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The Tribune
VOICE OF THE PEOPLE

Sun, 11 March, 2018

In Leh today. Sitharaman to discuss border security

Defence Minister Nirmala Sitharaman is arriving in Leh on a day-long visit tomorrow.

She is scheduled to attend the Defence Research and Development Organisation's International Women's Day function at Leh town. She will hand over the 'Deep Lakshmi Baton' to the next year's host.

She is also expected to meet the representatives of the Ladakh Autonomous Hill Development Council, Leh. She will also interact with local farmers and women self-help groups. Sitharaman is also expected to review the security situation on the Indo-China border with the top Army officers. — OC

THE HINDU

Sun, 11 March, 2018

Indo-French ties: a signal for world powers

By Suhasini Haidar & Josy Joseph

New vision for the Indian Ocean indicates India is looking beyond traditional allies like U.S. & Russia

Marking the 20th anniversary of their strategic partnership, India and France stepped up their engagement to a new level by quietly and swiftly concluding the reciprocal logistics support between their Armed Forces.

In contrast, India and U.S. took almost 15 years and still could only conclude a curtailed version of it. A senior military officer said the agreement with France "does not suffer from the political sensitivities the way our agreement with the U.S. does."

Beyond the strategic consequences of the agreements is the deep diplomatic messaging from the two sides to all three world powers: U.S., Russia and China. The new Joint Strategic Vision for the Indian Ocean sends the message that India is not limiting itself to the "Quadrilateral" arrangement with the U.S. and its allies Japan and Australia to develop interests in the "Indo-Pacific".

A message for China

The "Joint Strategic Vision of India-France Cooperation in the Indian Ocean Region" is similar to the agreement signed with the U.S. in January 2015, a message for China, as the two countries will work to "maintain the safety of international sea lanes for unimpeded commerce and communications in accordance with the international law"..

Given the vast areas of cooperation between India and France, underlined by Prime Minister Narendra Modi as stretching from the "earth to the sky", the relationship contains an alternative to both the U.S. and Russia when it comes to military hardware, aircraft, space cooperation and nuclear reactors.

Western diplomats will point out that the U.S. alliance with France and its Major Defence Partnership with India are far deeper, while Russian diplomats will point to their older military ties with India and logistical agreements that date back much further. Even so the slew of agreements signed and the vision statement indicate that the strategic partnership with France, India's first in 1998, remains a competitor for influence.

In particular, Mr. Macron's statement that France wants India as its "first strategic partner here (region), and we want to be India's first strategic partner in Europe, and even the western world," will be read closely.

Despite the bonhomie, one spoiler in the ties could come from China's Belt and Road Initiative (BRI), which India has strongly opposed. But France is likely to play a "leading role" in it.

THE HINDU

Sun, 11 March, 2018

Defence dialogue on the anvil

India and France on Saturday inked a strategic pact providing for the use of each other's military facilities including opening naval bases and warships, an agreement that comes amid China's growing military expansionism in the Indo-Pacific region.

Prime Minister Narendra Modi and French President Emmanuel Macron have also decided to create an annual defence dialogue at the ministerial level to explore ways to further deepen defence and strategic ties.

There were indications that the French side pitched for procurement of another batch of 36 Rafale jets by India during the talks.

Officials said the issue was also raised by French Defence Minister Florence Parly during a meeting with her Indian counterpart Nirmala Sitharaman.

The Tribune
VOICE OF THE PEOPLE

Sun, 11 March, 2018

Women from region bag top honours at OTA

Chandigarh cadet first from the city to get Sword of Honour, Haryana's gets silver medal

By Vijay Mohan

Lt Preeti Choudhary, an NCC cadet from Chandigarh has created a record of sorts by becoming the first woman officer from the city and third in the Officers Training Academy (OTA) since women were inducted in 1992 to be awarded the coveted Sword of Honour for being the best all-round cadet of her course at the academy in Chennai.

Another cadet from Haryana, Senior Under Officer Vreeti, was awarded the silver medal. A B.Tech in mechanical engineering, Vreeti quit a highly paid job in Japan as a design engineer before joining OTA as Lady Cadet. Both the cadets scored over more than 200 Gentlemen Cadets to bag the top two honours.

Lt Preeti Choudhary received the sword from Lt Gen DR Soni, General Officer Commanding-in-Chief, Southern Command, who was the reviewing officer of the passing-out parade today. She was among 37 Lady Cadets and 196 Gentlemen Cadets who were commissioned as Lieutenants.

She is from the 19th Short Service Commission (Women) Course and she has opted for the Army Air Defence (AAD) corps. As of January 2018, the total strength of women officers in the Army (excluding the medical stream) was 1,561 out of which 63 were in the AAD.

Preeti is from the second generation in her family to join the armed forces. Her father, Honorary Captain Inder Singh, served in the Army Medical Corps. Though a native of Haryana, she studied in Chandigarh and graduated from the Government College for Girls, Sector 11. She was also an active NCC air wing cadet.

Wg Cdr MR Pandeya, Commanding Officer No. 1 Chandigarh NCC Air Squadron, said Preeti had represented the Punjab, Haryana, Himachal Pradesh and Chandigarh NCC Directorate at the national level and was adjudged as the Second Best Air Wing Girl Cadet across the country in 2016. She trained with the NCC

for three years, after which she applied for NCC special entry and cleared the Service Selection Board interview in the first attempt, he added.

THE HINDU

Sun, 11 March, 2018

U.S. military parade set for Nov. 11

It will focus on on the contributions of our veterans, says Pentagon memo

U.S. military vehicles will roll through Washington on November 11 in a salute to veterans, a Pentagon memo said on Friday, detailing President Donald Trump's dream of hosting a military parade.

The White House announced a month ago that Mr. Trump had asked for a large-scale military parade, an unconventional call that immediately fuelled comparisons with similar events in more autocratic countries.

"This parade will focus on the contributions of our veterans throughout the history of the U.S. military, starting from the Revolutionary War and the War of 1812 to today, with an emphasis on the price of freedom," said the memorandum for General Joe Dunford, who chairs the Joint Chiefs of Staff.

The Defense Department had earlier said it was planning for "around" that date, which is known in the U.S. as Veterans Day and in other countries as Remembrance Day, marking the end of World War I.

Pentagon plans call for "wheeled vehicles only, no tanks," as they would tear up city roads.

There would also be "a heavy air component at the end of the parade, to include older aircraft as available".

The parade route will stretch roughly 1.6 km from the White House to the Capitol, where Mr. Trump will review his troops surrounded by veterans and Medal of Honor recipients.

As planning continues, the memo gave no more details on the type of weaponry to be featured in the parade.

MAIL TODAY

Sun, 11 March, 2018

Jupiter's jet streams unearthly

Data collected by NASA's Juno mission to Jupiter indicate that the atmospheric winds of the gas-giant planet run deep into its atmosphere and last longer than similar atmospheric processes found here on Earth.

The findings will improve understanding of Jupiter's interior structure, core mass and, eventually, its origin. Other Juno science results released today include that the massive cyclones that surround Jupiter's north and south poles are enduring atmospheric features and unlike anything else encountered in our solar system.

"These astonishing science results are yet another example of Jupiter's curve balls, and a testimony to the value of exploring the unknown from a new perspective with next-generation instruments," said Scott Bolton, principal investigator of Juno.

THE HINDU

Sun, 11 March, 2018

IIT Hyderabad's novel composite keeps tomatoes fresh for 30 days

By R. Prasad

Composite has antimicrobial activity, allows optimum exchange of gases, moisture

Researchers at Indian Institute of Technology (IIT) Hyderabad have been successful in keeping tomatoes fresh and without any microbial spoilage for as long as 30 days. This was possible thanks to the food packaging material developed by a two-member team led by Dr. Mudrika Khandelwal from the institute's Department of Materials Science and Metallurgical Engineering. The food packaging material is made of bacterial cellulose impregnated with silver nanoparticles.

Bacterial cellulose was first prepared by using *Gluconacetobacter xylinus* bacteria to produce semicrystalline cellulose nanofibre from a standard glucose media. "We can use any fruit juice that is rich in sugar or even beer and wine, which are fermented, to produce bacterial cellulose," says Dr. Khandelwal.

Nanofibrous

Bacterial cellulose is highly crystalline, has high porosity and water holding capacity and possesses great mechanical properties. Also, bacterial cellulose is nanofibrous unlike plant cellulose, which is microfibrous. The results were published in the *Journal of Materials Science.*

The bacterial cellulose was first treated with sodium hydroxide to remove all bacteria and then impregnated with silver nanoparticles. This was done by dipping the bacterial cellulose in silver nitrate solution and subsequently in sodium borohydride solution. Reduction of silver nitrate to form silver nanoparticles happens inside the pores of the bacterial cellulose.

The nanosized pores present in the bacterial cellulose matrix restricts the growth of nanoparticles, thereby controlling their size. It prevents the nanoparticles from forming aggregates. "We found that the smaller the size [5-6 nanometres] of the silver nanoparticles the better was the antimicrobial activity. There was also sustained release of nanoparticles," she says. This was not the case with silver nanoparticle colloid where the nanoparticles tend to form aggregates.

The antimicrobial activity of bacterial cellulose was first tested on bacteria and fungi isolated from rotten tomatoes and later on mixed culture. Compared with controls, the composite (bacterial cellulose impregnated with silver nanoparticles) showed 99% killing efficiency. The antibacterial activity was successfully tested up to 72 hours. The antibacterial activity of colloid was only 90%. "The bacterial cellulose with silver nanoparticles not only had activity against bacteria but also against fungus," says Dr. Khandelwal.

The researchers then tested the antimicrobial efficacy of the composite by using it to wrap freshly harvested tomatoes. Tomatoes wrapped in polyethylene (polythene) and polypropylene served as controls.

Fresh tomatoes

At room conditions, tomatoes wrapped in the composite remained fresh without any wrinkles or microbial spoilage even at the end of 30 days.

"This is because besides antimicrobial activity, the composite also allows appropriate exchange of gases and moisture. The water holding capacity of the composite helps maintain optimum moisture transmission," says Shivakalyani Adepu from the Department of Materials Science and Metallurgical Engineering at IIT Hyderabad and first author of the paper. "The composite also acts as ethylene blocker thus preventing excess ripening of fruits. It ensures that fruits age slowly."

On the contrary, tomatoes wrapped with polyethylene started wrinkling within the first week, and microbial spoilage was seen within 15 days; tomatoes had completely deteriorated within 30 days. But in the

case of polypropylene, tomatoes remained fresh for a week; they started wrinkling within 15 days and became soft and wrinkled all around within a month.

"We want to test our composite on exotic fruits," says Dr. Khandelwal. "We would also like to extend the same principle to healthcare products. The composite can be used as antimicrobial lining in sanitary napkins, and disposable clothing and covering in hospitals."

THE HINDU

Sun, 11 March, 2018

Now, low viscosity fuel oil from plastic waste

By Aswathi Pacha

Prolonged pyrolysis at 300-400 degree C in inert conditions yields high calorific value oil

Certain plastic wastes can soon help fuel your cars. Researchers from IIT Guwahati have successfully converted packaging plastic waste to plastic-derived oil (PDO), which has characteristics similar to diesel.

Low- and high-density polyethylene (LDPE, HDPE) and polypropylene are commonly used as packaging materials and end up in the waste stream. According to a 2016 Central Pollution Control Board report, almost 15,000 tonnes of plastics waste is generated per day in India.

The researchers collected the waste (biscuit wrappers, shopping bags, food containers, shampoo bottles) from houses, cleaned and segregated them according to the resin identification code. These codes on plastics indicate the type of plastic resin it is made of.

Using a semi-batch reactor, the different wastes were heated for six to seven hours at 300-400 degree Celsius. "Heating at very high temperatures in inert conditions caused the plastic to convert into wax, so we chose this particular temperature range in which the plastic turned to plastic-derived oil and stayed in its oil state," explains Pallab Das, PhD scholar at the institute and first author of the paper published in *Resources, Conservation and Recycling.*

But burning plastic waste generates pollution, particularly dioxins which are toxic to humans. "There is no oxygen in the three plastic wastes that is heated that we are also not supplying any oxygen. Pyrolysis is done under inert conditions. Only hydrocarbon gases such as methane, ethane and propane were produced and there was negligible amount of carbon dioxide and carbon monoxide produced," says Das.

Further research

"More experiments need to be carried out to get a trade-off between the quality of the oil and the environmental pollution caused by the pyrolysis process. We are working on this and hope to create an ideal operating condition which can provide high-quality oil with less pollution," says Dr. Pankaj Tiwari, Assistant Professor, IIT Guwahati, and corresponding author of the paper. "Compared with combustion, pyrolysis causes less pollution."

The researchers then studied the properties of the new plastic derived oil. One of the oil samples from polypropylene showed a high research octane number of approximately 92. Octane number indicates the quality of the gasoline range fuel. Premium petrol has research octane number of 98 to 100.

The oil also showed low viscosity and had high calorific value. Calorific value denotes the amount of heat generated when unit amount of sample was burnt with oxygen supply. The new oil had calorific value greater than 45 MJ per kilogram. Calorific value of petrol and diesel is 46-48 and 44-46 MJ per kilogram, respectively.

"We are yet to carry out engine tests. Once tested, these oils can soon find application in transport and industrial sectors," says Dr. Tiwari.

THE HINDU

Sun, 11 March, 2018

Electricity from soil bacteria and reading lights from plants

By D. Balasubramanian

Biology appears to suggest ways of generating electricity from plants and microbes that live beneath them in the soil

We generate electric power through hydroelectric plants (in Bhakra, Nagarjunasagar or Hirakud dams), from coal and fossil fuels (Ramagundam, Bhilai and Neyveli), or nuclear plants (ones at Tarapur, Kudankulam or Kakrapar). Each method has its downside – be it water shortage or inter-state disputes, fouling the environment with pollution dust and greenhouse gases, or safety issues with radioactive damage. Can we at all have a pollution-free and nature-friendly power plant?

Biology appears to suggest a way. A group of researchers at the Wageningen University in the Netherlands, led by Dr. Marjolein Helder, has hit upon a method that generates electricity from living plants and the microbes that live beneath them in the soil, where the plants drop their roots. The plant of course does photosynthesis, using sunlight, water and atmospheric carbon dioxide, generating food in the form of carbohydrates and oxygen for our breathing. The microbes in the soil use some of this organic material coming out of the plants into the ground, metabolise them and, in the process, generate carbon dioxide and hydrogen ions and electrons.

While the plant above the ground does photochemistry, the bacteria beneath do electrochemistry, generating positive and negative ions. What Dr. Helder and colleagues have done is to place positive and negative electrodes in appropriate positions and obtain an electric current, just as we do with batteries. This method of producing electricity is through what is termed as plant microbial fuel cells (PMFC).

Look at the simplicity of it. The method is completely natural and environment-friendly, needs no externally added material and is part of a cyclic process in nature. But how much electricity is produced with such PMFC? It depends on the size. A small 50 cm x 50 cm plot of a garden is estimated to produce 5 volts of electricity, while a 100 square metre garden gives enough electric power to charge a cell phone or to light up several LED light bulbs. Indeed the Wageningen group has lit up their Atlas building with LED bulbs, using PMFCs, and a mobile phone charging station in a place at the nearby town Tilburg.

Theory suggests that one should be able to generate 3.2 watts of electric power per square meter (3.2W/m2), using PMFCs. The best level obtained so far in practice is but a sixteenth of it, namely, 220 mW/m2. Thus, improvement in efficiency needs to be done, both by adding such microbes in the soil which perform better, and by enhancing the area by miles and miles of grass lawns, farm lands and focus on paddy fields and similar acreages. These will also bring the cost–benefit ratio to acceptable proportions. It is with this in mind that Dr. Marjolein Helder came over to visit N. Chandrababu Naidu to consider taking up electricity generation across the state of Andhra Pradesh.

Plants that glow

Another dramatic advance, this one directly from the plants themselves rather than the microbes underneath, has come from Dr. Michael Strano of MIT, Cambridge, MA, USA. This is an audacious idea, namely, “how to make plants glow with light”! We know that a plant captures light, and using this, converts water molecules and atmospheric carbon dioxide into sugar. What Strano’s group aims to do is to make plants not just absorb but also emit light and, indeed, glow such that we may use such plants as a table lamp to help read a book in a dark room! In other words, make a plant glow as a firefly does.

A firefly glows because it has an enzyme that converts a molecule called luciferin into oxyluciferin, and the energy released in this reaction comes out in the form of visible light. The enzyme is called luciferase. (Incidentally, luciferin is named after the Latin word lucifer, meaning light-bringer or the morning star). Now, plants do not have luciferin or luciferase. If we can somehow inject into a plant luciferin and luciferase,

perhaps the plant too will emit light — this was the idea that Strano had. Towards this, he used the technology of nanoparticles.

Taking watercress and spinach as experimental plants, his group first packaged luciferase in nanoparticles made of silica. Then, they packed luciferin in another set of nanoparticles made of the polymer PLGA. Each of these nanoparticles carried a tag that would allow it to go to one specific part of the plant cells. Then they also devised a third nanoparticle system, packed with molecules called co-enzyme A, which was to remove a product of the luciferin reaction, which inhibits or stops the reaction from proceeding.

They now immersed the plant in water, added the three sets of nanoparticles, and applied high pressure so that these will enter and position themselves in appropriate places inside the plants. Now, the reaction proceeded and the plant emitted feeble glow, a Eureka moment, which lasted for about 3 hours!

Clearly, more tinkering needs to be done in order to brighten the glow, increasing the time it lasts and other issues. Also how to turn off the light when you do not need it anymore (this has already been established by adding a switch-up the off molecule at will). Given the progress, these appear doable soon enough. Strano says: “our work seriously opens up the doorway to street lamps that are nothing but treated trees and to indirect lighting around homes”.