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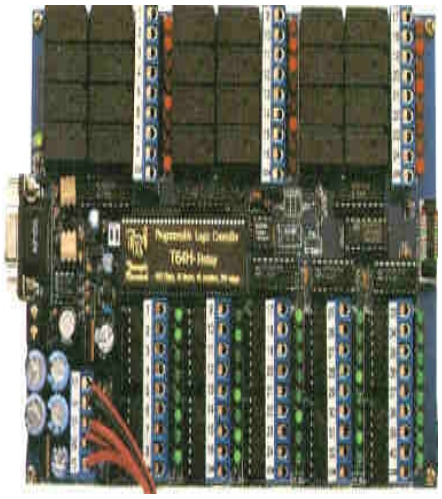
Tech & Trade Offers

The Compact Workhorse: T64H-Relay PLC



Tech News Headlines

- Dairy Wastewater for Electricity Generation
- Mixed Matrix Membranes for CO_2 Separation
- Wireless Power Transfer to Drones during Flight
- The Ultimate Radar Detector
- Fuel Cells with Increased Flexibility and Lower Cost
- Exploding Smartphones: A Silent danger lurking in our Rechargeable Devices
- Nanowires for Biomedical Procedures
- Lightweight Rotor Blades Made from Plastic Foams for Offshore Wind Turbines
- Soft Robots Can Mimic Human Muscles

Forthcoming Tech Events

- International Conference on Innovative Computing Technology
- Frontiers of Information Technology
- 5th Annual Entrepreneurship Conference LEARN. CREATE. LEAD
- 131st International Conferences on Engineering and Natural Science (ICENS)
- The 8th World Congress on Power and Energy Engineering (WCPEE'2016)
- ISER 94th International Conference on Nanoscience, Nanotechnology & Advanced Materials (IC2NAM)
- ISER 106th International Conference on Nanoscience, Nanotechnology & Advanced Materials (IC2NAM
- 7th Annual Congress on Materials Research and Technology

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Indigenous Technology

Dairy Wastewater for Electricity Generation

Global industrialization and rapid rise in the non-sustainable use of fossil resources is increasing the amount of CO2 that enters the atmosphere leading to a warming of the planet and resulting in climate changes. Moreover, rising population and increasing consumption, and land use, have caused a rapid acceleration of climate change over the past twenty years. Parallel to the global warming issues, the rapid depletion of fossil fuels is leading to increased global tension towards resource availability. Most of the human race is striving for growth; development and urbanization, with a corresponding enhance energy requirements.

Microbial Fuel Cells (MFCs) provide a novel bioprocessing strategy to produce sustainable energy and wastewater treatment. It produces electricity and under certain conditions, biogas from biodegradable compounds and simultaneously reduces carbohydrates and complex substrates in wastewater. MFC with saline catholyte is used in this laboratory scale study. Salt-bridge of dimensions of 5 cm length and 2 cm diameter was used in a plastic MFC unit with electrodes manufactured to the same dimensions (5×5). Dairy wastewater was used as the substrate, with its microorganism as the biocatalyst.

The dual chambered MFC was operated at room temperature. The study was carried out in three experiments. In the first experiment, the maximum voltage of 0.36 V and current of 0.35A was generated. In experiment 2 and 3 the maximum voltages were 0.42 V, 0.46 V and maximum current were 0.36A and 0.42A respectively were obtained per liter of the dairy wastewater. The MFC was operated for 7 days while the performance was monitored every 1 hr. The main aspects of MFC research are to produce the cost of treatment as well as simplifying operational or functional conditions. MFCs can be the next generation of fuel cell technology and thus might play an important role in energy conservation, electricity generation, bio-hydrogen production, biosensors and wastewater treatment as well as in alternate fuel utilization using microbes to generate electricity

Courtesy:

NUST Journal of Engineering Sciences, 2015 , 8 (1), 44-50
Anand Parkash*, Shaheen Aziz, Imran Nazir and Suhail A Soomro
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Indigenous Technology

Mixed Matrix Membranes Comprising for CO_2 Separation

The excessive use of fossil fuels such as coal and petroleum products is one of the primary sources of CO2 emissions. CO2 thus emitted is a major contributor to the greenhouse effect of earth, resulting in increase in global warming. Membrane technology is an attractive choice to perform this task due to its many advantages over other separation techniques such as environment friendly, cheap and energy efficient. Mixed matrix membranes (MMMs) comprising of an inorganic filler and a polymer matrix have shown the potential to increase the performance of gas separation membranes. SEM images of cross-sections of MMMs containing (a) 20 and (b) 30% loading of COK-12 particles. In this research, new types of MMMs composed of novel polymer, a fluorinated and sulfonated aromatic poly (ether ether ketone) (FSPEEK) and SO3 functionalized mesoporous silica spheres were prepared by solution casting method. The dispersion of the fillers in the polymer matrix was improved by employing solution blending and probe sonication techniques. The thickness of the membranes was controlled at 50-65 µm. Sulfonated polymers have shown their potential to surpass the Robeson upper bound .

The incorporation of bulky fluorinated groups in the polymer is expected to further increase the separation performance due to inhibition of chain packing and increased steric in Process Industries hindrance. The presence of C2F6 type fluorinated groups improves the fractional free volume by the inhibition of chain packing. These bulky groups also restrict the torsional motion of the polymeric chains and simultaneously increase the rigidity of polymer resulting in strong ability of size sieving. The degree of sulfonation was fixed at 50% for all the synthesized MMMs. CO2 permeation and SEM images of the synthesized MMMs suggest that the fillers adhered well to the polymer matrix. The non-functionalized COK-12 based MMMs showed up to 26% increase in CO2 permeability at 30% filler loading. The selectivity values however decreased upon addition of more COK-12. In contrast, the SO3 functionalized filler showed a 35% and 29% higher CO2/CH4 and CO2/N2 selectivity respectively at the 30 wt. %. This behavior resulted from the increase in the content of polar SO3 sites, the introduction of fixed mesopores by the filler and disruption of chain packing by the addition of fillers. The performance of the synthesized MMMs were also tested under mixed gas conditions to evaluation their commercial application. The results showed slightly lower permselectivity values in comparison to pure gas tests. This was attributed to the competitive sorption effect of the permeating gas molecules. The effect of pressure was also studied to evaluate the plasticization performance. The observed increase in permeability and selectivity along with good anti-plasticization properties make this novel fluorinated and sulfonated polymer with -SO3 based mesoporous COK-12 a promising candidate for gas separation membranes

Courtesy:

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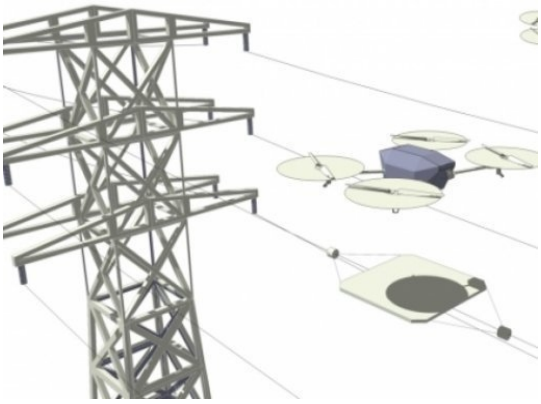
Wireless Power Transfer to Drones during Flight

Scientists have demonstrated a highly efficient method for wirelessly transferring power to a drone while it is flying. The technology uses inductive coupling, a concept initially demonstrated by inventor Nikola Tesla over 100 years ago. Two copper coils are tuned into one another, using electronics, which enables the wireless exchange of power at a certain frequency. Scientists have been experimenting with this technology for decades. Now, scientists from Imperial College London have removed the battery from an off-the-shelf mini-drone and demonstrated that they can wirelessly transfer power to it via inductive coupling. They believe this wireless charging method can be efficiently done with a flying object like a drone, potentially paving the way for wider use of the technology.



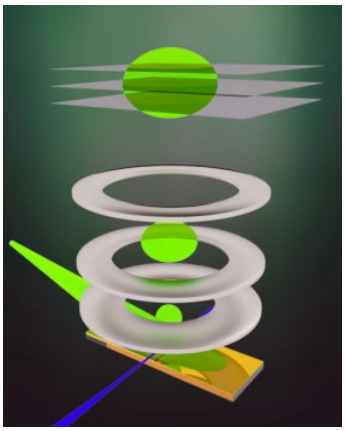
To demonstrate their approach the researchers bought an off-the-shelf quadcopter drone, around 12 centimetres in diameter, and altered its electronics and removed its battery. They made a copper foil ring, which is a receiving antennae that encircles the drone's casing. On the ground, a transmitter device made out of a circuit board is connected to electronics and a power source, creating a magnetic field. The drone's electronics are tuned or calibrated at the frequency of the magnetic field. When it flies into the magnetic field an alternating current (AC) voltage is induced in the receiving antenna and the drone's electronics convert it efficiently into a direct current (DC) voltage to power it. The technology is still in its experimental stage. The drone can only currently fly ten centimeters above the magnetic field transmission source. The team estimate they are one year away from a commercially available product. When commercialized they believe their breakthrough could have a range of advantages in the development of commercial drone technology and other devices.

The use of small drones for commercial purposes, in surveillance, for reconnaissance missions, and search and rescue operations are rapidly growing. However, the distance that a drone can travel and the duration it can stay in the air is limited by the availability of power and re-charging requirements. wireless power transfer technology will solve this, wirelessly transferring power could have also applications in other areas such as sensors, healthcare devices and further afield, on interplanetary missions. Professor Paul Mitcheson, from the Department of Electrical and Electronic Engineering at Imperial College London, said that imagine using a drone wirelessly transmitting power to sensors on things such as bridges to monitor their structural integrity. This would cut humans labour to reach these difficult places to re-charge them.

www.imperial.ac.uk

The Ultimate Radar Detector

The Nesbitt group has invented a nifty technique for exploring the physics and chemistry of a gas interacting with molecules on the surface of a liquid. The group originally envisioned the technique because it is impossible to overestimate the importance of understanding surface chemistry. For instance, ozone depletion in the atmosphere occurs because of chemical reactions of hydrochloric acid on the surface of ice crystals and aerosols in the upper atmosphere. Interstellar chemistry takes place on the surface of tiny grains of dust. And, any time industrial chemists want to react a gas with a liquid or solid, the secret is getting the gas to touch the surface of whatever they want the gas to react with. At the surface of the ocean, wave action generates small little liquid droplets that get popped up into the air. This is why we smell the ocean and, there is a great deal of chemistry occurs at the interfaces of these microscopic to nanoscopic aerosol particles. Nesbitt added that it is even possible that life itself may have originated inside microscopic liquid particles formed early in Earth's history.



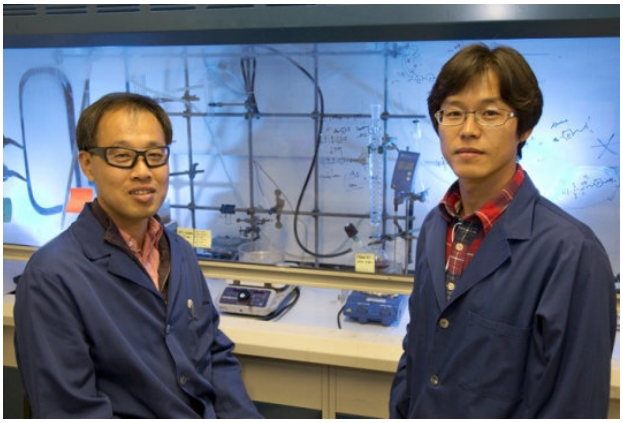
Back in present time, however, the new technique will help the group investigate the complex chemistry that occurs on the surface of liquids. For instance, the technique (which Nesbitt has dubbed the ultimate radar detector) can identify the quantum states of new molecules produced in chemical reactions that occur when a supersonic jet of gas molecules interacts with a liquid-like surface called a self-assembled monolayer, or SAM.

Some neat things about a SAM are that the SAM sways around like a liquid even though it is attached to a solid anchor at one end and it is possible to link different kinds of molecules to it. Different molecules on the SAM will react differently with the same supersonic jet of gas molecules. The new technique is able to not only identify the products of these chemical reactions, but also detect the flight paths and speed of all the molecules that come flying off the SAM. The researchers responsible for inventing the new ultimate radar detection system, which they call Quantum-State Resolved 3D Velocity Map Imaging. Researchers are graduate student Carl Hoffman and Fellow David Nesbitt.

www.jila.colorado.edu

Fuel Cells with Increased Flexibility and Lower Cost

A new class of fuel cells based on a newly discovered polymer-based material could bridge the gap between the operating temperature ranges of two existing types of polymer fuel cells, It will accelerate the commercialization of low-cost fuel cells for automotive and stationary applications. A Los Alamos National Laboratory team, in collaboration with Yoong-Kee Choe at the National Institute of Advanced Industrial Science and Technology in Japan and Cy Fujimoto of Sandia National Laboratories, has discovered that fuel cells made from phosphate-quaternary ammonium ion-pair can be operated between 80°C and 200°C with and without water, enhancing the fuel cells usability in a range of conditions.



The Polymer-based fuel cells are regarded as the key technology of the future for both vehicle and stationary energy systems, There is a huge benefit to running fuel cells at the widest possible operating temperature with water tolerance. But current fuel-cell vehicles need humidified inlet streams and large radiators to dissipate waste heat, which can increase the fuel-cell system cost substantially, so people have looked for materials that can conduct protons under flexible operating conditions. Los Alamos has been a leader in fuel-cell research since the 1970s. Fuel cell technologies can significantly benefit the nation's energy security, the environment and economy through reduced oil consumption, greenhouse gas emissions, and air pollution. The current research work supports the Laboratory's missions related to energy security and materials for the future.

Currently, two main classes of polymer-based fuel cells exist. One is the class of low-temperature fuel cells that require water for proton conduction and cannot operate above 100°C. The other type is high-temperature fuel cells that can operate up to 180°C without water; however, the performance degrades under water-absorbing conditions below 140°C. The research team found that a phosphate-quaternary ammonium ion-pair has much stronger interaction, which allows the transport of protons effectively even under water-condensing conditions. The Los Alamos team collaborated with Fujimoto at Sandia to prepare quaternary ammonium functionalized polymers. The prototype fuel cells made from the ion-pair-coordinated membrane demonstrated excellent fuel-cell performance and durability at 80-200°C, which is unattainable with existing fuel cell technology. The performance and durability of this new class of fuel cells could even be further improved by high-performing electrode materials, within five to ten years that is another critical step to replace current low-temperature fuel cells used in vehicle and stationary applications.

www.lanl.gov

Exploding Smartphones: A Silent Danger Lurking in Our Rechargeable Devices

Dozens of dangerous gases are produced by the batteries found in billions of consumer devices, like smartphones and tablets. The research, published in Nano Energy, identified more than 100 toxic gases released by lithium batteries, including carbon monoxide. The gases are potentially fatal, they can cause strong irritations to the skin, eyes and nasal passages, and harm the wider environment. Many people may be unaware of the dangers of overheating, damaging or using a disreputable charger for their rechargeable devices. In the new study, the researchers investigated a type of rechargeable battery, known as a "lithium-ion" battery, which is placed in two billion consumer devices every year. According to Dr. Jie Sun Nowadays, lithium-ion batteries are being actively promoted by many governments all over the world as a viable energy solution to power everything from electric vehicles to mobile devices. The lithium-ion battery is used by millions of families, so it is imperative that the general public understand the risks behind this energy source. The dangers of exploding batteries have led manufacturers to recall millions of devices: Dell recalled four million laptops in 2006 and millions of Samsung Galaxy Note 7 devices were recalled during this year after reports of battery fires. But the threats posed by toxic gas emissions and the source of these emissions are not well understood.

Dr. Sun and her colleagues identified several factors that can cause an increase in the concentration of the toxic gases emitted. A fully charged battery will release more toxic gases than a battery with 50 percent charge. The chemicals contained in the batteries and their capacity to release charge also affected the concentrations and types of toxic gases released. Identifying the gases produced and the reasons for their emission gives manufacturers a better understanding of how to reduce toxic emissions and protect the wider public, as lithium-ion batteries are used in a wide range of environments.

Such dangerous substances, in particular carbon monoxide, have the potential to cause serious harm within a short period of time if they leak inside a small, sealed environment, such as the interior of a car or an airplane compartment. Almost 20,000 lithium-ion batteries were heated to the point of combustion in the study, causing most devices to explode and all to emit a range of toxic gases. Batteries can be exposed to such temperature extremes in the real world, if the battery overheats or is damaged in some way. The researchers now plan to develop this detection technique to improve the safety of lithium-ion batteries so they can be used to power the electric vehicles of the future safely. They hope this research will allow the lithium-ion battery industry and electric vehicle sector to continue to expand and develop with a greater understanding of the potential hazards and ways to combat these issues.

www.elsevier.com

Nanowires for Biomedical Procedures

Grown like a snowflake and sharpened with a sewing machine, a novel device by Kansas State University researchers may benefit biomedical professionals and the patients they serve during electrode and organ transplant procedures. The device uses gold nanowires and was developed by Bret Flanders, associate professor of physics, and Govind Paneru, former graduate research assistant in physics, to manipulate and sense characteristics of individual cells in medical procedures. The gold nanowires are 1,000 times smaller than a human hair. Conventional surgical tools, including electrodes that are implanted in people's tissue, are unfavorably large on the cellular level, Working at the individual cellular level is of increasing importance in areas such as neurosurgery. Flanders said the size of the nanowires is

what makes their device so unique. Each wire is less than 100 nanometers in diameter. Cells in skin and hair are about 10-20 micrometers in diameter, while red blood cells measure about 7 micrometers. Because the wire is so small, it can pierce a biological cell to stimulate the cell membrane and investigate its interior. The nanowires are electrochemically grown, meaning they do not grow by a lengthening or enlarging an existing wire, but rather by accumulating particles from solution into a new wire. In heavily zoomed video footage the nanowire appears to grow out of the micrometer-thick electrode. Actually, the nanowire forms similarly to how a snowflake is assembled in the sky when water vapor molecules in the air condense onto the surface of pollen or dust and grow non-uniformly until they become a recognizable snowflake. Similar to snowflake formation, the gold atoms condense onto its sharp tip. Like the water condensing onto the snowflake seed, the golden solution condenses onto the gold 'seed,' or the microelectrode. The researchers developed sharp electrodes with an unconventional tool not found in many laboratories: a sewing machine. It is like putting the wire in a pencil sharpener to turn the crank to sharpen it, except we do not do it mechanically with a pencil sharpener it is done with a common salt solution and a sewing machine. This turned out to be the approach that worked the best, and the sewing machine cost only $10 at the Salvation Army. The sewing machine oscillates the microelectrode up and down in a beaker of potassium chloride solution. Application of a voltage dissolves the tip of the microelectrode. The process sharpens the electrode because the tip is in the solution longer than any other point, Instead, dipping the tip in and out causes the tip to dissolve the most, and sharpens it. The sharpened electrode allows the nanowire to grow. The researchers then dismount the nanowire from the electrode and ship it to collaborators across the country, including a nanofabrication company that may incorporate the invention into a pre-existing device to provide it with greater power.

www.k-state.edu

Lightweight Rotor Blades made from Plastic Foams for Offshore Wind Turbines

Offshore wind turbines are becoming ever larger, and the transportation, installation, disassembly and disposal of their gigantic rotor blades are presenting operators with new challenges. Fraunhofer researchers have partnered with industry experts to develop highly durable thermoplastic foams and composites that make the blades lighter and recyclable. The new materials are also suitable for other lightweight structures, for instance in the automotive sector. The trend toward ever larger offshore wind farms continues unabated. Wind turbines with rotor blades measuring up to 80 meters in length and a rotor diameter of over 160 meters are designed to maximize energy yields. Since the length of the blades is limited by their weight, it is essential to develop lightweight systems with high material strength. The lower weight makes the wind turbines easier to assemble and disassemble, and also improves their stability at sea. By Improving the design and materials used, they hope to reduce the weight of the blades and thus increase their service life.

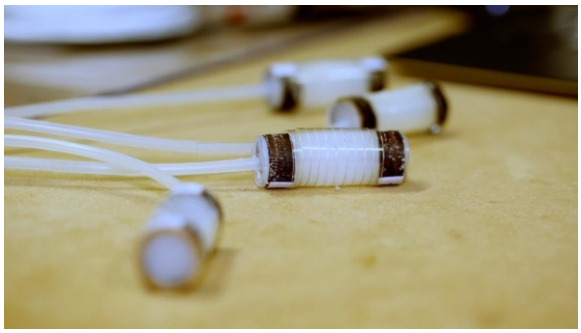
These days, rotor blades for wind turbines are largely made by hand from thermosetting resin systems. These, however, do not permit melting, and they do not suitable for material recycling. At best, granulated thermoset plastic waste is recycled as filler in simple applications. "In the project, they are pursuing a completely new blade design by We are switching the material class and using thermoplastics in rotor blades for the first time. These are meltable plastics that can process efficiently in automated production facilities. The goal is to separate the glass and carbon fibers and to reuse the thermoplastic matrix material. For the outer shell of the rotor blade, as well as for segments of the inner supporting structure, the project partners use sandwich materials made from thermoplastic foams and fiber-reinforced plastics. In general, carbon-fiber-reinforced thermoplastics are used for the areas of the rotor blade that bear the greatest load, while glass fibers reinforce the less stressed areas. For the sandwich core, Researchers are developing thermoplastic foams that are bonded with cover layers made of fiber-reinforced thermoplastics in sandwich design. This combination improves the mechanical strength, efficiency, durability and longevity of the rotor blade.

The ICT foams provide better properties than existing material systems, thus enabling completely new applications for instance in the automotive, aviation and shipping industries. In vehicles, manufacturers have been using foam materials in visors and seating, for example, but not for load-bearing structures. The current foams have some limitations, for instance with regard to temperature stability, so they can not be installed as insulation near the engine. These meltable plastic foams, by contrast, are temperature stable and therefore suitable as insulation material in areas close to the engine. They can permanently withstand higher temperatures than, for example, expanded polystyrene foam (EPS) or expanded polypropylene (EPP). Their enhanced mechanical properties also make them conceivable for use in door modules or as stiffening elements in the sandwich composite. They can be processed quickly and they save material. Yet another advantage is that thermoplastic foams are more easily available than renewable sandwich core materials such as balsa wood. These innovative materials are manufactured in the institute's own foam extrusion plant in Pfinztal. Researchers explain the process. They melt the plastic granules, mix a blowing agent into the polymer melt and foam the material. The foamed, stabilized particles and semi-finished products can then be shaped and cut as desired. In the area of foamed polymers, the ICT foam technologies research group covers the entire thermoplastic foams production chain, from material development and manufacture of extrusion-foamed particles and semi-finished products to process media and finished components.

www.fraunhofer.de

Soft Robots Can Mimic Human Muscles

Robots are usually expected to be rigid, fast and efficient. But researchers at EPFL's Reconfigurable Robotics Lab (RRL) have turned that notion on its head with their soft robots. Soft robots, powered by muscle-like actuators, are designed to be used on the human body in order to help people move. They are made of elastomers, including silicon and rubber, and so they are inherently safe. They are controlled by changing the air pressure in specially designed 'soft balloons', which also serve as the robot's body.



Potential applications for these robots include patient rehabilitation, handling fragile objects, biomimetic systems and home care. The Researchers conducted numerous simulations and developed a model for predicting how the actuators deform as a function of their shape, thickness and the materials. One of the variants consists of covering the actuator in a thick paper shell made by origami. This test showed that different materials could be used. "Elastomer structures are highly resilient but difficult to control. We need to be able to predict how, and in which direction, they deform. And because these soft robots are easy to produce but difficult to model, our step-by-step design tools are now available online for roboticists and students. In addition to these, other RRL researchers have developed soft robots for medical purposes.

This work is described in Soft Robotics. One of their designs is a belt made of several inflatable components, which holds patients upright during rehabilitation exercises and guides their movements. According to Matthew Robertson, the Researcher Incharge of the project are working with physical therapists from the University Hospital of Lausanne (CHUV) who are treating stroke victims. The belt is designed to support the patient's torso and restore some of the person's motor sensitivity. The belt's soft actuators are made of pink rubber and transparent fishing line. The placement of the fishing line guides the modules' deformation very precisely when air is injected. "For now, the belt is hooked up to a system of external pumps. The next step will be to miniaturize this system and put it directly on the belt. Adaptable and reconfigurable robots Potential applications for soft actuators do not stop there. The researchers are also using them to develop adaptable robots that are capable of navigating around in cramped, hostile environments. And because they are completely soft, they should also be able to withstand squeezing and crushing.Using soft actuators, Researchers can come up with robots of various shapes that can move around in diverse environments," They are made of inexpensive materials, and so they could easily be produced on a large scale. This will open new doors in the field of robotics.

www.epfl.ch/index.en.html

Forthcoming Tech Events

National

International Conference on Innovative Computing Technology
22-24, November 2016
Bahawalpur, Pakistan
www.intech-bahawalpur

Frontiers of Information Technology
22-24, November 2016
COMSATS Institute of Information Technology, Pakistan

5th Annual Entrepreneurship Conference LEARN. CREATE. LEAD
2-3 December 2016
Jinnah Convention Center Islamabad
Www.lcl.com.pk/2016/

131st International Conferences on Engineering and Natural Science (ICENS)
29-30 January, 2017
Rawalpindi, Pakistan
/www.Conference2017/Pakistan/1/ICENS/

International Events

The 8th World Congress on Power and Energy Engineering (WCPEE'2016)
5-8 December, 2016
Luxor, Egypt

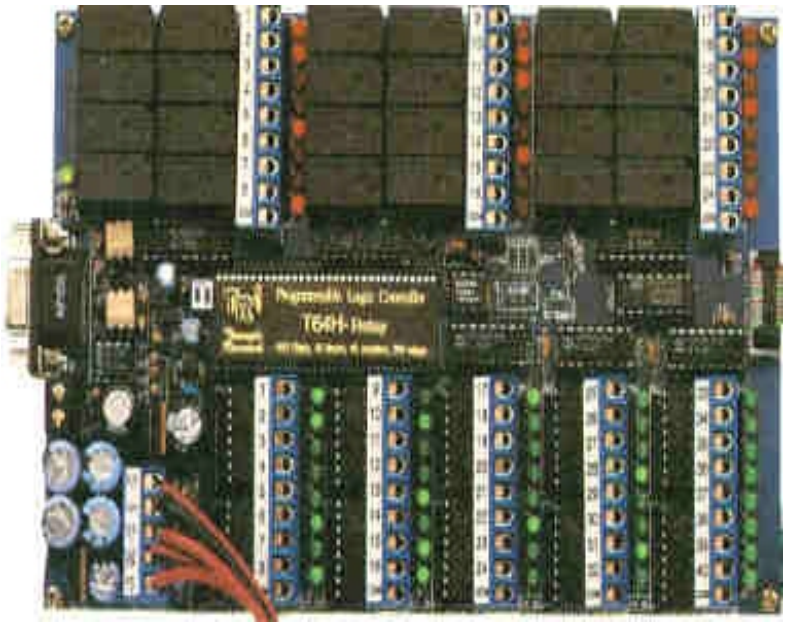
ISER 94th International Conference on Nanoscience, Nanotechnology & Advanced Materials (IC2NAM)
26-27 December 216
Manila , Philippines
www.iser.co/conference

ISER 106th International Conference on Nanoscience, Nanotechnology & Advanced Materials (IC2NAM)
29-30 January 2017
Tokyo Japan
www.iser.co

7th Annual Congress on Materials Research and Technology
20-21 Feburary 2017
Berlin Germany
www.materialsresearch.conferenceseries.com

Tech & Trade Offers

The Compact Workhorse: T64H-Relay PLC



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