VATIS UPDATE

Waste Management

Vol. 5 No. 101 • Nov - Dec 2010
ISSN 0971-5665

Highlights

- Converting plastic back into petroleum
- New method to ease out noble metals
- Electrocoagulation of wastewater
- Clean energy from toxic waste
- Egg shell membrane can absorb CO_2 emissions
- Low-cost capture of carbon dioxide

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Economic and Social Commission for Asia and the Pacific

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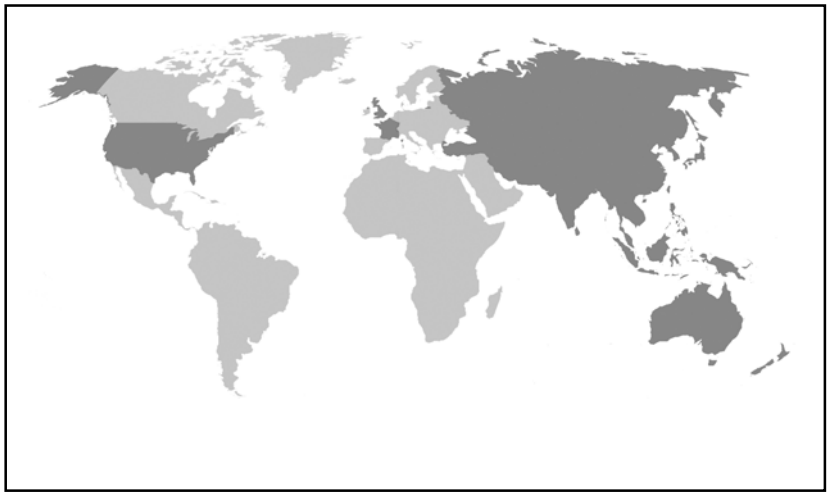
- Research and analysis of trends, conditions and opportunities;
- Advisory services;
- Dissemination of information and good practices;
- Networking and partnership with international organizations and key stakeholders; and
- Training of national personnel, particularly national scientists and policy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



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

Cover Photo

Aluminium shavings from machining operations at General Motors are collected and reused at its foundries to make new transmission parts.
(Credit: General Motors, the United States)

VATIS* Update Waste Management
is published 6 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.

Website: http://www.techmonitor.net

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This publication is supported by the German Agency for Technical Cooperation (GTZ), Germany.

This publication has been issued without formal editing

*** Value Added Technology Information Service**

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Scientists raise concerns about flame retardants

According to a statement signed by nearly 150 scientists from 22 countries, flame retardants used in a wide range of consumer products pose a threat to human health and may not even be very effective. Brominated and chlorinated flame retardants (BFRs and CFRs) are employed in products such as televisions, computers, mobile phones, furniture upholstery, mattresses, carpet pads, textiles and cars.

BFRs and CFRs can increase fire toxicity and their overall benefit in improving fire safety has not been proven. Further, they "can increase the release of carbon monoxide, toxic gases and soot". These fire retardant chemicals are accumulating in the environment and humans. Some of them might harm unborn children, affect people's hormones and even be carcinogenic, according to the San Antonio Statement, named after the city in Texas, the United States, that hosted the 30th International Symposium of Halogenated Persistent Organic Pollutants (POPs) in September 2010. The statement called on manufacturers to provide more information about the toxicity testing of these flame retardants and for governments to respond to the health and environmental threats of BFRs and CFRs.

Source: www.businessweek.com

China issues rules for importing whole PET scrap bottles

The Chinese government has issued long-awaited rules detailing how companies can import whole polyethylene terephthalate (PET) scrap bottles. The rules – issued in October 2010 and discussed by government officials and companies at a conference held on 4 November in Ningbo, Zhejiang province – have been closely watched globally as China is the world's largest importer of scrap plastics. China had earlier allowed only recycled PET, which had already been processed in some way, as imports owing to concerns about importing unclean materials.

The new rules require importers to have existing facilities and a current licence to import recycled plastic. They should be located in a district designated for recycling and should have imported at least 10,000 t of material in each of the past three years. Companies outside the existing recycling districts must have imported at least 30,000 t of materials in each of the past three years. Licences would be issued by the Ministry of Environmental Protection.

Chinese recyclers at the conference felt the new rules would bring more buyers into the market, raise prices at some points in the supply chain and potentially allow end-users like polyester fibre manufacturers more direct access to materials. If fibre makers can legally import bottles, they may set up their own recycling operations and start buying directly, rather than working through existing recyclers. Some smaller recyclers processing whole PET bottles collected within the country urged government officials to relax the rules for an import licence, saying they had additional capacity and could cleanly process more material.

Source: www.plasticsnews.com

Malaysia may make electronics firms take up recycling

The Malaysian government is considering a regulation that will make manufacturers and retailers of electronic goods responsible for recycling products they sell. According to Mr. Seri Douglas Uggah Embas, the Minister of Natural Resources and Environment, the regulation is in the discussion stage and feedback from the private sector was being sought. Mr. Uggah Embas hoped there would not be staunch resistance from the relatively "well educated" private sector, with some of them having already started collecting centres by themselves under their own corporate social responsibility efforts.

On other challenges, the Minister said the smuggling of waste containing precious metals into Malaysia was still a concern. Further, waste was becoming more valuable, with progress on recycling techniques, pioneered in developed countries. About 225 g of gold is present in about 1 t of computer chips. "You can understand why electronic waste smuggling happens. On the other hand, I hope local entrepreneurs will take up the challenge of making more money from waste," said Mr. Uggah Embas.

Source: thestar.com.my

India sets up 'green court' to make polluters pay

India has set up a "green" tribunal to make polluters pay damages, as the government steps up policing of the country's environmental laws. Minister of Forests and Environment, Mr. Jairam Ramesh, said India was only the third country in the world after Australia and New Zealand to set up such a tribunal. "This is the first body of its kind (in India) to apply the polluter pays principle and the principle of sustainable development," Mr. Ramesh claimed.

The tribunal will be constituted of members who are environmental

experts and will have powers to "try all matters related to and arising out of environmental issues," according to a government statement. The move to launch the tribunal was the latest sign of a tougher approach by India to improve its green track record, as concerns mount about the impact of growing industrialization on air and water quality, wildlife and forests.

Earlier, a panel set up by the government had urged that clearance granted to the Republic of Korea's steel giant Posco for the construction of a US$12 billion steel plant in eastern India be scrapped due to environmental concerns. In August, the government rejected plans by the United Kingdom-based Vedanta Resources to mine bauxite in an area held sacred by certain Indian tribes and also cited "serious violations" of environmental rules.

Source: www.google.com

Phone recycling campaign launched in Pakistan

At a discussion organized by Nokia Pakistan, Country Communications Manager Mr. Adeel Hashmi announced that people can now bring their used phones back to Nokia Care Points in the country for responsible recycling. Nokia and other leading companies have launched a worldwide recycling scheme with a view to protect environment on the one hand and put the old handsets to good use, ensuring economic benefits.

There are about 5,000 Nokia Care Points located in 85 countries. Only 3 per cent of people owning mobile devices claim to recycle their handsets. It is estimated that if all of the around 4.6 billion people using cell phones globally recycled at least one of their unwanted devices, that would save 370,000 t of raw material and reduce gases to the same extent as taking 6 million cars off the streets.

On Nokia's efforts at waste reduction, Mr. Hashmi said: "During the years of 2006-2008, we have reduced the size of our packaging and used more recycled materials to make it. This has enabled us to reduce the use of paper-based materials by almost 100,000 t. This translates not only into financial savings of 474 million euros, but less packaging also means reduced transportation volume enabling us to take at least 12,000 trucks off the roads."

Source: pakobserver.net

Pact to promote clean production parks

The Taiwan Electrical and Electronic Manufacturers' Association (TEEMA) and the China Resource Recycling Association (CRRA) have signed a pact to jointly set up clean production pilot parks across the Taiwan Straits. Under the pact, both sides will set up a mechanism governing the exchange of clean production technology and information. In addition, both sides will jointly set up clean production technology and consultancy service task forces to render services to enterprises across the Taiwan Straits in the fields of resources recycling, water conservation, emission reduction, energy saving and pollution control.

Source: www.chinapost.com.tw

Warning issued to the public on 'cleaners' with cyanide

In the Philippines, the Department of Environment and Natural Resources (DENR) and Department of Health (DoH) have issued warning to the public against buying silver cleaners containing cyanide because of the "threat to health and safety", reiterating the prohibition of the sale of the toxic substance in the market. A joint memorandum signed recently by DENR and DoH stated that laboratory analysis of samples of these silver cleaning solutions show "elevated levels of cyanide clearly posing imminent danger or even death to humans" when ingested.

Data provided by the University of the Philippines-National Poison Management and Control Centre (UP-NPMCC) to environmental group EcoWaste Coalition show that in 2009 alone, 11 Filipinos (three adults and eight children) died out of the 235 cases of silver cleaner poisoning handled or referred to the Philippine General Hospital. In the first nine months of 2010, 11 people have died (6 adults and 5 children). The UP-NPMCC also reported a dramatic increase in the non-accidental intake of silver cleaners, rising from 7 per cent in 2005 to 86 per cent in 2009.

Source: www.mb.com.ph

Thailand approves green tax in principle

In Thailand, the Cabinet has agreed in principle to impose a new tax to penalise polluting industries. The Finance Minister Mr. Korn Chatikavanij explained that the new law would be an important tool for the government in helping preserve the environment. Actual tax rates to be imposed for polluters would be set under organic laws covering different types of pollution including water, air and industrial waste.

"Based on our studies, pollution costs the country an average of 300 baht (US$10) a person each year in terms of health costs or 18 billion baht (US$598.3 million) per year," said Mr. Korn, adding that

funds raised from the new tax will be used to help offset these expenses. He said other countries with similar environmental taxes raise the equivalent of 1 to 6 per cent of gross domestic product (GDP) per year from taxes to help support conservation and social programmes. Thailand is expected to impose much lower tax rates from the start, with collections at just 1 per cent of the annual budget expenditure.

Source: www.bangkokpost.com

China plans to cut dioxin emissions to improve air quality

In an effort to address the rising air pollution in the country, China aims to cut the intensity of dioxin emitted by over 10,000 industries) by 20 per cent in the coming five years. A circular issued by nine central government departments, including the Ministry of Environmental Protection, called for stricter control of dioxin in key sectors including ferrous metal production, garbage incineration and steel or iron smelting.

The government has ordered all emission-producing equipment in key industries to be fitted with dust-removing facilities by June 2011. By 2015, the country should have in place a sound, long-term mechanism for monitoring and preventing dioxin pollution. The reduction and control of dioxin will be considered in assessing the environmental impact of key industries. Newly built, reconstructed and expanded projects and enterprises will have to pass the national standard for dioxin emissions at the outset.

The circular also required waste incineration facilities to release an annual environmental impact report to the public, with statistics on their release of sulphur dioxide, nitrogen oxides and hydrogen chloride being updated online, real time and tested once a year for accuracy. Heavily polluting factories that fail the national standards on emissions must be shut down or suspend its operations. Local environmental authorities were told to set up a database on pollution sources in their areas as well as to regularly monitor factories that emit dioxin. China has a national standard on dioxin emissions of 1 ng/m^3 – 10 times the legally allowed amount in the United States and the European Union.

Source: www.hindustantimes.com

Assessment of polluting industrial clusters in India

The Indian Institute of Technology (IIT), New Delhi, has carried out a comprehensive environmental assessment of prominent industrial clusters in the country. The aim was to identify polluted industrial clusters and prioritize planning needs for intervention to improve the environment quality in these industrial clusters and the nation as a whole. In all, 88 industrial clusters were assessed, selected on the basis of environmental data available with the State Pollution Control Boards (SPCBs) and the Central Pollution Control Board (CPCB).

The report shows that 43 industrial clusters/areas having aggregated Comprehensive Environmental Pollution Index (CEPI) scores of 70 and above need to be considered as critically polluted, and require further detailed investigations in terms of the extent of damage and formulation of appropriate remedial action plans. Thirty-two clusters/areas having CEPI scores of 60-70 were considered as severely polluted areas and shall be kept under surveillance, followed with efficiently implemented pollution control measures. CEPI is linked to public health in terms of presence of toxins and their concentration, impact on human health and level of exposure.

The CEP index has taken into consideration the following two factors related to public health: factor B2 – reliable evidence of symptoms of adverse impact on people due to exposure; and factor C1 – for air pollution, number of people affected within a 2 km radius from the industrial pollution source including industrial workers and their families. CPCB has been asked to take follow up action on the findings of the assessment and coordinate with the Public Health Foundation of India.

Source: www.commodityonline.com

Japan finances waste treatment project in Viet Nam

Japan's New Energy and Industrial Technology Development Organization (NEDO) and Viet Nam's Ministry of Natural Resources and Environment (MNRE) signed a contract on 15 October 2010 to build a waste treatment facility to generate power in Hanoi's Soc Son district. Covering an area of 1 ha in Nam Son waste treatment complex, the facility will have an incinerator with a capacity of 75 t/d of waste and generate 1.2 MW of electricity. The pilot project has a total investment of US$21 million, of which US$17 million will be contributed by Japan and the remaining by Viet Nam's state-owned Urban Environment Company (URENCO). The project, which will employ advanced Japanese technology for the first time in the country, will be implemented during 2011-2012. It will contribute to both environmental protection and sustainable development in Viet Nam.

Source: english.vovnews.vn

Pyrolysis for recycling pneumatic tyres

Ms. María Felisa Laresgoiti Pérez with pyrolysis equipment

Ms. María Felisa Laresgoiti Pérez, a chemist at the University of the Basque Country, Spain, chose to study the process of pyrolysis, both to recover part of the energy and material costs of the manufacture of pneumatic tyres as well as to solve the problem of the elimination of used tyres. With the results, she presented her thesis on "Chemical recycling of pneumatic tyres through pyrolysis" for a Ph.D.

Ms. Laresgoiti Pérez used a 3.5 litre fixed bed reactor (one or more vertical tubes packed with particles which accelerate the process of reaction) and ensured the absence of oxygen – necessary for pyrolysis – by means of a nitrogen sweep. After a number of trials, she concluded that, at temperatures above 500°C, the decomposition of the organic material of the tyres is completed in 30 minutes of reaction time. This decomposition generates 40 per cent of liquids and 16 per cent of gases, useable as fuels and/or sources of raw material. The remaining 44 per cent left after the process is solid inorganic material – mostly metals and soot – which is practically unaltered by the process and can be reused in various applications.

The liquids from the pyrolysis are a complex mixture of organic products that can carry out the same function of certain petroleum fractions, and so are reusable as an alternative to fossil fuels. Besides their use as fuel, these liquids are also useful as a source of various valuable chemical compounds. The pyrolysis gases are basically hydrocarbons, and their high calorific value makes them an important energy source and can be used to power the process. According to the thesis, the soot (carbon black) from the pyrolysis could be used for a number of commercial applications. For example, Ms. Laresgoiti Pérez believes that it has possible application as a reinforcement in the manufacture of new pneumatic tyres or as pigment for inks.

Source: www.gizmag.com

Converting plastic back into petroleum

Plastic-to-plastic recycling is the optimum way to reuse plastic trash, but that method is fraught with problems of its own. Plastics cannot be commingled, meaning that once the plastic is collected (using big, petroleum-burning garbage trucks in most cities where central recycling is done) it must be taken to the sorter, where dozens of people separate the plastic trash by hand. Mr. Akinori Ito, founder of Blest Corporation, Japan, has developed a portable machine that takes plastic and converts it back into oil. Mr. Ito has developed a small, portable tabletop machine that uses a tank into which all types of plastic trash are stuffed. The materials can be commingled because only the usable gases and oils are extracted. Using both heat and pressure, the machine converts this commingled plastic trash in a few hours into unrefined oil, composed of kerosene, diesel, petroleum and heavy oils.

A pipe running from the heating machine to a container of tap water puts the resulting gas through a filter and into the water, which breaks it down into water and carbon dioxide (CO_2), so there is not really any smell or release of CO_2 into the atmosphere. The unrefined oil can be immediately used for industrial machinery, incinerators and other uses where refined gas is not required for operation. The machine is capable of turning 1 kg of plastic into 1 litre of oil, using 1 kW of electricity at a cost of about US$0.20.

Source: www.plasticstoday.com

Recovery of waste polyester liner film

Mitsubishi Polyester Film (MPF), the United States, has developed a technical breakthrough to establish a post-industrial closed loop process for the sustainable recovery of waste polyester liner film. MPF has been developing the Reprocess™ Sustainable Liner Programme for many years in an effort to curb its carbon footprint and reduce greenhouse gases. "It is the first time a company has created a closed loop sustainable recycling process for polyester release liners," said Mr. Marshall Ledbetter, programme leader for the project.

MPF's plant produces in-line silicone-treated release films, which become the dispensing liner for labels that are placed on consumer goods including beverage bottles and personal care products. The labelling process leaves behind a "spent liner" after the label is placed onto a package or container. This leftover liner becomes waste for the companies in the labelling value chain. Previously, no means existed to convert and reclaim this spent liner in a closed loop fashion. MPF researchers have developed technologies to blend new and "spent liner" recycled materials in a new proprietary process. An independent

Life Cycle Assessment found that this process, when used to produce recycled PET pellets, will decrease the energy demand by 91 per cent and the global warming potential by 74 per cent compared to virgin pellet production.

Source: www.packworld.com

Process for carton recycling

In Canada, Groupe RCM Inc. has introduced what it has termed a new method to optimize the recycling of cartons at its facility. The company says the new recycling process, which it claims to be the first of its kind in the world, breaks down carton, plastic bag and film waste into a thermoplastic resin than can be used in industrial and commercial manufacturing. The process, which took three years to develop and an investment of US$3.5 million, was spearheaded by Tetra Pak, the packaging multinational firm.

The facility will accept all gable top and aseptic cartons as well as plastic shopping bags and cellophane film. "A thermokinetic process uses high-speed knives to homogenize disparate waste materials into plastic granules that can later be used for making a wide variety of plastic products" such as flower pots, railway ties, guard rail posts, pallets and plastic lumber, according to Tetra Pak. "The process is waste-free, converting all elements, including straws, caps and other plastic attachments, into plastic granules," the company adds.

Source: www.recyclingtoday.com

Reverse polymerization gets oil from tyre

An advanced technology at a plant of Ellsin Environmental Ltd. under construction in Sault Ste. Marie, Canada, will extract oil from used tyres, along with other valuable by-products, when it becomes operational early next year. The facility will be using a proprietary technology developed by Environmental Waste International Inc. (EWS). Its patented microwave system breaks down the tyres at molecular level, reducing them to oil, carbon black, steel and hydrocarbon gases.

Running at a planned recycling rate of about 300,000 tyres a year, the plant would produce about 908,000 litres of oil, 907 t of carbon black and 272 t of steel annually. Off-gases produced by the system will be used to co-generate electricity that allows the system to be self-sufficient in energy. The patented EWS technology, Reverse Polymerization™, used in this system, is claimed to be the most advanced process of its kind. Since it does not melt tyres, but rather breaks apart the molecular bonds, virtually 100 per cent of the by-products of the tyres are reclaimed.

Source: www.americanrecycler.com

Converting end-of-life plastic into car fuel

Sita, the waste company owned by France-based Suez Environnement, plans to build 10 plants across the United Kingdom to convert end-of-life plastic into diesel fuel. The company will commission the first plant in London by the end of 2011. Each plant will convert 6,000 t/y of mixed waste plastic into four million litres of diesel. The fuel will primarily be used by Sita vehicles as well as bulk transport companies such as lorry firms, according to the company. Sita has signed an exclusive agreement with Cynar, the United Kingdom, to develop the conversion technology.

"The process we are using involves shredding or chipping the plastic, which is pre-melted," explained Mr. Stuart Haywood-Higham, Technical Director of Sita. "We then apply a pyrolys process, which allows us to re-crack the waste into liquid." Once the impurities are removed by a vacuum process, the material that results is mainly diesel. Any waste that isn't plastic comes out as char.

Source: www.europeanplasticsnews.com

Extrusion technology for PET recycling

Gneuß Kunststofftechnik, Germany, has launched its MRS extruder for recycling polyethylene terephthalate (PET) sheet, fibre and tape without pre-drying. The company claims high devolatilizing and decontamination performance for the patented combination of a single screw extruder with a multiple-screw section. The system is also said to be robust, as well as easy to operate and maintain.

A Gneuß line for recycling of light fibre or film scrap directly consists of an MRS 110 extruder, a cutter/feeder unit, an "RSFgenius 150" rotary melt filtration system and an on-line viscometer. This configuration allows a wide range of fibre and film waste to be processed to an output comparable to virgin material, with a throughput of 500-700 kg/h, the company says. Medium-capacity extrusion lines (500-4,000 kg/h) have large active filtration area. In many cases, a system one size smaller can provide the same filtration performance and throughput, at a lower investment cost. Gneuß has moved its melt pressure transducers from a mercury medium to its proprietary NTX medium for better reliability, accuracy and environmental benefits.

Source: www.plasticsnews.com

Rare earth metal recycling process

At the Institute of Industrial Science (IIS), University of Tokyo, Japan, researchers have developed a process for recycling rare earth metals, essential for the production of high-tech goods from hybrid car motors to liquid crystal displays. "This is at the basic research level, but it could well become an important recycling technology that will help us live in harmony with nature," says Prof. Toru Okabe.

The research team concentrated its efforts on neodymium, the rare earth used in high-efficiency magnets for hybrid car motors and hard disk drives. At present, the majority of these magnets are dumped when the devices they are part of come to the end of their operational lives. Prof. Okabe's team has developed a high-temperature process that extracts neodymium and dysprosium from the magnets.

The researchers separated the rare earth metals in the alloy magnets from unneeded materials like iron and boron by submerging them in high-temperature magnesium chloride, causing the desired rare earth metals to melt. The molten rare earth metals were then distilled in a vacuum at 1,000°C, and the team was able to recover over 80 per cent of the neodymium and dysprosium in the magnets.

Source: mdn.mainichi.jp

Recycling nickel for new batteries

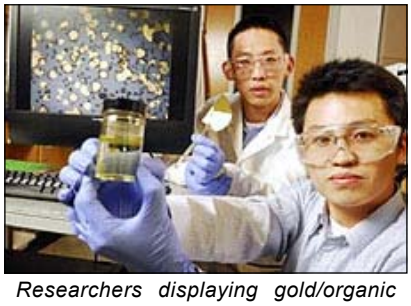
In Japan, Toyota Motor Corporation, along with Toyota Chemical Engineering, Sumitomo Metal Mining, and Primearth EV Energy, is working to recycle nickel in used nickel-metal hydride (NiMH) batteries from hybrid vehicles for use in new NiMH batteries. Previously, NiMH batteries recovered by car dealers and vehicle dismantling businesses were subjected to reduction treatment. The scrap containing nickel was recycled as a raw material for stainless steel manufacture.

High-precision nickel sorting and extraction technology has been developed where the materials can be introduced directly into the nickel refining process. The technology thus leads to battery recycling process. Toyota Motor has established battery collection centres, and constructed advanced recycling facilities exclusively designed for large-scale operation.

The new facilities are only in Japan for now. It is expected that the establishment of this recycling system in the country would accelerate the creation of a sustainable and recycling-based society. Toyota Motor Corporation is currently working on introducing this recycling system overseas.

Source: www.greenpacks.org

New method to ease out noble metals



Researchers displaying gold/organic aqua regia solution and silicon substrate coated with gold nanolayer

Existing recycling processes use a combination of two inorganic acids known as 'aqua regia' to dissolve noble metals – a class of materials that includes platinum, palladium, gold and silver. However, because the metals are dissolved together, impurities introduced in the recycling process may harm the efficiency of catalysts produced from the recycled materials. Researchers at the Georgia Institute of Technology (Georgia Tech), the United States, have developed a new organic solvent-based process that may help address the problem, and open up new possibilities for using these metals in microelectronics as well as in other applications.

The Georgia Tech solvent system uses a combination of two chemicals: thionyl chloride, and a variety of organic reagents such as pyridine, pyrimidine, imidazole and N, N-dimethylformamide (DMF). The concentrations can be adjusted to preferentially dissolve gold or palladium, and more importantly, no combination of the organic chemicals dissolves platinum. This ability to preferentially dissolve noble metals allows a customized system with a high level of control over the process to be created. "Though we don't fully understand how it works yet, we believe this system opens a lot of new possibilities for using these metals," said Dr. C.P. Wong, a Regents professor in the Georgia Tech School of Materials Science and Engineering.

Catalyst systems that make use of more than one metal, such as palladium with a gold core, are being more widely used in industrial processes. To recycle those, the new solvent system – dubbed 'organic aqua regia' – could first use a combination of thionyl chloride and DMF to dissolve out the gold, leaving hollow palladium spheres. Then the palladium spheres could be dissolved using a different combination. So far, the scientists have demonstrated that their solvent system can selectively dissolve gold and palladium from a mixture of gold, palladium and platinum. They have also used it to remove gold from a mixture of gold and palladium.

Beyond recycling, the new solvent system could also offer new ways of producing nanometre-scale cancer chemotherapy agents that involve these metals. The new solvent approach could have important implications for the electronics industry, which uses noble metals that must often be removed after specific processing steps. Beyond selectivity, the new approach also offers other advantages for electronics manufacturing – no potentially harmful contamination is left behind and processing is done under mild conditions. This selective process could also facilitate the recycling of noble metals used in electronics manufacturing. Wire-bonding, metallization and interconnect processes currently use noble metals.

Source: www.emtworldwide.com

Recycling of lithium ion battery

Lithium ion (Li-ion) batteries have rapidly found application in automobiles and other products, besides personal and household electronic goods. With continued increases in production expected in the future, there is a need for a method to recover the valuable metals – such as cobalt, nickel and lithium – contained in these batteries. Moreover, there is a growing need for appropriate, low-cost recycling solutions for these metals to make recycling cost-efficient.

Dowa Eco-System Co. Ltd., Japan, is commercializing Li-ion battery recycling business at its existing facilities. The new business will recycle used batteries as well as the scraps produced from Li-ion battery manufacturing process, like Dowa does. High-purity cobalt is recovered from cathode material scrap and recycled as raw material for new battery cathodes. Dowa has developed a technology to refine high-purity lithium from the batteries, and is studying the possibility of supplying lithium as a raw material for new batteries. *Contact: Dowa Eco-System Co. Ltd., 14-1 Sotokanda 4-chome, Chiyoda-ku, Tokyo, Japan. Tel: +81 (3) 6847 1230; Fax: +81 (3) 6847 1241.*

Source: www.waste-management-world.com

Recovery of metals from e-waste

Shenzhen Green Eco-Manufacture Hi-Tech Co., China, has obtained a United States patent for a method of recovering the metal from automobile scrap and electronic waste (e-waste). The steps involved include separating the automobile scrap and the e-waste to get metal pieces, washing and/or shredding and/or selecting the metal pieces to get groups of metal pieces having the same metal element, making a full-elemental analysis, comparing the weight of different metal pieces with the same metal element and attaining different combinations of value, weighted averaging the combination of value to calculate the full-elemental weighted average according to the different combinations of value, comparing the different full-elemental weighted averages to different composite material and finding an optimal set or sets, further disposing of the metal pieces according to the optimal set, and manufacturing the alloy.

The washing process comprises water washing, chemical cleaning and/or ultrasonic cleaning. Size reduction is carried out by cutting and hammering, while a vibration grader and magnetic sorter are used for metal selection. The heavy processing device for metals consists of a bead machine, a dry smelting device and a wet smelting device. The wet smelting process involves a differential dissolution method and an extraction method, and the dry smelting process comprises plasma high-temperature melting. The dry smelting device comprises a sintering furnace for powder metallurgy, while the wet smelting device consists of a sedimentary trough for dissolving acid liquid, a cleaning trough, and a filtering device.

The method is claimed to have the advantages of reduced secondary pollution generated during a treating and recycling process, reduced treatment cost, and enhanced range of waste that could be treated. It improves the traditional process by quantitatively combining weights of the different piles of homogenous metal pieces, and comparing various alloy grades in order to select certain virtual combinations and to employ corresponding processes. Using the virtual combinations and selection, the method is claimed to eliminate a separation and a purification steps featuring high energy usage and secondary pollution.

Source: www.freepatentsonline.com

Asian Network for Prevention of Illegal Transboundary Movement of Hazardous Wastes

This network facilitates the exchange and dissemination of information on transboundary movements of hazardous wastes and some used products among North-east and South-east Asian countries, and aids participating countries in formulating legislative responses. For more information, contact:

Office of Waste Disposal Management, Waste Management and Recycling Department, Ministry of the Environment, Japan.
Tel: +81 (3) 5501 3157; Fax: +81 (3) 3593 8264
E-mail: env-basel@env.go.jp; Website: www.env.go.jp/en/recycle/asian_net/

Technology to curb tannery pollution

The Central Pollution Control Board (CPCB), India, claims to have developed a clean and cost-effective technology that will substantially cut down effluent discharged from tanneries, thus preventing groundwater from contamination. "We have applied for patent for the lyophilizer technology, a salt-less vaccumization process for preserving hides that would ensure cleaner manufacturing practises in the tannery sector," said Chairman of CPCB, Mr. S.P. Gautam.

The new technology will eliminate the use of common salt for preservation. When salt is eliminated, effluent treatment plants (ETPs) will work more efficiently because of the reduction in the total dissolved solids (TDS), Mr. Gautam explained. He said the technology would bring down use of water as well as treatment cost in the tanning industry besides purging them from environmental pollution.

Source: www.ptinews.com

Using wastewater to create recyclable plastic

Micromidas, the United States, has developed a technology to convert carbon from wastewater into a degradable and recyclable bioplastic. By introducing specific microbes to wastewater, the solid mass can be refined into a plastic capable of a myriad of uses. A reduction in the amount of solid waste sludge that needs to be treated, which accounts for about 40 per cent of the annual budget for municipal waste treatment plants, is another benefit of refining the wastewater. The plastic produced is quite similar to polypropylene used in many containers, houseware and automotive parts, including batteries. The product also has bio-compatible properties that would make it to break down gradually in the body without damage, which would allow it to be utilized for medical purposes.

Source: www.psfk.com

Industrial wastewater treatment solutions

Industrial wastewater disposal is a formidable challenge for companies battling to keep costs down, meet ever-stricter and more complex legislative requirements, and treat increased flows and loadings. ACWA Services, the United Kingdom, can design, supply and install the appropriate preliminary and primary treatment, secondary settlement, final clarification and tertiary treatment processes as required. The company has almost 25 years of experience in design, installation, commissioning and operation of wastewater treatment plants for the industrial sector.

ACWA is able to provide a comprehensive range of primary treatment systems, including conventional settlement systems, biofilters, lamella separators and dissolved air flotation (DAF) systems. It can also supply fat, oil and grease removal systems. Preliminary processes offered by ACWA include coarse and fine screening, grit removal, balancing, pH correction, nutrient addition and polymer systems. The aerobic treatment plants offered by ACWA range from simple partial treatment systems to multi-stage plants to treat a wide range of effluent types. The company can offer conventional secondary biofilters, low and high rate biotowers, activated sludge processes using coarse or fine bubble diffused air or pure oxygen, sequencing batch reactor (SBR), membrane bioreactor (MBR), nutrient removal systems and high-rate ammonia removal systems. To meet the most demanding of discharge standards ACWA can supply a comprehensive range of tertiary treatment processes including continuous upflow, rapid gravity and moving bed sand filters and nutrient removal systems.

The company also has experience in providing quaternary systems that produce an effluent quality suitable for re-use in irrigation, process waters or washwaters. *Contact: Mr. Gary Harris, Proposals Manager, ACWA Services Limited, ACWA House, Keighley Road, Skipton, North Yorkshire, BD23 2UE, United Kingdom. Tel: +44 (1756) 794794; Fax: +44 (1756) 790898; E-mail: gharris@acwa.co.uk; Website: www.acwa.co.uk.*

Source: www.edie.net

Decolorization and degradation of reactive dyes

Textile dyeing process consumes large quantities of water, resulting in huge amounts of coloured wastewater. Most of the dye wastewater treating methods focused on the treatment of wastewater after the rinsing process of dyed textile. In China, researchers from Sichuan University, Sichuan Textile Industry Research Institute and units of the General Logistics Department have studied decolorization and degradation of reactive dyes during the dyed cotton fabric rinsing process.

A tetraacetylethylenediamine/hydrogen peroxide active oxidation (AO) system was developed to rinse dyed textile and decolorize the rinsing wastewater simultaneously. The results indicated that the decolorization ratio of the rinse effluent obtained by AO method were in the range of 51.72 per cent to 84.15 per

cent according to different dyes, and the chemical oxygen demand (COD) value decreased more than 30 per cent compared with that of traditional rinsing process. The decolorization kinetics investigation showed that the decolorization of dyes during AO rinsing process followed the law of pseudo-first order kinetics.

The result of UV-Vis and UPLC-MS analysis demonstrated that the dye was degraded into colourless organic molecular fragments and partly mineralized during the AO rinsing process. *Contact: College of Light Industry, Textile & Food Engineering, Sichuan University, Chengdu, Sichuan 610065, China. E-mails: luoshifly@gmail.com; zhengqingk @scu.edu.cn; chensheng@scu. edu.cn; liuqingshu1229@126.com.*

Source: www.iwaponline.com

Pilot-scale system for chromium removal

Researchers from the Faculty of Science, Universiti Teknologi Malaysia, have investigated the use of a pilot-scale system for removing chromium (Cr) from electroplating wastewater. The ChromeBac™ system achieves enzymatic reduction of Cr(VI) to Cr(III) by Cr(VI)-resistant bacteria followed by chemical precipitation. *Acinetobacter haemolyticus* was immobilized onto carrier material inside a bioreactor. Neutralized electroplating wastewater with Cr(VI) concentration of 17-81 mg/L was fed into the bioreactor. Complete Cr(VI) reduction to Cr(III) was obtained immediately after the start of bioreactor operation. Together with flocculation, coagulation and filtration, outflow concentration of less than 0.02 mg/L of Cr(VI) and 1 mg/L total Cr were obtained always. The bioreactor performance was not affected by fluctuations in pH (6.2-8.4), Cr(VI) (17-81 mg/L), nutrient (liquid pineapple waste, 1-20 per cent v/v) and temperature (30°-38°C). Standby periods of up to 10 days can be tolerated without loss in activity. Thus, a robust yet effective biotechnology to remove chromium from wastewater has been demonstrated.

The process steps adopted were as follows. In the mixing tank (0.15 m^3), raw Cr(VI) wastewater was mixed with liquid pineapple waste (LPW) to a final LPW concentration of 1-20 per cent (v/v). The pH of the mixture was adjusted to 7.0 ±0.5 using a controller-regulated dosing of 12.5 per cent (v/v) sodium hydroxide (NaOH) prior to transferring into the holding tank (0.3 m^3). Upon reaching the capacity of the holding tank, the neutralized and LPW amended Cr(VI) wastewater entered the bioreactor (0.2 m^3) gravitationally in a down flow mode at 0.11-0.33 m^3/h. Effluent collected from the bioreactor then ran through a flocculation (alum) and coagulation (anionic polymer) set-up where Cr(III), total Cr, other heavy metals, colour, odour and organic contents were removed from the wastewater. Sludge formed was dried at a sludge drying bed prior to safe disposal. The treated effluent was passed through powdered activated carbon units (total of 0.3 m^3) prior to discharge to the nearby water system.

In a pilot-scale plant, the technical feasibility of the ChromeBac Cr(VI) removal system was demonstrated. The high percentage conversion of Cr(VI) to Cr(III) clearly supports the feasibility of using a bacterial (*A. haemolyticus*) system as an alternative treatment for Cr(VI) contamination in aqueous systems. *Contact: Mr. Zainul Akmar Zakaria, Department of Chemistry, Faculty of Science, Universiti Teknologi Malaysia, 81310 Skudai, Johor, Malaysia.*

Source: web.utm.my

Electrocoagulation of wastewater

OilTrap's electrocoagulation system

OilTrap Environmental Products Inc., the United States, offers an electrocoagulation system for the sustainable and green treatment of wash water and wastewater. Electrocoagulation is a green technology that uses a very low voltage DC electrical charge to clean the water. The process employs a proprietary treatment chamber where DC current is applied to treat a wide range of differing waste streams containing heavy metals, oil, grease, suspended solids, etc.

Electrocoagulation can be used to treat municipal, industrial and commercial wastewater. The contaminated water is given an electrical charge in the ElectroCell. The reaction is immediate, separating the contaminants from the water. This removes contaminants that other water treatment options (filtration, bioremediation and chemical treatment, etc.) fail to treat. The OilTrap system can process around 19 to 1,514 litres per minute typically to a quality that can be recycled or discharged to a sewer and in some cases discharged to surface water also. ElectroPulse is totally automated, with a programmable logic controller managing all system processes, monitoring operation and errors, and providing direct communication to the factory.

Source: www.waterandwastewater.com

Enhanced bioremediation of groundwater

In 2008, a full-scale *in situ* chemical reduction (ISCR) was implemented at the Siltronic Corporation site in Portland, the United States, to treat a source area with contamination of groundwater by trichloroethylene (TCE), with concentrations greater than 11,000 µg/L, suggesting its presence as dense non-aqueous phase liquid (DNAPL). Remediation involved injecting a controlled-release, integrated carbon and micro-scale zero-valent iron (ZVI) reagent (EHC) and select microbial agents (KB-1) throughout approximately one-half acre of the source area.

The approach was selected following a comparative bench testing of various options, and a successful field pilot of combined EHC+KB-1 injections. ISCR enhanced bioremediation was selected due to its: low cost when compared with alternative technologies such as electrical resistance heating (ERH); higher predictability than technologies such as surfactant flushing or emulsified oil sequestration; and compatibility with ongoing manufacturing operations and facilities.

A 30 per cent carbon and ZVI slurry was injected to 40-112 feet below ground surface using a direct push (DP) drill rig. The microbe culture was placed 7-14 days later in the same holes through use of a peristaltic pump and a standard DP well screen from the bottom-up. This injection process continued for six months. Approximately 269,400 kg of the carbon and ZVI fine powder and 1,831 litres of microbe culture were injected into the subsurface. Groundwater was monitored at 23 wells within and up-gradient of the treatment area, with 13 of the wells having TCE content above 11,000 µg/L. In about 16 months, TCE concentrations in 12 of these wells had decreased to levels less than 100 µg/L at 12, and to less than the 5 µg/L in 7 of the wells in another 4 months.

Source: www.environmental-expert.com

Clean energy from toxic waste

A team of Australian and Chinese researchers has pioneered a new method to make clean energy from land contaminated with toxic waste. The collaboration between scientists from Australia's Cooperative Research Centre for Contamination Assessment and Remediation of the Environment (CRC CARE) and its offshore partners in China – HLM Asia Group and Shaoguan University – delivered proof of concept for a new system that cleans up highly polluted land and produces environment-friendly energy at the same time.

"We use special plants to extract the toxins from the soil and then we convert the plants into safe, clean energy," said CRC CARE Managing Director Prof. Ravi Naidu. The secret of the process lies in the giant Napier grass (*Pennisetum purpureum*), which is a tall perennial plant that is native to the tropical grasslands of Africa and a relative of the sugar-cane plant. Prof. Naidu said giant Napier grass was chosen for the project because it grows in extremely poor soils and is efficient at drawing heavy metals and other pollutants out of contaminated soil.

The grass has been tested on several large sites in the Guangdong province of China, and the trials showed the grass was effectively removing metals like copper, nickel and cadmium, as well as high concentrations of zinc and lead. "The grass has a fairly high sugar content and is therefore used to generate ethanol through a fermentation process," Prof. Naidu said. The biofuel ethanol could then be used to generate energy.

Source: english.cri.cn

Efficient bacterial culture to degrade 1,4-dioxane

In the United States, Innovative Engineering Solutions Inc. (IESI) and Bioremediation Consulting Inc. (BCI) have developed the first *in situ* technique for the bioremediation of 1,4-dioxane ($C_4H_8O_2$), an extensively distributed groundwater contaminant commonly used as a solvent stabilizer, especially with 1,1,1 trichloroethane (TCA).

The companies cultured a propanotrophic organism (one that uses propane as the sole carbon source) to aerobically degrade at least 10 mg/L of 1,4-dioxane within hours of application. The team is the first to develop techniques for enrichment of native propanotrophs that can degrade 1,4-dioxane, resulting in an application-ready culture available for bioaugmentation, as well as a safe and reliable dissolved-propane sub-surface delivery method. The technology, now being tested in the laboratory has been shown to degrade 100 per cent of the dioxane within 12 hours. The micro-organism was not genetically engineered in the laboratory, since it had already developed the ability to degrade 1,4-dioxane when fed with propane.

Dissolved oxygen and propane are used for bioenhancement. Propane is solubilized in water in a tank maintained at a pressure slightly above 1 atm and dosed to the main tank. Oxygen is obtained from a dilute (<0.5 per cent) solution of hydrogen peroxide, the injection of which

allows delivery of supersaturated, oxygenated water to sub-surface. A pulse-feeding mode was devised for the propane so as to maximize the dioxane degrading activity of the bacteria.

An *ex situ* clean-up that would take 30-50 years could be done in 3-5 years using *in situ* bioremediation techniques. The companies plan to achieve 95-99 per cent destruction of up to 50 ppm of 1,4 dioxane, says Mr. Sami Fam, President of IESI. *Contact: Innovative Engineering Solutions Inc., 25 Spring Street, Walpole, MA 02081, United States of America. Tel: +1 (508) 6680033; Fax: +1 (508) 6685175; E-mail: info @iesionline.com; Website: www.iesionline.com.*

Source: www.waterworld.com

Bioremediation of highly aromatic hydrocarbon wastes

Indian Oil Corporation Ltd. (IOCL) has patented a biopile-based process for the bioremediation of hydrocarbon waste with high aromatic content. The method consists of isolating specific micro-organisms and preparing microbial blend, preparing biopile, adding the microbial blend into the biopile, and providing nutrient, aeration and water to biopile. It aims to provide bioremediation of highly aromatic hydrocarbon waste in an efficient and environment-friendly way, using a synergistic mix of selected micro-organisms.

In one preferred embodiment of the invention, the method consists of preparing a microbial blend wherein micro-organisms in the blend are adsorbed on a biodegradable carrier, preparing a biopile comprising a mixture of the hydrocarbon waste, soil and a bulking agent, adding the microbial blend into the biopile followed with addition of nutrients to promote bioremediation reaction and maintaining aeration and moisture of the biopile for a time sufficient to complete the bioremediation of the pollutant.

The microbial blend is prepared by isolating specific micro-organisms by selective enrichment technique in a suitable nutrient medium and mixing the isolated selected micro-organisms enabling synergistic combination. The biopile comprises a layer of clean soil at the base of the biopile, a layer of aromatic waste soil mixed with bulking agent, perforated pipes placed inside the biopile, a layer of clean soil at the top of the biopile, and a covering of perforated plastic sheet.

Source: www.freepatentsonline.com

Enhancing bioremediation of heavy metals

Researchers at University of California, San Diego, the United States, and colleagues have created a process using Abc2 genes of plant or yeast to enhance bioremediation of heavy metal-contaminated soil and water. The inventors have identified a yeast transporter that mediates the accumulation of peptide-thiol complexes into the vacuoles, thus conferring cadmium tolerance. This was demonstrated in yeast using cadmium. Enhancing the metal-uptake ability of certain plants by over-expressing the yeast or plant Abc gene family should provide new opportunities for enhancing plant-based heavy metal bioremediation. Manipulating yeast genes in plants is a better way of overcoming gene silencing in plants than the over-expression of existing plant genes.

Current bioremediation strategies include expressing yeast glutathione-cadmium transporters. Phytochelatin transporters have key advantages over glutathione transporters: compared with glutathione, the affinity of phytochelatins for cadmium is more than 1000-fold higher, indicating phytochelatin is more efficient at sequestering heavy metals.

Source: www.ibridgenetwork.org

Compost biocarrier for soil remediation

Researchers at Sepuluh Nopember Institute of Technology, Indonesia, have investigated the suitability of compost as a biocarrier of microbes for augmented lead removal from soil. Soil polluted with lead (Pb) at various levels (10 to 70 mg/kg) was amended with compost. Microbial species in compost and polluted soil were identified. Criteria for effective remediation were half time for 50 per cent Pb removal and 50 per cent microbial elimination. Initial Pb concentration in soil for the half time – the initial concentration time fifty (ICT-50) – was a novel criterion to assess the maximum Pb concentration initially present in soil. ICT-50 of 35 mg/kg could be treated by compost addition of more than the weight of polluted soil.

The research team concluded that compost could be used as a microbial (mainly *Bacillus subtilis*) carrier to remediate polluted soil for initial Pb level of less than 70 mg/kg. The ICT-50 of the current research was found ~35 mg/kg that resulted in equal half time of Pb removal and microbial elimination. *Contact: Dr. Sarwoko Mangkoedihardjo, Ecotoxicology Laboratory, Environmental Engineering Department, Sepuluh Nopember Institute of Technology, Gedung Rektorat Lantai 2, Kampus ITS Keputih - Sukolilo Surabaya 60111, Jawa Timur, Indonesia. E-mail: sarwoko@enviro.its.ac.id.*

Source: www.ijar.lit.az

Converting CO_2 into high-value chemicals

The Electroreduction of Carbon Dioxide (ERC) technology from Mantra Energy Alternatives Ltd., Canada, uses renewable energy to combine captured carbon dioxide (CO_2) with water and produce high-value materials, including formic acid, formate salts, oxalic acid and methanol. ERC technology was developed by the Clean Energy Research Centre of University of British Columbia, Canada. Mantra has successfully completed a prototype capable of processing 1 kg of CO_2 per day.

Mantra is in negotiations with KC Cottrell, the Republic of Korea, to construct its first commercial-scale carbon recycling demonstration unit. The two companies aim to combine Mantra's ERC technology with KC Cottrell's proprietary carbon capture technology. *Contact: Mantra Energy Alternatives Ltd., Unit 4 - 2119 152nd Street, South Surrey, British Columbia, Canada V4A 4N7. Tel: +1 (604) 535 4145; Fax: +1 (604) 535 2597; Website: www.mantra energy.com.*

Source: www.chem.info

Egg shell membrane can absorb carbon dioxide emissions

In a study published recently, Mr. Basab Choudhari and colleagues from University of Calcutta, India, report that a membrane commonly found in eggs has the ability to absorb carbon dioxide (CO_2) seven times its weight, and the gas thus can be easily stored as well. With the membrane being as "thick" as 100 µm, it can be separated by a weak acid and used as a CO_2 absorbent. This discovery could work if an economical industrial process is designed to separate the membrane from the eggshells that could each absorb tiny amounts of CO_2. The only caveat, as pointed out by the authors of the study, is that if an economical industrial system is able to separate these membranes but uses a large amount of energy to do so, this geo-engineering discovery would be rendered useless as it will produce the same amount of CO_2 as well.

Source: www.medicaldaily.com

Nanotechnology for exhaust gas catalyst

At Japan's National Institute for Materials Science (NIMS), a team of researchers headed by Dr. Hideki Abe, Senior Researcher at the Advanced Electronic Materials Centre, and Dr. Katsuhiko Ariga, Principal Investigator at the International Centre for Materials Nanoarchitectonics, developed an exhaust gas catalyst material with about 10 times greater thermal agglomeration resistance than conventional materials. This dramatic improvement in thermal agglomeration resistance opens the road to a large reduction in the amount of rare metals used in exhaust gas purification technologies.

Metal catalysts, which are the most critical element materials in environmental and energy technologies, are confronted with the problem of thermal agglomeration, in which the catalyst loses its activity because of bonding/fusion of the catalyst due to heat and the accompanying reduction in the number of catalytic active sites. Mainly platinum, palladium, rhodium and other noble metals are used as catalysts. To compensate for the reduction in catalytic activity caused by thermal agglomeration, the current technologies require large amounts of rare metals, as there is no other method of introducing a large excess of active sites in the catalyst.

In the current research, the NIMS team developed a metal catalyst with high thermal agglomeration resistance to by controlling the topology of the material at the nanoscale, which is completely different from the conventional approach. The new catalyst, called "Metallic Cell", consists of metal spheres with a cavity approximately 1/100 mm in diameter clad in a thin cell wall containing pores 1/1000 mm in diameter that enable transmission of substances and energy to and from outside. As the catalytic active site in the Metallic Cell is protected by the cell wall, it displays excellent long-term catalytic properties, even under high temperature conditions in which ordinary catalyst materials would lose their activity due to thermal agglomeration.

Metallic Cell is synthesized by precipitating a platinum film on the surface of commercially available polystyrene powder by chemical reduction in an alcohol solution at normal temperature and pressure. The polystyrene is then vaporized by heating to 500°C, to get platinum film with hollow topology and pores (through which the polystyrene gas escapes). The method used to synthesize Metallic Cell is applicable to a number of metals that display catalytic activity. The applications of Metallic Cell are not limited to exhaust gas purification technology. Taking advantage of its excellent heat resistance and high scalability, it can also be used in environmental and energy technologies, such as fuel cell technology.

Source: www.nanowerk.com

Packed tower gas scrubbers

Packed tower gas scrubbers are low-energy gas scrubbers. They are used for gas absorption, cooling, and recovery. They have high

Schutte & Koerting's packed tower gas scrubber

scrubbing efficiency and low power consumption. Scrubbers of this type perform best when gases handled are free from particles. Schutte & Koerting, the United States, offers packed tower gas scrubbers for use in many industries for a broad range of applications.

In operation, scrubbing liquid enters the tower through a nozzle and is sprayed uniformly across the top of a packed bed so that it trickles evenly through the packing material from top to bottom without channelling. Gas enters the tower through the inlet at the bottom and passes through the support plate into the packed bed, counter current to the flow of the scrubbing liquid, removing contaminants. After passing through the packed bed, the cleaned gas travels through a mist eliminator section near the top of the tower. Here, any entrained liquid is removed before the clean air is discharged through the outlet. The scrubbers are designed to remove most of the common gas contaminants at very high efficiencies (up to and beyond 99 per cent)

The gas scrubbers are available in standard sizes, but can also be designed or modified to suit unusual service conditions. When desired, the company can supply complete systems. Applications of packed tower gas scrubbers include removal of chlorine, hydrogen chloride, sulphur dioxide, hydrogen sulphide and ammonia, and scrubbing of water-soluble volatile organic compounds. *Contact: Schutte & Koerting, 2510 Metropolitan Drive, Trevose, PA 19053, United States of America. Tel: +1 (215) 639 0900, Fax: +1 (215) 639 1597.*

Source: www.s-k.com

CO_2 reduction by bleaching at low temperatures

G. Tosi S.p.a., one of Italy's biggest finishers of cotton yarn and knitted fabrics, and the Netherlands-based company Tanatex Chemicals B.V. have jointly developed a new low-temperature bleaching process. In the classical process for mercerized yarn, a lot of water, energy and chemicals are used to achieve high quality levels. However, owing to recent environmental legislations, G. Tosi has decided to optimize its production process, focusing on the reduction of water, energy and effluent pollution and carbon dioxide (CO_2) emission, without impairing the quality.

Reducing the bleaching temperature results in reduced consumption of methane gas and therefore lowers the emission of CO_2. The new technology ensures bleaching at just 75°C. The process is suitable for both dyeing and for full bleaching of white. The technology concept is based on a low-temperature peroxide activator controlling the decomposition of peroxide and rapidly developing the required whiteness. This system is based on specially selected dispersants, surfactants and a bleaching activator. Process cycles for mercerized yarn could be simplified by reducing the total time, and consumption of water and gas (CO_2 emission) up to 50 per cent. Additionally, a reduction of 25 per cent in chemical oxygen demand (COD) levels in the effluent has been measured.

Source: www.fibre2fashion.com

Value-added sulphur scrubbing

Flue gas desulphurisation (FGD) has become mandatory in the power plants in most of the industrialized world. There are several methods, but most are based on wet limestone and caustic scrubbing. Wet limestone scrubbing generates large quantities of solid gypsum waste, while wet caustic scrubbing generates alkaline waste containing aqueous mixture of bisulphite, sulphite and sulphate. Sulphate can be removed from water by desalination processes such as reverse osmosis and ion exchange, but these are expensive.

Researchers in India have devised a way to convert into value-added products the waste sulphur compounds produced by the scrubbing process in power plants. Ms. Rima Biswas and colleagues from the National Environmental Engineering Research Institute (NEERI) have designed a chemo-biological process for treating the sulphate-rich effluent generated during wet scrubbing of flue gas emissions in fossil-fuel fired power plants. The process involves microbial sulphate reduction using an anaerobic up-flow packed bed bioreactor containing microbes, with ethanol as the carbon source.

The team found that more than 90 per cent of the total equivalent sulphate present in the effluent was reduced to sulphide at a rate of up to 3 kg/day/m^3 of sulphate residue. In this form, the waste can easily be converted into elemental sulphur for industrial use or into metal sulphide nanoparticles for research.

Source: www.sciencedaily.com

Charcoal biofilter cleans up fertilizer waste gases

Removing the toxic and odorous emissions of ammonia from the industrial production of fertilizer is a costly and energy-intensive process. Now, researchers Mr. Jahir Bin Alam, Mr. A. Hasan and Mr. A.H. Pathan of the Department of Civil and Environmental Engineering, Shahjalal University of Science and Technology, Bangladesh, have turned to microbes and inexpensive wood charcoal to create a biofilter that can extract the noxious gases from factory exhaust. Among the many advantages of biofiltration are that it is an environment-friendly technology, resulting in the complete degradation by oxidation of toxic pollutants to water and carbon dioxide without generating a residual waste stream, and that it uses very little energy.

The researchers built a prototype biofilter for extraction of ammonia based on wood charcoal on which the nitrogen-fixing microbe *Nitrosomonas europaea* – commonly found in soil, sewage, freshwater, etc. in polluted sites – is grown. This microorganism derives all its energy for metabolism, growth and reproduction from ammonia, which it absorbs and oxidizes to nitrite.

The team found that their prototype biofilter could function at an ammonia concentration of 100 to 500 mg/L of gas and remove the ammonia from this gas stream almost completely. Approximately 93 per cent removal of ammonia gas was seen within seven days.

Source: www.sciencedaily.com

Low-cost capture of carbon dioxide

The Institute for Energy Systems and Technology (IEST) of Darmstadt Technical University (TUD), Germany, is investigating two new methods for carbon dioxide (CO_2) capture that will allow near-total elimination of CO_2 emissions and require virtually no additional energy input and entail only slight increases in operating costs. The carbon capture and storage (CCS) methods might be able to reduce CO_2 emissions resulting from the use of fossil fuels for industrial applications, such as power generation, to near zero and make available a product for reuse and sales.

Previous approaches to CO_2 capture required high energy expenditure and high operating costs, which raised questions on their efficiency and acceptance. IEST Director, Prof. Dr.-Ing. Bernd Epple, and his 26 co-workers will be investigating the "carbonate looping" and "chemical looping" methods for CO_2 capture over the next two years. Both methods employ natural substances and cuts the energy presently required for CO_2 capture by more than half.

The carbonate looping method involves utilizing naturally occurring limestone to initially bind CO_2 from the stream of flue gases transiting power plants' stacks in a first-stage reactor. The resultant pure CO_2 is then liberated in a second reactor and can then be stored. The advantage of the carbonate-looping method is that even existing power plants can be retrofitted with this

Experimental carbon capture plant at Darmstadt Technical University

new method. On new power plants, the chemical looping method can allow capture of CO_2 with hardly any loss of energy efficiency. Under this method, a dual-stage, flameless combustion yields a stream of exhaust gases containing only CO_2 and water vapour. The CO_2 can then be captured and stored.

Source: www.sciencedaily.com

SCR catalyst system

CRI Catalyst Company, the United States, offers selective catalyst reduction (SCR) catalyst systems based on the addition of ammonia (NH_3) to the flue gas containing nitrogen oxides (NOx) and passing the mixture over an active catalyst. This converts NOx to naturally occurring nitrogen (N_2) gas and water. Together, the high-activity catalyst and the low pressure drop result in cost-effective NOx reduction, says the company.

CRI SCR technology is claimed to be more cost-efficient that other NOx control technologies. Further, its Lateral Flow Reactor-based design, low-temperature activity and very low pressure drop ensure the performance required at much less energy consumption. *Contact: CRI Catalyst Company, 16825 Northchase Drive, Suite 1000, Houston, Texas, TX 77060, United States of America. Tel: +1 (281) 874 2600; Fax: +1 (281) 874 2499; E-mail: cricatalystsales@cri-criterion.com.*

Source: www.cricatalyst.com

Environmental Biotechnology

This book provides information essential to students taking courses/modules in biotechnology as part of environmental sciences, environmental management, and environmental biology programmes. It is also recommended for those studying water management, waste management and pollution abatement. Topics discussed include biodiversity, renewable energy, bioremediation technology, recombinant DNA technology, genetic engineering, solid waste management, composting, vermicomposting, biofertilizer, chemical pesticides, biological control of pests, and genetically modified organisms. The book also discusses bioethics and risk assessment, intellectual property rights, environmental clean-up technologies, and environmental nanotechnology.

Contact: CRC Press, United Kingdom. Tel: +44 (1235) 400 524; Fax: +44 (1235) 400 525; E-mail: book.orders@tandf.co.uk.

Water and Wastewater Management in India 2010

This report covers various aspects of water management techniques and overview of water situation and consumption structure in India. It begins with an overview of water situation and consumption structure in the country across the sectors, showing the growth in water consumption. This is followed by a section that depicts the amount of wastewater generated across sectors and the level of degradation. It also highlights the lakes and water bodies that are under threat of depleting and being polluted.

The market overview section provides the size and growth of the wastewater treatment market and details the various techniques available for water and wastewater treatment. It also gives an in-depth analysis of the various techniques and their status in India. The characteristics and trends in the market are analysed, and include increasing urbanization, initiatives taken at the corporate level, initiatives of various research and training institutes, licensing agreements, various summits and seminars, consumer awareness initiatives and public private partnerships. A brief analysis of the issues/challenges hindering growth is also provided.

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