Technology Scan

ASIA-PACIFIC

AUSTRALIA

Hydrogen storage technology

A team of Australian scientists have developed a solid state hydrogen storage technology that is safer, costs less and stores a higher density of hydrogen than the gaseous and liquid systems presently used in industry. The magnesium alloy developed by Arne Dahle and Kazuhiro Nogita from Queensland University's School of Engineering features seven times the storage density of a standard hydrogen pressure cylinder.

A new company called Hydrexia has been established to realise the commercial potential of the technology, which CEO Jeffrey Ng says is relevant across many sectors. "Any application that uses hydrogen is coming across this issue of hydrogen storage, because with pressurised gas or liquid you just don't store enough hydrogen safely," Ng says. Ng defined four key things that people look for when it comes to hydrogen storage: safety, hydrogen storage density, low cost and manufacturability. On all of these fronts, Ng says, Dahle and Nogita's new magnesium alloy performs better than the two most common storage methods to date.

The material Dahle and Nogita have discovered is a hydride. Under the right pressure and temperature conditions, the hydrogen binds into the nanostructure of a material. Under different conditions of temperature and pressure, the process is reversible with the hydrogen released and the material returning to its original state. Every kilogram of Hydrexia's magnesium can store about 75g of hydrogen, which according to Ng, is about seven times the storage density of a standard pressure cylinder.

The Hydrexia material can be produced by straight casting methods, rather than requiring the energy intensive and dangerous process of high-energy ball milling. Hydrexia has just built its first prototype system for on-site industrial hydrogen storage and is talking to a number of commercialization partners.

http://www.ferret.com.au

CHINA

Sludge transferred into treasures

A Chinese expert has recently found a new way of dealing with the mounting sludge produced in sewage treatment and dumped in city suburbs amidst the rapid urbanization process. Weng Huanxin, a professor with the Environmental and Biological Geochemistry Institute of the Zhejiang University, in east China's Zhejiang Province, has developed a low cost method of transferring sludge into innoxious materials for bricks and cement.

Sludge is threatening to besiege more than 700 cities in China. Beijing alone produces 1,000 tonnes of sludge a day, Shanghai 700 tonnes and Shenzhen 300 tonnes. It is estimated that China's sludge amount will rise at an annual rate of 10 to 15 per cent in the years to come.

Beijing is expected to discharge more than 2 million tonnes of sewage every day in 2008, which is likely to yield more than 2,000 tonnes of sludge if all the sewage is treated. Most of the sludge is just piled up in open air or land filled, which occupies too much land and may cause pollution. And direct burning will produce toxic fumes.

According to Weng's new technology, sludge can be dried at a low temperature, under which toxic components are permanently fixed and won't volatilize any more. It is then made into hard bean-sized granules. The granules, mixed with clays, can be burnt into lightweight bricks. Since each granule contains 1,500 kilocalories of heat, they themselves can contribute to burning and help save fuels.

Meanwhile, small holes emerging inside the granules after burning will reduce the weight of bricks and enhance their resistance against pressure. Weng said that a production line using the new technology to deal with 100 tonnes of sludge a day will help save about 1 million yuan (US$ 125,000) of landfill cost.

Statistics show that accumulating sludge is also plaguing the United States and countries in Europe. The United States will see its sludge amount to 8.2 million tonnes in 2010, and Britain produces about 1.1 million tonnes of thickened sludge every year.

http://english.people.com.cn

Technical system for molecular animal breeding

With the support of the National 863 Program, China has established a technical system for molecular animal breeding and associated scaled reproduction. The system improves the understanding of QTL that affects the milk producing performance of a cow, using refined positioning techniques and molecular markers. Researchers also developed an innovative system for embryo screening and production, using molecular markers.

The efforts have resulted in numerous findings. These include:

- An improved positioning of QTL using high density DNA markers;
- Defining 15 new microsatellite markers on the 6th chromosome;
- Obtaining high density marker clusters covering the major genetic belt involving milk producing performance; and
- Establishing a highly efficient system for embryo screening and production, using molecular markers.

Researchers bred out 18 bulls, featured with low fat but high proteins. This produced the cows in the first birth having a milk yield of 8,200 kg, and the cows in the third birth producing 10 tonnes of milk, with a 3.52 per cent protein content and a 3.6 per cent fat content.

Researchers also improved ovulation and egg picking techniques, and optimized fetus transplanting and separation processes. The efforts also led to the establishment of a PCR technique for telling the fetus gender at an earlier stage, and a cell cloning technique for high-yield cows. The technical system has produced 2,900 high-yield cows, and 17,605 valid embryos, which is about 6 embryos from each. More than 5,300 embryos are transplanted, with a fresh embryo conceiving rate of 62 per cent. 90 per cent of the frozen embryos can be thawed for transplanting, with a conceiving rate of 56 per cent. Both indicators have reached an internationally advanced level. Researchers have landed an accuracy of 97.09 per cent for screening the fetus gender at an earlier stage, using the PCR technique. They also established a technical system for collecting eggs from live cows, and for in-vitro impregnation as well. The freezing and defreezing techniques, also derived from the project, for regular and glassified embryo cloning, has successfully led to the birth of calves, the first of its kind in the country.

http://www.most.gov.cn

INDIA

Patent for Biocurcumax

The Controller of Patents in India has granted a patent to the Aluva-based Arjuna Natural Extracts Ltd. for its speciality product Biocurcumax. The patent has been awarded for a reconstituted product of curcumin, an active constituent of turmeric and essential oil of turmeric in a specific proportion, said a communication from the company.

Biocurcumax has enhanced bioavailability and better absorption of curcumin into blood, besides longer retention time, compared to normal curcumin powder. Curcumin has proved to be beneficial in the treatment of cancer and Alzheimer's disease. The product of the invention is currently exported to the United States and Japan, said the company communiqué.

Curcumin isolated from turmeric is rapidly metabolized in the body, and the body does not retain clinically significant concentrations. As a result, its health benefits were largely unrealized, according to earlier observations made by researchers. A team of researchers, led by Benny Antony, technical director, Arjuna Natural Extracts, found a solution to the problem, after three years of study.

Biocurcumax has shown 700 per cent more activity in human clinical trials, helping reduction in dosage required for clinical benefits. The company is awaiting the U.S. patent.

http://www.hindu.com

Patents for natural dyes

Government has granted provisional patents for two plant sources, 'Biscorata' and 'Nutgraff', which are natural dyes for cotton, wool and silk, to Punjab Agriculture University (PAU). It is the first time PAU sought for a patent for any invention, and they are hopeful to get a permanent patent within six months from the Patent Office at Delhi, informed Neelam Grewal, Head of the Department of Clothing and Textiles at PAU.

These invented plant sources have all the capabilities to produce colours similar to those produced by traditional dyes like 'Maddar' and 'Arjun'. Sources informed that these invented plant sources are cheaper and they cut the commercial cost of cotton dyeing by as much as 70 per cent. The handloom and handicraft industries will be benefited more through these new plant sources.

http://www.fibre2fashion.com

ISRAEL

Nano-battery technology

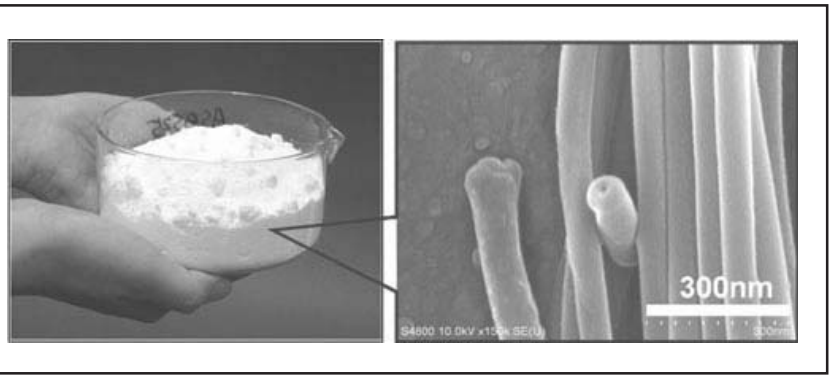
Innovative nano-battery technology for fast charge/discharge batteries, developed at Tel Aviv University, could provide an alternative source of power for mobile devices, without the fire hazards associated with current lithium-based batteries.

Over the past years, battery technology has not kept up with advances in semiconductor technology. As a result, batteries have become the weakest link in the operability of electronic devices. The growth in power-hungry mobile devices in the marketplace, however, means that manufacturers must substantially increase battery running time, by packing more and more power into tighter packages. Moreover, end-users are becoming impatient with the amount of time needed to charge these high power batteries, resulting in a need to design quicker charging devices. These two characteristics - capacity and speed - have resulted in the development of heavily Li-loaded batteries that are operated at high temperatures which pose a fire hazard. When overheated, Li Ion batteries can burst into flames and pose a major risk to users. Recently, Dell Inc., a leading US computer company, has recalled a certain class of its Sony-made laptop batteries, because of the danger of overheating and fire hazard.

Now, new nano battery technology, developed by research teams led by Prof. Menachem Nathan of the Tel Aviv University's Fleischmann Faculty of Engineering and by professors Emanuel Peled and Dina Golodnitsky of the University's School of Chemistry could eliminate this fire hazard by preventing overheating. The new device comprises a substantial number of miniature batteries, about 30,000 on an area as small as one square centimeter, all connected in parallel. This architecture provides a high output of electrical power, without the risk of overheating, a major cause of flammability in laptop computer and other mobile batteries.

Professors Nathan, Peled and Golodnitsky have developed a solution that combines the low internal resistance characteristics of a thin film battery with the high capacity of regular chargeable lithium batteries. Using ingenuous and proprietary coating technologies, tens

Figure 1: (Left) White solid powders (weight = 100 g) consisting of organic nanotubes (mean outer diameter = 80 nm, and mean inner diameter = 60 nm), and (Right) a scanning electron micrograph of the nanotubes we have developed.



of thousands of miniature lithium batteries are laid out in parallel within a half mm thick non-conducting substrate. The substrate volume is thus used to increase charge capacity per footprint, up to 10mAh/cm squared, more than 80 times over similar-area and similar cathode thickness planar thin film batteries. Such nano-battery assemblies were tested in the lab for hundreds of charge/discharge cycles, without loss of capacity and stability.

An extensive patent portfolio covers the Tel Aviv University nano-battery technology worldwide. The technology is available for licensing through Ramot at Tel Aviv University, the technology transfer arm of the university.

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JAPAN

Synthesis of white organic nanotubes

The High Axial-Ratio Nanostructure Fabrication Team of the Nanoarchitectonics Research Center of the National Institute of Advanced Industrial Science and Technology have newly designed and synthesized amphiphilic molecules with hydrophilic and hydrophobic moieties, and have developed a technique for the synthesis of various organic nanotubes of 40-200 nm in inner diameter, 70-500 nm in outer diameter, and several μm in length, by self-assembling them in organic solvents.

This method needs less than one thousandth of the solvent used by conventional methods, enabling mass-production of organic nanotubes (Figure 1). Unlike carbon nanotubes, organic nanotubes have excellent dispersibility in water, and can incorporate guest substances of over 10 nm in size, such as proteins and nucleic acids. The organic nanotubes can encapsulate even functional substances that are so large that cyclodextrins, produced on a commercial basis as encapsulation substances at present, cannot do. Thus the organic nanotubes are promising for application to various fields such as medical, health, and nanobio technologies.

In this work, using the hydrophilic and hydrophobic parts of inexpensive and safe materials such as saccharides and peptides which can be used as foods, we have designed and synthesized N-glycoside-type glycolipids and peptidelipids for the formation of nanotubes. Moreover, we have succeeded in the synthesis of hollow fiber-like organic nanotubes by self-assembly of the lipids in safe organic solvents, such as ethanol which is also used for food, but not using a water solvent.

By convenient processing, such as room-temperature preservation and evaporation of solvents, and using organic solvents which are good solvents of nanotube materials, we have succeeded in mass-producing over 1 kg of solid-powdery organic nanotubes with the amounts of solvents lower than 1,000-10,000th of that needed for conventional methods.

The synthesized amphiphilic molecules can form nanotube assemblies in only one step, without undergoing multiple steps like nanotubes in water, resulting in the production of a large amount of nanotubes in a very short time. We have confirmed that the white solid powders consist of organic nanotubes of 40-200 nm in inner diameter, 70-500 nm in outer diameter, and several μm in length using transmission and scanning electron microscopes.

In this work, we have produced over 1 kg of nanotubes, using organic solvents of approximately 10 *L* (conventional methods need 20,000 *L* of water). Furthermore, in preparation of nanotubes enabling encapsulation of functional substances, conventional methods need a vacuum-drying process over several days, but our organic solvent method makes the drying process easy to accomplish in several hours.

The characteristics, sizes, and functions of our organic nanotubes are different from those of carbon nanotubes, and hereafter their applications, research and development, and research for practical use will be accelerated as a work originating from Japan. We have thus named our nanotubes the "Organic Nanotube AIST," and we have recently applied for this to be registered as our trademark.

Cyclic molecules, called "cyclodextrin," which are constituted of 6-8 glucose molecules connected circularly, have been widely used in a variety of fields, such as food, medicine, and house hold goods. Encapsulating various organic low-molecular-weight compounds in their hydrophobic pockets,

the molecules have functions in making unstable substances stable, in the slow release of medicines and aroma chemicals, and in making water-insoluble substances soluble.

On the other hand, organic nanotubes formed by self-assembly of glycolipids can be well dispersed in water. Furthermore, the nanotubes can encapsulate 10-50-nm scale substances, e.g. proteins, nucleic acids, viruses, and metal nanoparticles, which cyclodextrin molecules cannot, to disperse them in water. Actually, using organic nanotubes of 30-60 nm in inner diameter, we have succeeded in the encapsulation of metal nanoparticles of 1-20 nm in diameter and spherical proteins of 12 nm in diameter (ferritin).

Recently, products utilizing encapsulation functions of cyclodextrin have been researched and developed, and many of them have already been produced on a commercial basis. However, our nanotubes, enabling mass-production and encapsulation of large molecules, are promising for industrial applications, as new materials with encapsulation functions.

http://www.aist.go.jp

New process for biomass ethanol

Honda Motor Co has co-developed a process for producing ethanol out of cellulosic biomass, which it claims to be the world's first practical process for using non-edible plant materials as fuel. Honda has partnered with the Research Institute of Innovative Technology for the Earth (RITE), a non-profit entity set up by the Japanese government and private enterprises, for perfecting the new process. Honda said the new process can be used to produce large volumes of ethanol from widely available waste wood, leaves and other soft biomass.

Ethanol is now produced mainly from sugar cane and corn, which raises the issue of balancing their use as food crops. Ethanol, which is a major renewable fuel, is widely used as motor fuel in Brazil and is gaining popularity in the United States. Ethanol, or ethyl alcohol, is on its way to becoming a mainstream world commodity as soaring prices for crude oil and gasoline push consumers to use more "green" fuels produced from renewable resources.

Current technology for converting cellulosic biomass yields only very low levels of ethanol due to fermentation problems - a problem associated with the process of separating cellulose and hemicellulose from soft biomass.

The new process uses a microorganism developed by RITE that helps reduce the fermentation interference, allowing for far more efficient ethanol production. Honda's research unit Honda R&D Co, is planning to set up a pilot plant in 2008, to test the technology for practical application.

http://www.domain-b.com

KOREA

Demonstration of 4G mobile technology

Samsung Electronics announced its plan to demonstrate 4th Generation (4G) mobile technology at the annual Samsung 4G Forum in Jeju Island, Korea, for the first time in the world. The demonstration will take place at the specially designed bus in mobile circumstances reaching 100 Mbps data transmission, as well as at the display area inside forum venue to show speeds of 1Gbps of data transmission.

The bus demonstration will give participants first-hand experience of this latest technology. A demonstration bus will be moving at speeds of 60 km/h to show multi-cell Handover with a data speed of 100 Mbps. A live broadcast of the Forum, VOD, and Internet access will be shown simultaneously in a demonstration bus, allowing delegates to experience the stability and speed of 4G connectivity of 100Mbps data speed.

Handover is the process of transferring an ongoing call or data session from one channel, connected to the core network, to another. 1 Gbps data speed under nomadic circumstances is 50 times faster than current Mobile WiMAX technology. It takes about 2.4 seconds to transfer 100 MP3 files (300 MByte), 5.6 seconds to transfer 1 Movie (800 MByte) at speeds of 1 Gpbs.

Samsung will demonstrate 1 Gpbs data speed at nomadic circumstances by showing 32HD channel broadcast (20 Mpbs) download, Internet access and video telephony, all at the same time. Furthermore, a 3.5 Gbps data transfer demonstration will be shown, using 8X8 MIMO (Multi-Input Multi-Output) technology.

Samsung's 4G technology demonstration is a next generation wireless communication service, a step up from last year's Mobile WiMAX demonstration. Samsung has recently announced its plans to provide Mobile WiMAX systems and handsets to Sprint Nextel, and lead the industry in next generation telecommunications technology. Additionally, Samsung has plans to commercialize Mobile WiMAX with nine major operators in seven different countries such as the USA, Italy and Brazil.

Ki Tae Lee, president of Samsung's Telecommunications Network Business, says, "We are proud to demonstrate 4G technology for the first time at the Samsung 4G Forum. We hope to drive development and standardization of 4G mobile technology with this successful demonstration and realize our dream to begin the 4G era." He adds, "We hope to work with associated parties for the successful commercialization of 4G technology."

ITU defines 4G technology as a future wireless telecommunications technology, allowing data transfer rates of 1 Gbps at nomadic circumstances and 100 Mbps at mobile circumstances. The spectrums for 4G technology will be decided at WRC (World Radiocommunication Conference) in October of 2007. The 4G mobile communications format is expected to become commercially available around 2010.

http://www.physorg.com

DNA information for diagnosis

A Korean research team has developed technology to help find DNA information speedily for the detection of germs in humans as well as in plants and animals. The National Institute of Agricultural Biotechnology, affiliated with the Rural Development Administration, said that its team has developed five DNA kits to detect disease agents affecting major farm crops, at an early stage. The technology can also be used in surveying useful microbes, including marine microbes, the institute said.

The development came after Dr. Park Dong-suk, a researcher at the Institute, analyzed and diagnosed the genomes of microorganisms posted on the website GenBank (www.ncbi.nlm.nih.govv) as part of his research, into the means and database needed for finding orphan genes and unique sequences of each microorganism from microbial genome sequences. The website is famous for genomes gathered from throughout the world and is also open to the public.

The Institute is preparing to apply for patent rights regarding the research outcome, which is a step higher in analysis than the DNA fingerprint method and ribosome genome sequences method, which have been customarily used so far.

Till now, disease agent diagnosis and identification technology have been in use in a variety of applications, but it is hard to identify exactly. About 360 kinds of genomes in disease agents have been found since 2000, and have provided a landmark foothold in the method of finding and diagnosing disease agents, in particular information of genomes.

"The technology on analysis of genome information will be the base for the second war in genetic engineering. If this technology is used well, it will cut the period and budget for the commercialization of research results of genetic engineering," Dr. Park said.

http://www.korea.net

EUROPE

GERMANY

Trenches create memory space

The requirements are tightening up. Computers are required to become more and more efficient. A new technology boosts memory capacity - etching the silicon wafer creates deep trenches that increase its capacity to store data.

Since computers are required to become more efficient, inevitably, this involves greater demands on memory devices as well. They should be as small, strong, fast, and economical as possible - and always stay cool, if you please! Only memory modules - known in technical terminology as DRAM - which outstrip their rivals in these areas, have any chance of a future career in PCs, laptops, mobile communications, the entertainment industry and the gigantic server parks of Internet service providers.

The memory business generates a worldwide sales volume of 25 billion dollars a year. The pressure to innovate is relentless, and only manufacturers with the best technologies and the most efficient production methods can survive.

The world's second-largest supplier in the hotly contested DRAM market is the Dresden-based chip manufacturer Qimonda. The new company, a wholly-owned Infineon subsidiary, currently produces memory components based on 90-nanometer technology, and is striving to be able to etch structures only 65 nanometers wide on the silicon wafers, in the not-too-distant future.

Qimonda is supported by engineers at the Fraunhofer Institute for Ceramic Technologies and Systems IKTS in Dresden. The team of researchers led

300-mm wafers are coated with an etch-resistant film in the cleanroom. Currently being tested: Masks made of aluminum nitride instead of silicon dioxide.

by Tobias Mayer-Uhma, Falko Schlenkrich and Ingolf Endler has developed a new etch-resistant film that will make it possible to produce deeper and narrower "trenches", for it is this that makes the vital difference in memory chip production.

After a series of complex processing steps such as photolithography, etching and polishing, an etch-resistant silicon dioxide film, known as the "hard mask", is applied. This film contains the structures into which the trenches are later etched, using an etching gas. Subsequently filling up such a trench with dielectric material produces a capacitor. The deeper the trenches are etched, the more wall surface is available and the greater is the capacitance.

"We provide the technology for manufacturing and etching these masks," explains Mayer-Uhma. In order to etch increasingly deep trenches, the Fraunhofer researchers are developing and testing more reactive gas mixtures, along with correspondingly more robust mask materials. Masks made of aluminum nitride - which is five times more resistant to etching gas than silicon dioxide - are currently being tested at the team's own modified vapour deposition facility.

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ITALY

Fuel from carbon dioxide

Carbon dioxide is the biggest contributor to climate change. Now chemists are hoping to convert carbon dioxide into a useful fuel, with a little help from the sun. If they succeed, it will be possible to recycle the greenhouse gas produced by burning fossil fuels. The work could also lead to a way for future Mars missions to generate fuel for their return journey from carbon dioxide in the planet's atmosphere.

Chemists have long hoped to find a method of bringing the combustion of fuel full circle by turning CO_2 back into useful hydrocarbons. Now researchers at the University of Messina in Italy have developed an electrocatalytic technique they say could do the job. "The conversion of CO_2 to fuel is not a dream, but an effective possibility which requires further research," says team leader Gabriele Centi.

The researchers chemically reduced CO_2 to produce eight and nine-carbon hydrocarbons using a catalyst of particles of platinum and palladium confined in carbon nanotubes. These hydrocarbons can be made into petrol and diesel. To begin with, the researchers used sunlight plus a thin film of titanium dioxide to act as a photocatalyst to split water into oxygen gas, plus protons and electrons. These are then carried off separately, via a proton membrane and wire respectively, before being combined with CO_2 plus the nano-catalyst to produce the hydrocarbons.

Although the nano-catalysts produced two or three times more hydrocarbons than a commercially available catalyst, the process converted only about 1 per cent of the CO_2 at room temperature. Centi believes it will be possible to improve on that, by using higher temperatures and a larger surface area of catalyst. It will also be necessary to boost the efficiency of the solar water splitting, he says. With the right research, Centi believes that an efficient solar-powered reactor for converting CO_2 into fuel could be available "within a decade".

He presented his latest work, which is funded by the European Union, at a meeting of the American Chemical Society in San Francisco on 13 September. Other chemists reacted positively, but cautiously, to the findings. "It sounds feasible," says John Turner from the US National Renewable Energy Laboratory in Golden, Colorado. "The solar-to-hydrocarbon conversion efficiency is pretty small, but it sounds like they are just getting started."

Ian Plumb, who researches water-splitting reactions at the Australian national research institute CSIRO Industrial Physics, says that unless the efficiency is improved it will be too expensive to implement. "But there is no doubt that what they are trying to achieve is very worthwhile."

http://www.azom.com

NORTH AMERICA

USA

Environmentally friendly method of producing ethanol

A Purdue University team, led by professor Li-fu Chen and research assistant Qin Xu, both from the Purdue food science department, discovered a new method to create ethanol from corn. The method also produces biodegradable byproducts that could be safely eaten.

"Our process, which we are calling the Chen-Xu Method, not only makes ethanol, but products that are fit for human consumption," Chen said. "This process also produces corn oil, corn fibre, gluten and zein, which is a protein that can be used in the manufacture of plastics, so that the containers are good for the environment because they are biodegradable and decompose easily.

"The containers would actually be edible, although there probably wouldn't be much market for that."

Bio Processing Technology, based in West Lafayette, Indiana, was formed to bring inventions from Chen and Xu to the marketplace. They have teamed with John Y. D. Tse, a management professor emeritus who is the CEO of the startup company.

The Chen-Xu Method produces about 2.85 gallons of ethanol for every bushel of corn processed. That output is slightly higher than current methods, but the same process that creates the ethanol also creates other marketable products. Chen said the method also meets federal Clean Air Act standards, eliminating costs that other methods incur in meeting environmental regulations.

"One of the common methods of manufacturing ethanol, called dry milling, is often the cause of air pollutants due to the drying and storage of DDG, a byproduct of the process," Chen said. "Another method - wet milling - produces an odour, because it requires the input of sulfur dioxide. The Chen-Xu Method eliminates both issues, and the only odour is that from the fermentation of corn and yeast."

Using a machine originally designed to make plastics, the Chen-Xu Method grinds corn kernels and liquefies starch, using high temperatures. The water input required by wet milling is reduced by 90 per cent, Chen said. The wastewater output is cut by 95 per cent, and electricity use is reduced by 47 per cent.

"The total operating cost of a Chen-Xu Method ethanol plant should be much less than that of a wet-milling plant, and the total equipment investment is less than half," Chen said. "And with proper planning and management, the total equipment investment should be less than that of a dry-milling plant."

Funding for the work came from industry donations and there was a one year support from the Value-Added Grant Program of the Indiana State Department of Agriculture. Chen said the next step for the fledgling company is to commercialize the technology worldwide. The technology was licensed to Bio Processing Technology Inc. through the Office of Technology Commercialization, a division of Purdue Research Foundation.

"More than 40 faculty-led startups, based on Purdue University technologies, have been launched in the Pur-

due Research Park," said Joseph B. Hornett, senior vice president and treasurer/COO of the Purdue Research Foundation. "They are part of the family of more than 140 companies that now call the Purdue Research Park home. This makes the park the largest concentration of high-tech businesses in Indiana."

Established in 1930, the Purdue Research Foundation is a nonprofit corporation that is legally constituted to accept gifts, administer trusts, acquire property, negotiate research contracts and perform other services helpful to Purdue. As part of its $ 550 million in holdings, the foundation owns more than 130 properties, including the Purdue Research Park, named the best research park in the country in 2004 by its peers in the 120-member Association of University Research Parks. The park is home to the most high technology companies in Indiana, as well as to the largest university-affiliated business incubator in the country.

http://www.azom.com

New chip developed that can produce laser beams

A silicon-based computer chip that can produce laser beams has been developed by researchers at Intel Corporation and the University of California, Santa Barbara. The breakthrough may afford the use of laser as a high-speed medium to send data between chips rather than the clutter of wires that are used now. It can also possibly bring down the cost of data communications.

Intel plans to make use of the new chip for communications between components placed inside a computer system and between computer systems located in data centres.

However, any commercial application of the chip may not be possible until the end of the decade, technologists are upbeat about the prospect of the new technology that can create light beams to carry data at super speed. In normal circumstances, the speediest of connections can send about eight gigabits to 10 gigabits of data per second over distances of just 18 inches. The new technology affords speeds of 20 gigabits to 40 gigabits over distances of several feet, according to the researchers at Intel.

The performance of the computer can improve phenomenally, and the core of hardware design will undergo revolutionary change, they feel.

Lasers are already in use to transmit high volumes of computer data over longer distances, using fibre optic cables, However, when data is sent between computer chips, it moves at great speed over the wires inside, and then slows down when sent chip-to-chip. This barrier can be removed by the laser, the researchers feel, and this can lead to packing the computer systems with more number of chips and thereby increase the power of processing.

According to the researchers, they could create the new chip by bonding a layer of light-emitting indium phosphide onto the surface of a standard silicon chip etched with special channels, which act as light-wave guides. The combination has the potential to create on a computer chip several thousands of tiny, bright lasers that can be switched on and off billions of times in a second.

Mario Paniccia, director of the photonics technology lab at Intel, says the Intel-UC-Santa Barbara research proves that it is possible to make complete photonic devices using standard chip-making machinery, although not entirely out of silicon.

Earlier work in this field has been facing constraints because it was not possible to combine standard silicon with materials that emit light when electrically charged. But, the university team could develop a low-temperature bonding technique that does not melt the silicon circuitry.

John Bowers, director of the multidisciplinary optical switching technology centre at UC-Santa Barbara, who is involved in the research, says the new system will make everything change, and laser communications will be everywhere, including fibre to the home. He said dozens or hundreds of lasers could be integrated onto a single chip and the price of the laser, which is now reigning high, can drop to as low as a dollar per laser.

Details of the research will be reported in a forthcoming issue of Optics Express, an international journal.

http://www.earthtimes.org

'Green' approach to transform plastics manufacturing

Using environmentally safe compounds like sugars and vitamin C, scientists at Carnegie Mellon University have vastly improved a popular technology used to generate a diverse range of industrial plastics, for applications ranging from targeted drug delivery systems to resilient paint coatings. The revolutionary improvement in atom transfer radical polymerization (ATRP) now enables large-scale production of many specialty plastics, according to the scientists.

Developed by Matyjaszewski, ATRP is a broadly adopted process that allows the production of specialty polymers for coatings, adhesives, lubricants, cosmetics, electronics and numerous other markets. During ATRP, scientists produce a complex polymer structure using a special catalyst to add one or a few monomer units at a time to a growing polymer chain. ATRP requires a balance between two species of copper (Cu) catalyst, CuI and CuII. But as an ATRP reaction progresses, CuII builds up. Typically, researchers add more CuI to compensate for this effect and maintain the balance between the two copper species. But this approach ultimately generates materials with high overall levels of copper - levels that are too costly to remove efficiently on a large-scale industrial basis.

http://www.innovations-report.com