VATIS UPDATE

Waste Management

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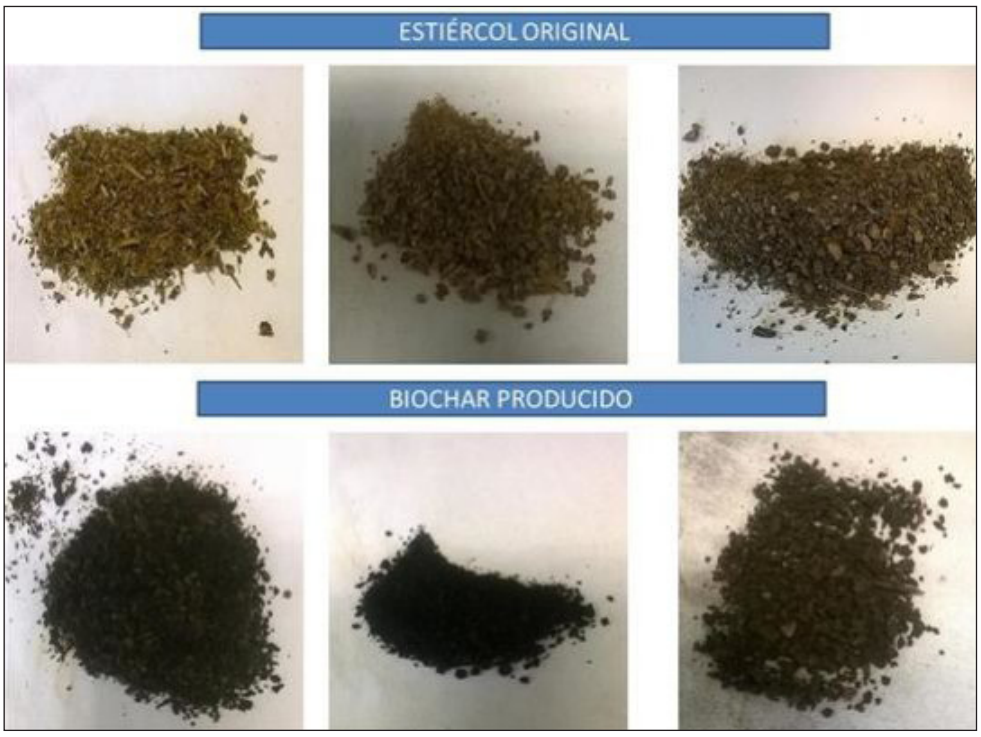
Apprise yourself with the latest technological innovations

Highlights

- PET bio-recycling process
- Extraction of gold, copper from e-waste
- New method to remove strontium
- Cactus-based technology to disperse oil spills
- Oil spill clean-up solution
- Catalytic converter for emission control



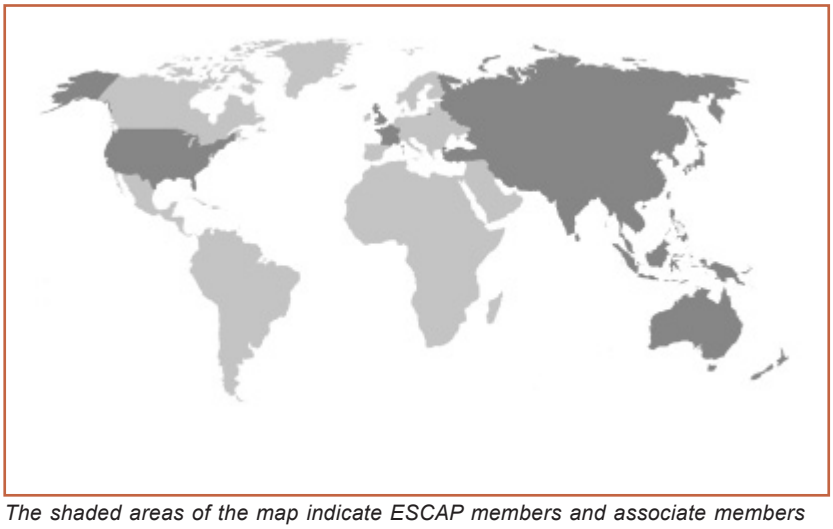
APCTT
Asian and Pacific Centre for Transfer of Technology

UNITED NATIONS ESCAP
Economic and Social Commission for Asia and the Pacific

The **Asian and Pacific Centre for Transfer of Technology (APCTT)**, a subsidiary body of ESCAP, was established on 16 July 1977 with the objectives: to assist the members and associate members of ESCAP through strengthening their capabilities to develop and manage national innovation systems; develop, transfer, adapt and apply technology; improve the terms of transfer of technology; and identify and promote the development and transfer of technologies relevant to the region.

The Centre will achieve the above objectives by undertaking such functions as:

- Research and analysis of trends, conditions and opportunities;
- Advisory services;
- Dissemination of information and good practices;
- Networking and partnership with international organizations and key stakeholders; and
- Training of national personnel, particularly national scientists and policy analysts.



The shaded areas of the map indicate ESCAP members and associate members

Cover Photo

Biochar using manure waste, a new material that can improve soil properties and increase crop yields

(Credit: Research group of Valuation of resources at Universidad Politécnica de Madrid, Spain)

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VATIS* Update Waste Management
is published 4 times a year to keep the readers up to date of most of the relevant and latest technological developments and events in the field of waste management. The Update is tailored to policy-makers, industries and technology transfer intermediaries.

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e-Waste disposal demo plant in India

The Government of India's Department of Electronics and Information Technology (DEITY) has initiated the process of setting up the country's first e-waste disposal demonstration plant in Bengaluru with indigenous technology. Upon the success of the plant, the Centre plans to set up similar facilities in different parts of the country. DEITY has developed a technology for segregating and extracting metals from printed circuit boards and plastics out of e-waste. According to government officials, the plastics can be taken out, categorised and reused to make car bumpers and switches.

The government said that upon the success of the Bengaluru plant, the department may plan to transfer the technology to any manufacturer who would like to use it and recycle waste. To encourage private entrepreneurs, the government is also providing 25 per cent cash-back on the capital expenditure for e-waste processing plants. Besides, the government also plans to encourage formal recyclers or entrepreneurs to apply through MSIP (modified special incentive package scheme) under Deity to avail subsidy for creating recycle plants in India.

Source: http://www.deccanherald.com

Mechanism to collect e-waste in Sri Lanka

The government of Sri Lanka has planned to introduce a mechanism that the e-waste be collected by the same shops that sell those electronic equipment. "This programme is at the level of obtaining the public views. Following their views obtained, the programme will be taken up for consideration of implemention," said Anuradha Jayaratne, Mahaweli Development and Environment Deputy Minister.

According to Jayaratne, a single CFL (compact fluorescent light) bulb contains mercury enough to contaminate 6,000 liters of water and people continue to dispose them to harm environment owing to either ignorance or negligence. Sri Lanka was currently generating around 3,000 tonnes of electronic waste annually. Around 3,000 tonnes of e-waste is disposed annually under the e-Waste management programme of the Central Environmental Authority (CEA).

Electronic waste is generated to a considerable extent in Sri Lanka and it is a threat to the health of the people as other kinds of waste. The e-waste management activities implemented by licensed institutes and national programmes are closely monitored and controlled by the CEA. The CEA issues waste management licenses for e-waste generating institutions and the licenses are renewed annually.

Source: http://www.dailynews.lk

e-Waste collection launched in Indonesia

The Jakarta Sanitation Agency has launched a new initiative for treating the dangerous garbage, involving deploying special trucks to collect it in cooperation with a private waste-treatment company. Sanitation agency head Isnawa Adji said that cooperation was being considered with waste-treatment company PT Prasadha Pamunah Limbah Industri, Indonesia. Isnawa said the company had treated only industrial waste in the past but was open to working with the administration. It had actually already looked into treating electronic waste, or e-waste, but had found it difficult to collect.

"We plan to help the company collect e-waste while it pays compensation to the garbage facilities," said Isnawa. He added that e-waste such as computers, refrigerators, batteries and other broken electronic devices still had value, so residents could receive compensation. Isnawa said the agency would use two ways to collect the e-waste. The first one is residents can actively submit their e-waste through their local garbage facilities. He added that Jakarta currently had only 380 garbage facilities, not many considering the number of community units in the capital city, which is up to 2,700.

Source: http://www.thejakartapost.com

Malaysia to legislate household e-waste management

The Ministry of Natural Resources and Environment (NRE), Malaysia, is expected to introduce household e-waste management and control legislation on the matter by 2018. The decision was agreed upon at the meeting of state Environment Ministers and Executive Committee Members responsible for the environment (Mexcoe). Mexcoe is a formal forum to encourage cooperation and coordination between the federal and state governments in the management of environmental issues.

"The Department of Environment (DoE) is cooperating with the Japan Cooperation Agency (JICA) to develop the household e-waste management and control system. "DoE will look into and get legal advice from the ministry and if the legislation is ready, by 2018, we (Malaysia) will have a system and legislation relating to the management and handling of household e-waste," said NRE Minister Wan Junaidi Tuanku Jaafar.

Source: http://www.freemalaysiatoday.com

Circular economy package by the European Union

The European Commission has recently announced its new Circular Economy Package which was certainly more ambitious than the last albeit. While the original expectation for the 2015 policy was to ban all landfill by 2030, the final policy package for 2015 outlines a common target for recycling of 75% of all packaging waste and a binding landfill target of a maximum of 10% of all waste by 2030.

The proposed actions will contribute to "closing the loop" of product lifecycles through greater recycling and re-use, which will bring benefits for both the environment and the economy. The revised legislative proposals on waste set out clear targets for reduction of waste and establishes a long-term path for waste management and recycling.

The new EU Action Plan for the Circular Economy establishes a concrete programme with measures that cover the whole cycle from production and consumption to waste management and the market for secondary raw materials. It also sets out a timeline that stipulates when actions need to completed, which is a positive step in the right direction.

Source: http://www.waste-management-world.com

Strict standards for sugar industry in India

The Government of India has notified stricter environment standards for sugar industries operating in various states in the country. The primary aim of these standards is to minimise water pollution. Specific waste-water discharge standards have been made stricter, by limiting the same to 200 litre per tonne of cane crushed, as against the earlier limit of 400 litre per tonne cane crushed. This will ultimately result in less consumption of raw water at operational level.

The final treated effluent discharge has been restricted to 100 litre per tonne of cane crushed and waste water from spray pond overflow, or cooling tower blow down to be restricted to 100 litre per tonne of cane crushed. Only single outlet point from unit has been allowed to encourage operational efficiency and treated effluent recycling practices. Further, only one outlet/discharge point will be allowed, which will be covered as per the 24x7 online monitoring protocol.

The number of effluent quality parameters to be monitored for ascertaining compliance have now been increased to six (6) i.e. pH, Bio-chemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Total Suspended Solids (TSS), Total Dissolved Solids (TDS) and Oil & Grease (O&G). Earlier, the notified parameters were only BOD & TSS. The emission limits for particulate matter from stack has been limited to 150milligramme per normal cubic metre.

Source: http://www.business-standard.com

New regulations on plastics recycling in China

The Chinese Ministry of Industry and Information Technology has announced the new regulations, stipulating detailed requirements on recyclers' location, operation scale, energy consumption, technology and equipment, environmental protection, safety, quality, as well as inspection. Most notably, new PET bottle recyclers, considered category I recyclers, need to meet a minimum annual processing capacity of 30,000 metric tons. Existing PET recyclers must process annual capacity of no less than 20,000 tons.

The minimum capacity for category II recyclers, companies that sort, clean and shred plastic scrap, is also 30,000 tons for new players and 20,000 for existing companies. Category III recyclers, or companies that extrude reprocessed pellets, need to have at least 5,000 metric tons of capacity for industry newcomers and 3,000 tons for existing players. Companies will be required to have properly sized processing areas that matches their capacity.

Source: http://www.plasticsnews.com

Thailand to lower toxic waste from industries

The Thailand Department of Industrial Works (DIW) was able to safely dispose of 1.3 million tons of toxic waste in 2015. The country was also able to get rid of 22 million tons of non-toxic waste in 2015. To minimize environmental impact from toxic waste, a Thai recycling company, General Environmental Conservation PCL (GENCO), has signed an agreement to buy a Refuse-derived fuel (RDF) machine from Finland.

DIW Director-General Pasu Loharjun is hoping this purchase will encourage other industries to follow suit to lower the amount of toxic waste in the environment. GENCO will set up the RDF machine. The Ministry of Industry is also expected to provide 200 million

baht in financial aid to install more machines in the industrial estate before the end of this year. The ministry is now conducting a study on the possibility of introducing RDF machines in six special economic zones, through cooperation with the Industrial Estate Authority of Thailand and the Japanese Ministry of Industry.

Source: http://www.news.thaivisa.com

Viet Nam to control urban wastewater

Viet Nam plans to allocate big budgets to develop waste water drainage systems in urban areas in recent years. However, the systems' conditions remain poor which still cause pollution because of low drainage capacity. The waste water drainage in urban areas depends on concentrated sewer systems. According to a report there are 30 urban waste water treatment plants as of July 2015 with total capacity of 809,000 cubic meters per day.

There are 40 other plants under design or construction with total capacity of 1.6 million cubic meters per day. Though the plants all are operational, they only run at 50 percent of the designed capacity, while only 65 percent of the plants link with water drainage systems and 12 percent of domestic waste water can be treated. It is estimated that 4 percent of waste sludge can be treated if considering the current operation capacity.

A government's report submitted to National Assembly's Deputies in May 2015 showed that 90 industrial zones have been built or were building waste water treatment systems. Meanwhile, a report of the Ministry of Health released in June 2014 showed that only 50 percent of hospitals in the country have waste water treatment systems. In most of the 5,000 existing craft villages, waste water goes directly to the environment without any treatment.

Source: http://www.english.vietnamnet.vn

e-Waste collection centres in India

From now on, manufacturers of electrical and electronic items in India will have to set up "collection centres" to take back the e-waste generated through their products. Manufacturers will also have to ensure that the e-waste, including hazardous electronic parts, thus collected is properly recycled, say the environment ministry's new rules announced. The existing e-waste management rules, instituted in 2011, had bound manufacturers by extended producer responsibility (EPR) to channelise the hazardous e-waste to registered recyclers. But, the lack of clarity on who was responsible for collecting such waste led to loose implementation of EPR rules.

Separate authorisation letters from the respective State Pollution Control Boards (SPCBs), which were necessary for setting up such collection centres earlier, have now been done away with. The complicated process, which had been cited by manufacturers as an excuse for low compliance, has now given way to a collection mechanism that also allows buying back waste from consumers.

Manufacturers have also been asked to submit detailed EPR plans whereby 30 per cent of the waste generated by them have to be collected back during the first two years, followed by 40 per cent in the third and fourth years and so on, to 70 per cent during the seventh year onwards. The new rules say dealer or retailers "shall refund the amount as per take-back system or deposit refund scheme of the producer to the depositor of e-waste". Refurbishers, on the other hand, have been mandated to channelise the waste thus collected to an authorised recycler.

States have also been brought into the picture with the rules authorising industry departments to ensure space is allocated for recycling plants. Besides, state labour departments have been asked to register workers involved in dismantling and recycling at such facilities. This is to ensure the safety of these workers by monitoring their health.

Source: http://www.business-standard.com

Cambodia issue new rules for disposal of e-waste

The Environment Ministry of Cambodia has been put in charge of regulating the largely informal disposal of the Kingdom's electronic waste, or e-waste, with a ministry official attributing this to a rapid increase in the use of consumer electronics across the country. A sub-decree, made public yesterday and signed in early February, sets guidelines for businesses that buy, break down or dispose of electronics – such as TVs, phones and batteries – which will now be required to submit a request to the ministry before starting their operations.

The sub-decree also prevents the import of electronic waste into the country and sets out penalties for individuals and firms found disposing e-waste into rivers or dumps, ranging from 40,000 riel for individuals to 2 million riel for businesses. A 2015 United Nations report on e-waste in Cambodia found a high level of cross-border, often illegal, movement of e-waste into Cambodia, which after being dismantled was then exported to countries like, China, Thailand and Viet Nam.

Source: http://www.phnompenhpost.com

PET bio-recycling process

Green chemistry company CARBIOS, France, has taken 'a major step forward' in the development of its enzymatic depolymerisation process for polyesters. The new recycling method can now be applied to PET, thus enabling the regeneration of monomers while maintaining the same quality and physicochemical properties as their petroleum-based counterparts. CARBIOS describes its innovation as "a unique technology paving the way to infinite recycling of PET", a plastic for which global production reached 21 million tonnes in 2014.

Citing an annual growth rate of roughly 5%, CARBIOS expects PET output to exceed 26 million tonnes by 2020. According to CARBIOS, applying its bio-recycling process would allow for treatment of 100% of this waste including the 1.4 million tonnes currently landfilled or incinerated. "Researchers are now looking to adapt the new technology to the recycling of other plastic polymers. We are also conducting advanced discussions with many major players in the industry in order to quickly bring our innovation to an industrial level," said Jean-Claude Lumaret, at CARBIOS.

Source: http://www.ccfgroup.com

Recycling polycarbonate using glycerol

Deepak Pant, an associate professor from the Central University of Himachal Pradesh (CUHP), India, has developed a new chemical technique to recycle polycarbonate plastics using abundant and environmentally-friendly glycerol which can recover up to 98% of the plastic's monomer, bisphenol A (BPA), for reuse. According to Pant, his new recycling method is both green and economic. Glycerol is a byproduct of biodiesel production, so is cheap and easy to obtain. Pant tested raw glycerol against analytical grade glycerol, using both to recycle scrap optical discs.

The three-part process first involved pulverising the scrap discs into 2-3 mm pellets. The optical aluminium layer is removed by vibratory shaking – the heavier polycarbonate particles sink to the bottom. The pulverised polycarbonate pellets then go through a digestion step. Pant mixed the pellets with glycerol, Na2CO3, a zinc oxide catalyst, and urea, which improves the yield of the desired BPA products and slows the breakdown of glycerol, making it reactive for longer. The mixture is heated to 120˚C for 15 minutes and then to 170˚C for 90 minutes.

During the reaction the digested polymer further reacts in an alkoxylation process, giving the desired BPA monomer. After being cooled to room temperature, methanol is added. The mixture is then filtered to remove unreacted polymer, leaving a methanol solution of the BPA. Pant achieved similar conversion rates using both crude glycerol and the pure glycerol. The carbon dioxide and ammonia produced as by-products can be easily removed by collecting them over water.

Source: http://www.tcetoday.com

Plastic flake optical sorting system

TOMRA Sorting, Norway, which manufactures sensor based sorting equipment for the recycling industry, has launched its next generation AUTOSORT FLAKE for sorting plastic flakes by both polymer and colour. According to the company, the AUTOSORT-FLAKE's next-generation sensor technology also detects metal, while its twin-processing mode offers customers a high waste throughput together with a constant high quality output from one single machine.

"Compared to our first generation flake sorter introduced in 2010, the new generation is able to do the job of two separate units and with a much higher degree of precision reducing the loss of good material. The latest advance is a clear example of partnering with our customers to develop optimal results. Our new AUTOSORT FLAKE has combined a field-proven mechanical setup with experienced in-house R&D to deliver another industry milestone," said Valerio Sama, at TOMRA Sorting.

The AUTOSORT FLAKE deploys TOMRA's patented FLYING BEAM® technology combined with the newly developed FOURLINE 2mm optic module. This feature is said to provide customers with continuous calibration to eliminate errors leading to costly downtime and providing output. It was also claimed to contribute to low maintenance requirements and low energy consumption.

Source: http://waste-management-world.com

Fully recyclable polymer

A team of scientists at Colorado State University (CSU), the United States, has successfully produced a completely recyclable, biodegradable polymer. "More than 200 pounds of synthetic polymers are consumed per person

each year – plastics probably the most in terms of production volume. And most of these polymers are not biorenewable," said Prof. Eugene Chen at CSU. According to Prof. Chen and his colleague, Miao Hong, while synthesizing a polymer when reheated for about an hour, converts back to its original molecular state, ready for reuse.

Their starting feedstock was gamma-butyrolactone (GBL), a monomer that scientists had declared non-polymerizable. Prof. Chen and Ms Hong used both metal-based and metal-free catalysts to synthesize the polymer, called poly(GBL). They employed specifically designed reaction conditions, including low temperature, to make the poly(GBL), and heat between 428-572 °F (220-300 °C) to convert the polymer back into the original monomer, GBL, demonstrating the thermal recyclability of the polymer.

"This work established relationships between the poly(GBL) structure and its thermal and dynamic mechanical properties, and it demonstrated the complete thermal recyclability of poly(GBL) back into its monomer, which thereby opens up unique opportunities for discovering new sustainable (renewable and recyclable) biomaterials based on the ROP (ring-opening polymerization) of other five-membered lactones," Prof. Chen and Ms Hong said.

Source: http://www.sci-news.com

New way to recycle carbon fiber waste

A team of researchers from Shanghai Jiao Tong University, China, has developed a new technology and equipment for recycling carbon fiber composite waste material. Carbon fiber is often described as "the king of new materials" and is mostly used in the manufacture of spacecraft, aircraft, communication satellites and other cutting-edge technologies. It is also widely used in cars, bicycles, tennis rackets and fishing rods. The team has discovered a method to accomplish exactly that.

The team developed a technology that allows the material waste to be processed in large chunks, without the need to cut or grind them into small pieces. The result is generated carbon fiber that is longer. The technology can be undertaken on a large-scale operation, with annual processing capacity exceeding more than 200 tons. Earlier, only three companies in Germany, Japan and the United States had an industrialized technology for recycling carbon fiber composite waste material.

Source: http://www.chinadaily.com.cn

Plastic waste into carbon nanotubes

Scientists at BlueRen, Singapore, have found an eco-friendly way to convert plastic waste into carbon nanotubes – tiny cylinders of carbon atoms. With this innovation, more plastic waste can be recycled and the use of cement to make concrete reduced, as the carbon material can be used as an additive in concrete instead. BlueRen's technology converts plastics into hydrocarbon gases, which are then passed through different chambers such that carbon nanotubes can be formed from these gases.

A key difference in its recycling process is that BlueRen uses a different mineral as the catalyst, one that is more environment-friendly. BlueRen's method gives a 10 per cent yield – every 10,000 tonnes of plastic waste can be converted to 1,000 tonnes of carbon nanotubes. The patent for BlueRen's technology is pending, but its future looks promising. Last October, it beat about 300 applicants to become one of 11 groups that received the DBS Foundation Social Enterprise Grant. BlueRen intends to use the grant to develop its prototype.

Source: http://www.straitstimes.com

New technology to convert plastic waste into fuel

Scientists at Nepal Academy of Science and Technology (NAST) in Lalitpur, has installed a technology that can convert plastic waste into diesel and petrol. NAST Chief of Faculty of Technology Suresh Kumar Dhungel and chairperson of Japan-based Eco Party Matsumoto Chiseko, have signed a Memorandum of Understanding (MoU) for development and promotion of the technology to derive plastic-derived petroleum products.

NAST scientists converted one kg plastic into 1000ml raw fuel during test operation of the technology supported by Eco Party. The raw fuel can be converted into 700ml of petrol or diesel. "Plastic grocery bags, bottles and caps can be converted into high-quality usable petroleum products. The technology converts plastic into gasoline or diesel through the use of a combination of suitable catalysts. The development of this technology is also expected to keep the environment clean and get rid of plastic waste," said Dr. Rabindra Prasad Dhakal, at NAST.

Source: https://www.thehimalayantimes.com

Extraction of gold, copper from e-waste

Mahdokht Arshadi, a researcher from Islamic Republic Iran has recycled electronic waste using biological methods managing to recover gold and copper. “E-waste is a term for electronic products that have become unwanted, non-working or obsolete, and have essentially reached the end of their useful life and need to be recycled or buried,” said Arshadi.

The researcher stated that “we managed to recycle e-waste through a biological method exploiting two indigenous bacteria in order to extract gold and copper. Consisted of a two-step process on the basis of bio-leaching procedures, the new method is simple, inexpensive and environmentally friendly”. She further enumerated the benefits of the newly-developed biological method including being cost-effective, producing a high rate of value-added as well as preventing environmental problems.

Source: http://www.en.mehrnews.com

Gold from e-waste

Stephen Foley and his research team from the University of Saskatchewan, Canada, have developed a simple, cheap and environmentally benign solution that extracts gold in seconds, and can be recycled and reused. “We use one of the most mass-produced chemicals: acetic acid; at five per cent concentration it’s plain table vinegar. We use a minute amount of an acid and an oxidant to finish our solution,” said Foley. The solution is the greenest solvent next to water, so eliminates the vast number of environmental concerns that come with long standing methods of gold extraction.

In this technique, the gold extraction is done under very mild conditions while the solution dissolves gold with the fastest rate ever recorded. “Gold is stripped out from circuits in about 10 seconds leaving the other metals intact” Foley said. When time is factored in with lower toxicity and consequential effects, this new solution appears to be a natural replacement that could revolutionize the industry.

To highlight the improvement Foley’s solution presents, consider that it costs $1,520 to extract one kilogram of gold using aqua regia and results in 5,000 litres of waste. With the U of S solution it costs $66 to produce one kilogram of gold and results in 100 litres of waste that can be reused over again. The other main advantage over current recycling processes, he continued, is that this specific solution is gold selective, meaning it only dissolves gold not other base metals, like copper, nickel, iron and cobalt, found in printed circuit boards.

Source: http://www.words.usask.ca

Mining rare earth elements from recycled LEDs

Researchers at the Fraunhofer Project Group for Materials Recycling and Resource Strategies IWKS, Germany, have developed a method to mechanically separate LEDs that could expedite processes to recycle them. The researchers adapted their experimental mechanical separation setup for use on retrofit LED lamps. However, they said the method works in principle also for other sizes, such as for LEDs from television sets or from automobile headlights, as well as from other electronic products.

To break the LED lamps into their component parts without destroying the LEDs themselves, the researchers used a process called “electrohydraulic comminution.” They separated the components at their predetermined break points with the help of shock waves created by electrical impulses in a water bath. They are continuing to test whether the comminution process can be repeated until the desired

The SnST-550A green Tin Stripper

materials have been separated. The group is able to adjust parameters of the setup such as type and quantity of fluid, container size and electric pulse voltage so that separation occurs precisely at the specified break points. The researchers expect that the electrohydraulic comminution process could be used in other LED application areas following further study and improvement.

Source: http://www.photonics.com

Large-scale e-waste recycling

UWin Nanotech Co., Ltd., Taiwan (Province of China) has researched and developed an innovation type of environmentally-friendly agent for tin stripping, (SnST-550A Tin stripper), which can directly strip tin from waste boards and make it possible to quickly remove metal components and chips from boards so that they can undergo further recycling. Barrel One is a new type of treatment program which can be used with the SnST-550A green tin stripper to automatically strip tin from waste PCB boards.

It allows metal parts to be completely sorted in order to obtain higher recycling value and purity while also leaving behind tin and aluminum. The Barrel One is a program capable of reversing thoughts about operations in this industry. It is both an environmental-friendly process for recycling e-waste and has the capacity to satisfy the industrial requirements for processing large volumes of materials. It is truly an excellent recycling waste board solution, which has the double advantages of being both environmentally friendly and profitable.

Barrel One is also equipped with an immersion tank and a cleaning tank as well as a 400 liter capacity material handling cylinder which enables it to automatically carry out the process of immersing materials in the solution and rinsing. Furthermore, the equipment used by the machine features a Programmable Logic Controller(PLC) with Human Machine Interface (HMI); therefore, employees need only use the controller in order to control the entire tin stripping process.

Source: https://www.en.ctimes.com.tw

Basic and acid leaching for recycling of e-waste

The recycling of printed circuit board (TCI) for the production of metals, given the environmental degradation that can cause toxic substances of these, is the reuse of valuable materials recovered from the TCI, this being an economic engine that promotes the recycling of this waste. Researcher from the Universidad Autónoma del Estado de Morelos , Mexico, have suggested a methodology for evaluating the reaction kinetics and leaching of metals that form the metal substrate, which have environmental and energy advantages, so the generation of new recovery techniques metals from the TCI low environmental and energy impact is increasingly necessary, for it is essential to establish the parameters affecting the reaction rate and identify design alternatives to determine whether or not sustainable, economically viable and that does not pollute.

The method adopted was a leaching acid samples, where the full factorial method employed two experimental levels to evaluate the influence of: leaching time, temperature of the aqueous leach solution, reaction kinetics and solid/liquid, on the percentage of metal extraction. Subsequently, the metals are obtained by calcining and smelting the resulting salts by addition of acid liquor.

Source: http://file.scirp.org

e-Waste processing technology

Victoria's e-waste processing capabilities have been significantly expanded with the launch of Australia's first automated electronic waste processing system at PGM Refiners in South-East Melbourne. Victorian Minister for Environment and Climate Change, Lisa Neville, who attended the launch of the new e-waste system, said the Andrews Labor Government invested $470,000 towards the purchase and installation of a new state-of-the-art machine capable of processing large quantities of e-waste in a faster and more efficient way.

"This Australian-first technology represents a significant advancement in how we process e-waste, demonstrating our commitment to keeping these materials out of landfill," the Minister said in a media statement. "This machine will reduce environmental and health impacts by eliminating the need to manually dismantle products, which can be unsafe and labour intensive."

This new technology will be able to process 2500 tonnes of e-waste each year, producing saleable commodities through resource recovery which can be used by local manufacturers to create new products. Member for Dandenong Gabrielle Williams welcomed the opening of the country's first automated electronic waste processing system in Victoria, saying it will have a positive economic and environmental impact on the state.

Source: http://www.australianmanufacturing.com.au

Cleaning rivers using a nano-composite

Scientists from the Indian Institute of Science (IISc), India, have developed a novel 'reusable' nano-composite material, with Cerium being the crucial compound in it, which can degrade microbes and chemical dyes that are among common effluents in rivers. The scientists looked at ceria (CeO{-2}) a cheap rare earth oxide with properties that include a strong absorption of ultraviolet light (this property also sees it being widely used for UV-blocking and radiation shielding agent).

It is this notion, that the compound can speed up the degradation of chemical dyes and the bacterium Escherichia coli (which forms a large chunk of organic waste in sewage) led the researchers to develop ceria nanoflakes, which combines ceria with silver salts. In this composite, ceria absorbs light across the spectrum (and not just UV light), while the silver salts (silver phosphate, and silver bromide) form photocatalysis agents, where chemical reactions are accelerated in the presence of light.

The results showed that the composite material ended up generating large amounts of hydrogen peroxide (a strong oxidizing agent) that degrades the dyes and bacteria. Within 60 minutes, nearly all of methylene blue and methyl orange (both common chemical dyes) were degraded by the composite. In comparison, ceria-silver phosphate compound that had been synthesized previously, researchers managed to degrade the chemical dyes by 80 per cent in this time frame.

Source: http://www.thehindu.com

New method to remove strontium

Researchers from Okayama University, Japan, have found a new technique effective in removing strontium 90 (90Sr) from aqueous solution. The method is based on the hydroxyapatite (HAP) column procedure, which could help remove strontium 90 from water and wastewater. HAP is a major mineral constituent of bone and tooth and has an outstanding biocompatibility. HAP is also a possible sorbent for heavy metals in wastewater due to its high adsorption capacity and low water solubility.

Tests indicated that HAP particles adsorbed more than 90 percent of 90Sr, which was significantly more than tests using zeolite. Calcium ion concentrations of up to 1 millimolar (mM) did not affect its adsorption. 90Sr was also barely affected by the magnesium levels tested. Using a small amount of eluate, the researchers stripped90Sr from the column and regenerated the column for another round of separation.

In addition to removing 90Sr from wastewater, researchers hope the technique will also remove it from natural water in the environment. The concentrated element could also be stored as dry, solid waste, therefore reducing disposal space and lowering costs.

Source: http://www.watertechonline.com

Photocatalyst for wastewater treatment

According to Iran Nanotechnology Initiaitve Council (INIC), researchers from Semnan University, Islamic Republic of Iran, have designed a photocatalyst with high efficiency and rate to eliminate organic pollutants at laboratorial scale to obtain an optimum water and wastewater purification system. The nanocatalyst has a long life, and it can be used in successive cycles. The use of sustainable energy in the purification system is another advantage of the research.

The nanophotocatalyst is able to perfectly purify waters contaminated by organic pollutants such as textile synthetic dyes and pharmaceutical compounds. The important advantage of the research is the application of solar photovoltaic cells (solar panels) as sustainable source of energy. Based on the results, the system can be used in the purification of industrial water and wastewater, elimination of oil industry pollutants, disinfection, pharmaceutical purification and refinery, and other scientific and technical fields after production at industrial scale.

The designed nanophotocatalyst is made of titanium dioxide (TiO2) nanoparticles in the presence of zeolite particles stabilized on a bed of low density polyethylene (LDPE). In this research, a photocatalyst has been produced with high porosity, strength and reactivity, and its rate and efficiency in the elimination of pollutants have significantly increased. Results of the research have been published in Applied Catalysis B: Environmental.

Source: http://www.en.mehrnews.com

Super-fine solution to remove micropollutants

In a new study researchers at EPFL, Switzerland, found a super-fine form of powdered activated carbon captures micropollutants more rapidly than the conventional kind and could by used in Swiss wastewater treatment plants. In the lab, EPFL researchers, further improved this approach using a super-finely ground variant of the powder, which accelerated micropollutant removal rates by a factor 5 or more. Their study, which could potentially have future appli-

cations in Swiss wastewater treatment plants, has been published in the journal Water Research.

In the lab, environmental chemists working with Tamar Kohn have now shown that using super-finely ground powdered activated carbon has the potential to bring down the cost of micropollutant removal. All ten representative micropollutants it was tested on were removed more efficiently, in some cases up to 65 times as fast. Achieving the removal target, which Swiss authorities have set at 80%, would therefore require both less time and less carbon. "As the next step, we will have to test the approach in a pilot study to be sure that it is workable in a full-scale wastewater treatment plant," said Florence Bonvin, the lead author of the study.

Source: http://www.phys.org

Magnetic nanoparticles to purify wastewater

Researchers from Tarbiat Modarres University (TMU), Islamic Republic of Iran, coated and modified the surface of magnetic nanoparticles to produce a special nanosorbent to eliminate environmental pollutions. The nanosorbent can also be used in various industrial and agricultural sections to eliminate organic and inorganic compounds from polluted water after being mass produced. The researchers modified and coated the surface of ferrous magnetic nanoparticles to produce a nanosorbent to eliminate organic and inorganic pollutants from water.

The researchers tried to create stability by modifying the surface of nanoparticles, and also to make selective the sorbents by selecting the appropriate coating. Magnetic nanosorbents were separated very easily after the purification process by using an external magnetic field; therefore, there was no need for an individual separation stage or the application of centrifugal methods to recover the nanosorbent.

The separation and recovery processes become simpler, faster and more cost effective this way. The surface of magnetic nanoparticles were coated and modified by using metalorganic compounds. Then, the product was used to eliminate environmental pollution from industrial and agricultural polluted water.

Source: http://www.nanotech-now.com

Novel wastewater treatment system

A team of researchers from the Centre de recherche industrielle du Quebec (CRIQ) Canada, and Institut national de recherche scientifique (INRS), Canada, have been granted a U.S. patent for their newly developed wastewater treatment system, which removes emerging micropollutants like bisphenol-A, better known as BPA. The treatment technology is known as the membrane bioreactor system. According to both organizations, early studies showed their membrane technology is capable of removing 99% of BPA and similar contaminants from heavily polluted water.

BPA is a synthetic compound commonly used in the production of plastics and epoxy resins. CRIQ and INRS said their system is also able to remove medications from wastewater, including antidepressants, antibiotics, analgesics, hormones, anticonvulsants and chemotherapy products. Researchers suggest their technology could be installed at the source, hospitals and industrial plants, for example, to remove contaminants from wastewater before it ever reaches municipal treatment facilities.

Source: http://www.upi.com

Biotech to treat steel plant wastewater

India's state-owned Steel Authority of India Limited (SAIL) will use biological technology for the first time to treat waste water in its iron and steel plants. The technology - developed by SAIL in collaboration with the biotechnology department of the Indian Institute of Technology (IIT) in New Delhi and the civil engineering department of Jamia Milia Islamia University - will remove toxic components, like cyanide, phenol and ammonia from industrial wastewater without using any chemicals.

Named mixed microbial consortium (MMC), the three tier cleansing technology is cost-effective and can be used in steel plants already in operation and upcoming greenfield projects, SAIL's Ranchi-based Research and Development Centre for Iron and Steel (RDCIS) said. Sources said microbes and roots of three plants will be used to break down cyanide, phenol and ammonia particles into lesser toxic chemicals like carbon dioxide, nitrogen and nitrous oxide.

"The biological technology will be able to reduce the presence of toxic chemicals in water to less than 2 parts per million (PPM) cubic meter," Ujjwal Bhaskar, chief of communications of SAIL RDCIS told TOI. The three tier step will comprise bio-remediation, bio-leeching and biospotion, SAIL said. "In layman's language, the microbes will see the toxic particles as their food and degenerate it after devouring. The microbes in turn will degenerate themselves," Bhaskar added.

Source: http://timesofindia.indiatimes.com

Cactus-based technology to disperse oil spills

A Lecturer from University of Guyana (UG), Guyana has invented a technology that could use cactus to help deal with oil spills. Dr. Dawn Fox, in the Department of Chemistry, has been listed as an inventor on US Patent 9,163,374. "The patent was issued for an innovative technology: using cactus mucilage as a dispersant and absorbant for oil in oil-water mixtures," said UG. The invention consists of employing cactus mucilage as the active ingredient. Cactus mucilage is an extract from the tuna cactus (Opuntia ficus-indica) also known as nopal.

The mucilage is a natural hydrogel polysaccharide found in many water storing succulents including aloes and slimy vegetables. It swells in water but remains insoluble and is able to precipitate bacteria, suspended solids and ions from water. UG explained that conventional chemical clean-up of oil spills utilizes dispersants that reduce the surface tension of water allowing oil and water to mix; this is emulsification. This causes the oil layers to break up into smaller droplets allowing more efficient biodegradation.

In laboratory trials, the mucilage showed ability to both disperse/break up oily layers as well as to absorb oil from oil-water mixtures. Both methods of action are critical for targeting oil slick. Dispersal allows gases to dissolve in the water bodies which would reduce fish kills. The mucilage stays afloat while absorbing the oil layer which facilitates the ultimate physical removal of the oil-mucilage complex. This material is environmentally-friendly and readily available which make it an attractive alternative for a competitive technology to clean up oil spills.

Source: http://www.demerarawaves.com

Oil spill clean-up solution

Researchers from National University of Singapore (NUS), has developed the world's first biodegradable cellulose-based aerogel made from paper-waste that features an exceptional ability to absorb oil. The material can absorb up to 4-times as much oil as the best existing commercial sorbents. This, combined with its non-toxic and biodegradable nature, makes the material an ideal candidate for oil spill cleaning. Capable of absorbing up to 90-times its dried weight, the novel aerogel can be squeezed and up to 99% of the absorbed oil recovered.

The aerogel, coated with Trimethoxy-methylsilane, is water repellent and therefore absorbs only oil. In addition to its environmentally friendly nature, the aerogel has been manufactured using an energy-saving method. The team believes that in addition to its oil-absorbing properties, the paper-based aerogel can find applications in many other sectors, for example, as an insulation material in the built environment or as a biodegradable packaging material, e.g. a replacement for plastic-based bubble wrap.

Further modifications can turn the aerogel into a smart coating material that can be used for drug deliveries or to stop bleeding. This is achieved by first infusing the aerogel with a solution of metallic nanoparticles. The cellulose aerogels are then hammered flat to remove most of the air, resulting in a magnetic thin film that has a weight capacity of over 28 tonnes per square centimetre. The team has filed a patent for their invention in the USA, China, India and Southeast Asia.

Source: http://www.eandt.theiet.org

Biodegradable agent to clean up oil spills

A team of researchers led by chemist George John from City College of New York (CCNY), the United States, have developed an eco-friendly biodegradable green "herding" agent that can be used to clean up light crude oil spills on water. Derived from the plant-based small molecule phytol abundant in the marine environment, the new substance would potentially replace chemical herders currently in use.

Source: http://www.tech01.us

Microbes thriving above natural oil seeps

In the water above natural oil seeps in the Gulf of Mexico, where oil and gas bubbles rise almost a mile to break at the surface. Scientists from three US institutions, the Georgia Institute of Technology (GIT), Columbia University (CU) and Florida State University (FSU) have discovered something unusual: phytoplankton, tiny microbes at the base of the marine food chain, are thriving.

According to a study, the oil itself does not appear to help the phytoplankton, but the low concentration of oil found above natural seeps isn't killing them, and turbulence from the rising oil and gas bubbles is bringing up deep-water nutrients that phytoplankton need to grow. The result is phytoplankton concentrations above oil seeps that are as much as twice the size of populations only a few kilometers away.

The research shows that the effects of oil and gas at the sea surface can be very different from the impacts of events such as the Deepwater Horizon spill. The research could lead to a reconsideration of the response made to spills. The

study is the first to demonstrate this kind of teleconnection between the sea floor, subsea floor and microbial processes in the upper ocean. It also provides insight into how microbes and oil interact under water.

Source: http://www.news.gatech.edu

Researchers study crude oil infected desert soil

In a recent study, researchers from Qatar University and United Arab Emirates University (UAEU) evaluated the relative merits of bioaugmentation, biostimulation and surfactant-enhanced bioavailability of a desert soil contaminated by crude oil through biopile treatment. The results showed that the desert soil required bioaugmentation and biostimulation for bioremediation of crude oil. The bioaugmented biopile system led to a total petroleum hydrocarbon (TPH) reduction of 77% over 156 days while the system with polyoxyethylene (20) sorbitan monooleate (Tween 80) gave a 56% decrease in TPH.

The biostimulated system with indigenous micro-organisms gave 23% reduction in TPH. The control system gave 4% TPH reduction. The addition of Tween 80 led to a respiration rate that peaked in 48 days compared to 88 days for the bioaugmented system and respiration declined rapidly due to nitrogen depletion. Nitrogen was found to be a limiting nutrient in desert soil bioremediation

Source: http://www.mdpi.com

Algae to target contaminants in wastewater

Researchers from University of Calgary, Canada, have found a way to program algae with bacterial genes to target unwanted chemicals and pharmaceuticals that end up in wastewater. Lee Jackson, scientific director of the Advancing Canadian Wastewater Assets (ACWA) research facility, and Joenel Alcantara with the Department of Microbiology, Immunology and Infectious Diseases at the Cumming School of Medicine, are planning to patent their new biotechnology shortly, once they conduct a few more tests. “This has huge potential,” says Jackson. “Wastewater treatment plants have not been designed to remove chemicals and drugs that benefit our daily lives, yet find their way into our wastewater.”

So far, the experiments have been conducted in the laboratory where Alcantara and Jackson have successfully implanted into algae bacterial genes that will break down antibiotics, pesticides and herbicides.

They are currently testing versions that will target birth control drugs and commonly used antibiotics. These compounds can enter river systems through municipal wastewater effluents, stormwater, veterinary processes and agricultural run-off and have been detected in several river systems around the world, including the United States and Europe. There remain unanswered questions about their potential impacts on human and aquatic health.

Source: http://www.ucalgary.ca

Pyrene bioremediation using bacteria

A study by researchers from South China University of Technology, Guangdong Vocational College of Environmental Protection Engineering and The Key Laboratory of Pollution Control and Ecosystem Restoration in Industry Clusters, China, reported on the enhanced bioremediation of pyrene (PYR)-contaminated soil resulting from organisms immobilized in layer-by-layer (LBL) assembled microcapsules.

The characterization by microscopy indicated that the shape of the microcapsule was like a flake with a diameter of 3–4 μm and that bacteria were encapsulated in the microcapsules. Soil remediation experiments revealed that PYR with an initial concentration of 100 mg kg^{-1} in dry soil could be 81% removed by an immobilized consortium (107 CFU g^{-1} in dry soil) in 40 days, while only 42% was removed by the free bacteria.

Moreover, the LBL-immobilized cells could cause a significant increase in the biodiversity of the bacterial community, soil enzyme activity and the number of PYR-degrading bacteria in the soil, successfully accounting for accelerated PYR removal. Illumina MiSeq sequencing results showed that Proteobacteria and Actinobacteria were observed as the predominant groups during bioremediation in the LBL groups.

The active uncultured bacteria belonged to Xanthomonadaceae, Planococcaceae,*Pseudomonas*, *Mycobacterium*, Sphingomonadaceae, *Acinetobacter*, *Flavobacterium*, Comamonadaceae, *Bacillus, Sphingobacterium*, Enterobacteriaceae, and *Streptomyces*, the latter two classes having rarely been associated with PAH-degrading activity.

Source: http://pubs.rsc.org

New CO_2 recycling process

Chemists from the University of Southern California (USC), the United States, have claimed that carbon dioxide (CO_2) absorbed from the atmosphere can be converted into methanol, which offers two major benefits. First, it reduces the concentration of harmful CO_2 in the atmosphere. Second, it aids in the use of methanol as a substitute fuel. In the study published in the *Journal of the American Chemical Society*, the researchers were interested in coming up with ways to recycle CO_2 into things that can be useful and reduce its effects on the environment.

They found that the by-product of the process, methanol, is useful as alternative fuel and as hydrogen storage. The group was led by G. K. Surya Prakash, at the USC. It also involved George A. Olah, at USC. "Direct CO_2 capture and conversion to methanol using molecular hydrogen in the same pot was never achieved before. We have now done it!" said Prakash. The researchers reiterated that the key factor in producing methanol directly from CO_2 is using a stable homogeneous catalyst, which will speed up the chemical process.

Unfortunately, most catalysts decompose when exposed to heat. The stable and good catalyst that they have developed was based on ruthenium, which is a kind of metal that does not decompose and can withstand extreme high temperatures. The new catalyst paved way to about 79 percent of the CO_2 captured from the atmosphere being converted into methanol. With the success of the study, the researchers hope that their work will soon contribute to a "methanol economy," in which energy storage and fuel are based on methanol.

Source: http://www.techtimes.com

Biofilter degrades air pollutants

Biotechnology expert Raul Pineda Olmedo, of the National University of Mexico (UNAM), has designed a biofilter that uses microorganisms living in the shell of the peanut, in order to clean the air of pollutants such as methanol and solvents used in the industry. The researcher noted that microorganisms grow naturally on peanut shell, which can be used to clean the air. Furthermore, in Mexico this material is generated in large amounts and is considered a worthless agricultural residue.

The idea is a prototype filter with peanut shells, which cultivates the microorganisms to degrade toxic pollutants into carbon dioxide (CO_2) and water, thereby achieving clean air. "The peanut shell is special for these applications because it is naturally hollow and has an area of contact with air, which favors the development of microorganisms," said Pineda Olmedo. He also said it has been observed that this organic material can be applied to biotechnology as biological filters similar to those used by cars, but instead of stopping dust it can degrade the contaminants.

Olmedo Pineda development focuses on solving the problem of air pollution in companies dedicated to handling inks or solvents, which have a contaminated workplace. The prototype is similar to a bell or kitchen extractor, but it not only absorbs and stores polluting vapors, it degrades and purifies the air. The design consists of a filter made with peanut shells containing microorganisms, which purify the air. For optimum development it should be in a temperature controlled environment.

Source: http://www.phys.org

Catalytic converter for emission control

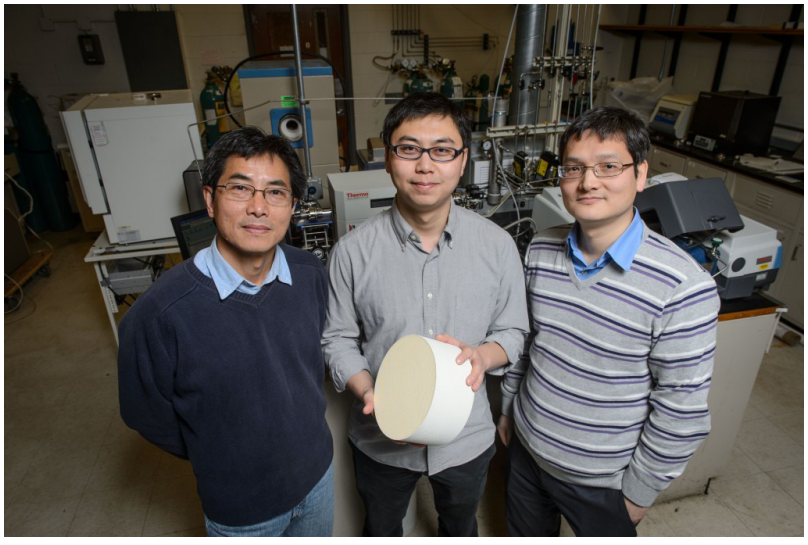
Two researchers from University of Connecticut (UConn), the United States, have developed a technology that promises big improvements on one of the most common and important emission control tools used to protect the environment: the catalytic converter. With help from UConn's NSF program, the pair are now well on their way to commercializing their new technology. Yanbing Guo and Pu-Xian Gao, both from UConn, created an innovative nanorod-array technology to produce a novel, low-temperature catalyst for applications in automotive and industrial emission controls.

Guo and Gao's invention improves upon standard catalytic converters by reducing the amount of precious metals, such as platinum, rhodium, and/or palladium, that coat acres of surface area of a honeycomb ceramic core to create a chemical reaction converting noxious emissions into more environmentally friendly products. Using their patented process, high-efficiency nano-catalysts are fabricated within the converter device, improving low-temperature performance, increasing the lifetime of the converter, and potentially decreasing the price of the converter by up to 30 percent by reducing the use of precious metals.

Source: http://www.today.uconn.edu

Electric pulses reduce emissions

Tai Chong Cheang Steamship (TCC), Hong Kong, and the University of Southern California (USC), the United States, have developed a new system for improving fuel efficiency and reducing Nitrogen Oxides (NOx) emissions. The technology uses tailored electrical nano-pulses to change the underly-



Sample of the catalyst for emission control (Credit: Peter Morenus/UConn Photo)

ing chemistry, either at the point of exhaust or during combustion. The group's experiments both in laboratories, and via a series of recent sea trials, consistently cut nitrogen oxide emissions at the point of exhaust by almost 90% and reduced particulate matter by up to 75%.

The dramatic improvement in efficiency was achieved using the radically different and more cost effective approach of nano-pulse power, compared to the standard scrubbers typically used on vessels that require training for crews and maintenance, said the researchers, who have also conducted tests using the same technology towards improving the combustion efficiency in marine diesel engines so that they can operate at their optimal continuous rating output.

Source: http://www.maritime-executive.com

Tray scrubber recovers acids from emissions

Bionomic Industries, the United States, manufacturer of air pollution abatement and product recovery technologies, has announced availability of its advanced Series 6000 Tray Scrubber. Available in sizes to handle gas volumes from 500 to 150,000 cfm, the Series 6000 utilizes special high performance tray designs in single or multiple stages to achieve maximum gas absorption using once through water at extremely low rates to absorb and concentrate product in one easy step, without the need for recirculation pumps. This once through water flow pattern also enables recovery of higher vapor pressure concentrated solutions for reuse in the process.

For applications where fine mists are formed during absorption a final coalescing filter is used to reduce overall emissions to extremely low, nearly non-detectable levels to easily meet environmental standards. The Series 6000 is ideally suited for recovering and re-concentrating acids such as hydrochloric from metal pickling operations, acetic acid, ammonia and alcohols from supply and process operations including a host of other emission source compounds.

Contact: Bionomic Industries Inc., 777 Corporate Drive, Mahwah, NJ 07430, USA. Tel: +1-201-529-1094; Fax: +1-201-529-0252; E-mail: info@bionomicind.com.

Source: http://www.environmentalleader.com

New technology for reduction in SPM

Researchers from the Department of Atomic Energy (DAE), Government of India, have developed a flue gas conditioning technology for reduction in suspended particulate matter (SPM). The elegance of this technology is that it is simple, robust and can be implemented with minimum downtime once the initial characterization and system design is finalized scientifically based on the site specific conditions. This technology can be incorporated in new or existing installations in the country, where thermal power stations still continue to be main stay in power generation and where unfortunately coal contains high ash in some cases, excess of 40-45%.

This spin-off technology was developed by the Heavy Water Board when in one of its heavy water plants having a coal fired captive co-generation plant had an excess of SPM emission levels during its initial days (500-600 mg/nm3 compared to a limiting value of 115 mg/nm3). The most appropriate solution was to externally alter the resistivity of the ash particles in the charged flue gas medium through weak alkali conditioning agents. A pilot level study with ammonia as a conditioning agent was followed by actual plant set up based on in-house design and engineering.

A full fledged technology demonstration plant was set up for the first time in 1999 in the Captive Power Plant. Subsequent to the demon-

stration of this technology and completing the patenting formalities, the technology was demonstrated at some more power stations within the country with successful results. A systematic scientific approach followed at all these places in terms of selection of dosing rate, types of distributor of the ammonia and air mixture resulted in bringing down the SPM concentration in all these power stations. The comparison with other flue gas conditioning chemicals indicated that ammonia or its derivatives would be the most appropriate flue gas conditioning chemical for Indian conditions.

Source: http://www.dae.nic.in

Electrocatalyst for converting CO_2 into liquid fuel

A team of researchers working at the University of Science and Technology, China, has developed a new and potentially better electrocatalyst for use in converting carbon dioxide (CO_2) into methanoic acid, which could be used as a liquid fuel. The team found that it may provide a path to reducing CO_2 emissions and thus help to slow global warming. In this new effort, the researchers tried a new approach, a four-atom thick layer of either mixed or pure cobalt and cobalt oxide.

They found that the cobalt, which is not normally catalytically active for carbon dioxide, became active when arranged in a certain oxidized state. In testing their catalyst, the team found it able convert CO_2 to methanoic acid and that it provided better catalytic activity than other known metal or metal oxides. These findings point to new opportunities for manipulating and improving the CO_2 electroreduction properties of metal systems, especially once the influence of both the atomic-scale structure and the presence of oxide are mechanistically better understood.

Source: http://www.phys.org

Pelletized adsorbents for CO_2 capture

Scientists from Monash University, Australia, have scientists have developed a new method to produce via compression pellets from amine type composites without additional binder. Highly selective "molecular basket" sorbents and water tolerant, the pellets demonstrate a high capacity for carbon dioxide (CO_2) capture, which is similar to the promising commercially developed powder forms. The pellets can be used for post combustion capture of CO_2 from flue gas streams, in conjunction with industrial gas separation process technologies, such as pressure swing adsorption (PSA), and temperature swing adsorption (TSA). The method can also be adapted for gas adsorption pellet production in the pharmaceuticals or agrochemicals sectors and the food industry. The invention relates to a method to produce a pelletized form of a porous support material for gas separation applications. More specifically, the invention demonstrates a new process to compress mesocellular siliceous foam (MCF) loaded with Polyethyleneimine (PEI) as a solid sorbent for CO_2 capture. This pelletization technique doesn't use any binder and, CO_2 capture relies on the well-known technical sorbent capacity and features of the composites. The proof of concept has been demonstrated by the researchers.

Source: http://www.monash.edu

Process to convert CO_2 and water into liquid hydrocarbon fuel

A team of researchers from University of Texas, the United States, have proven that concentrated light, heat and high pressures can drive the one-step conversion of carbon dioxide and water directly into useable liquid hydrocarbon fuels. This simple and inexpensive new sustainable fuels technology could potentially help limit global warming by removing carbon dioxide from the atmosphere to make fuel. The process also reverts oxygen back into the system as a byproduct of the reaction, with a clear positive environmental impact, researchers said.

The researchers have demonstrated that the one-step conversion of carbon dioxide and water into liquid hydrocarbons and oxygen can be achieved in a photothermochemical flow reactor operating at 180 to 200 C and pressures up to 6 atmospheres. "We are the first to use both light and heat to synthesize liquid hydrocarbons in a single stage reactor from carbon dioxide and water," said Brian Dennis, UTA professor of mechanical and aerospace engineering and co-principal investigator of the project.

The hybrid photochemical and thermochemical catalyst used for the experiment was based on titanium dioxide, a white powder that cannot absorb the entire visible light spectrum. The authors envision using parabolic mirrors to concentrate sunlight on the catalyst bed, providing both heat and photo-excitation for the reaction. Excess heat could even be used to drive related operations for a solar fuels facility, including product separations and water purification. The research was supported by grants from the National Science Foundation and the Robert A. Welch Foundation.

Source: http://phys.org

Hazardous Waste and Pollution

This volume examines crimes that violate environmental regulations, as part of an emerging area of criminology known as green criminology. The contributions to this book examine criminal justice concerns related to regulating and enforcing environmental laws, as well as the consequences for families and communities impacted by hazardous waste and pollution. It also describes possible strategies for deterring and preventing organized crime related to environmental regulations, including black market sales of ozone depleting substances.

Integrated Waste Management in India

This book provides insights into the current status of waste management in India and research approaches to minimize waste and convert useful waste into energy alternatives towards achieving environmental sustainability. It also discusses the implications of waste on human health and approaches to minimize the burden. Contributed research papers from academic studies and industry focus on applied waste-management methods currently being practiced, waste strategies and eco-friendly approaches such as bioremediation.

For the above two publications, contact: Regional Sales Director, Southeast Asia, Academic & Government Sales, Springer Asia Limited. Tel: +603-8060-1030; E-mail: sawluan.chua@springer.com

E-Waste Management: From Waste to Resource

The emphasis of the book is mainly on the dramatic change of the entire e-waste sector from the cheapest way of getting rid of e-waste in an environmental sound way to how e-waste can help to reduce excavation of new substances and lead to a sustainable economy. It is an ideal resource for policy-makers, waste managers and researchers involved in the design and implementation of e-waste.

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