientists 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. Michael McCloskey, an associate professor of genetics, development and cell biology who led the design of the device, said 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, which may allow off-grid energy harvesting," McCloskey said recently in his ISU laboratory. "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." In a paper published this month in the peer-reviewed academic journal PLOS ONE, 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.



Curtis Mosher, an associate scientist at Iowa State and co-author of the paper, said it's not that great of a leap from the prototype the researchers built to a much more convincing artificial tree with tens of thousands of leaves, each producing electricity derived from wind power. "It's definitely doable, but the trick is accomplishing it without compromising efficiency," Mosher said. "More work is necessary, but there are paths available." 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.

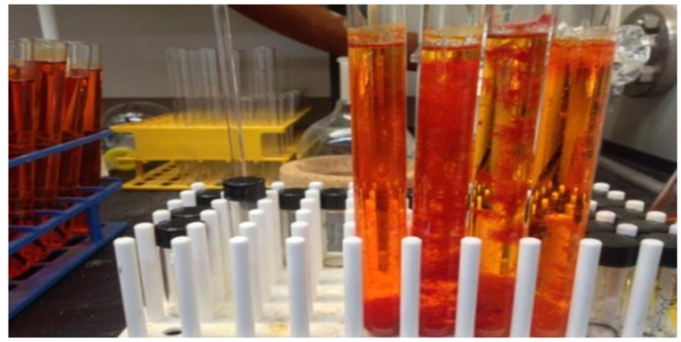
Eric Henderson, a professor of Genetics, development and cell biology who also works on the research team, envisions a future in which biomimetic trees help to power household appliances. Such biomimetic technology could become a market for those who want the ability to generate limited amounts of wind energy without the need for tall and obstructive towers or turbines, Henderson said. But McCloskey said making that vision reality means finding an alternative means of mechanical-to-electrical transduction, or a scheme for converting wind energy into usable electricity. The piezo method adopted for the ISU experiments didn't achieve the efficiency the technology will need to compete in the market. Piezoelectricity was an obvious place to start because the materials are widely available, Henderson said. But taking the next step will require a new approach. Other transduction methods such as triboelectricity, or the generation of charge by friction between dissimilar materials, work at similar efficiency and can power autonomous sensors. However, McCloskey said it will require much greater efficiency -- and further research -- to produce a practical device.

www.sciencedaily.com

Bacteria Fed Synthetic Iron-containing Molecules turn into Electrical Generators

The bacterial world is rife with unusual talents, among them a knack for producing electricity. In the wild, "electrogenic" bacteria generate current as part of their metabolism, and now researchers at the University of California, Santa Barbara (UCSB), have found a way to confer that ability upon non-electrogenic bacteria. This technique could have applications for sustainable electricity generation and wastewater treatment, the researchers report February 9 in the journal Chem

"The concept here is that if we just close the lid of the wastewater treatment tank and then give the bacteria an electrode, they can produce electricity while cleaning the water," says co-first author Zach Rengert, a chemistry graduate student at UCSB. "And the amount of electricity they produce will never power anything very big, but it can offset the cost of cleaning water." The bacteria that inspired this study, Shewanella oneidensis MR-1, live in oxygen-free environments and can breathe in metal minerals and electrodes -- instead of air -- via current-conducting proteins in their cell membranes. Most bacterial species, however, do not have such proteins and therefore naturally do not produce current. Taking inspiration from S. oneidensis' membrane-spanning conductive proteins, the team hypothesized that with the right kind of bio-compatible molecular additive, this electrogenesis might be conferred to bacteria that have not evolved to do so.



The researchers, under the guidance of senior author Guillermo Bazan at UCSB, built a molecule called DFSO+, which contains an iron atom at its core. To add the DFSO+ to bacteria, the researchers dissolved a small amount of the rust-colored powder into water and added that solution to bacteria. Within a few minutes, the synthetic molecule found its way into the bacteria's cell membranes and began conducting current through its iron core, providing a new pathway for the bacteria to shuttle electrons from inside to outside the cell. Because the DFSO+ molecule's shape mirrors the structure of cell membranes, it can quickly slip into the membranes and remain there comfortably for weeks. The approach might need some tweaking before being applied to long-term power generation, the researchers say, but it's an encouraging initial finding.

This chemical approach to changing bacteria's capabilities will most likely be cheaper than bacteria genetically engineered to do the same job. "It's a totally different strategy for microbial electrical energy generation," says the other co-first author, Nate Kirchhofer (@natekirchhofer), formerly a grad student at UCSB and now a postdoctoral researcher at Asylum Research in Santa Barbara, CA. "Before, we were building these devices, and we were limited to optimizing them by changing reactor materials and architectures or using genetic engineering techniques." The researchers call the DFSO+ molecule a "protein prosthetic" because it is a non-protein chemical that does a protein's job. "It's sort of analogous to a prosthetic limb, where you're using a plastic limb that's not actually made out of someone else's body," says Rengert. Understanding how electrogenic bacteria consume organic fuels and use their metabolic processes to generate electric currents could lead to more efficient biological electricity-generating technology. "It's useful to have a well-defined, well-understood molecule that we can interrogate," says Kirchhofer. "We know how it's interfaced with the bacteria, so it gives us very precise electrochemical control over the bacteria. While this molecule might not be the best one that will ever exist, it's the first generation of this kind of molecule."

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Liquid Metal Nano printing set to revolutionize Electronics

A new technique uses liquid metals to create large wafers around 1.5 nanometres in depth to produce integrated circuits for the advancement of electronics, report scientists in a new report. The process opens the way for the production of large wafers around 1.5 nanometres in depth (a sheet of paper, by comparison, is 100,000nm thick). Other techniques have proven unreliable in terms of quality, difficult to scale up and function only at very high temperatures -- 550 degrees or more. Distinguished Professor Kourosh Kalantar-zadeh, from the School of Engineering at RMIT University in Melbourne, Australia, led the project, which also included colleagues from RMIT and researchers from CSIRO, Monash University, North Carolina State University and the University of California. He said the electronics industry had hit a barrier. "The fundamental technology of car engines has not progressed since 1920 and now the same is happening to electronics. Mobile phones and computers are no more powerful than five years ago. "That is why this new 2D printing technique is so important -- creating many layers of incredibly thin electronic chips on the same surface dramatically increases processing power and reduces costs. "It will allow for the next revolution in electronics." Benjamin Carey, a researcher with RMIT and the CSIRO,

said creating electronic wafers just atoms thick could overcome the limitations of current chip production. It could also produce materials that were extremely bendable, paving the way for flexible electronics. "However, none of the current technologies are able to create homogenous surfaces of atomically thin semiconductors on large surface areas that are useful for the industrial scale fabrication of chips.
"Our solution is to use the metals gallium and indium, which have a low melting point. "These metals produce an atomically thin layer of oxide on their surface that naturally protects them. It is this thin oxide which we use in our fabrication method. "By rolling the liquid metal, the oxide layer can be transferred on to an electronic wafer, which is then sulphurised. The surface of the wafer can be pre-treated to form individual transistors. "We have used this novel method to create transistors and photo-detectors of very high gain and very high fabrication reliability in large scale."

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Digital Fabrication in Architecture: The challenge to Transform the Building Industry

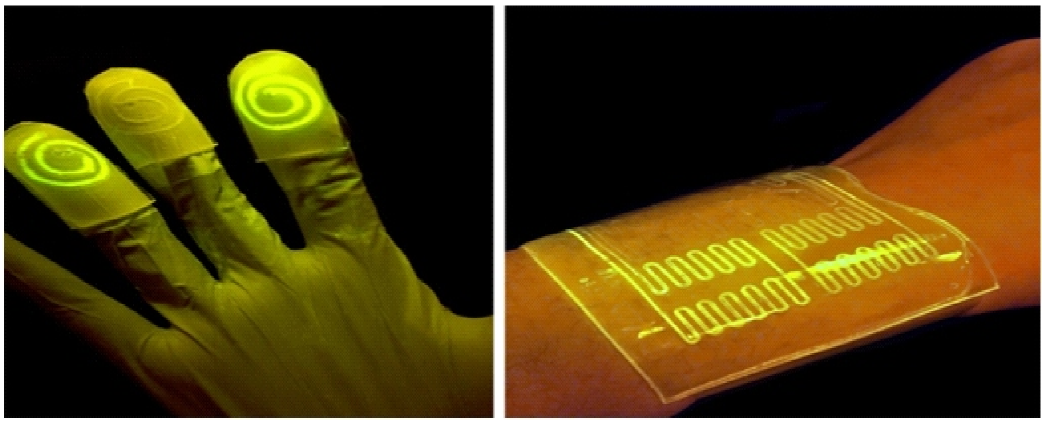
Current research on digital fabrication in architecture indicates that the development and integration of innovative digital technologies within architectural and construction processes could transform the building industry -- on the verge of a building industry 4.0. Digital technologies in architecture and construction could increase productivity creating new jobs. The multidisciplinary nature of integrating digital processes remains a key challenge to establishing a digital building culture. In order to fully exploit the potential of digital fabrication, an institutional and funding environment that enables strong interdisciplinary research is required. Traditionally separated disciplines such as: architecture, structural design, computer science, materials science, control systems engineering, and robotics now need to form strong research connections. During the AAAS 2017 Annual Meeting in Boston, Jonas Buchli, ETH Zurich -- The Swiss Federal Institute of Technology in Zurich, Switzerland, Ronald Rael, University of California, Berkeley, U.S.A., and Jane Burry, RMIT University, Melbourne, Australia reveal the latest developments in digital fabrication in architecture at 1:1 building scale. In their presentations, they show digital technologies can be successfully integrated in design, planning, and building processes in order to successfully transform the building industry.

Jonas Buchli, Assistant Professor for Agile and Dexterous Robotics at ETH Zurich in Switzerland and principal investigator in the Swiss National Centre of Competence in Research (NCCR) Digital Fabrication is proposing a radical focus on domain specific robotic technology enabling the use of digital fabrication directly on construction sites and in large scale prefabrication. Digital computation has freed designers from the constraints of the static 2- and 3- dimensional representational techniques of drawing and physical modelling. Design attributes can be directly linked to extraneous factors: structural or environmental optimization, or fabrication and material constraints. Mathematical design models contain sufficient information even for computer numerical controlled (CNC) fabrication machines and techniques. Most materials currently used in 3D printing, were developed to print small scale objects. Ronald Rael, Associate Professor for Architecture at University of California, Berkeley, U.S.A., reveals how he is developing new materials that can overcome the challenges of scale and costs of 3D printing on 1:1 construction scale. He demonstrates that viable solutions for 3D printing in architecture involve a material supply from sustainable resources, culled from waste streams or consideration of the efficiency of a building product's digital materiality. The methods of such architectural additive manufacturing must emerge from interdisciplinary research.

www.sciencedaily.com

Living Sensors at your Fingertips: Cell-infused Gloves and Bandages Light up when in contact with certain Chemicals.

Researchers have found that the hydrogel's mostly watery environment helps keep nutrients and programmed bacteria alive and active. When the bacteria reacts to a certain chemical, the bacteria are programmed to light up, as seen on the left. Engineers and biologists at MIT have teamed up to design a new "living material" a tough, stretchy, biocompatible sheet of hydrogel injected with live cells that are genetically programmed to light up in the presence of certain chemicals. In a paper published this week in the Proceedings of the National Academy of Sciences, the researchers demonstrate the new material's potential for sensing chemicals, both in the environment and in the human body.



The team fabricated various wearable sensors from the cell-infused hydrogel, including a rubber glove with fingertips that glow after touching a chemically contaminated surface, and bandages that light up when pressed against chemicals on a person's skin. Xuanhe Zhao, the Robert N. Noyce Career Development associate professor of mechanical engineering at MIT, says the group's living material design may be adapted to sense other chemicals and contaminants, for uses ranging from crime scene investigation and forensic science, to pollution monitoring and medical diagnostics. "With this design, people can put different types of bacteria in these devices to indicate toxins in the environment, or disease on the skin," says Timothy Lu, associate professor of biological engineering and of electrical engineering and computer science. "We're demonstrating the potential for living materials and devices." The paper's co-authors are graduate students Xinyue Liu, Tzu-Chieh Tang, Eleonore Tham, Hyunwoo Yuk, and Shaoting Lin. Lu and his colleagues in MIT's Synthetic Biology Group specialize in creating biological circuits, genetically reprogramming the biological parts in living cells such as *E. coli* to work together in sequence, much like logic steps in an electrical circuit. In this way, scientists can reengineer living cells to carry out specific functions, including the ability to sense and signal the presence of viruses and toxins. However, many of these newly programmed cells have only been demonstrated *in situ*, within Petri dishes, where scientists can carefully control the nutrient levels necessary to keep the cells alive and active an environment that has proven extremely difficult to replicate in synthetic materials.

"The challenge to making living materials is how to maintain those living cells, to make them viable and functional in the device," Lu says. "They require humidity, nutrients, and some require oxygen. The second challenge is how to prevent them from escaping from the material."

To get around these roadblocks, others have used freeze-dried chemical extracts from genetically engineered cells, incorporating them into paper to create low-cost, virus-detecting diagnostic strips. But extracts, Lu says, are not the same as living cells, which can maintain their functionality over a longer period of time and may have higher sensitivity for detecting pathogens.

www.news.mit.edu

Forthcoming Tech Events

National

Oil & Gas Asia Exhibition & Conference

March 14-16, 2017
Karachi Expo Center, Karachi
www.ogpoasia.com/

International Plastic, Packaging & Print Asia Exhibition

March 20-22, 2017
Karachi Expo Center in Karachi
Www.foodtechnologyasia.com

Food Technology Asia

March 20-22, 2017
Karachi Expo Center in Karachi
www.agroasia.net/

2nd All Pakistan DICE-Textile Innovation Event

March 28-29, 2017
National Textile University in Faisalabad, Pakistan
Http://ntu.edu.pk

Dawn Pakistan Agri Expo

April 4-5, 2017
Expo Centre Lahore in Lahore, Pakistan
www.agri.dawn.com/

International Events

MTA Manufacturing Technology Asia Singapore Expo, Singapore

April 4 - 7, 2017
www.mta-asia.com

CIMT 2017 - China International Machine Tool Show,

China International Exhibition Center, Beijing, China
April 17 - 22, 2017
Www.cimtshow.com

EASTEC USA 2017,

16-18 May 2017
West Springfield, Massachusetts, USA
www.easteconline.com/

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- **SODIUM HYPOCHLORITE**
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