

TECHNOLOGY ROUNDUP

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- 2nd International Conference On Business Innovation and Management (ICBIM-2014)
- International Conference on Robotics and Emerging Allied Technologies in Engineering (iCREATE)
- 10th Pakistan Oil, Gas & Energy Industry Conference
- 10th International Conference on Web Information Systems and Technologies (WEBIST 2014)
- The International Conference of Bio-security and Bio-safety
- Cell Culture Engineering XIV

Indigenous Technology

Design and Implementation of GUI Based Chemical Industrial Automation Software

The researchers from Department of Computer Science and Engineering, University of Engineering and Technology, Lahore, Pakistan have developed “Design and Implementation of GUI Based Chemical Industrial Automation Software

Chemical Industry has a great contribution in the progress and development of a country. Industrial revolution has updated the fortune of several western countries. The computer-based management is necessary to observe and control the operations of the chemical plants and to react to adjusting user requirement. The engineer/plant managers are not only responsible for planning, designing, and controlling the chemical units, their job is also to keep the plant running smoothly and efficiently, with little or no down time. Generally speaking, the functions of a manager include installing and configuring devices, diagnosing and troubleshooting chemical processes, controlling access to services, etc.

This work specifies a set of software tools for the site or chemical laboratory managers/operator to manage and control the various chemical processes readings and the lab environment status like temperature, air pressure, sunlight etc. The common problems of such chemical industrial laboratories are the management issues like fault, manpower, configuration and performance. The proposed system may helpful to minimize the fast intensifying equipments' cost and complexities by offering improved set of simple GUI software tools to the labs manager or supporting workers to rapidly resolve or identify the chemical processing lab problems. Since it is a significant requirement for the chemical lab operator and personnel resources management to control and manage the chemical industrial plant from a central locality. So, it can also be used in critical industrial units where it is very difficult to manually control the plant or machinery. The researcher hope that work will be found useful by both chemical engineers and researchers, and will be used to design strategies for chemical industrial plant management system based on the presented strategies, or at least as a reference.

This Chemical Industrial Automation Software is developed to provide a user friendly environment that could help chemical engineers /managers to perform necessary management tasks to control and maintain the chemical industrial plant from a central point. The system is capable of remotely configuring, managing and monitoring the different chemical apparatus and serve as a platform for enhancement in order to develop a feature rich yet affordable management system.

Courtesy:

Journal of Pakistan Institute of Chemical Engineers (JPICChE), 2012 40(1): 87-91 refs 09

Muhammad Junaid Arshad*, Amjad Farooq, Khadim Hussain Asif (Department of Computer Science and Engineering, University of Engineering and Technology, Lahore, Pakistan).

Indigenous Technology

Solar Biogas Digester with Built-In Reverse Absorber Heater

The researcher from Mehran University of Engineering & Technology, Jamshoro, Pakistan have developed Solar Biogas Digester with Built-In Reverse Absorber Heater

It is known that consuming energy is proportional to the quality or standard of life. There is a close relationship between energy consumption and the GNP (Gross National Product). It is obvious that for further development of the country additional sources of energy is required, which are cheap, safe and environmentally compatible with respect to the action on possible wastes. Utilization of renewable energy is one route to help in solving the above mentioned problems. In particular, biogas as a source of renewable energy is produced by biotechnology and used



widely on residential scale. At present biogas is used widely in some countries for lighting, machines, and vehicles, generators, cooking and heating. Biogas generation is suitable for small to large scale operation and at present is realized in a number of developed and developing countries including USA, Hungary, China, India etc. Since 1990s biogas projects construction in China has developed steadily by the end of 1998, there were altogether 6.88 million household biogas digesters. In Russia biogas digesters are used for processing of hard dung into biogas.

In this study the design, fabrication and investigation of a solar biogas digester with built-in RAH (Reverse Absorber Heater) is presented. The maximum temperature (500°) inside of the methane tank was taken as a main parameter at the design of the digester. Using energy balance equation for the case of a static mass of fluid being heated; the parameters of thermal insulation of the methane tank were counted. The biogas digester is consisting of methane tank with built-in solar RAH to utilize solar energy for the heating of the slurry prepared from the different organic wastes (dung, sewage, food wastes etc). The methane tank was filled up to 70% of volume by organic wastes of the GIK Institute sewage,

firstly, and secondly, by sewage and cow dung as well.

The solar irradiance incident to the absorber, slurry's temperature and ambient temperature were measured. It was found that using sewage only and sewage with cow dung the retention times was 4 weeks and two weeks respectively and biogas quantity produced was 0.4 and 8.0 m^3 respectively. In addition, biogas up gradation scheme for removal of carbon dioxide, hydrogen sulphide and water vapor from biogas and conversion of biogas energy conversion into electric power is also worked out.

The biogas digester with built-in solar reverse absorber heater is presented where reverse absorber heater is installed under the methane tank. The temperature of the slurry-solar irradiance and ambient temperature relationships experimentally were investigated. The biogas up gradation scheme for removal of carbon dioxide, hydrogen sulphide and water vapor from biogas and conversion of biogas energy conversion into electric power are also worked out.

Courtesy:

Science, Technology and Development, 2012 32(1): 39-46 refs09

KHASAN S. KARIMOV*, AND MUHAMMAD ABID (Mehran University Research Journal of Engineering & Technology, Jamshoro, Pakistan).

Vanadium Dioxide Research Opens Door to New, Multifunctional Spintronic Smart Sensors

New research findings from a team led by North Carolina State University open the door to smarter sensors by integrating vanadium dioxide (VO₂) onto a silicon chip and using lasers to make the material magnetic. The advancement paves the way for multifunctional spintronic smart sensors for use in military applications and next-generation spintronic devices.

VO₂ is currently used to make infrared sensors. By integrating VO₂ as a single crystal onto a silicon substrate, the researchers have made it possible to create infrared smart sensors, in which the sensor and computational function are embedded on a single chip. This makes the sensor faster and more energy efficient, since it doesn't have to send data to another chip to be processed. Smart sensors are also lighter than conventional ones, since separate chips aren't necessary.

This research work achieves military applications, sensor technology that needs to be able to sense, manipulate, and respond to data quickly. In addition, the researchers used high-power nanosecond-pulsed laser beams to modify the VO₂ and make it magnetic. This will allow the creation of spintronic smart sensors that incorporate infrared sensors and magnetic sensors on a single chip. Spintronics refers to technologies used in solid-state devices that take advantage of the inherent spin in electrons and their related magnetic momentum. The potential advantages of spintronics include higher memory capacity, faster data transfer and more computational power on a computer chip.

www.news.ncsu.edu

Lab-on-a-Chip

A portable instrument that replaces a full-size laboratory provides accurate multi-element analysis in less than a minute.



Engineers from the A*STAR Institute of Materials Research and Engineering and their colleagues at the University of Basel, Switzerland, have designed and developed a compact, portable analytical instrument that can detect multiple ions and molecules down to a level of 300 parts per billion (ppb) in less than a minute.

The machine, based on lab-on-a-chip technology, needs only drop-sized liquid samples. The analysis is very quick, precise and sensitive, and can be performed remotely as no direct contact with the solution is necessary. As such, the device has widespread potential applications in the water, food and beverage, agriculture, environmental, pharmaceutical and medical industries. The instrument is now ready for commercialization, as it is one of only a handful of actual lab-on-a-chip instruments reported so far.

The easy-to-operate machine, which weighs only 1.2 kg, combines microchip electrophoresis (MCE) with a sensing technology known as a dual capacitively-coupled contactless conductivity detector (dC4D). The system first uses electrophoresis to separate ions and then detects the ions using dC4D. All analyses are performed in microfluidic channels consisting of capillaries inside polycarbonate plastic chips that are narrower than a human hair.

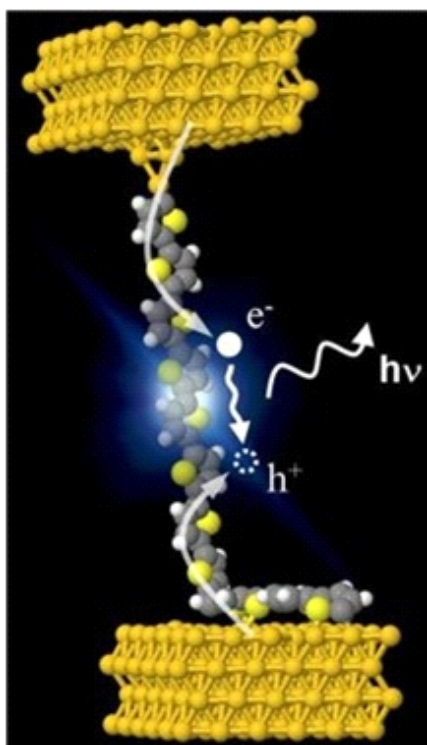
The beauty of the dC4D technology is its simplicity. It relies on remote conductivity measurements via a pair of electrodes. One electrode sends radio-frequency signals through a channel to the second electrode, and the signal received is read by a computer. Because the ions have charge, their resistance drops as they pass through the microfluidic channel, resulting in sudden peaks. Specially designed software then analyzes the data to provide both qualitative and quantitative information.

The instrument has two access compartments. The front compartment houses a plastic chip and a replaceable cartridge detector for the testing; both are designed to eliminate noise. The back compartment houses the electronics and software, the data acquisition card and a battery that powers the instrument for up to 10 hours.

The researchers tested the instrument's capability to measure inorganic ions in water, rabbit blood and human urine, as well as organic and inorganic acids in fruit juice. They assessed its accuracy against standard methods. The researchers have approached about licensing the technology by several companies active in clinical analyses and in the ornamental fish farm industry. They are hoping to further develop their system to achieve detection levels lower than 1 ppb by pre-concentrating the samples; they are also planning to introduce nanofluidics into the dC4D system.

www.research.a-star.edu.sg

Researchers Develop First Single-Molecule LED



The ultimate challenge in the race to miniaturize light emitting diodes (LED) has now been met. A team led by the Institut de Physique et de Chimie des Matériaux de Strasbourg (IPCMS, CNRS/Université de Strasbourg), in collaboration with UPMC and CEA, has developed the first ever single-molecule LED. The device is formed from a single polythiophene wire placed between the tip of a scanning tunneling microscope and a gold surface. It emits light only when the current passes in a certain direction. This experimental tour de force sheds light on the interactions between electrons and photons at the smallest scales. Moreover, it represents yet another step towards creating components for a molecular computer in the future.

Light emitting diodes are components that emit light when an electric current passes through them and only let light through in one direction. LEDs play an important role in everyday life, as light indicators. They also have a promising future in the field of lighting, where they are progressively taking over the market. A major advantage of LEDs is that it is possible to make them very small, so point light sources can be obtained. With this in mind, the researchers have produced the first ever single-molecule LED.

To achieve this, scientists used a single polythiophene wire. This substance is a good electricity conductor. It is made of hydrogen, carbon and sulfur, and is used to make larger LEDs that are already in the market. The polythiophene wire was attached at one end to the tip of a scanning tunneling microscope, and at the other end to a gold surface. The scientists recorded the light emitted when a current passed through this nanowire. Scientists observed that the thiophene wire acts as a light emitting diode: light was only emitted when electrons went from the tip of the microscope towards the gold surface. When the polarity was reversed, light emission was negligible. The researchers showed that this light was emitted when a negative charge (an electron) combined with a positive charge (a hole) in the nanowire and transmitted most of its energy to a photon. For every 100,000 electrons injected into the thiophene wire, a photon was emitted. Its wavelength was in the red range.

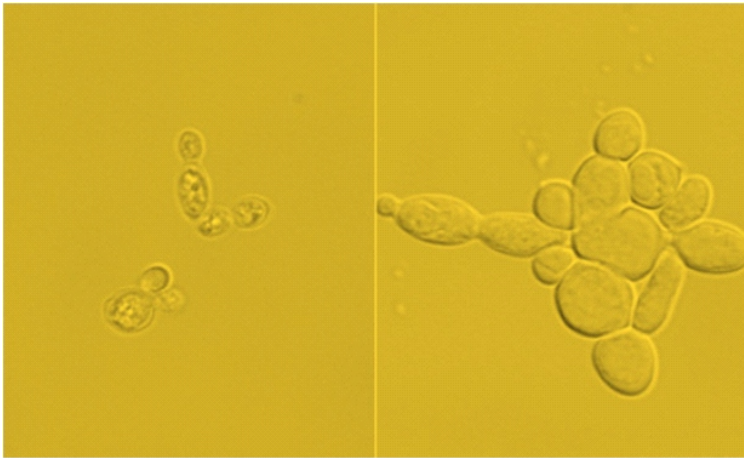
The researchers also envision its other potential applications in the foodstuffs industry. In the future, color indicator systems integrated into foils or bottle closures are intended to make the quality status of the packaged foods visible. Because the sell-

by date does not represent a guarantee of any kind. Food stuffs may often spoil prematurely unnoticed by the consumer due to a packaging error, or in the warehousing, or due to disruptions in the refrigeration chain. Oil-based and fat-containing products are specifically prone to this, as are meats, fish and ready meals.

From a fundamental viewpoint, this device gives researchers a new tool to probe phenomena that are produced when an electrical conductor emits light and it does so at a scale where quantum physics takes precedence over classical physics. Scientists will also be able to optimize substances to produce more powerful light emissions. Finally, this work is a first step towards making molecule-sized components that combine electronic and optical properties. Similar components could form the basis of a molecular computer.

www.sciencedaily.com

Engineers Converts Yeast Cells into 'Sweet Crude' Biofuel



Researchers at The University of Texas at Austin's Cockrell School of Engineering have developed a new source of renewable energy, a biofuel, from genetically engineered yeast cells and ordinary table sugar. This yeast produces oils and fats, known as lipids, that can be used in place of petroleum-derived products.

The researchers created the new cell-based platform given that the yeast cells grow on sugars and the biofuel produced by this process is called a renewable version of sweet crude. The researchers' platform produces the highest concentration of oils and fats reported through

fermentation, the process of culturing cells to convert sugar into products such as alcohol, gases or acids. The research team was able to rewire yeast cells to enable up to 90 percent of the cell mass to become lipids, which can then be used to produce biodiesel.

In many industrial biochemical processes lipid produced in such a high concentration that could theoretically be used to power a car. Since fatty materials are building blocks for many household products, this process could be used to produce a variety of items made with petroleum or oils i.e. from nylon to nutrition supplements to fuels. Biofuels and chemicals produced from living organisms represent a promising portion of the renewable energy market. The researchers took a starting yeast strain of *Yarrowia lipolytica*, and convert it into a factory for oil directly from sugar. This work opens up a new platform for a renewable energy and chemical source. The biofuel they formulated is similar in composition to biodiesel made from soybean oil. The advantages of using the yeast cells to produce commercial-grade biodiesel are that yeast cells can be grown anywhere, do not compete with land resources and are easier to genetically alter than other sources of biofuel.

By genetically rewiring *Yarrowia lipolytica*, the researchers have created a near-commercial biocatalyst that produces high

levels of bio-oils during carbohydrate fermentation. This is a remarkable demonstration of the power of metabolic engineering. So far, high-level production of biofuels and renewable oils has been an elusive goal, but the researchers believe that industry-scale production is possible with their platform.

The team increased lipid levels by nearly 60-fold from the starting point. At 90 percent lipid levels, the platform produces the highest levels of lipid content created so far using a genetically engineered yeast cell. To compare, other yeast-based platforms yield lipid content in the 50 to 80 percent range. However, these alternative platforms do not always produce lipids directly from sugar as the UT Austin technology does. The research team is continuing to find ways to further enhance the lipid production levels and develop new products using this engineered yeast.

www.esnciencenews.com

Single Chip Device to Provide Real-time 3-D Images from Inside the Heart and Blood Vessels



Researchers from George W. Woodruff School of Mechanical Engineering at the Georgia Institute of Technology have developed the technology for a catheter-based device that would provide forward-looking, real-time, three-dimensional imaging from inside the heart, coronary arteries and peripheral blood vessels. With its volumetric imaging, the new device could better guide surgeons working in the heart, and potentially allow more of patients' clogged arteries to be cleared without major surgery.

The device integrates ultrasound transducers with processing electronics on a single 1.4 millimeter silicon chip. On-chip processing of signals allows data from more than a hundred elements on the device to be transmitted using just 13 tiny cables, permitting it to easily travel through circuitous blood vessels. The forward-looking images produced by the device would provide significantly more information than existing cross-sectional ultrasound.

Researchers have developed and tested a prototype able to provide image data at 60 frames per second, and plan next to conduct animal studies that could lead to commercialization of the device. The device will allow doctors to see the whole volume that is in front of them within a blood vessel. This will give cardiologists the equivalent of a flashlight so they can see blockages ahead of them in occluded arteries. It has the potential for reducing the amount of surgery that must be done to clear these vessels.

The single chip device combines capacitive micromachined ultrasonic transducer (CMUT) arrays with front-end CMOS electronics technology to provide three-dimensional intravascular ultrasound (IVUS) and intracardiac echography (ICE) images. The dual-ring array includes 56 ultrasound transmit elements and 48 receive elements. When assembled, the donut-shaped array is just 1.5 millimeters in diameter, with a 430-micron center hole to accommodate a guide wire. Power-saving circuitry in the array shuts down sensors when they are not needed, allowing the device to operate with just 20 milliwatts of power, reducing the amount of heat generated inside the body. The ultrasound transducers operate at a frequency of 20 megahertz (MHz). Imaging devices operating within blood vessels can provide higher resolution images than devices used

from outside the body because they can operate at higher frequencies. But operating inside blood vessels requires devices that are small and flexible enough to travel through the circulatory system. They must also be able to operate in blood

www.news.gatech.edu

Forthcoming Tech Events

National

International Conference on Robotics and Emerging Allied Technologies in Engineering (iCREATE)

22 - 24 April, 2014

Islamabad, Pakistan.

www.allconferencealerts.com

2nd International Conference on Business Innovation and Management ICBIM-2014

26 - 27 April, 2014

Islamabad, Pakistan.

www.allconferencealerts.com

10th Pakistan Oil, Gas & Energy Industry Conference

29th May, 2014

Karachi, Pakistan.

www.oilcouncil.com

International

10th International Conference on Web Information Systems and Technologies (WEBIST 2014)

03 -05, April 2014

Barcelona, Spain

www.wonference.com

The International Conference of Bio-security and Bio-safety

5th - 7th May, 2014

Giza, Egypt

www.nature.com

Cell Culture Engineering XIV

04th - 09th May, 2014

Quebec , Canada

www.conferencealerts.com

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