

TECHNOLOGY ROUNDUP

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



September-October, 2015

Vol. 7, No. 5

Editorial Board

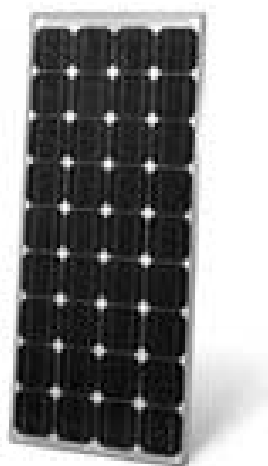
Patron/Executive Editor
Dr. Muhammad Akram Shaikh
Director General, PASTIC

Managing Editors
Ms. Nageen Ainuddin
Mr. M. Aqil Khan
Editor
Saima Siddique Tariq

Composer
Kashif Farooqui

Tech & Trade Offers

Solar Solutions



Tech News Headlines

- Reverse Osmosis (RO) Based Wastewater Treatment
- Desulfurization of Oils; Produced from Pyrolysis of Scrap Tires
- Nanoparticles to Track Cells and Interactions within them
- New Drug Significantly Reduces Mortality Rate after Stroke
- UJI Patents New Graphene-Based Catalysts
- From Trees to Power: Engineers Build Super Capacitors
- Next Generation Pacemakers may be Powered by the Heart itself
- New Way to Capture Energy from Sunlight
- The Device for Diagnosis of Diabetes in Low-income Populations

Forthcoming Tech Events

- International Conference on Information Management & Libraries
- 6th International Conference on Information and Communication Technologies
- Frontiers of Information Technology
- World Engineering Conference and Convention
- 39th International Conference and Expo on Advanced Ceramics and Composite
- 2016 AHRD International Research Conference
- 10th International Renewable Energy Storage Conference (IRES)
- The 5th International Conference on Informatics, Environment, Energy and Applications

Indigenous Technology

Reverse Osmosis (RO) Based Wastewater Treatment

Water, a colorless, odorless and tasteless liquid, is an important entity for life, plants and animals to survive. Scarcity of water sources has been noted in certain parts of the world despite the availability of clean drinking water. Water availability in Pakistan is decreasing day by day due to drastic increase in population and misuse of water resources. Membrane filtration technology offers an advanced alternative for conventional water treatment technology by producing water free of biological contamination. Especially, Reverse Osmosis (RO) and Nano filtration (NF) technologies, mainly because of their small pore sizes, have a great potential to remove biodegradable organic substances from source water and consequently reduce the potential for bacterial growth in the distribution system.

In the past few years, the commercialization of small scale reverse osmosis(RO) plant for low total dissolved solids(TDS) brackish and contaminated groundwater water desalination offered an alternative solution to obtain drinking water with TDS lower than 500mg/L. Due to rapid development in membrane technology the technical and economical usefulness of RO process has been improved. In the current research work, a prototype Reverse Osmosis (RO) waste water treatment plant has been developed and its performance was evaluated to produce the safe and drinkable water at local small community. Salt rejection and permeate water flow rate are the key performance parameters. These performance parameters are influenced by other variable parameters such as applied feed pressure, temperature, recovery and feed water salinity. The RO plant performance has been evaluated through testing different water quality parameters; including physical, chemical and biological analysis of the treated sample. The plant was operated by varying feed water pressures and feed water salinity which indicated that the product water has the highest quality and maximum permeate flow rate at 25 bar of applied feed water pressure for feed water salinity upto 4000 mg/L. The water quality results indicate that permeate obtained after treatment has excellent quality free of physical and microbial contaminants.

Courtesy:

NUST Journal of Engineering Sciences, Volume 6 No. 1

Muhammad Younas, Wajid Ali, Muhammad Zaheer: (Department of Chemical Engineering, University of Engineering and Technology, Peshawar, Pakistan)

www.nust.edu.pk

Indigenous Technology

Desulfurization of Oils; Produced from Pyrolysis of Scrap Tires

With the Socio-economic growth of any society the usage of vehicles and thus production of scrap tires increases. The complicated structure of scrap tires doesn't allow its disposal without thermal degradation. On the other hand high calorific value of scrap tire makes sense for its use as a fuel. Until the recent past, use of scrap tires as an alternative fuel in industries like cement is common throughout the world. Due to sulfur presence and hazardous effects of sulfur compounds, the direct use of scrap tires as an alternative fuel is perilous for the environment. The fuel gases produced as a result of tire burning is a serious threat to the environment. With the passage of time alternative techniques are developed for disposal of scrap tires. Pyrolysis is one such approach towards scrap tire disposal and utilization of high percentage of carbon for energy. In pyrolysis of scrap tires, tires are thermally degraded in the absence of oxygen and converted into vapours. The vapours are then condensed into liquid while the non-condensable vapours are emitted as gases into the environment and the solid residue is left behind in the reactor.

In this research work on pyrolysis process along with techniques of desulfurization and purification of pyrolytic oils is reviewed. Effects of temperature, heating rate, and tire composition on pyrolysis products have been discussed. The optimum yield of pyrolytic oils was found in temperature range of 450-500°C. Composition and other fuel properties of pyrolytic oil changes with varying operating conditions. The sulfur content of pyrolytic oils may be reduced with the use of additives and acids. In additives the desulfurization efficiency of CaO is better than other additives. In acids, formic acid and H₂O mixture is effective. The desulfurized pyrolytic oil can be separated into its light and heavy oil fractions by distillation. The desulfurized pyrolytic oil can be used in diesel engine with diesel blend and a mixture of 90% pyrolytic oil and 10% diesel fuel can be burned in diesel engines

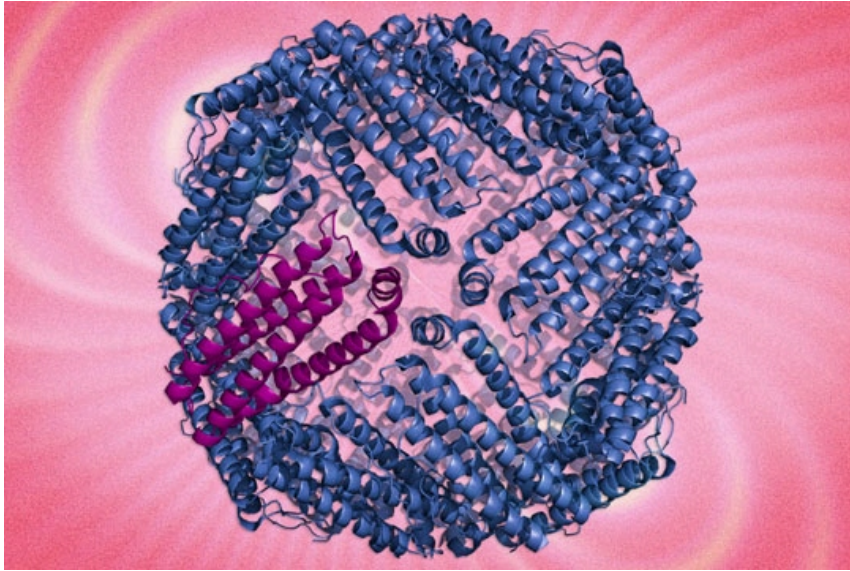
Courtesy:

NUST Journal of Engineering Sciences Volume 6 No. 1

Shahzad Ahmed, Muhammad Imran Ahmed: (Department of Chemical Engineering, University of Engineering and Technology, Peshawar, Pakistan)

www.nust.edu.pk

Nanoparticles to Track Cells and Interactions within them



MIT engineers have designed magnetic protein nanoparticles that can be used to track cells or to monitor interactions within cells. The particles are an enhanced version of a naturally occurring, weakly magnetic protein called ferritin. Ferritin, which is as close as biology has given us to a naturally magnetic protein nanoparticle, is really not that magnetic. According to Alan Jasanoff, an MIT professor of biological engineering and the paper's senior author they used the tools of protein engineering to try to boost the magnetic characteristics of this protein.

The new “hypermagnetic” protein nanoparticles can be produced within cells, allowing the cells to be imaged or sorted using magnetic techniques. This eliminates the need

to tag cells with synthetic particles and allows the particles to sense other molecules inside cells.

The paper's lead author is former MIT graduate student Yuri Matsumoto. Other authors are graduate student Ritchie Chen and Polina Anikeeva, an assistant professor of materials science and engineering.

Previous research has yielded synthetic magnetic particles for imaging or tracking cells, but it can be difficult to deliver these particles into the target cells. In the new study, Jasanoff and colleagues set out to create magnetic particles that are genetically encoded. With this approach, the researchers deliver a gene for a magnetic protein into the target cells, prompting them to start producing the protein on their own.

As a starting point, the researchers used ferritin, which carries a supply of iron atoms that every cell needs as components of metabolic enzymes. In hopes of creating a more magnetic version of ferritin, the researchers created about 10 million variants and tested them in yeast cells.

After repeated rounds of screening, the researchers used one of the most promising candidates to create a magnetic sensor consisting of enhanced ferritin modified with a protein tag that binds with another protein called streptavidin. This allowed them to detect whether streptavidin was present in yeast cells; however, this approach could also be tailored to target other interactions.

The mutated protein appears to successfully overcome one of the key shortcomings of natural ferritin, which is that it is difficult to load with iron. To be able to make more magnetic indicators for MRI would be fabulous, and this is an important step toward making that type of indicator more robust,” says Koretsky, who was not part of the research team.

Because the engineered ferritins are genetically encoded, they can be manufactured within cells that are programmed to make them respond only under certain circumstances, such as when the cell receives some kind of external signal, when it divides, or when it differentiates into another type of cell. Researchers could track this activity using magnetic resonance imaging (MRI), potentially allowing them to observe communication between neurons, activation of immune cells, or stem cell differentiation, among other phenomena.

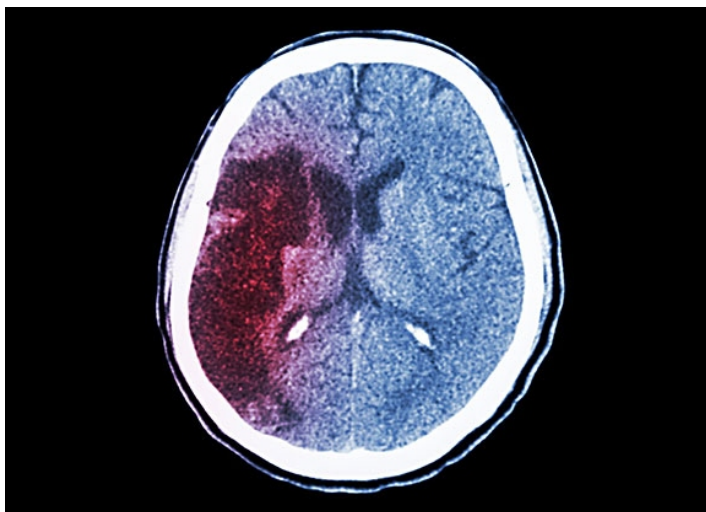
Such sensors could also be used to monitor the effectiveness of stem cell therapies. The researchers are now working on adapting the magnetic sensors to work in mammalian cells. They are also trying to make the engineered ferritin even more strongly magnetic.

New Drug Significantly Reduces Mortality Rate after Stroke

An existing drug administered intravenously reduces the chances of dying from major stroke by 60%. According to Yale. They have never seen a drug have that kind of impact on stroke mortality.

About 10% to 15% of the 800,000 Americans who suffer strokes annually suffer from large, ischemic strokes, in which blood clots develop dangerous levels of swelling in the brain. About half of these patients end up dying.

The trial assessed impact of a reformulated version of the drug glyburide, which has been used to treat diabetes for decades. The intravenous drug Cirara™ is delivered in a three-stage dosing regimen designed to target swelling following a central nervous system injury.



Brain swelling was reduced by 50% in patients who took the study drug, based on the most commonly accepted measure of swelling following a stroke. The frequency of emergency decompressive craniectomies surgical procedures in which part of the skull is removed to reduce internal pressure from swelling common to large, ischemic strokes was not reduced among those given Cirara. However, mortality was reduced in subjects receiving the drug whether they underwent the procedure or not.

www.yale.edu

UJI Patents New Graphene-Based Catalysts



Researchers at the Universitat Jaume I have developed materials based on graphene that can catalyze reactions for the conversion and storage of energy. The technology patented by the UJI combines graphene and organometallic compounds in a single material without altering the most interesting properties of graphene, such as its electrical conductivity.

The technology, developed by the Group of Organometallic Chemistry and Homogeneous Catalysis (QOMCAT) of the UJI, is of great interest to the energy industry and is part of the so-called “hydrogen economy”. An alternative energetic model in which energy is stored as hydrogen. In this regard, the materials patented by the UJI allow catalyzing

reactions for obtaining hydrogen from alcohols and may also serve as storage systems of this gas.

It is a novel technology since it uses graphene for the first time as a support of organometallic compounds. These hybrid

materials have catalytic properties and are modular and recyclable. Thus, the catalyst developed at the UJI can be recycled ten times without suffering a loss of activity, a very attractive property from the industrial viewpoint.

The new material is also obtained from a novel system of obtaining hybrid materials in a single step. An easy and affordable system that allows that all the technology that is currently based on graphene can be easily converted using these new materials. Thus, the patented materials can be used both in the development of catalysts as well as storage batteries or other energy types.

www.universitat.jaume

From Trees to Power: Engineers Build Super Capacitors

The scientists are using cellulose, an organic compound found in plants, bacteria, algae and trees, to build more efficient and longer-lasting energy storage devices or super capacitors. This development paves the way toward the production of lightweight, flexible, and high-power electronics, such as wearable devices, portable power supplies and hybrid and electric vehicles.



According to Cranston the goal of this research is to find ways to power current and future technology with efficiency and in a sustainable way. This means anticipating future technology needs and relying on materials that are more environmentally friendly and not based on depleting resources.

Cellulose offers the advantages of high strength and flexibility for many advanced applications; of particular interest are nanocellulose-based materials. The work by Cranston, an assistant chemical engineering professor, and Zhitomirsky, a materials science and engineering professor, demonstrates an improved three-dimensional energy storage device constructed by trapping functional nanoparticles within the walls of nanocellulose foam.

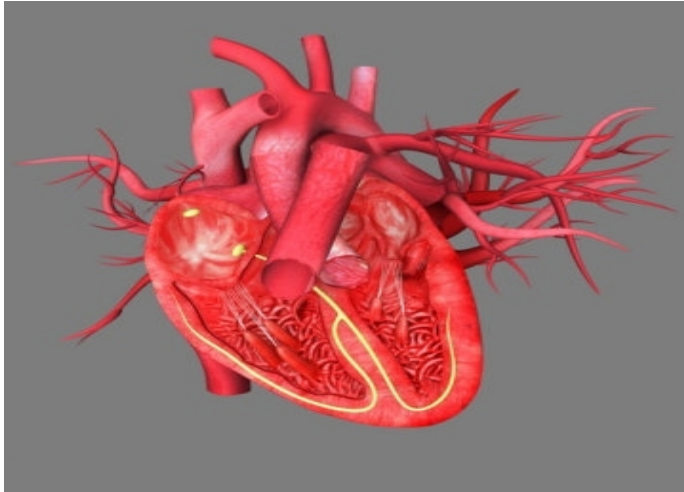
The foam is made in a simplified and fast one-step process. The type of nanocellulose used is called cellulose nanocrystals and looks like uncooked long-grain rice but with nanometer-dimensions. In these new devices, the 'rice grains' have been glued together at random points forming a mesh-like structure with lots of open space, hence the extremely lightweight nature of the material. This can be used to produce more sustainable capacitor devices with higher power density and faster charging abilities compared to rechargeable batteries.

Lightweight and high-power density capacitors are of particular interest for the development of hybrid and electric vehicles. The fast-charging devices allow for significant energy saving, because they can accumulate energy during braking and release it during acceleration.

www.sciencedaily.com

Next Generation Pacemakers may be Powered by the Heart itself

Researchers are developing technology to make pacemakers battery-free. The advancement is based upon a piezoelectric system that converts vibrational energy, created inside the chest by each heartbeat, into electricity to power the pacemaker. According to M. Amin Karami, PhD, assistant professor of mechanical engineering at the University at Buffalo School of Engineering and Applied Sciences, who is leading the research they are



creating technology that will allow pacemakers to be powered by the very heart that they are regulating. The technology may eliminate the medical risks, costs and inconvenience of having a battery replacement every five to 12 years for millions of people worldwide. The development of pacemakers dates back nearly a century. At the beginning, most efforts focused on devices that patients would carry outside their body. Surgeons first successfully implanted a pacemaker in a human in 1960 in Buffalo, New York. The device, invented by UB alumnus Wilson Greatbatch, enabled the patient to survive another 18 months. While there have been advancements since 1960, the devices are smaller, the batteries last longer, there are even "smart" pacemakers that are linked to computers but the basic

design from Greatbatch is the same. The pacemakers are implanted under the skin through an incision in the chest. Wires, also called leads, connect the device to the heart and deliver electrical signals that regulate the heart's activity.

The new wireless option does not require leads because it rests inside the heart. This removes a potential point of failure, but the device still relies on a battery that must be replaced as often as the batteries that conventional pacemakers use. A state of constant motion

The idea of heart-powered pacemakers came to Karami after doing PhD work on piezoelectric applications for unmanned aerial vehicles and bridges. He wanted to apply that knowledge to the human body. The heart was an obvious choice because of its relative strength and constant motion. It moves significantly, in turn, that movement creates energy that researchers just now figuring out how to harvest. Karami initially designed a flat piezoelectric structure for a conventional pacemaker. A prototype generated enough power to keep the pacemaker running at a range of 7 to 700 beats per minute. With the development of wireless pacemakers, however, he has revamped the design to accommodate the smaller, tube-shaped device. Karami, is building the new prototype and expects to have animal tests done within two years. From there, it should be ready for human trials and, eventually, approval from the U.S. Food and Drug Administration.

www.buffalo.edu

New way to Capture Energy from Sunlight

Solar energy is an inexhaustible resource that we currently only utilise to a very limited extent. Researchers around the world are therefore trying to find new and more efficient ways to use the energy in sunlight. The technique the researchers in Lund are working on is solar cells consisting of a thin film of nanostructured titanium dioxide and a dye that captures solar energy. Today, the best solar cells of this type use dyes containing ruthenium metal -- a very rare and expensive element.

According to Professor Villy Sundstrom many researchers have tried to replace ruthenium with iron, but without success. All previous attempts have resulted in molecules that convert light energy into heat instead of electrons, which is required for solar cells to generate electricity.

Researchers at the Chemistry Department in Lund, in collaboration with Uppsala University, have now successfully produced an iron-based dye that is capable of converting light into electrons with nearly 100 per cent efficiency.

According to Kenneth Warnmark, the advantage of using iron is that it is a common element in nature. It can provide inexpensive and environmentally friendly applications of solar energy in the future.

By combining the experiments with advanced computer simulations, the researchers are able to understand in detail required design concepts for the iron molecules to work. This knowledge is now being used for further developing the iron-based dyes. The results of the study suggest that solar cells based on these materials can be at least as effective as those of today that are based on ruthenium or other rare metals. The discovery could also advance research on solar fuels in which, like in photosynthesis of plants, water and carbon dioxide are turned into energy-rich molecules -- solar fuel -- with the help of sunlight.

The researchers envision that the new iron-based molecules could also drive the chemical reactions that create solar fuel. The researchers have worked on developing iron-based solar cell dyes for three years and are surprised by how quickly they found a dye that can capture sunlight as efficiently as this.

www.lu.se

The Device for Diagnosis of Diabetes in Low-income Populations

A device that detects in saliva a biological indicator of a possible risk of type II diabetes is the development of a technological and scientific team of the Tec de Monterrey (Mexican University) in collaboration with the University of Houston. What makes this development unique is that it is adaptable to the cell phone and gives results in a few seconds, avoiding the annoying use of needles.

In other words, it is a cartridge adaptable to the mobile phone that will record whether a compound is present in saliva, which becomes visible if the patient has diabetes. Dr. Marco Antonio Rite Palomares, director of the Biotechnology Center of the Tec de Monterrey FEMSA explained that it is as simple as pregnancy tests, where the specific marker shows in a few seconds.

The multidisciplinary team united scientific experts to work in enzyme technology to make visible this marker and use an analytical process; also, they developed a micro device that can be integrated into a cell phone and where one can place a saliva sample showing the results through a software.

The director of FEMSA Biotechnology Center mentions that he considered using the camera phone to detect the marker in saliva, as the resolution is getting better each year. Afterwards it was considered to make it visible through an enzymatic reaction where the biomarker is fluorescent or emits light identifiable from the rest of the compounds through a strategy that has been used in other areas of technology and is now applied to biology.

While the idea is to make the patient's life easier, researchers also want to bring health care to the low-income population, helping to make an early detection before it can lead to more problems and take action to prevent high costs for the population and the government, " he added.

www.invdes.com.mx

Forthcoming Tech Events

National

International Conference on Information Management & Libraries

10-13 November, 2015

Lahore, Pakistan

[www. Pu.edu.pk](http://www.Pu.edu.pk)

6th International Conference on Information and Communication Technologies

12-13 December 2015

Karachi, Pakistan

www.icict.iba.edu.pk

Frontiers of Information Technology

14-16 December 2015

Comsats, Islamabad

www.fit.edu.pk

International Events

39th International Conference and Expo on Advanced Ceramics and Composites

25-30 January, 2016

Florida USA

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

2016 AHRD International Research Conference

February 18-20, 2016

Florida 32202 United States

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

10th International Renewable Energy Storage Conference (IRES 2016)

15-17, March 2016

Brussels Belgium

www.eurobat.org

The 5th International Conference on Informatics, Environment, Energy and Applications

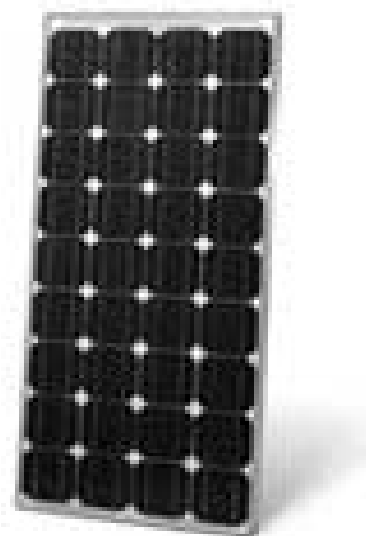
26-28 March 2016

Hong Kong

www.ieea.org

Tech & Trade Offers

Solar Solutions



- ✎ Solar for villages in remote areas
- ✎ Solar for homes and summer cottages
- ✎ Solar for microwave / Radio repeater stations
- ✎ Solar for Medical facilities in rural areas
- ✎ Solar for emergency communication
- ✎ Solar System for water quality and environmental data monitoring
- ✎ Solar solution for drinking water and livestock water pumping
- ✎ Small-scale irrigation pumping
- ✎ Cathodic protection
- ✎ Solar Aviation obstruction lights
- ✎ Solar Environmental data monitoring
- ✎ Solar Railway signals
- ✎ Solar Street lighting
- ✎ Small-scale desalination

Company Contact:-

Sharif International

House # 151-A Street # 8 Chaklala Scheme 3, Rawalpindi

Tel: 92-51-5766380, Fax: 92-51-5598354

www.sharifinternational.net

www.olympiainternational.com

About PASTIC

PASTIC serves as a gateway for Scientific & Technological Information for R&D by catering to the information needs of researchers, entrepreneurs, industrialists, educationists, policy makers and planners through anticipatory and responsive information services.

Technology Information Service Section of PASTIC works exclusively for support and promotion of technological information on trade and industry in the country. "Technology Roundup" is a news bulletin that provides latest and innovative technology news, forthcoming events, etc. It also promotes products, technologies and services globally in sectors such as Agro-Industry, Bio-Technology, Building Material, Business, Chemicals, Electronics, Energy, Fisheries, Food Processing, Machinery, Packaging, Mining Pharmaceuticals and Textiles.

Please give us your feedback and address queries to editor@pastic.gov.pk