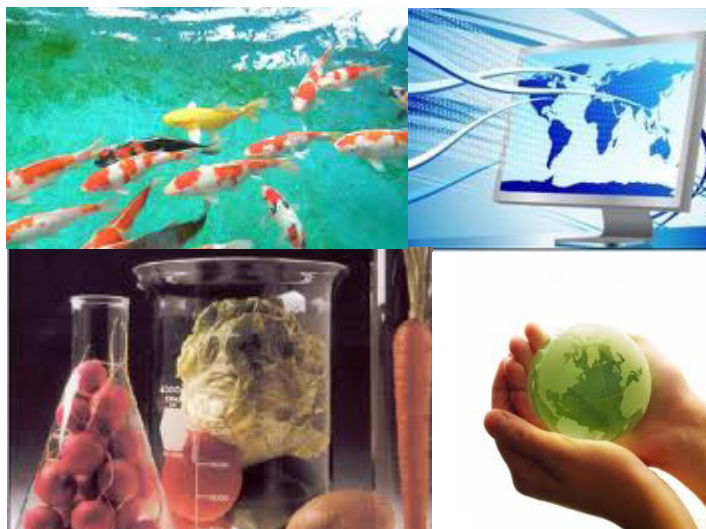


“A vital link between global technology developers and the local technology practitioners”
E-Newsletter published by the Technology Division,
National Science Foundation



National Science & Technology Awards 2010

One of the major events took place during the 4th quarter of 2010 at NSF

Science & Technology plays a dynamic role in economic development. To recognize the significant contribution made by Sri Lankan Scientists and Technologists towards economic and social development, the National Science Foundation in collaboration with the Ministry of Technology and Research presents National Science and Technology Awards biennially.

**In 2010, the ceremony was held on
16th November
at Hotel Cinnamon Lakeside, Colombo**

More details are on page 17.

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FOOD SCIENCE & TECHNOLOGY

Golden delicious DNA sequenced



An international collaboration has resulted in the Golden Delicious apple having its genetic code sequenced. The sequencing should help in producing tastier and more disease-resistant crops. The researchers, made up from teams in Italy, France, New Zealand, Belgium and the USA chose to study the Golden Delicious, as it is one of the most popular varieties. The study involved investigating and sequencing over 600 million base pairs of DNA. “Now we have the sequence of the apple genome, we will be able to identify the genes which control the characters that our sensory scientists have identified as most desired by consumers – crispness, juiciness and flavour.” Said Roger Hellens of the project. Aside from the commercial benefits that this study will yield, it has also helped in understanding the history of the apple. Most interestingly – it is now believed that the apple’s wild ancestor is from Kazakhstan and dates back 3,400 years.

www.projectsmagazine.eu.com/news/golden_delicious_dna_sequenced

Healthy nut components

The skins of almonds are an important source of phytochemicals, according to Karen Lapsley, Chief Scientific Officer of the Almond Board of California.

Almond skins contain more phenolics than flavonoids, and they are bioavailable, said Lapsley. As a result, almond skins may have potential use as a value-added ingredient, she added.

Additional researchers presented information conducted on the phytochemicals in other nuts. They showed that phytochemicals in nuts have free-radical scavenging, anticarcinogenic, antimutagenic, cholesterol-lowering, and cardioprotective abilities. One researcher explained that consuming mixed nuts helped to improve cardiovascular risk factors and glycemic control in subjects with type 2 diabetes. There was a significant reduction from baseline HbA1c by -0.2 ± 0.05 % units and a significant reduction in LDL cholesterol in the subjects who consumed 75 g of mixed nuts for 12 weeks, reported Cyril WC Kendall, Research Associate in the Dept. of Nutritional Sciences at the University of Toronto.

<http://live.ift.org/2010/07/18/healthy-nut-components-highlighted/>

Antibiotics in animal feed to be replaced by natural alternatives



A European research project has developed a natural alternative to using antibiotics in animal feed. The method uses clay minerals and algae molecules to combat fungal growth.

Antibiotics are required in animal feed to stop the spread of mycotoxins, the chemical products of fungal moulds which are often present in cereal grains and forage crops. Mycotoxins have become one of the major concerns of animal feeds producers, and are of particular concern in warm and humid regions such as Asia and South America, where climatic conditions are perfect for mycotoxin growth. By consuming mycotoxins, animals can not only become more susceptible to disease and liver and kidney damage, but also affect the health of humans who consume animal products – such as meat, milk and eggs – which are contaminated with mycotoxins.

Antibiotics have traditionally been used to control mycotoxin production. However, the EU banned

FOOD SCIENCE & TECHNOLOGY

Antibiotics have traditionally been used to control mycotoxin production. However, the EU banned the practice in 2006 amidst fears of microbial resistance to antibiotics. French company Olmix used the MONALISA project to explore the potential for natural alternatives to antibiotic mycotoxin control. Researchers at Olmix used a process known as intercalation to include molecules extracted from seaweed between layers of clay – a material already known to absorb mycotoxins – forming a new product called Amadelite. The seaweed molecules in Amadelite increase the interlayer space, creating much more room for mycotoxins to be absorbed.

<http://www.projectsmagazine.eu.com>

New strategy identified to fight bacterial cheese contamination



Scientists have identified a way of using a virus to control levels of the *Clostridium tyrobutyricum* bacteria in cheese to prevent spoilage and minimise product waste.

Originating from the silage that cows eat, *C. tyrobutyricum* is a significant problem for cheese makers, especially manufacturers of hard or semi-hard cheeses. Even small amounts can produce butyric acid, which gives off a rancid taste, and result in an excess build-up of carbon dioxide causing cracks to emerge.

They concentrated their work on a bacteriophage (a type of virus that infects bacteria) called Φ CTP1. This produces a protein, called an endolysin, which recognises *C. tyrobutyricum* and breaks open its cells from the inside.

By sequencing the genome of endolysin, identifying the gene encoding it and then expressing this gene in *E. coli*, IFR research leader Arjan Narbad told team was able to produce endolysin and introduce it to break down *C. tyrobutyricum* from the outside

In laboratory trials and in milk, Narbad said endolysin proved to be effective in reducing levels of *C. tyrobutyricum* and importantly their research suggests that it is highly specific. This means that using endolysin to control the bacteria may not interfere with the bacteria that ferment the cheese.

To develop the technology further, Narbad said there are two potential possibilities. Firstly, endolysin can be made in the lab and then added in the cheese making process in place of lysozyme, which is often used to control *C. tyrobutyricum* contamination but with some concerns about resistance.

Secondly, endolysin could be expressed in *Lactococcus lactis*, the bacterium involved in the cheese fermentation process. This would ensure that the endolysin can be produced in situ during cheese production but would make the resulting cheese a GM products.

*Source: Applied and Environmental Microbiology
By Guy Montague-Jones, 27-Aug-2010*

Performance of different drying methods and their effects on the chemical quality attributes of raw cocoa material

Studies were carried out to investigate the impact of different drying processes on the chemical quality traits of raw cocoa beans. The pH of less fermented cocoa is higher than the well-fermented cocoa's. The sun-dried beans pH ranged from 4.5 to 5.5, while the pH of both oven- and mixed-dried beans was between 3.8 and 5.2. The sun-dried beans contained lower volatile acidity than oven-dried beans. Artificially dried beans resulted in higher free acidity content when compared to both sun- and mixed-dried beans. Ammonium nitrogen content in raw cocoa beans is not influenced by the drying methods. Free fatty acid content increases slowly but remains below the critical value of 1.75% whatever the drying processes. While oven-dried beans show the FFA content above 0.70% both of sun- and mixed-dried beans are associated with FFA content below 0.70%.

*International Journal of Food Science & Technology
Volume 45, Issue 8, Pages 1564-1571, August 2010*

FOOD SCIENCE & TECHNOLOGY

Cinnamon extracts may reduce diabetes, heart disease risk factors



A study led by U.S. Department of Agriculture (USDA) Chemist Richard Anderson suggests that a water-soluble extract of cinnamon, which contains antioxidative compounds, could help reduce risk factors associated with diabetes and heart disease. For the study, conducted in Ohio, coauthor Tim N. Ziegenfuss enrolled volunteers and collected samples. Twenty-two obese participants with impaired blood glucose values & condition classified as prediabetes; volunteered for the 12-week experimental research study. Prediabetes occurs when cells are resistant to the higher-than-normal levels of insulin produced by the pancreas (in an attempt to help remove elevated glucose levels from blood).

The volunteers were divided randomly into two groups and given either a placebo or 250 mg of a dried water-soluble cinnamon extract twice daily along with their usual diets. Blood was collected after an overnight fast at the beginning of the study, after six weeks, and after 12 weeks to measure the changes in blood glucose and antioxidants.

The study demonstrated that the water-soluble cinnamon extract improved a number of antioxidant variables by as much as 13% & 23%, and improvement in antioxidant status was correlated with decreases in fasting glucose, according to Anderson.

Only more research will tell whether the investigational study supports the idea that people who are overweight or obese could reduce oxidative stress and blood glucose by consuming cinnamon extracts that have been proven safe and effective.

www.ift.org/food-technology

Coffee may protect against DNA damage

A daily cup of coffee may reduce the oxidative damage to DNA by 12 percent, according to a pan-European study.

No changes in overall antioxidants status of the 38 participants were observed, according to findings published in *Mutation Research/Fundamental and Molecular Mechanisms of Mutagenesis*.

“It is conceivable that indirect effects such as reduced uptake of glucose via the gastrointestinal tract, which was seen with specific types of coffee and with chlorogenic acids may play a role as it is known that alterations of the energy metabolism may lead to reduced reactive oxygen species formation in the mitochondria,” wrote the researchers.

The coffee is one of the richest sources of polyphenols in the Western diet, with one cup of the stuff providing 350 milligrams of phenolics. Of these, the most abundant compounds coffee is chlorogenic acids, making up to 12 per cent of the green coffee bean. The most abundant of these compounds is caffeic acid

The researchers recruited 38 people to participate in their controlled intervention trial with a cross-over design. The subjects were assigned to drink either 800 ml coffee or water daily for five days. Various measures of DNA damage were used.

At the end of the study, a reduction in DNA damage, as measured by a reduction in the formation of oxidised purines of 12.3 percent was observed in the coffee drinkers.

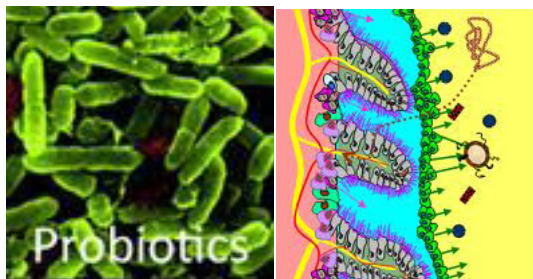
On the other hand, no significant changes in levels of antioxidants in the blood, or levels of reactive oxygen species in the blood were observed,

“Overall, the results indicate that coffee consumption prevents endogenous formation of oxidative DNA-damage in human, this observation may be causally related to beneficial health effects of coffee seen in earlier studies,” concluded the researchers.

<http://www.nutraingredients-usa.com>

FOOD SCIENCE & TECHNOLOGY

Probiotic bacteria change gene activity in humane intestines



A study published in the American Journal PNAS (Proceedings of the National Academy of Sciences) shows that consuming drinks with probiotic bacteria change the activity of the genes in the small intestine.

Seven healthy volunteers drank dairy drinks with three different types of probiotic bacteria, each drink containing 10 billion bacteria. Six hours after consumption of these drinks biopsies were taken from the upper part of the small intestine (duodenum) for genetic research. The biopsies were taken by an endoscope brought into the mouth and stomach. The seven volunteers had to drink all three probiotic bacteria drinks or a sports drink without bacteria (placebo) with two weeks in between each. Neither the volunteers nor the physicians knew who was drinking what type of drink at what time.

Genetic research of the mucosa biopsies shows a change in the activity of hundreds of genes after drinking the bacteria drinks. The molecular pathways that were found show much resemblance to the pathways that certain medicines cause in the human body, Michiel Kleerebezem of Wageningen UR said. "Probiotics cause a local reaction in the mucosa of the small intestines. These effects are similar to the effects of components that the pharmaceutical industry applies to medicines, but less strong." This concerns medicines influencing the immune system in a positive manner and medicines lowering the blood pressure. Based on this resemblance to medicines there might be new areas to discover for the application of probiotics, concluded the researchers.

Disease-resistant crops harvested from EU-funded study

A project funded by the European Union has produced crops that are capable of defending themselves against disease.

The research team aimed to improve the capability of the plants' own immune system in order to fight diseases. Scientists from The Sainsbury Laboratory in the UK, alongside an international team, worked on identifying an immune receptor known as the pattern recognition receptor (PRR) found in some plant species. PRRs identify molecules that are essential to keeping a pathogen alive so, if plant PRRs can be engineered to recognise and defend against these common molecules, they should be able to defend against all pathogens.

The researchers used a Brassica-specific PRR and transformed it into two plants (including one tomato plant) to find out if new recognition receptors lead to better resistance, before testing this resistance against many types of plant pathogens. Their results showed that resistance against many bacteria was significantly increased, and that PRRs could be successfully transferred between plant families.

'The strength of this resistance is because it has come from a different plant family, which the pathogen has not had any chance to adapt to, ' explained Dr Cyril Zipfel of The Sainsbury Laboratory. 'We can now transfer this resistance across plant species boundaries in a way traditional breeding cannot.' The team are hoping that their research can be applied to disease-susceptible crops such as potato, cassava, apple and banana.



Source: CORDIS

<http://www.projectsmagazine.eu.com>

For more information visit the ERA-PG website.

www.pnas.org/ Peter van Baarlen et al

AQUACULTURE TECHNOLOGY

New patented method to remove organic pollutants from molluscs



Researchers at the Universitat Jaume I (UJI) and the Spanish Research Council (CSIC) have patented an innovative method to remove organic pollutants, such as pesticide residues, from bivalve molluscs. The new technique increases the rate of removal of organic compounds by a factor of two or, depending on the type of pollutant, even four with respect to other methods used to date.

The cultivation of bivalve molluscs in shallow waters close to urban, industrial and agricultural areas may cause these organisms to accumulate organic pollutants, including pesticides, polycyclic aromatic hydrocarbons, polychlorinated biphenyls, dioxins, furans and endocrine disruptors. High consumption of these polluted animals during periods of intense contamination represents a serious concern for public health.

“The method that we have developed allows us to improve this process and means that pesticides can be removed from the tissues of molluscs twice or even four times as quickly, depending on the type of pollutant. It also increases tolerance to oxidative stress.

The method consists in utilising N-acetylcysteine, a substance that is capable of stimulating the intracellular synthesis of glutathione and triggers glutathione S-transferase and glutathione reductase activity in mussels. Glutathione is essential in most living organisms, since it intervenes in several very important cellular phenomena, such as detoxification of xenobiotics and the elimination of free radicals. The importance of the work carried out by the UJI and CSIC researchers lies in the fact that it proves that administration of N-acetylcysteine enhances glutathione activity in molluscs and, therefore, has remarkable applications as a technique for removing pollutants from mussels.

Animal by-products can provide cholesterol for shrimp feed

An imbalance of sterol, particularly cholesterol, can reduce growth rates, molting frequency and survival in farmed shrimp. It is generally believed that shrimp rely upon a dietary source of cholesterol for good health. Animal by-products like blood meal, meat and bone meal, and other rendered products are good sources of cholesterol for use in aquaculture feed.

In each animal by-product sample, the most abundant sterol was cholesterol at levels that were never below 70% of the total sterols (Table 1). While only the blood meal sample possessed only cholesterol, the majority of samples possessed other sterols at low levels. From these preliminary studies, rendered products seem to be cost-effective sources of cholesterol for fish and shrimp diets.

Table 1. Relative percentages of sterols found in animal by-products and plant oils.

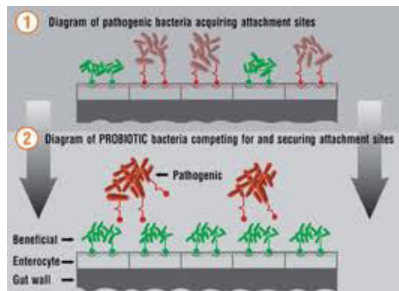
	Sterols as % of Total Lipids Extracted	Cholesterol	Campesterol
Blood meal	0.29	100.00	
Feather meal	13.10	73.00	0.30
Fish oil*		37.70	10.30
Meat and bone meal	0.42	89.30	2.60
Poultry by-product meal	2.32	74.10	1.00
Poultry by-product meal, pet grade	0.59	81.80	1.40
Poultry by-product meal, feed grade	1.29	77.20	1.40
Soybean oil*		0.50	20.00

Sergio F. Nates

Global Aquaculture Advocate, January/February 2010

AQUACULTURE TECHNOLOGY

Varied feed additives improve gut, animal health



There is increasing evidence that natural feed additives can have beneficial effects on aquaculture animals by supporting wellbalanced gut microflora and improving gut health. Prebiotics, probiotics, immunostimulants and other products represent more sustainable alternatives to the widespread use of antibiotics and offer preventive measures to reduce pathogenic loads and manage gut health and performance.

Different strategies have been used to face bacterial and viral threats. Chemotherapy using antibiotics and other chemical products has been the most used approach. However, this should not be a routine method in fish and shrimp culture due to risks resulting from the potential for pathogens' increased resistance to antimicrobials, its cost and environmental pollution risks. Nowadays, have learned more sustainable ways to manage gut microflora and fish performance using nutraceuticals or functional foods to modulate the health of farmed animals. The options available to regulate fish gut environments include the use of probiotics, prebiotics, immunostimulants, phycophytic and phytogetic substances, and organic acids and their respective salts, commonly known as acidifiers.

Global Aquaculture Advocate, Vol. 13, Issue 3, May/June 2010

Biofloc: Novel sustainable ingredient for shrimp feed

Recent research is demonstrating that biofloc-based proteins are suitable replacements for fishmeal in aquaculture diets. Since bioflocs can be produced while treating aquaculture effluents, a waste product can be converted into a valuable resource. Work by the authors found that shrimp fed diets with bioflocs grew faster

than similar shrimp fed fishmeal based feed. Potential also exists for the production of bioflocs with targeted nutrient levels by manipulating production factors

Global Aquaculture Advocate, Vol. 13, Issue 3, May/June 2010

Oysters may help fight cancer

Promising new research from a major United States university gives oyster lovers yet another reason to enjoy the plump, delicious bivalves: cancer prevention.

In a study funded by the Louisiana State University, Jack Losso, Ph.D., found that ceramides, a lipid compound in oysters, could be a key ingredient in treating and preventing certain types of cancer. Losso said ceramides is also currently being used in clinical trials to help speed the healing process for patients undergoing chemotherapy.

Losso's work suggested that the fat found in oysters restricts blood vessel growth and development of breast cancer cells, both in the laboratory and in rats. "This is incredibly exciting," Losso said. "When we looked at cancer cells treated with ceramides, their growth had been inhibited and they were dying."

According to a press release issued by Louisiana Sea Grant, oyster ceramides fights both hormone-dependent and hormone-independent breast tumor cells in test tubes and kill them within 48 hours. In laboratory rats treated with oyster ceramides, blood vessel growth that stimulates cancer cell growth and proliferation was reduced by 57% in seven days without toxicity to the animals. Losso said the advantage of ceramides in cancer prevention is that ceramides occur naturally and can prevent, as well as treat, cancer – essentially giving people another reason to enjoy oysters, raw or cooked. Because the ceramides is in the oil, its benefit is lost if the oysters are cooked using a counter-top grill that drains off the fats and oils, Losso pointed out.

Global Aquaculture Advocate, March/April 2009



ENVIRONMENTAL TECHNOLOGY

Different techniques for the production of biodiesel from waste vegetable oil



The production of biodiesel from waste vegetable oil offers a triple-facet solution: economic, environmental and waste management. The new process technologies developed during the last years made it possible to produce biodiesel from recycled frying oils comparable in quality to that of virgin vegetable oil biodiesel with an added attractive advantage of being lower in price. Thus, biodiesel produced from recycled frying oils has the same possibilities to be utilized. While transesterification is well-established and becoming increasingly important, there remains considerable inefficiencies in existing transesterification processes. There is an imperative need to improve the existing biodiesel production methods from both economic and environmental viewpoints and to investigate alternative and innovative production processes. This study highlights the main changes occurring in the oil during frying in order to identify the characteristics of oil after frying and the anticipated effects of the products formed in the frying process on biodiesel quality and attempts to review the different techniques used in the production of biodiesel from recycled oils, stressing the advantages and limitations of each technique and the optimization conditions for each process. The emerging technologies which can be utilized in this field are also investigated. The quality of biodiesel produced from waste vegetable oil in previous studies is also reviewed and the performance of engines fueled with this biodiesel and the characteristics of the exhaust emissions resulting from it are highlighted. The overarching goal is to stimulate further activities in the field.

Refaat, A. A., (2010). Different techniques for the production of biodiesel from waste vegetable oil. *Int. J. Environ. Sci. Tech.*, 7 (1), 183-213.

Turning up the heat on antibiotic resistant bacteria

Bacteria are evolving resistance to antibiotics, due to overuse of the drugs in medicine and agriculture. Now researchers have developed a method that could slow the spread of resistance genes in the environment by reducing their release through treated sewage. People can excrete resistant bacteria from their guts and flush them into the sewer system. Farmers often apply treated wastewater solids to their fields as fertilizer. Bacteria in the sludge can share antibiotic resistance genes with other microbes in the environment.

Most treatment plants incubate sludge in “digester” tanks at 37°C, where sewage bacteria decompose organic material and destroy pathogens, including other bacteria. Two types of digesters – aerobic digesters with added oxygen, and anaerobic without – select for different populations of bacteria. Since digesters are operated at our body temperature, that is a very good condition for resistant bacteria to survive.

Researchers studied five bacterial genes encoding tetracycline resistance and one gene encoding the integrase of class I integrons, which scientists have linked to multidrug resistance. The researchers processed sludge from a nearby treatment facility in lab-scale aerobic and anaerobic digesters at four different temperatures: 22°C, 37°C, 46 °C, and 55°C. Quantitative polymerase chain reaction revealed that in the anaerobic reactor, the amounts of antibiotic resistance genes declined with increasing temperature presumes that higher temperatures killed resistant bacteria or caused them to lose resistance genes. The effect was most dramatic for the integrase gene: At the highest temperature, the scientists could remove 99.99%. In contrast, during aerobic digestion, higher temperatures did not substantially change the prevalence of antibiotic-resistance genes

Raising the temperature of anaerobic digestion at wastewater treatment plants should not be cost prohibitive, he says, because the digesting bacteria produce methane gas that can heat the reactor.

<http://pubs.acs.org/cen/news>

ENVIRONMENTAL TECHNOLOGY

Mining industrial waste for medicine

Every year, factories producing a key ingredient used in dyes and detergent brighteners generate 500 billion gal of toxic wastewater. Now Chinese researchers have developed a process to turn that waste into a drug used to treat multi-drug resistant tuberculosis (Environ. Sci. Technol., DOI: 10.1021/es101950k).

Industrial-scale production of dye-precursor 4,4'-dinitrostilbene-2,2'-disulfonic acid (DNS) creates byproducts that are generally tough to break down and non-biodegradable, such as p-nitrotoluene-sulfonic acid. As a result, current DNS waste treatments are energy-intensive and costly, says Xiaobin Fan, a chemical engineer at Tianjin University

The researchers came up with a process, which involves an oxidation, reduction, and sodium hydroxide treatment step, to convert more than 85% of the wastewater's contaminants into 4-amino-2-hydroxybenzoic acid (paramycin), which is part of cocktail treatments for multi-drug-resistant tuberculosis. Each year, drug-makers produce 500 tons of paramycin. But it also has non-medical uses: Chemical manufacturers synthesize over 1 million tons of the compound for use in the production of polymers, pesticides, and alumina.

Treating DNS wastewater normally costs about \$4/m³ of wastewater, but this new process can net \$77 worth of valuable chemicals per m³ of wastewater, according to the researcher's calculations. This route to paramycin is also more environmentally friendly than existing methods, producing less waste per amount of paramycin produced. "It solves environmental problems and obtains economic benefits at the same time," says Fan.

<http://pubs.acs.org/cen/news>



Sugar derivative solidifies oil

Materials Chemistry: Gelation process could turn spilled oil into skimmable fat for easy cleanup

A new sugar-based compound that selectively converts oils into a gel could serve as a new tool for cleaning up oil spills, its inventors say.

To mitigate oil spills such as the current one in the Gulf of Mexico, cleanup crews typically reach for dispersants—mixtures of chemicals that cause the oil to collect in tiny droplets. If successful, a gelling process would represent an entirely new strategy that could have advantages over the use of dispersants, which have raised toxicity concerns.

In a one-step process aided by enzymes, materials chemist George John of the City College of New York and chemical engineer Srinu Raghavan of the University of Maryland and their colleagues have synthesized amphiphilic sugar molecules that bind with hydrocarbon oils and form a gel, even when the oil is mixed with water (Angew. Chem. Int. Ed., DOI:10.1002/anie.201002095).

The group tested the gelator in mixtures of water and diesel fuel. Within five minutes, the oil becomes a congealed mass that floats on top of the water and can be lifted out with a spoon.

The group synthesized several gelator variants, dialkanoate derivatives of mannitol and sorbitol, before settling on one mannitol-based molecule, dubbed "Man-8." In addition to being nontoxic, Man-8 is relatively cheap to produce and works at room temperature.

Santanu Bhattacharya, an organic chemist at the Indian Institute of Science, in Bangalore, notes that Man-8 belongs to "a rather elusive class of molecules" known as phase-selective gelators, which were first discovered in his lab in 2001. Since then, he adds, fewer than 10 such gelators have been discovered. In addition, these gelators require many more steps to make than Man-8, and triggering their gelation requires heat or ultrasonic vibration.

ENVIRONMENTAL TECHNOLOGY

Eco friendly paints

There are more than 10,000 chemicals that can be used in conventional paints. Many of these chemicals may lead to health problems or complicate existing conditions. Substances found in some paint, such as formaldehyde and benzene, are carcinogenic while others, such as heavy metals and phthalates, are human and ecosystem toxins.

Today, to save the ecosystem there are paints with non-toxic elements. These environmental friendly choices are made for a healthier lifestyle. The use of Eco Paints ensures a healthier body and greener environment to live. The Eco-Paints are Non-toxic with zero VOC (Volatile Organic Content) and have no odour and can be tinted to any colour your heart or home desires with non-toxic tints. Eco Paints are also safe for the chemically sensitive. The Eco-Paints are produced from fewer than 250 chemical components and more than 98 % of these chemicals are naturally derived from plant sources and minerals. Most of the ingredients have been used for centuries or more. The raw materials that are low in toxic substances, renewable and feature a low environmental footprint.

In the Eco-Paints, the paints, stains, thinners and waxes are made from naturally-derived raw materials including citrus peel extracts, essential oils, seed oils, tree resins, inert mineral fillers, tree and bee waxes, lead-free dryers and natural pigments.



The eco-fan

Eco - Fan is a soundless, powerful (up to 150 cfm) fan that stands on top of your woodstove to help distribute warm air throughout your house but doesn't use electricity! This environment friendly freestanding heat-powered Eco-Fan is designed to improve the efficiency of a wood stove by circulating the warm air produced by the stove. When placed on top of a

heated surface, the Eco-Fan generates its own electricity. Temperatures of operation range from 150 degrees to 700 degrees Fahrenheit. The Eco-Fan does not use any batteries or external electrical connections.

The fan has a thermoelectric module which acts as a small generator to power the fan's motor. When this generator module experiences a heat differential between its top and bottom surfaces, it creates electricity. The bottom surface of the module is heated by the wood stove, while the top of the module is kept cool by the fan's top cooling fins. The speed of the fan varies with the stovetop temperature; on average.

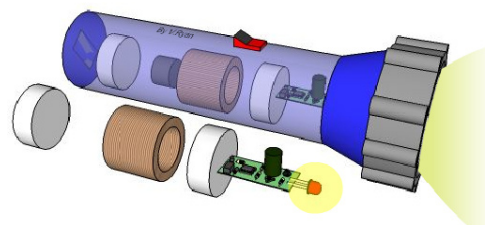
The magnetic force torch

The Magnetic Force Torch is an unusual LED torch. It is composed of a circuit which includes a heavy duty capacitor. As the torch is shaken a rare earth magnet passes through a copper coil producing electricity. The electricity is stored by a capacitor for use when light is needed. A low power ultra bright LED provides the light. Shaking the torch for one minute provides enough electricity for up to twenty minutes.

Torches of this type are valuable because they do not require batteries. The magnetic force torch has only one moving part, the magnet itself. Windup torches on the other hand have several moving parts making breakdown more likely.

The torch shown is made of high impact polyurethane. This resists damage and comes in a range of colours. The example torch is translucent which means the parts inside can be seen.

www.technologystudent.co



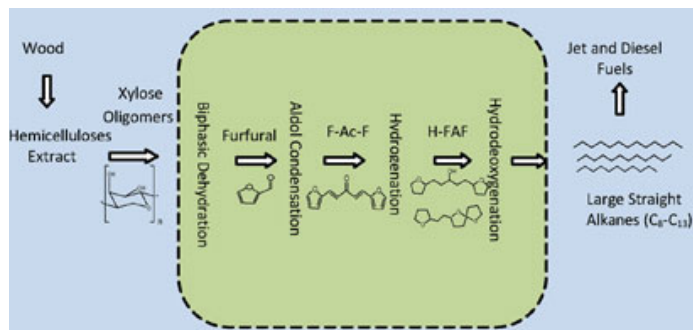
ENVIRONMENTAL TECHNOLOGY

Making fuels from biomass waste

Making fuels from biomass waste Jet and diesel fuel can be produced in a simple economic process using waste products of wood processing and pulp mills, claim US scientists.

Sustainable production of fuels has been attempted using non-food biomass (composed of cellulose, hemicellulose, and lignin) and vegetable oils. But these methods only make light alkanes that are not suitable for use as jet and diesel fuel due to their high volatility, so jet and diesel fuels are currently still reliant on petroleum-based crude oils.

In the search for alkanes more suited for transport fuels, A research team has shown that waste feedstocks from biomass power plants or composite wood manufacturing facilities can be turned into jet fuel in an integrated and economical process. Team treats a hemicellulose extract from hardwood trees, a common by-product from the wood manufacturing industry, in a four-step process that includes acid hydrolysis and xylose dehydrogenation, aldol condensation, low temperature hydrogenation, and high temperature hydrodeoxygenation. High yields of 76 per cent are obtained and the cost works out to between \$2.06/gal and \$4.39/gal, depending on initial xylose concentration, refinery size and overall yield. This is a significant step forward in achieving sustainable transportation. The economic analysis is also particularly important and the sensitivity analyses highlight promising pathways for improvement.'



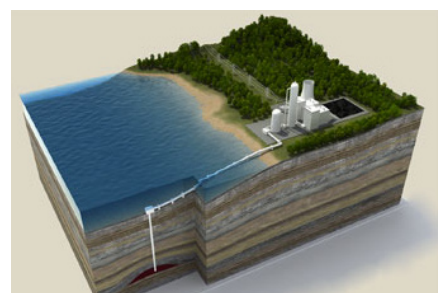
Geo thermal energy

Geothermal energy is the heat from the Earth. It's clean and sustainable.

Almost everywhere, the shallow ground or upper 10 feet of the Earth's surface maintains a nearly constant temperature between 50° and 60°F (10° and 16°C). Geothermal heat pumps can tap into this resource to heat and cool buildings. A geothermal heat pump system consists of a heat pump, an air delivery system (ductwork), and a heat exchanger—a system of pipes buried in the shallow ground near the building. In the winter, the heat pump removes heat from the heat exchanger and pumps it into the indoor air delivery system. In the summer, the process is reversed, and the heat pump moves heat from the indoor air into the heat exchanger. The heat removed from the indoor air during the summer can also be used to provide a free source of hot water.

Wells can be drilled into underground reservoirs for the generation of electricity. Some geothermal power plants use the steam from a reservoir to power a turbine/generator, while others use the hot water to boil a working fluid that vaporizes and then turns a turbine. Hot water near the surface of Earth can be used directly for heat. Direct-use applications include heating buildings, growing plants in greenhouses, drying crops, heating water at fish farms, and several industrial processes such as pasteurizing milk.

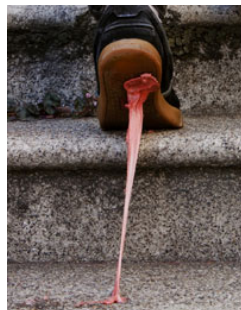
Hot dry rock resources occur at depths of 3 to 5 miles everywhere beneath the Earth's surface and at lesser depths in certain areas. Access to these resources involves injecting cold water down one well, circulating it through hot fractured rock, and drawing off the heated water from another well. Currently, there are no commercial applications of this technology.



Reference:
Renewable
Energy World

POLYMER SCIENCE & TECHNOLOGY

Non-stick chewing gum



A new chewing gum has produced that's simple to remove and degrades much more easily than traditional gum while retaining the familiar minty taste and consistency.

Traditional chewing gums use poly(styrene-co-butadiene) or poly(ethylene-co-vinylacetate) as the gum base material. However, the properties of these materials mean that they stick to surfaces readily and are tricky to remove, even with detergents. The new gum, called Rev7, overcomes this because it also contains a new amphiphilic comb copolymer made up of a polyisoprene backbone and grafts of poly(ethylene oxide) (PEO).

This amphiphilic graft copolymer will not only markedly reduce its adhesion strength to surfaces, but also will degrade into more water-soluble polymeric components that can easily be rinsed away.

Many surfactants form complexes with PEO such as sodium dodecyl sulfate, a common ingredient of soaps and detergents, and hence a mild detergent will remove the gum from many surfaces including clothes and carpets. The hydrophilic nature of the PEO which allows it to retain and to reabsorb water is also key for the gum's degradation.

There should be no environmental risks since the polymer is made up of two ingredients that are used widely in other consumer products, including adhesives and medicines. The remaining ingredients are either inert or natural.

Safety tests revealed that the Rev7 polymer is as safe and inert as any other gum polymers for human consumption.

Wood mimics packaging polymer

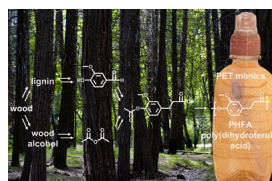
Polyethylene terephthalate (PET) is the third most common synthetic polymer behind polyethylene and polypropylene. Its unique thermal and physical properties make it ideal for use in industry, food packaging and soft drinks bottles. However, growing environmental concerns are causing a drive for more eco-friendly polymeric materials derived from bio-renewable feedstocks to replace these petroleum-based plastics, but their properties have proved hard to mimic.

PET is made up of alternating units of the fossil fuel feedstocks terephthalic acid and ethylene glycol, and it is this aromatic-aliphatic structure that is the key to its thermal stability. Lignin - one of the most abundant naturally occurring organic polymers - to produce a polymer that possesses alternating aromatic and aliphatic segments. Thus it not only bears a structural resemblance to PET but, importantly, it also has very similar thermal properties.

Researches combined acetic anhydride with vanillin - a by-product in the manufacture of paper from lignin - to form the monomer acetyldihydroferulic acid. Polymerisation of this monomer forms poly(dihydroferulic acid), PHFA, which mimics the structure and thermal properties of PET.

Unlike some bio renewable polyesters that have poor thermal properties that limit their applications, this work focuses on materials that are comparable to PET. If other chemical and mechanical properties are suitable, and the economics of production are favourable, these polymers could have a promising future.'

In future, researches plan to investigate the long-term degradation characteristics of PHFA as well as performing scale-up fabrication studies to compare the bio renewable polymer with PET in different forms, such as a cup, plate or water bottle.



POLYMER SCIENCE & TECHNOLOGY

Self healing coatings for steel

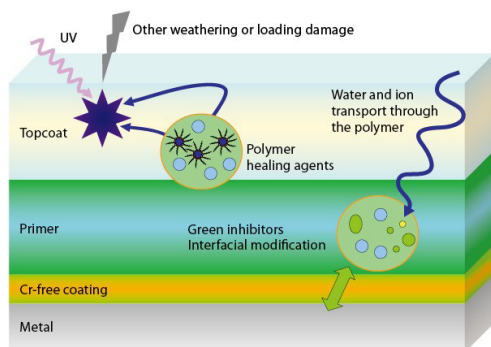
A conducting polymer film acts as a self healing coating to protect metals from corrosion, say researchers in Japan.

Steel is used to construct many different structures but is susceptible to corrosion, which can limit its practical uses and lifetime. Structures such as bridges or boats are often exposed to salt solutions that rapidly corrode them.

Researches have developed a new type of coating using an intrinsically conducting polymer (ICP), polypyrrole, which could be used as an alternative to expensive and toxic chromates currently used.

ICPs are, in effect 'synthetic metals', capable of conducting electrical currents or ions. A researcher doped polypyrrole with heteropolyanions (PMo₁₂O₄₀³⁻ and HPO₄²⁻). When the polymer coating is damaged, healing ions are released to the affected site, react with the steel forming an insoluble iron molybdate salt in the defect zone. This is different to other systems where usually a monomer is released to recreate the coating in the damaged region.

The key to the system is the control of the healing, researches have demonstrated how to control the release of these healing ions using an ion-permselectivity approach. This stops the healing ions reacting with the metal before the coating is damaged, significantly increasing the lifetime of the coating.



Polymerization reveal hidden finger prints

Fingerprints leave their mark on surfaces that remain even if they are washed off allowing them to be detected using disulphur dinitride, claim UK scientists.

Fingerprint analysis of crime scenes has become a powerful weapon in the forensic scientist's arsenal. The ridges present on the tips of the fingers are unique to a person. By comparison of impressions left in materials - typically flat, regular surfaces, such as glass - to a sample taken from a suspect it is possible to identify the owner of the fingerprints.

But there are occasions where fingerprints are not easily viewable or are fragmented. Here, latent fingerprinting - where obscured fingerprints are enhanced - can be used to identify an individual. Researchers noticed that the strained four-membered rings system S₂N₂ quickly polymerizes to (SN)_x in the presence of fingerprints. Detecting this polymer produces a visual image of the fingerprint.

Now they have shown that this polymerization still occurs when the chemicals in the fingerprint that were thought to trigger it are washed off the surface, which could occur by simple wiping or an explosive blast. The polymerization is triggered by an effect brought about by interaction of the chemicals with the surface before they are removed.

As long as the print has been on the surface long enough to bring this about before washing off - and this only has to be hours or less - this signature will be present and we can image it. That the key to this process is that it is based on the interaction of S₂N₂ vapour with the surface. The crucial point is that a vapour can reach areas of a surface that are not accessible to solids and liquids, such as the crumpled remains of an explosive device.

POLYMER SCIENCE & TECHNOLOGY

Colorful green polymers

A new environmentally friendly concept in functionalizing polymers allows coloured dye to be integrated directly into polymers that can be used in clothes and packaging.

New ways to make environmentally friendly polymers are needed due to dwindling reserves of petroleum and poor degradability of existing polymers. Polylactic acid (PLA) may provide a solution; it is a polyester material made from renewable resources that uses less petroleum to make than comparable petroleum-based fibers. It also degrades easily in landfill. However, use of PLA in commercial fabrics has not been popular, in part because of difficulties in the dyeing process.

Patrick McGowan, Christopher Rayner and Richard Blackburn at Leeds University, UK have now developed an innovative way of producing colored PLA in fewer steps than conventional PLA dyeing, and which uses significantly less water and energy

They have made a catalyst with a dye attached, which initiates the ring-opening polymerization of lactide into PLA and then becomes covalently incorporated into the polymer. The dye is also incorporated and causes the polymer to be colored. Because the dye becomes part of the polymer structure, there is no excess dye to wash away as in conventional processes, so pollution is also minimized. People often worry about getting the catalyst out of the polymer because of health and safety or discoloration, but they've taken a new approach and can tune the catalyst to incorporate the desired color. The team has made black, red, yellow and purple PLA fibers.

The researchers suggest that functionalising the polymers to incorporate fluorescent or UV-active molecules could be useful for PLA used in packaging. And also believes the idea could be used to embed antimicrobials or even fragrances into sportswear, fundamentally altering the way textiles are designed and used.

Polymer nanofibres smash energy record

The nanogenerators in question are based on organic nanofibres made from a piezoelectric material that create a current when put under mechanical strain. Similar devices have previously been demonstrated with nano-scale inorganic wires fabricated from ZnO or BaTiO₃, but by using poly(vinylidene fluoride) (PVDF) instead. Using PVDF makes a highly flexible and robust device, and allowed to develop an elegant assembly method. PVDF is usually made in thin films, but to trigger its piezoelectric characteristics, it needs to be mechanically stretched and electrically poled. A researcher applied an electrical field between a syringe containing a charged polymer solution, and an aluminium conductive tape collector. As the polymer jet travels from the needle to the collector, the solvent evaporates and the polymer is stretched to form a thin and solid nanofibre, explains him. Stretching the polymer and applying an electrical field simultaneously makes the dipoles in the polymer align. When the plastic film that the aluminum tape and PVDF fibre rest on is bent, the alignment of the dipoles shifts, creating a potential difference at the fibre's ends. The polymer is an insulator, so current does not flow through the nanogenerator fibre itself, but electricity can flow when the two ends are connected into a circuit. The maximum energy conversion efficiency was 21.8 per cent, with an average of 12.5 per cent. That is much greater than the 0.5 to 4 per cent achieved in typical power generators made from experimental piezoelectric PVDF thin films, and 6.8 per cent in nanogenerators made from ZnO fine wires. The key advance made here is the enhancement of energy conversion efficiency to 20 per cent. This is a great accomplishment, which shows that converting mechanical energy can be an effective way to provide power in the future, especially for self-powered nano- and micro-systems.

ELECTRONIC & TELECOMMUNICATION

Twist & shine

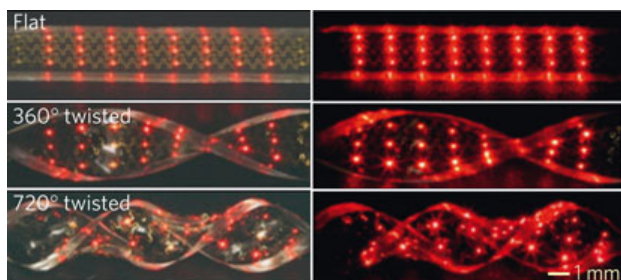
An international team of researchers has developed flexible sheets of tiny light emitting diodes (LEDs) that could be implanted under the skin like glowing tattoos and used in a range of biomedical applications.

To make the new LEDs, the team worked with arrays 100 x 100um in size and just 2.5um thick, several times smaller than any similar commercially available devices. The researchers printed the circuits onto a rigid glass substrate before transferring them to poly(dimethylsiloxane) (PDMS), a low cost, flexible biocompatible polymer.

Most recent research on flexible LED circuits has focused on organic LEDs (OLEDs) but this has benefits for biomedical applications. OLEDs are extremely sensitive to oxygen or water, but this has been encapsulated in a thin layer of silicon rubber. The brightness, lifetime and the ability to make them in a waterproof form are distinguishes of this device. To demonstrate the array's ability to function in these environments, research team integrated the miniature LEDs into the fingertip of a vinyl glove and immersed it in soapy water, and implanted an LED array beneath the skin in an animal model.

The hope is that these new devices will find a variety of applications, including as suture threads or implantable patches that could perform spectroscopy to characterize bodily tissue, or be used in sophisticated diagnostics and to monitor wound healing. The arrays could also be used in photodynamic drug therapy, to control the delivery of drugs that are triggered by light in a more precise way.

Reference: Chemistry World, RSC Publishing



Pore-enhanced silicon used to increase capacity of Li-ion batteries

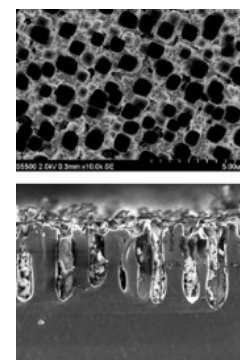
A team of Rice University and Lockheed Martin scientists has discovered a way to use simple silicon to increase the capacity of lithium-ion batteries by enhancing the inherent ability of silicon to absorb lithium ions

Silicon has the highest theoretical capacity of any material for storing lithium, but there's a serious drawback to its use. It can sop up a lot of lithium, about 10 times more than carbon, which seems fantastic. But after a couple of cycles of swelling and shrinking, it's going to crack.

However, the researchers say they discovered that putting micron-sized pores into the surface of a silicon wafer gives the material sufficient room to expand. While common Li-ion batteries hold about 300 milli-amp hours-per-gram of carbon-based anode material, the researchers determined the treated silicon could theoretically store more than 10 times that amount.

The pores, a micron wide and 10-50 microns long, form when positive and negative charge is applied to the sides of a silicon wafer, which is then bathed in a hydrofluoric solvent. The hydrogen and fluoride atoms separate. The fluorine attacks one side of the silicon, forming the pores. They form vertically because of the positive and negative bias.

The researchers are confident that cheap, plentiful silicon combined with ease of manufacture could help push their idea into the mainstream. This material has the potential to significantly increase the performance of lithium-ion batteries, which are used in a wide range of commercial, military and aerospace applications.



Reference: Ceramic Tech Today

ELECTRONIC & TELECOMMUNICATION

The latest developments in the ever-changing realm of connectivity

In the world of computing, standards are essential to ensuring consistency and compatibility across the entire technological spectrum. Without standards, IT would be a complex and vexing gaggle of competing and incompatible. Networking is one of computing's core technologies, so there are dozens of standards dedicated to advancing networking technologies. Administrators who run complex networks must keep up with a constant stream of newly promulgated or modified standards; if they don't, they run the risk of falling behind the technology curve and drastically compromising their ability to deliver value to their organizations.

Power over Ethernet is fast becoming a more viable option for powering devices with low power requirements over the data network. New methods of routing packets over the Internet, such as LISP (Locator/ID Separation Protocol), are increasing routing efficiency without requiring major changes or upgrades to network infrastructures or hosts. The ongoing adoption of virtualization has added a new level of complexity to network switching, requiring the development of new approaches to ease management issues.

This limited PoE technology to devices with low power requirements, such as IP phones, WLAN access points, and IP cameras. IEEE802.3at increases the maximum power that can be delivered to a device to 51W, using two 25.5W power interfaces placed on a single CAT 5 or better cable. This level of power, allows complete computing devices—such as notebook computers—to be powered over Ethernet. This revision to the standard allows for easier deployment of any device because devices can be located anywhere without the need for a certified electrician to wire a location. According to researcher, IEEE802.3at can turn PoE into the force that allows for true enterprise-wide power management.

<http://www.processor.com/editorial/article.asp?article=articles/P3219/26p19/26p19.asp&guid=>

SanDisk, Sony and Nikon propose high-speed memory cards

SanDisk, Sony and Nikon have jointly released specifications for a new type of memory card for larger files, and are hoping for approval by the international standards group CompactFlash Association.

Meant for professional photography and high-def video, the proposed specification would allow for data transfer at rates of up to 500 MB per second, compared to a maximum of 167 MB per second now. The companies said the new specification has the potential for capacities of up to 2 terabytes.

“This ultra high-speed media format will enable further evolution of hardware and imaging applications, and widen the memory card options available to CompactFlash users such as professional photographers,” said Shigeto Kanda, chairman of the CFA board. “The development of a new high-performance card standard with a serial interface will meet the needs of the professional imaging industry for years to come and open the door for exciting new applications,” Kanda said.

www.homemediamagazine.com

Ultrathin alternative to silicon for future electronics

Researchers with the U.S. Department of Energy's Lawrence Berkeley National Laboratory (Berkeley Lab) and the University of California (UC) Berkeley, have successfully integrated ultra-thin layers of the semiconductor indium arsenide onto a silicon substrate to create a nanoscale transistor with excellent electronic properties. A member of the III-V family of semiconductors, indium arsenide offers several advantages as an alternative to silicon including superior electron mobility and velocity, which makes it an outstanding candidate for future high-speed, low-power electronic devices.

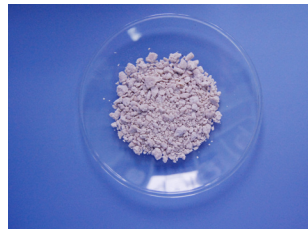
TECHNOLOGY DIVISION

National Science & Technology Awards 2010 give under the 5 award categories. Below mentioned the award categories and the winners.

Award Category 1: Innovative advance technologies with commercial potential

Green nano-fertilizer system for slow and sustained release of nitrogen and othe micronutrients

Dr. Nilwala Kottegoda
Ms. Imalka Munaweera
Mr.A.Nadeesh Madusanka
Prof. Veranja Karunarathne



(Sri Lanka Institute of Nanotechnology (Pvt) Ltd)

Award Category 4: Development of eco material/ eco friendly processes for industry

Power mat- An eco friendly devolpment based on dipped product wastes for weed management

Dr.A.Nugawrla
Mrs.D.G.Edirisinghe
Mrs.M.K.Mahanama



(Rubber Research Institute of Sri Lanka)

Award Category 9: Locally developed new technologies which have resulted in a successfully marketed product/ service

Development and technology transfer of a natural lime based sports drink

Dr.(Ms).Jaanaki Gooneratne
(Industrial Technology Institute)



Award Category 11: Science and technology contribution to improve sustainable social development

eleAlert: A sensor network for monitoring fences

The University of Moratuwa
Dialog Axiata PLC
The Sri Lanka Wildlife Conservation Society
(SLWCS)



Award Category 14: Outstanding leadership in introducing technologies/ services

20MW Pioneering wind power plant in Sri Lanka

Mr.Manjula Perera
(Seguwantivu Wind Power (Pvt) Ltd)



“Driving the innovators to develop, assimilate and use technologies for wealth creation”

Technology Division
National Science Foundation
47/5, Maitland Place
Colombo 07
Tel/ Fax - 2676766
E-mail: td@nsf.ac.lk
www.nsf.ac.lk