TECHNOLOGY ROUNDUP

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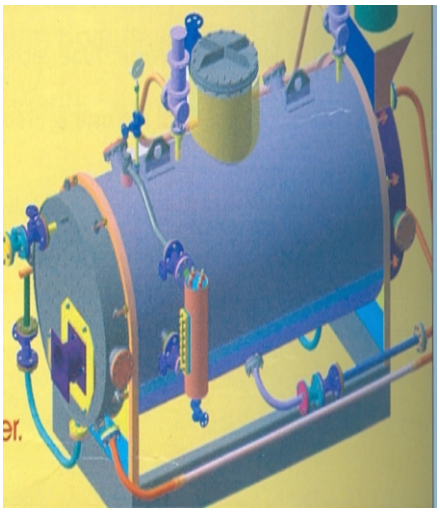
Editorial Board

Tech & Trade Offers

Industrial Boilers



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Forthcoming Tech Events

- International Bhurban Conference on Applied Sciences & Technology
- 2nd International Conference on Research and Practices in Education
- International Conference on Recent Innovations in Engineering & Technology
- International Conference on Innovation on Electrical Engineering & Computational Technologies
- 2nd International Conference on Global Business, Social Sciences & Technology
- 1st international conference on Energy Research & Social Science
- 7th International Conference on Science, Technology, Engineering and Management
- International Conference on Applications of Radiation Science and Technology

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Indigenous Technology

Physicochemical Properties of Agricultural Biomass Residues for Future 'Energy Mix' Potential

This research characterizes various locally available agricultural residues in Pakistan to evaluate their potential as feedstock for renewable energy production and contributing toward solving energy crisis and environmental issues. The thermo-chemical characterization has been performed in order to determine if the residues have potential to be used in biomass conversion technologies producing combined heat and power.

The characterization methods for comparing different agricultural residues include proximate and ultimate analysis, heating value, ash content, thermo gravimetric analysis (TGA) and functional group analysis (FTIR). Widely available agricultural wastes in Pakistan were selected for the characterization i.e. bagasse, corn cob, rice husk, wheat straw and wood chip. The analysis showed that the corn cob had the highest moisture content that will result in low energy efficiency of the thermal conversion technology due to energy requirement for drying whereas wheat straw had the lowest moisture content. Ash and volatile contents were found to be highest in rice straw and wood chip respectively. The thermo gravimetric analysis and functional group identification showed that most of the agricultural residues can be easily decomposed and represent potential feedstock for biomass flexible combined heat and power systems through pyrolysis or gasification.

Courtesy:

Salman Raza Naqvi, Abdul Hadi Chara, Rida Mehtab, Shahzeb Zafar, Muhammad Zubair, School of Chemical & Materials Engineering & Pakistan, Center for Advanced Studies in Energy, National University of Sciences & Technology, Islamabad.

Indigenous Technology

Energy Harvesting from Vehicle's Suspension Vibrations

In this research, the fabrication and experimentation of a vibration-based, electromagnetic type energy harvester is reported for vehicles vibration. The harvester is suitable for harvesting energy from vehicle suspension vibrations and consists of movable permanent magnets and static wound coils. When the harvester is subjected to vibration, due to the movement of magnets relative to coils, the coils experience the change in magnetic flux density which causes an EMF to generate at the coils terminals. The developed energy harvester can be easily attached to the vehicle suspension system and its power generation can be easily utilized to operate the wireless sensor nodes in the smart vehicles.

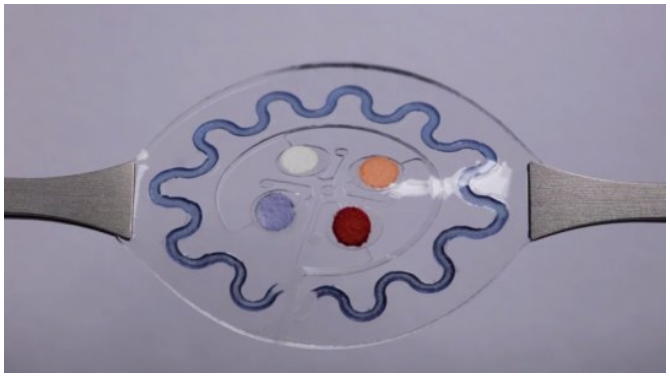
The developed energy harvester is characterized under a sinusoidal vibration from 0.5 to 3 g base acceleration. At base acceleration of 3 g and resonant frequency of 16 Hz, the energy harvester produced an open circuit voltage of 13.43 V. However, under same excitation level, when a matching impedance of 256 ohms is attached to the harvester's coil, it produced a power of 151 mW.

Courtesy:

Farid Ullah Khan, Aamir Fazal,
Institute of Mechatronics Engineering, University of Engineering and Technology, Peshawar

Soft, Micro Fluidic 'Lab on the Skin' for Sweat Analysis

Northwestern University research team has developed a soft, flexible micro fluidic device that easily adheres to the skin and measures the wearer's sweat to show how his or her body is responding to exercise. A little larger than a quarter and about the same thickness, the simple, low-cost device analyzes key biomarkers to help a person decide quickly if any adjustments, such as drinking more water or replenishing electrolytes, need to be made or if something is medically awry. The device placed directly on the skin of the forearm or back, even detects the presence of a biomarker for cystic fibrosis. In the future, it may be more broadly used for disease diagnosis. The intimate skin interface created by this wearable, skin-like micro fluidic system enables new measurement capabilities not possible with the kinds of absorbent pads and sponges currently used in sweat collection. John A. Rogers (Professor of Materials Science and Engineering, Biomedical Engineering and Neurological Surgery in the McCormick School of Engineering and Northwestern University Feinberg School of Medicine) is leading the multi-institution research team that created the 'lab on the skin.'



Rogers and his collaborator Yonggang Huang (Professor of Civil and Environmental Engineering and Mechanical Engineering at the McCormick School) are pioneers in developing skin-like stretchable electronics that move naturally with the skin. The sweat analysis platform developed will allow people to monitor their health on the spot without the need for a blood sampling and with integrated electronics that do not require a battery but still enable wireless connection to a smart phone.

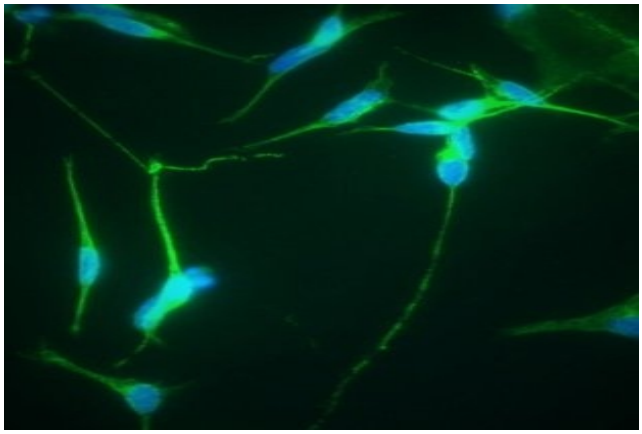
In a study of accuracy and durability, the device was tested on two different groups of athletes: one cycling indoors in a fitness center under controlled conditions and the other participating in the El Tour de Tucson, a long-distance bicycle race in arid and complex conditions. The researchers placed the device on the arms and backs of the athletes to capture sweat. During moderate or vigorous exercise, sweat winds through the tiny microscopic channels of the device and into four different small, circular compartments. where reactions with chemical reagents result in visible color changes in ways that quantitatively relate to pH and concentrations of glucose, chloride and lactate.

When a smart phone is brought into proximity with the device, the wireless electronics trigger an app that captures a photo of the device and analyzes the image to yield data on the biomarker concentrations. The researchers chose four biomarkers because they provide a characteristic profile that's relevant for health status determination, the device also can determine sweat rate and loss, and it can store samples for subsequent laboratory analysis, if necessary. In the group that cycled indoors, the researchers compared the new device's biomarker readouts to conventional laboratory analysis of the same sweat and found the two sets of results agreed with each other. (Conventional methods include capturing sweat with absorbent patches taped to the skin and analyzing them off site.) With the long-distance cyclists, the researchers tested the durability of the device in the complex and unpredictable conditions of the desert. They found the devices to be robust: They stayed adhered to the athletes' skin, did not leak and provided the kind of quality information the researchers sought. The device can capture, store and analyze sweat in real time, the device can quantitatively determine biomarker levels using colorimetric analysis. A power source is not required to display the results; instead, a smart phone camera and app are used to read the biomarker change. The multidisciplinary work involved close collaborations with clinical investigators, including Dr. Marvin J. Slepian, at the Sarver Heart Center of the University of Arizona, as well as contributions from dermatology experts from L'Oréal, including Guive Balooch.

www.northwestern.edu

Living Bio-Hybrid System

One of the biggest challenges in cognitive or rehabilitation neurosciences is the ability to design a functional hybrid system that can connect and exchange information between biological systems, like neurons in the brain, and human-made electronic devices. A large multidisciplinary effort of researchers in Italy brought together physicists, chemists, biochemists, engineers, molecular biologists and physiologists to analyze the biocompatibility of the substrate used to connect these biological and human-made components, and investigate the functionality of the adhering cells, creating a living bio-hybrid system. The research team used the interaction between light and matter to investigate the material properties at the molecular level using Raman spectroscopy, a technique that, until now, has been principally applied to material science. The coupling of the Raman spectrometer with a microscope, spectroscopy becomes a useful tool for investigating micro objects such as cells and tissues. Raman spectroscopy presents clear advantages for this type of investigation:



The molecular composition and modification of sub cellular compartments can be obtained in label-free conditions with non-invasive methods and under physiological conditions, allowing the investigation of a large variety of biological processes both in vitro and in vivo. Once the biocompatibility of the substrate was analyzed and the functionality of the adhering cells investigated, the next part is connecting with the electronic component. In this case a memristor was used. Its name reveals its peculiarity (memory resistor), it has "memory": depending on the amount of voltage that has been applied to it in the past. It is able to vary its resistance, because of a change of its microscopic physical properties. By combining memristors, it is possible to create pathways within the electrical circuits that work similar to the natural synapses, which develop variable weight in their connections to reproduce the adaptive/learning mechanism. Layers of organic polymers, like polyaniline (PANI) a semiconductor polymer, also have memristive properties, allowing them to work directly with biological materials into a hybrid bio-electronic system.

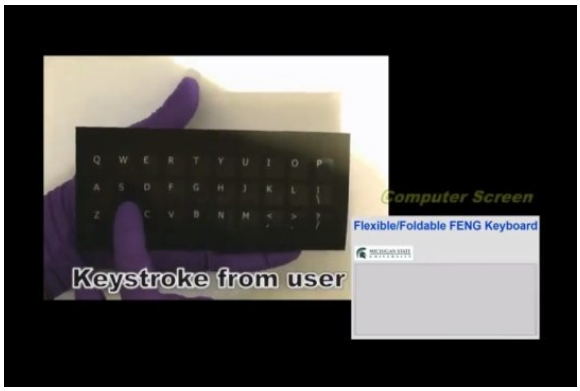
The researchers applied the analysis on a hybrid bio-inspired device but in a prospective view, this work provides the proof of concept of an integrated study able to analyze the status of living cells in a large variety of applications that merges nanosciences, neurosciences and bioelectronics. A natural long-term objective of this work would be interfacing machines and nervous systems as seamlessly as possible. The multidisciplinary team is ready to build on this proof of principle to realize the potential of memristor networks. Once assured the biocompatibility of the materials on which neurons grow, the researchers want to define the materials and their functionalization procedures to find the best configuration for the neuron-memristor interface to deliver a full working hybrid bio-memristive system.

www.aip.org

Nanotechnology Captures Energy from People

The day of charging cell phones with finger swipes and powering Bluetooth headsets simply by walking is now much closer. Michigan State University engineering researchers have created a new way to harvest energy from human motion, using a film-like device that actually can be folded to create more power. With the low-cost device, known as a nanogenerator, the scientists successfully operated an LCD touch screen, a bank of 20 LED lights and a flexible keyboard, all with a simple touching or pressing motion and without the aid of a battery.

Nelson Sepulveda is the associate professor of electrical and computer engineering and lead investigator of the project. According to Nelson he is foreseeing, relatively soon, is the capability of not charge your cell phone for an entire week, because that energy will be produced by your movement.



The innovative process starts with a silicon wafer, which is then fabricated with several layers, or thin sheets, of environmentally friendly substances including silver, polyimide and polypropylene ferroelectric. Ions are added so that each layer in the device contains charged particles. Electrical energy is created when the device is compressed by human motion, or mechanical energy. The completed device is called a biocompatible ferroelectric nanogenerator, or FENG. The device is as thin as a sheet of paper and can be adapted to many applications and sizes. The device used to power the LED lights was palm-sized, for example, while the device used to power the touch screen was as small as a finger. Being lightweight, flexible, biocompatible, scalable, low-cost and robust could make FENG a promising and alternative method in the field of mechanical-energy harvesting for many autonomous electronics such as wireless headsets, cell phones and other touch-screen devices. Remarkably, the device also becomes more powerful when folded. When folded each time increasing the exponentially the amount of voltage. By starting with a large device when fold it once, and again, and again, it has more energy. It may be small enough to put in a specially made heel of shoe so it creates power each time heel strikes the ground. Sepulveda and his team are developing technology that would transmit the power generated from the heel strike.

www.msu.edu

Solar Nanotech-Powered Clothing

University of Central Florida (UCF) Nano technologist Jayan Thomas & Nano Science Techology Center has developed a filaments that harvest and store sun's energy and can be woven into textiles. The breakthrough would essentially turn jackets and other clothing into wearable, solar-powered batteries that never need to be plugged in. It could one day revolutionize wearable technology, helping everyone from soldiers who now carry heavy loads of batteries to a texting-addicted teen who could charge his smart phone by simply slipping it in a pocket.

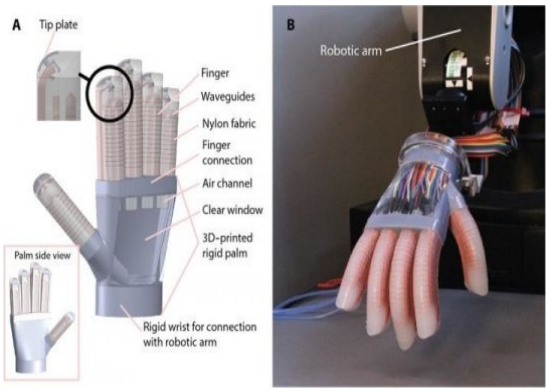
Thomas envisioned technology that could enable wearable tech. His research team developed filaments in the form of copper ribbons that are thin, flexible and lightweight. The ribbons have a solar cell on one side and energy-storing layers on the other. Though more comfortable with advanced nanotechnology, Thomas and his team then bought a small, tabletop loom. They wove the ribbons into a square of yarn. The proof-of-concept shows that the filaments could be laced throughout jackets or other outwear to harvest and store energy to power phones, personal health sensors and other tech gadgets. It is an advancement that overcomes the main shortcoming of solar cells: The energy they produce must flow into the power grid or be stored in a battery that limits their portability. A major application could be with military. They are walking in the sun. Some of them are carrying more than 30 pounds of batteries on their bodies. It is hard for the military to deliver batteries to these soldiers in this hostile environment.

A garment like this can harvest and store energy at the same time if sunlight is available. There are a host of other potential uses, including electric cars that could generate and store energy whenever they are in the sun. It is going to be very useful for the general public and the military and many other applications."

www.ucf.edu

New Robot has a Human Touch

Most robots achieve grasping and tactile sensing through motorized means, which can be excessively bulky and rigid. A Cornell University group has devised a way for a soft robot to feel its surroundings internally the same way humans do. A group led by Robert Shepherd, assistant professor of mechanical and aerospace engineering and principal investigator of Organic Robotics Lab, described how stretchable optical waveguides act as curvature, elongation and force sensors in a soft robotic hand. Doctoral student Huichan Zhao is lead author of "Optoelectronically Innervated Soft Prosthetic Hand via Stretchable Optical Waveguides, featured in the debut edition of Science Robotics. Most robots today have sensors on the outside of the body that detects things from the surface, but these sensors are integrated within the body, so they can actually detect forces being transmitted through the thickness of the robot, a lot like we and all organisms do when we feel pain. Optical waveguides have been in use since the early 1970s for numerous sensing functions, including tactile, position and acoustic. Fabrication was originally a complicated process, but the advent over the last 20 years of soft lithography and 3-D printing has led to development of elastomeric sensors that are easily produced and incorporated into a soft robotic application.



Shepherd's group employed a four-step soft lithography process to produce the core (through which light propagates), and the cladding (outer surface of the waveguide), which also houses the LED (light-emitting diode) and the photodiode. The more the prosthetic hand deforms, the more light is lost through the core. That variable loss of light, as detected by the photodiode, is what allows the prosthesis to sense its surroundings. The group used its optoelectronic prosthesis to perform a variety of tasks, including grasping and probing for both shape and texture. Most notably, the hand was able to scan three tomatoes and determine, by softness, which was the ripest.

www.cornell.edu

Fuel from Sewage is the Future

The new research at the Department of Energy's Pacific Northwest National Laboratory (PNNL) may sound like science fiction but wastewater treatment plants across the United States may one day turn ordinary sewage into biocrude oil. The technology, hydrothermal liquefaction, (HTL) mimics the geological conditions Earth uses to create crude oil, using high pressure and temperature to achieve in minutes something that takes Mother Nature millions of years. The resulting material is similar to petroleum pumped out of the ground, with a small amount of water and oxygen mixed in. This biocrude can then be refined using conventional petroleum refining operations.

Wastewater treatment plants across the U.S. treat approximately 34 billion gallons of sewage every day. That amount could produce the equivalent of up to approximately 30 million barrels of oil per year. PNNL estimates that a single person could generate two to three gallons of biocrude per year. Sewage, or more specifically

sewage sludge, has long been viewed as a poor ingredient for producing biofuel because it is too wet. The approach being studied by PNNL eliminates the need for drying required in a majority of current thermal technologies which historically has made wastewater to fuel conversion too energy intensive and expensive. HTL may also be used to make fuel from other types of wet organic feedstock, such as agricultural waste. Organic matter such as human waste can be broken down to simpler chemical compounds using hydrothermal liquefaction. The material is pressurized to 3,000 pounds per square inch nearly one hundred times that of a car tire. Pressurized sludge then goes into a reactor system operating at about 660 degrees Fahrenheit. The heat and pressure cause the cells of the waste material to break down into different fractions -biocrude and an aqueous liquid phase.

According to Corinne Drennan (for bioenergy technologist research at PNNL) there is plenty of carbon in municipal waste water sludge and interestingly, there are also fats, the fats or lipids appear to facilitate the conversion of other materials in the wastewater such as toilet paper, keep the sludge moving through the reactor, and produce a very high quality biocrude that, when refined, yields fuels such as gasoline, diesel and jet fuels. In addition to producing useful fuel, HTL could give local governments significant cost savings by virtually eliminating the need for sewage residuals processing, transport and disposal. The best thing about this process is its simplicity. The reactor is literally a hot, pressurized tube. The researchers have really accelerated hydrothermal conversion technology over the last six years to create a continuous and scalable process which allows the use of wet wastes like sewage sludge. An independent assessment for the Water Environment (WE)& Reuse Foundation (RF)calls HTL a highly disruptive technology that has potential for treating wastewater solids. WE&RF investigators noted the process has high carbon conversion efficiency with nearly 60 percent of available carbon in primary sludge becoming bio-crude. PNNL has licensed its HTL technology to Utah-based Genifuel Corporation, which is now working with Metro Vancouver, a partnership of 23 local authorities in British Columbia, Canada, to build a demonstration plant. Biocrude, the liquid phase can be treated with a catalyst to create other fuels and chemical products. A small amount of solid material is also generated, which contains important nutrients. For example, early efforts have demonstrated the ability to recover phosphorus, which can replace phosphorus ore used in fertilizer production.

www.pnnl.gov

Forthcoming Tech Events

National

International Bhurban Conference on Applied Sciences and Technology
10-14 January, 2017
Islamabad, Pakistan
www.ibcast.org.pk/

2nd International Conference on Research and Practices in Education
24-25 February, 2017
Islamabad, Pakistan
www.icrpe.aiou.edu.pk

International Conference on Recent Innovations in Engineering and Technology
29-30, March 2017
Rawalpindi, Pakistan
www.allconferencealert.com

International Conference on Innovation on Electrical Engineering & Computational Technologies
5-7 April, 2017
Karachi, Pakistan
Www.indus.edu.pk

International Events

2nd International Conference on Global Business, Social Sciences & Technology
2-3 March 2017
Izmir Turkey
www.icgsst-march-2017

1st international conference on Energy Research & Social Science
2-5, April 2017
Melia Spain
Www.erssconference.com

7thInternational Conference on Science, Technology, Engineering and Management
2-3 April 2017
Dubai, UAE
www.icstem.com

International Conference on Applications of Radiation Science and Technology
Vienna, Austria
24–28 April 2017
www.iaea.org

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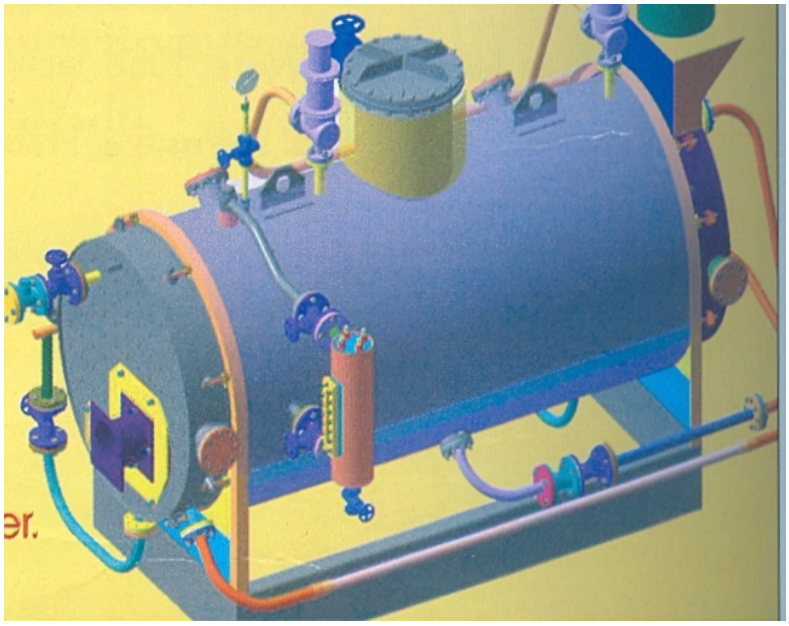

- Execution, Commissioning
- Coil type Boilers
- Cross Drums water Tube Boilers
- Wet Back Boilers
- Moderen Control Devices
- Own Design Special Burners
- Water Softening Plant Designing
- Oil & Gas Burner Designing
- Complete Boiler Mountings
- Complete Boiler Controls
- Tube Assembly in water Tube Boilers
- Designing of Economizer, Air pre Heater
- Rice Husk Design and many others

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