New Heart Tissue Fixture

Iranian scientists have developed a new type of heart tissue fixture used in open heart surgery, which is conducted to bypass a blocked vessel.

NANOTECH ACHIEVEMENTS

Iranian Student Makes Major Nano Breakthrough

What an Iranian university student thought was a failed experiment led to a serendipitous discovery hailed by some scientists as a potential game changer for the mass production of nanoparticles.

Soroush Shabahang, a graduate student in CREOL (College of Optics & Photonics) of University of Central Florida, made the finding that could ultimately change the way pharmaceuticals are produced, FNA reported.

Soroush Shabahang

The discovery was based on using heat to break up long, thin fibers into tiny, proportional seeds, which have the capability of holdingh multiple types of materials locked in place. The work, published in the July 18 issue of Nature, opens the door to a world of applications.

Craig Arnold, associate professor of mechanical and aerospace engineering at Princeton University and an expert in laser material interactions who did not work on the project, said no one else in the field has been able to accomplish this feat.

With a new non-chemical method of creating identical particles of any size in large quantities, "the possible applications are up to your imagination", Arnold said.

The most immediate prospect is the creation of particles capable of drug delivery that could, for example, combine different agents for fighting a tumor. Or it could combine a time-release component with medications that will only activate once they reach their target-infected cells.

"With this approach, you can make a very sophisticated structure with no more effort than creating the simplest of structures," said Ayman Abouraddy, an assistant professor at CREOL and Shabahang's mentor and advisor.

Glycerol Nanosensor Produced With Malaysians

Researchers at Shahr-e Rey Branch of Islamic Azad University in Iran and the Malaysian Academy of Sciences have succeeded in the joint production of glycerol nanosensor and a high-quality anode to be used in fuel cells.

As a byproduct, free glycerol is one of the most important impurities of biodiesel, which is a non-fossil and clean fuel, INIC reported.

The Iranian and Malaysian scientists electrochemically synthesized nickel nanoparticles and modified the surface of composite graphite electrode with nanoparticles through voltametric methods.

The purpose of the research was to manufacture a precise sensor with high sensitivity and at a reasonable price in order to measure free glycerol. To this end, the surface of the composite graphite electrode was modified through voltameteric methods by using nickel nanoparticles with an average size of approximately 10 nanometres.

Then, the modified electrode was studied and used in the electro-oxidation and free glycerol measurement in biodiesel due to the presence of nickel nanocatalyst on its surface.

The research was aimed at producing an electrochemical electrode or nanosensor based on nickel nanocatalyst in order to determine and measure glycerol or free glycerol in biodiesel with a sensitivity of 0.033 milimolar.

Iran to Set Up Nanotech Labs

Iran plans to establish 10 nanotechnology laboratories for students.

Secretary-General of Iran Nanotechnology Initiative Council (INIC) Dr. Saeed Sarkar made the announcement while addressing the closing ceremony of the 3rd Nano Olympiad in Iran, INIC reported.

"We hope to provide each province with at least one equipped nanotechnology research laboratory to exclusively serve the students as a motivation and to foster a culture of innovation and creativity," Dr. Sarkar said, informing that 10 provinces in Iran have made investments for establishing such nanotech labs.

The secretary-general of INIC also described the capabilities of each nation with regard to technologies, particularly the emerging technologies, as a measure of modernity and power.

"In future, success on an international scale will be achieved only by countries that maintain a high level of expertise in the emerging technologies. Nanotechnology, as a notable example of the latter, will impact all aspects of modern lives because of its wide range of service and our high degree of involvement in it," Dr. Sarkar said, emphasizing the importance of the national nanotechnology promotion programs.

"Students are our country's most valuable future resource. We need to provide them with theoretical as well as practical knowledge in different areas of nanotechnology to secure our nation's future success."

Sarkar said the INIC has so far devoted a good deal of attention to this issue and achieved progress, both quantitatively and qualitatively, and diversity in the educational programs.

The INIC has held three consecutive national student Olympiads on nanotechnology and recently a number of Asian countries have called for holding these scientific competitions at the international level.

Medicine to Cure Liver Tumor Developed

Iranian scientists have developed a new radiopharmaceutical to cure malignant liver tumor for the first time in the country.

The method, which uses injection of radioactive particles, was carried out in the Heart and Vessel Center of Tehran's Shahid Rajaei Hospital, ISNA reported.

The radiopharmaceutical was only used by a few countries, but researchers in Atomic Energy Organization of Iran have managed to produce the drug domestically.

Liver cancer is cured in Iran only through surgery or radiotherapy, but as per this method, radiopharmaceutical would be injected into a vessel feeding the tumor through angiography.

Animal tests of the project were successfully carried out on rabbit and sheep. Human trials of the new method will be conducted next year.

The new method also prevents the risk of radio hepatitis without damaging the liver.

Liver tumors are discovered on medical imaging equipment (often by accident) or present themselves symptomatically as an abdominal mass, abdominal pain, jaundice, nausea or liver dysfunction.

They should not be confused with liver metastases, which are cancers that originate from organs elsewhere in the body and migrate to the liver.

Water Oxidation In Artificial Photosynthesis

Iranian researchers at the Institute for Advanced Studies in Basic Sciences (IASBS) in Zanjan city have conducted comprehensive studies to identify nanosized manganese oxides as the active catalysts for water oxidation.

Artificial photosynthesis has been the subject of intense debate in recent years with the objective of creating useful materials or solar energy storage by taking inspiration from the natural photosynthesis process, En.nano reported.

Results of the research at IASBS have revealed that nano-metric manganese oxides, formed by the decomposition of manganese complexes, act as active species in the water oxidation process.

By applying a number of common analysis techniques, the researchers came to find similarities in reactions of different manganese complexes with cerium (IV) ammonium nitrate, which is a well-known and popular oxidizing agent.

Further studies led them to conclude the presence of a special type of nano-metric manganese oxide in the reactions of a number of complexes within the water oxidation process.

"We postulate that these complexes break down initially to form special manganese oxides which subsequently take part in the water oxidation process by a unique mechanism," Dr. Mohammad Mehdi Najafpour, a member of the research group, explained.

Results of this research shed light on understanding the mechanism of water oxidation and help better design water oxidizing catalysts.

Iran Closer To Medicinal Self-Sufficiency

Iran meets 96 percent of its medicinal needs through domestic production, Iranian Health Minister Marziyeh Vahid Dastjerdi announced.

"Iran is almost self-sufficient in producing drugs and 96 percent of the different needed medications are produced inside the country," Dastjerdi was quoted as saying by FNA.

Rapporteur of Majlis Health Commission Hassan Tamini had also announced earlier that Iranian experts and scientists produce 96 percent of the country's medicines and 85 percent of its disposable medical tools and equipment, hoping that the figure would increase to 100 percent at the end of the country's Fifth Five-Year Development Plan (2015).

Earlier this year, Dastjerdi had highlighted the country's astonishing progress in producing medical tools, equipment and drugs, saying that Iran ranks first in synthesizing medications in the region.

Iran has taken wide strides in science and technology, particularly in medical and medicinal fields, in recent years.

In a landmark pharmaceutical progress, the Atomic Energy Organization of Iran (AEOI) announced in January that Iranian scientists have synthesized two new types of radiomedicines to treat malignant types of cancer.

"Iranian scientists and researchers of AEOI's Nuclear Science and Technology Research Center succeeded in producing two new radiomedicines for the first time to cure malignant cancers," AEOI Spokesman Hamid Khadem Qaemi said at the time.

Qaemi named the radiomedicines as Lutetium-177 Phosponate for bone pain palliation in metastatic prostate cancer and Iodine 131 Chlorotoxin to treat malignant glioma.

Also in December, Iran unveiled five radiomedicine projects with applications for diagnosis, prevention and treatment of a number of diseases.

In September, Iran announced that it plans to synthesize 20 kinds of radiomedicines, stressing that its scientists are capable of supplying the 20 percent-enriched uranium needed for the production of such drugs.

"Iran has gained the necessary preparedness to produce 20 radiomedicines and we will provide the 20 percent (enriched) fuel needed for the production of these medicines this year," the deputy head of AEOI for planning, international and parliamentary affairs, Massoud Akhavan-Fard, told FNA in September.

In addition to the Tehran research reactor, which has long been used for radioisotope production, Iran also plans to build four other research reactors in other parts of the country.

Iranians Receive US Patent on Solar Cells

Researchers at Iran's Sharif University of Technology have received a US patent issued under the title of "Single-Sided Dye-Sensitized Solar Cells Having a Vertical Patterned Structure" and publication number of US20110220192.

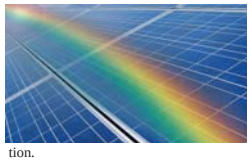
"We have proposed a novel structure for the solar cells which can eliminate the unnecessary formation of the conductive glasses--a major cost-intensive byproduct in the course of solar cells manufacturing," Nima Taqavinia, associate professor at Sharif University of Technology, was quoted as saying by Fars News Agency.

"Dye-sensitized solar cells are a type of nanostructured solar cells whose mechanism is based on light absorption by the pigment molecules plus electron and whole injection to a semiconductor and an electrolyte. This resembles the photosynthesis occurring in plants," Taqavinia explained about the invented dye-sensitized solar cells.

The research group is affiliated to the Nanoparticles and Nanocoatings Lab at the Department of Physics of Sharif University of Technology.

"Our main mission in the laboratory is to pave the way for commercialization of the solar cells technology. Concurrent with this project, we are conducting other researches within the same framework and hope to come up with suitable results soon in the future," he said.

As for the commercialization and mass production of solar cells in Iran, Taqavinia said, "For the fabrication of a small panel of solar cells, a large number of layering and heat treatment steps are required. From the mass production viewpoint, each simple step demands a great deal of design and operation."



The production rate, processing cost, cost of raw materials and all other parameters impacting the final cost should be low enough for the new product to beat its rivals. Also, the durability and excellence of performance are two other key factors.

As a result, a combination of parameters together with technical novelty can guarantee a promising commercialization.

"We make our contributions to the different aspects of this development. To materialize such a dream, which is the localization of the solar cell production technology, we need to build a diverse and strong portfolio of related patents," he said.

Iran Develops Biosensors for Detecting Ethanol

A team of Iranian researchers from the University of Kurdistan (UOK), led by Dr. Abdollah Salimi, has developed a carbon electrode modified with a nanocomposite that enables low-concentration detection of ethanol in different environments.

The fermentation of food products usually leads to the liberation of minute amounts of ethanol. Thus, the detection of ethanol at low levels provides a practical means for identification of food spoilage caused by food-borne pathogenic bacteria, Fars News Agency reported.

Ethanol is used as an ingredient in low concentrations in many pharmaceutical drugs and hence its precise measurement can serve as a criterion for the quality analysis of these products.

By preparing a platform to immobilize the electrogenerated NAD+ oxidation products (Ox-P(NAD+)) occurring at potentials as high as 1.2 V, the UOK researchers obtained a quinone-diimine composite that plays an influential role as an intermediate in the electrocatalytic oxidation of NADH.

Finally, members of the research group have appraised the ethanol-sensing performance of their proposed biosensor by taking alcohol dehydrogenase (ADH) as a model enzyme.

"The utilization of a nanocomposite constituting multi-walled carbon nanotubes and an ionic liquid furnishes a desirable platform for immobilization of the NAD+ oxidation products and allows the realization of a highly sensitive electrocatalytic system with a considerably lowered overpotential of the NADH oxidation process," Dr. Salimi said, highlighting the innovative features of their experimental work.

Furthermore, the inclusion of carbon nanotubes improves the mechanical stability of the system and accelerates the electron-transfer processes at the electrode surface, thanks to the unique electronic properties of the CNTs.

Moreover, the MWCNTs/ionic liquid nanocomposite, as the platform for immobilization of the electron-transfer mediators (i.e. NAD+ oxidation products), minimizes the superficial contaminations due to its anti-fouling property. As a result, the operational and storage stability of the system is enhanced.