

# TECHNOLOGY ROUNDUP

A NEWS BULLETIN FROM  
Technology Information Services (TIS)  
Pakistan Scientific & Technological Information Centre



May-June, 2010

Vol. 2, No. 3

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- BIT 3rd World Congress of Industrial Biotechnology

### *Tech News*

#### **Solar driven homogeneous Water Oxidation catalyst**

Emory University chemists in collaboration with Paris Institute of Molecular Chemistry have developed the most potent homogeneous catalyst known for water oxidation. It is a crucial component for generating clean hydrogen fuel using only water and sunlight. This fastest, carbon-free molecular water oxidation



catalyst (WOC) has really changed the standard from the other known homogeneous WOCs. Its Homogeneity not only boosts efficiency but makes the WOC easier to study and optimize. The new WOC has all qualities, and it is based on the cheap and abundant element cobalt, adding to its potential to help solar energy go to mainstream. The research aims to mimic natural processes of photosynthesis to generate clean fuel. The next step involves incorporating the WOC into a solar-driven, water-splitting system.

The long-term goal is to use sunlight to split water into oxygen and hydrogen. Hydrogen becomes the fuel. Its combustion produces the by-product of water which flows back into a clean, green, renewable cycle. Three main technical challenges being faced are developing a light collector, a catalyst to oxidize water to oxygen and a catalyst to reduce water to hydrogen. All three components need improvement. A viable WOC may be the most difficult scientific challenge because enzymes are nature's catalysts. The enzyme in

the oxygen-evolving center of green plants is about the least stable catalyst in nature, and one of the shortest lived. Emory chemists duplicated this complex natural process by taking some of the essential features from photosynthesis and using them in a synthetic, carbon-free, homogeneous system. The result is a water oxidation catalyst that is far more stable than the one found in nature.

Nearly all of the more than 40 homogeneous WOCs developed such as containing organic components that burn up quickly during the water oxidation process but two years back Hill's lab and collaborators developed the first prototype of a stable, homogenous, carbon-free WOC, which also worked faster than others known at the time. The prototype, however, was based on ruthenium, a relatively rare and expensive element. The researchers began experimenting with the cheaper and more abundant element cobalt. The cobalt-based WOC has proved even faster than the ruthenium version for light-driven water oxidation.

[www.emory.edu](http://www.emory.edu)

#### **Clams: The Secret Pollutant-detectives in water way**

Many streams and rivers are contaminated with pollutants like pesticides, lead, arsenic and PCBs. It is costly to clean them up. Scientists are using a new, inexpensive way to solve the problem. Contaminants are lurking in many rivers and streams. Some can be seen, and some cannot. These hidden chemicals ruin waterways and everything in it. Biologists are able to determine the sources of toxins in water by using clams as pollutant traps. Clams naturally clean water by feeding absorbing toxins in their tissues as they draw in water. By placing the clams downstream of industrial parks and highways, they can be analyzed for pollutants. These clams are opened after exposure to these waters and detach them from their shells; various lab tests reveal contaminants in the waterway.

Scientists from University of the District of Columbia, Washington, D.C., are teaming up with local high school students to dredge up clams to use as tiny detectives. They help by finding the source of toxic leaks. Students put the clams in streams that lead to rivers. Clams then suck in water swept down from industrial parks and highways. Clams clean the water as they feed, absorbing

toxins in their tissues. The clams are collected back from streams. Then, scientists open the clams and detach them from their shell. Later, lab tests will reveal the clam's secret, the kinds and quantities of pollutants in the water.

[www.aip.org](http://www.aip.org)

### *New way to make water*

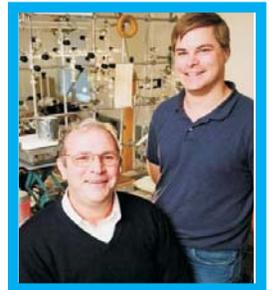
Two scientists from University of Illinois, America have discovered a new way to make water. Not only can they make water from unlikely starting materials, such as alcohols. Their work could also lead to a better catalyst, less expensive and more efficient fuel cells.

The unconventional metal hydride is used in oxygen reduction reaction ( $2\text{H}_2 + \text{O}_2 = 2\text{H}_2\text{O} + \text{Energy}$ ) for water production since two centuries, but until now no one has made it work in a homogeneous solution.

In a typical hydrogen fuel cell, the diatomic hydrogen gas enters one side of the cell; diatomic oxygen gas enters the other side. The hydrogen molecules lose their electrons and become positively charged through oxidation, while the oxygen molecules gain four electrons and become negatively charged through reduction. The negatively charged oxygen ions combine with positively charged hydrogen ions to form water and release electrical energy. The difficult side of the fuel cell is the oxygen reduction reaction, not the hydrogen oxidation reaction

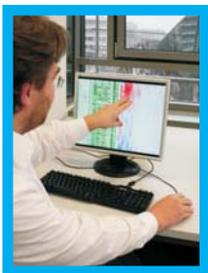
These scientists investigated a new generation of transfer hydrogenation catalysts for use as unconventional metal hydride for oxygen reduction. They used iridium-based transfer hydrogenation catalysts for oxygen reduction in a homogenous, non-aqueous solution that affects both the oxidation of alcohols, and the reduction of the oxygen. Since most compounds react with either hydrogen or oxygen, but this catalyst reacts with both. It reacts with hydrogen to form a hydride, and then reacts with oxygen to make water in a homogeneous, non-aqueous solvent.

<http://illinois.edu/>



### *Analytical Eye: Viewing through the data Jungle*

A large amount of information floods into business databases every day. To achieve their corporate objectives, companies try to evaluate information relevant to their activities as effectively as possible. In the day-to-day working environment they use business intelligence programs to collect, evaluate and present



data. But many of the current analytical methods can only display information statically, as lists or reports. Visualization techniques help to present the information in a form that can be more easily understood. Scientists are developing analytical techniques that make use of our ability to identify complex data relationships by means of pictorial images.

Scientist from the Fraunhofer Institute for Computer Graphics Research (ICGD) in Darmstadt, have developed such analytical methods and visualization techniques that can be combined into Visual Analytics. The user and the computer interact closely, but the user is always in the forefront. He or she makes the decisions, not the system.

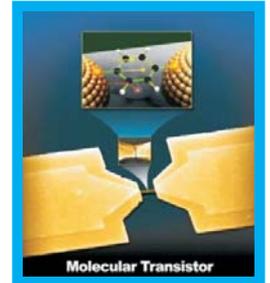
Instead of tables of figures, the system can display a mosaic of colored surfaces. If columns of figures differ from the customary data, they are shown in a different color or with a different structure, so that they catch the eye immediately. By concentrating on these patterns, users can evaluate the data more accurately. Connections or relationships that could easily be overlooked also become more noticeable. This makes it easier to reach reliable decisions. Visual Analytics has a lot to offer the financial market in particular. Trends and risks in global finance could be identified more quickly.

[www.fraunhofer.de](http://www.fraunhofer.de)

### *World's first Molecular Transistor*

A group of scientists from Yale University and the Gwangju Institute of Science and Technology in South Korea, has succeeded in creating the first transistor made from a single molecule. The researchers showed that a benzene molecule attached to gold contacts could behave just like a silicon transistor. They were able to manipulate the molecule's different energy states depending on the voltage they applied to it through the contacts. By manipulating the energy states, they were able to control the current passing through the molecule. It is like rolling a ball up and over a hill, where the ball represents electrical current and the height of the hill represents the molecule's different energy states. They were able to adjust the height of the hill, allowing current to get through when it was low, and stopping the current when it was high." In this way, the molecule is used in the same way as regular transistors are used. The work builds on previous research of the group in 1990, which demonstrated that individual molecules could be trapped between electrical contacts. Now they developed additional techniques over the years that allowed them to "see" what was happening at the molecular level. Being able to fabricate the electrical contacts on such small scales, identifying the ideal molecules to use, and figuring out where to place them and how to connect them to the contacts were also key components of the discovery. There were a lot of technological advances and understanding was built up over many years to make this happen. There is a lot of interest in using molecules in computer circuits because traditional transistors are not feasible at such small scales. This scientific research has fulfilled a decade-long quest and shown that molecules can act as transistors.

[www.yale.edu](http://www.yale.edu)



### *Bacterial Computers*

A research team of graduate students from the biology and mathematics departments at Missouri Western State University in Missouri and Davidson College in North Carolina, USA engineered the DNA of *Escherichia coli* bacteria, to create 'bacterial computers' with the potential to solve complicated mathematics problems. The findings of the research demonstrate that computing in living cells is feasible, thus opening the door to a number of applications. The second-generation bacterial computers illustrate the feasibility of extending the approach to other computationally challenging math problems,



creating bacterial computers capable of solving a classic mathematical problem known as the Hamiltonian Path Problem. The research extends previous work to produce bacterial computers that could solve the Burnt Pancake Problem. The Hamiltonian Path Problem asks whether there is a route in a network from a beginning node to an ending node, visiting each node exactly once. The student and faculty researchers modified the genetic circuitry of the bacteria to enable them to find a Hamiltonian path in a three-node graph. Bacteria that successfully solved the problem reported their success by fluorescing both red and green, resulting in yellow colonies. Since synthetic biology is the use of molecular biology techniques, engineering principles, and mathematical modeling to design and construct genetic

circuits that enable living cells to carry out novel functions. This research contributed more than 60 parts to the Registry of Standard Biological Parts, which are available for use by the larger synthetic biology community, including the newly split red fluorescent protein and green fluorescent protein genes, synthetic biology can be used to solve mathematical problems. Its applications can be found in medicine, energy and the environment. Synthetic biology has great potential in the real world.

[www.biomedcentral.com](http://www.biomedcentral.com)

### *Battery Powered Vehicles to be revolutionized by new technology*

Universite de Montreal researchers have developed a LifePO<sub>4</sub> battery that powered thousands of small electric scooters, bicycles and wheelchairs throughout Europe and Asia. This revolutionary battery is made from non-toxic materials abundant in the Earth's crust so it is not expensive. This battery is much more stable and much safer. In addition, it recharges much faster than previous batteries. The theoretical principle behind the battery was patented in 1995 by a Texas university professor. This battery could eventually make the electric car very profitable. Electric Phostech Lithium's production plant in Quebec produces the black LifePO<sub>4</sub> powder, which is shipped across the world in tightly sealed barrels. The NSERC Research Chair will investigate ways to improve the LifePO<sub>4</sub> battery. Even then lithium, iron and phosphate were theoretically promising materials, there is a need to make them efficient, to find the right voltage and maintain the right charging and discharging properties



[www.umontreal.ca](http://www.umontreal.ca)

### *New Solar Pond distillation system*



Scientists at University of Nevada, Reno has developed a new system that desalinate water using a specialized low-cost solar pond. The patented membrane distillation system powered by renewable energy will make safe aquatic habitat. The ecosystems of terminus lakes around the world could be benefited from this new system. These lakes see a decline in water levels and an increase in salinity from both human and natural processes. High levels of salinity are dangerous and unsustainable for aquatic life. In this system an artificial salt-gradient stratification process has been developed to trap solar heat at the

bottom of the solar pond and uses the collected energy to power the membrane distillation system recently patented by the University. The system is designed to help sustain the ecosystems of the closed-basin regions where there is no outflow for the water and a high evaporation rate, leaving a high concentration of minerals and salts.

The hot brine in the lower storage zone of the pond, which can reach temperatures greater than 195 degrees Fahrenheit, may then be used directly for heating, thermal desalination, or for other low-temperature thermal applications. The model results show that in a two-week period, the temperature in the bottom of the solar pond increased from 68 to 126 degrees Fahrenheit and, even though the insulating layer is being eroded by double-diffusive convection, the solar pond remained stable.

The cost to run the system is negligible because it uses the renewable energy of the sun, trapped as heat in the bottom, to power most of the system. This can operate 24 hours a day using the stored energy and little amount of electricity. For every surface acre of solar pond three acre-feet of freshwater can be made in about one year. The system has many advantages. The system has low maintenance and the stratification process that helps drives the process uses the salts from the lake itself. This process could serve as one component of a salinity management program and, coupled with other remediation efforts, could desalinate the lakes enough to make it a safe aquatic habitat. The new technology could be applied to declining water systems anywhere, with preference to areas with good solar capabilities and adequate freshwater flows

[www.unr.edu](http://www.unr.edu)

# *Forthcoming Tech Events*

### ***European Biomass Conference and Exhibition***

03-07 May, 2010

Lyon, France.

<http://cordis.europa.edu/news>

### ***Pharmatech 2010***

25-27 May, 2010

Kuala Lumpur, Malaysia.

[www.pharmatechnol.com](http://www.pharmatechnol.com)

### ***7th International Plastic and Packaging Industry Exhibition***

31 May-3 June, 2010

Karachi, Pakistan.

[www.plasticpakistan.com](http://www.plasticpakistan.com)

### ***Asia-Pacific Desalination Conference 2010***

22-25 June, 2010

Qingdao, China.

[www.desalination.biz](http://www.desalination.biz)

### ***ICBTE-2010, International Conference on Business Technology and Engineering***

23-24 July, 2010

Islamabad, Pakistan.

[www.iqraisb.edu.pk/icbte](http://www.iqraisb.edu.pk/icbte)

### ***BIT 3rd World Congress of Industrial Biotechnology***

25-27 July, 2010

Qingdao, China.

[www.bit.ibio.com](http://www.bit.ibio.com)

## ***Tech & Trade Offers***

### ***LPG Cylinders and Gas appliances***

International Engineering Company is the pioneer in manufacturing of LPG cylinders from 1 Kg to 45 Kg with lamp, burner and heater. The company is well equipped with advanced testing facilities and got the ISO-9001 certification. The company is selling its products throughout Pakistan and also supplying cylinders in Saudi Arabia, Dubai, Bahrain, South Africa and Yemen. The company has capability of producing 600 units per day.

#### **Company Contact**

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Fax: 92-55-3254440

[www.freewebs.com](http://www.freewebs.com)



### *Solar azimuth path rotator*

Solar azimuth path rotator can bear the total live load of system around 200 kgs Upto 1000 sq yds just sitting in the room the direction of hundreds of kgs weight can be changed with this rotator. It has finger touch operate controller.

The whole system of rotation is manufactured in Pakistan.

Specification:

Glow 40 energy savers & 10 dc fans

Solar panels life 50 years

Output guaranty of solar panels are 50 years

Manufacturing fault guaranty is 2 years

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A to Z Variety

Mr. Hammad Sabri [Sales]

72-M, Block 6, PECHS, Karachi, Pakistan

Phone: -92-300 252 99 22

[atozvariety786@yahoo.com](mailto:atozvariety786@yahoo.com)

### *Leksell Gamma Knife®*

Leksell Gamma knife for non-invasive brain surgery (without opening the skull) treats patients with malignant (cancerous) and benign tumor, vascular malformations, parkinson, epilepsy, and functional disorders. It provides a safe accurate and reliable treatment option. Company's product line covers from small hand held metal detector to bomb jammer and explosive detector. The company provides state-of-the-art technology worldwide.

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[www.firstglink.com](http://www.firstglink.com)

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