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THE TIMES OF INDIA

Wed, 07 July 2021

Indian Army Chief Gen Naravane discusses joint military cooperation with British Army's top brass

London: Chief of Army Staff Gen M M Naravane on Tuesday met General Sir Mark Carleton-Smith, Chief of General Staff of British Army and discussed issues of joint military cooperation. He also interacted with members of the Royal United Services Institute for Defence and Security Studies on the "security challenges and opportunities in the region", Additional Directorate General of Public Information (ADGPI) of the Indian Army tweeted.

Indian Army CDS General MM Naravane called on General Sir Mark Carleton-Smith, Chief of General Staff, British Army and discussed issues of joint military cooperation. (PTI Photo)

Gen Naravane arrived here on a two-day visit to the United Kingdom on July 5.

"General MM Naravane #COAS called on General Sir Mark Carleton-Smith, Chief of General Staff, #BritishArmy and discussed issues of joint military cooperation," ADG PI tweeted, sharing some photographs of the meeting.

On Monday, Gen Naravane met UK's Chief of Defence Staff Gen Sir Nicholas Carter and exchanged views on defence cooperation between the two countries.

Gen Naravane inspected the Guard of Honour provided by the Grenadier Guards on Horse Guards' Parade Square as part of his welcome by the British Army.

Gen Naravane is also scheduled to meet UK Secretary of State for Defence Ben Wallace.

During the second leg of his Europe tour on Wednesday and Thursday, Gen Naravane will be holding important discussions with the Chief of Defence Staff and the Chief of Staff of the Italian Army.

"Additionally, the Chief of Army Staff will also inaugurate the Indian Army Memorial in the famous town of Cassino and will be briefed at the Italian Army's Counter IED Centre of Excellence at Cecchignola, Rome," the Indian Army had said in a pre-visit statement.

https://timesofindia.indiatimes.com/india/indian-army-chief-gen-naravane-discusses-joint-military-cooperation-with-british-armys-top-brass/articleshow/84173592.cms

THE NORTHLINES

Wed, 07 July 2021

Why the Army Needs the IAF!

By David Devadas

In the early part of the Kargil operations, the army opted to more or less go it alone, sacrificing large numbers of men and officers in almost superhuman struggles against an enemy on higher ground.

Some generals seem to think their predecessors would have succeeded better if they had had air resources at their disposal, points out David Devadas.

The Indian Air Force has reason to feel miffed. It performed heroically in the 1965 and 1971 wars after it was kept out of the war in 1962, when it could have given the country an edge.

Now, the reorganisation of the forces threatens to turn the air force into largely an adjunct of the army, to be used when and if the army commander of the eastern or western theatres decides that his infantry or tanks require 'air support'.

In a public spat with the air chief, the chief of defence staff went so far as to compare the role of the air force to that of the army's engineers.

His plan, which has been animatedly discussed in newspapers over the past fortnight and on prime time TV, is evidently rooted in the framework of the two world wars. That is plain wrong more than a century after the first of those awful millions-of-men-consuming wars.

Even during the second world war, battles were not always skirmishes between tanks or infantry battalions, with pilots strafing the other side to blunt the attack on their own soldiers.

The crucial Battle of Britain was fought between the air forces of Germany and Britain in 1940, with some additional planes flown by naval, Polish, US, and other pilots defending Britain.

That battle was the first major turning point of that war — before Moscow, Pearl Harbour, and Stalingrad. If the RAF had been wiped out, as Hermann Goering had planned, the way would have been clear for Germany to invade Britain.

Air forces have since become far more potent. Technology now allows fighter planes to swoop deep into enemy territory undetected at twice or thrice the speed of sound. They can destroy enemy command posts or degrade the enemy's assets, without their armies needing to go that far.

Their craft is an art, not just a supportive back-up — and progressively so as technology advances.

As things stand, the plan to gear up defence for future wars does not seem to have sufficiently taken on board emergent trends, leave alone future scenarios.

Sad to say, my interactions over the past five years indicate that India's security set-up, including the army, did not really wake up to the threat from a belligerent China until about a year after the PLA intruded last year.

Even now, Indian strategists' response seems characteristically reactive and defensive. The plan apparently envisages a separate air defence command, but seeks to place some of the air force's assets under the army officers who would command the eastern and western theatres, and the admiral heading the integrated naval command.

How much under each is not yet in the public domain, but it will mean that an army or naval commander would decide how, where, and when the air assets under his command are to be deployed.

One retired vice chief of air staff, who did not want to be named, remarked caustically over the weekend that this would reduce the air chief to chief trainer — of pilots who would serve those theatre commanders.

For, although the reorganised eastern and western commands are intended to be integrated commands, the commander-in-chief of each is to be an army officer, with an air marshal by his side but under his command.

Over the past few years, the air force has already been given far fewer new aircraft than it requires. It currently has about 30 squadrons, though its sanctioned strength is 42 squadrons.

Many of the planes are old. Three Bison squadrons will be out of service by 2025. In 2007, the Cabinet had approved the purchase of 126 new fighter jets, but that became just 36 Rafales in 2015. One hopes the indigenously-produced single-engine Tejas will fill the gap to some extent.

In the 1962 War and in the early part of the Kargil operations, the army opted to more or less go it alone, sacrificing large numbers of men and officers in almost superhuman struggles against an enemy on higher ground. Some generals seem to think their predecessors would have succeeded better if they had had air resources at their disposal.

They might consider whether acknowledging the expertise of air force officers, and coordinating smoothly with them, might be a wiser alternative. That would be true jointmanship.

https://www.thenorthlines.com/why-the-army-needs-the-iaf/

Hindustan Times

Wed, 07 July 2021

India's armed services must prepare for reform

In the last few years, there has been a change and a slew of defence reforms have been brought in. More than at any other time in post-Independence India, there is a commitment to change the way the Indian defence forces are organized

By Harsh Pant

Defence reforms are tricky. With entrenched interests and bureaucratic rivalries, most nations struggle to bring in fundamental changes to their national security apparatus. India is no exception. The recent debate on the move towards theatre commands underscores the challenge that India faces as it seeks to rationalise its military assets to emerge as a more efficient fighting machine.

For decades, reports have revealed the fundamental inefficiencies embedded in our military structures and processes. But when it came to taking decisions, status quo was the preferred mode of operation. And it was all blamed on a lack of political will.

In the last few years, there has been a change and a slew of defence reforms have been brought in. More than at any other time in post-Independence India, there is a commitment to change the way the Indian defence forces are organised. While addressing the Combined Commanders Conference as far back as December 2015, Prime Minister (PM) Narendra Modi underlined, "At a time when major powers are reducing their forces and rely more on technology, we are still constantly seeking to expand the size of our forces. Modernisation and expansion of forces at the same time is a difficult and unnecessary goal. We need forces that are agile, mobile and driven by technology, not just human valour."

Exclusive: Indian armed forces T-90 tanks pass Rajpath, during the 72nd Republic Day celebrations in New Delhi on January 26, 2021. (PTI)

The government kept its side of the bargain. It ushered in a range of reforms, including by appointing India's first Chief of Defence Staff (CDS) and creating the department of military affairs (DMA). It gave a major push for indigenisation with a list of 101 defence items for which there is to be an import embargo.

Encouraging greater private sector participation has resulted in a visible shift in India's profile as a defence exporter. In a significant move first mooted decades ago to reform the functioning of the 41 ordnance factories across the country, the government also undertook corporatisation of the Ordnance Factory Board. Other reforms have ranged from energising defence research and development to the speedier enhancement of border infrastructure and opening up the gates of the Indian armed forces for women more substantively.

These reforms have been undertaken at the time when the three services are also being asked to streamline their own structures and processes. The silo-driven approach to defence planning has resulted in the lack of an integrated view. The three services, as well as the civilian and defence agencies, are often seen to be working at cross purposes. Such an ad hoc approach has meant that more often than not, issues such as threat perception and force structure are not managed via a centralised and authoritative overview. Instead, individual services tend to be driving the agenda at their own levels.

Since efficiency is at a premium in resource allocation, the CDS is expected to guide the government on personnel issues, training, budgetary priorities for each service and even logistical requirements for the services. A key step that the CDS has to undertake is encouraging the establishment of Integrated Theatre Commands (ITCs), which are essentially joint combatant commands. The CDS should push for this in consultation with the service chiefs, including the tri-service personnel within the CDS and the ministry of defence (MoD). They must be geared to guiding, constructing and planning

Commanders of ITCs can bring about efficiency if they have operational and some budgetary control over the forces under their command.

One of the most vital changes that may come about, though, would be how the three arms of the Indian military operate with one another, not as individual services, but as the armed forces of the Union. There has been some criticism of this integration process, with suggestions that it might perpetuate the dominance of the army and give it greater operational control. The recent controversy over some of the statements of senior defence officials seems to indicate that the road forward is likely to be tough.

Nowhere in the world have defence reforms come easily. Like all bureaucracies, the armed forces too have little incentive to change the status quo. The gold standard in defence reforms, the Goldwater-Nichols Department of Defense Reorganization Act of 1986 of the United States (US), came about not because there was a bottom-up clamouring for reforms. Instead, the US Congress imposed this legislation on a department of defense that was riven with inter-services rivalry and had no real interest in moving towards jointness on their own. And the result of this imposition was the emergence one of the most joint militaries in the world.

This landmark Act led to greater joint experience propelled by joint training and education.

It is fashionable to suggest that there is a civil-military divide in India, leading to sub-optimal defence outcomes. That may very well be true. But before that can be addressed, it is important for the three services to address their own internal divide. They need to understand each other better before they can expect the civilians to understand them. And for that, our defence personnel should be trained and educated better. For far too long, our officers are being trained in their own silos, making them unable to comprehend other services and their roles.

If there are any lessons to be learnt from the ongoing controversy on theatre commands, it is the urgent need for the military to introspect on how and why it got to a position where senior leaders in the services are unable to look at the nation's challenges through a similar prism. At a time when the civilian leadership is determined to see the process of defence reforms through to its logical conclusion, it would be a pity if the problems inherent in the services end up derailing that process.

(Harsh V Pant is professor, King's College London, and director of studies, Observer Research Foundation, New Delhi. The views expressed are personal)

https://www.hindustantimes.com/opinion/indias-armed-services-must-prepare-for-reform-101625567714773.html

THE TIMES OF INDIA

Wed, 07 July 2021

Drone attacks and the factor of increasing the costs for the adversary

By Niranjan Marjani

The drone attacks in Jammu have opened a new front of challenge for the Indian defence forces. The initial investigations have hinted at Pakistan's role behind these attacks. The drone attacks targeted at the Jammu Air Force station were first of a kind. However, these were not totally unexpected as there were instances of around 250 sightings of drones at the Western front with Pakistan since 2019.

While the agencies are further investigating, these incidents must also be considered from the cost perspective. Three recent events and a series of steps on India's part in the past few years highlight the cost angle in India-Pakistan relations.

First, the drone attacks took place immediately after Prime Minister Narendra Modi met with the leaders of various political parties from Jammu and Kashmir on June 24.

Second, there has been a sudden surge in terror attacks in Jammu and Kashmir. Since the declaration of ceasefire between India and Pakistan at the Line of Control (LOC) in February, there was relative peace in the union territory. But the possibility to initiate democratic process in Jammu and Kashmir has met with a violent response from Pakistan-backed terrorists. Sopore, Parimpore and Pulwama witnessed terror incidents, before and after the meeting, in which the armed forces successfully neutralized the terrorists.

Third, the drone attacks come parallel to India deploying 50,000 additional troops along the Line of Actual Control (LAC) even as the stand-off with China continues.

It would be far-fetched to think that these three events and the drone attacks are a co-incidence. Confirmation of Pakistan's role would further establish these drone attacks as an act of desperation. This desperation is the result of the costs that India has imposed over Pakistan since the past few years for backing terrorism.

Increasing the costs

Use of terrorism and non-state actors as a state policy by Pakistan has been a major security challenge for India over the decades. Inability to win a conventional war against India led to formulation of policy of thousand cuts by Pakistan's political and military dispensation in the 1970s.

Since the 1980s Pakistan has imposed huge costs on India by way of supporting terrorism, categorized as proxy war, in Jammu and Kashmir and also in other parts of India. While Indian armed forces have been valiantly dealing with these acts of state-sponsored terrorism, a question was always raised about India been unable to effectively respond to these attacks. The effective response implied increasing the costs for Pakistan to deter it from carrying out terror attacks in India.

While on one hand the drone attacks signal diversification and advancement in the techniques of war, on the other hand, these attacks are also the results of India's meticulous strategy against Pakistan-sponsored terrorism. It is noteworthy that since 2014, the terror attacks in India have been restricted to just Jammu and Kashmir with an exception of one attack in Pathankot, Punjab in 2016.

In the past few years India has adopted a proactive approach by following the policy of hot pursuit. This includes Operation All Out which was launched in 2017 to eliminate terrorists from Jammu and Kashmir. Apart from this operation, India conducted surgical strikes on terror camps across the LOC in response to the terror attack on army camp in Uri in 2016. In 2019, Indian Air Force carried out airstrikes on terror camps in Balakot in Pakistan. Also in 2019, the abrogation of Article 370 and 35A and changing the status of Jammu and Kashmir from a state to a union

territory further gave the central government better control over administration. While these steps were necessary for the development of Jammu and Kashmir, it has been difficult for Pakistan to continue with its activities in an unbridled manner.

With infiltration becoming difficult and human cost rising due to Indian armed forces' sustained operations against the terrorists, Pakistan's relevance had started waning. So, India has been successful in increasing the costs for Pakistan.

Implications

For India

The imminent challenge for India is to upgrade its defence systems to overcome this threat. After the drone attack, an anti-drone system has been installed at the Jammu Air Force station by the National Security Guard (NSG). The system includes radio frequency detector and soft jammers. However, India has a lot of catching up to do since the drone technology is evolving fast and is already being used in military applications and operations by several countries. India's existing defence systems, especially radar systems are not equipped to counter the threat posed by drone. It takes years of planning and research and billions of rupees of investments to develop or acquire weapon systems. In a way, the drone attacks have mandated India to incur additional costs on its defence immediately. Drones also render the international border more porous and vulnerable. Drones, which reduce the risk of losing human lives, could be used increasingly by India's enemies for information gathering, weapons supply or for targeted attacks. India, therefore, needs to act quickly to develop and acquire latest systems that are capable of countering this threat.

For Pakistan

Drone may seem like a cost-effective option for Pakistan but that may last only for a short period. Eventually, India would be better placed to tackle and neutralize these types of threats. If these drone attacks were meant to test India's capability of facing a two-front war (one with Pakistan and the other with China), then Pakistan itself is not very comfortably placed. Any action from Pakistan border may invite a strong response from a non-hesitant India even if it is a limited strike. Besides, with the situation emerging in Afghanistan with the Taliban wreaking havoc, the Afghanistan-Pakistan border may soon become a security concern for Pakistan. In the present situation, Pakistan is not well-equipped to start or to deal with a two-front war. Also, after the Jammu drone attack, India immediately raised issue of the use of drones by terrorists at the United Nations General Assembly. Recently, the Financial Action Task Force (FATF) has retained Pakistan in the grey list. All put together, the cost-effective option would turn out to be an expensive one for Pakistan from both strategic and diplomatic points of view.

While the drone attacks may have ushered in a new chapter of asymmetric warfare between India and Pakistan, but it could end up in India imposing more costs on Pakistan. The reason being that at least for now, the challenge for India is a uni-dimensional one with focus only shoring up the defence systems to neutralize this threat. The challenge for Pakistan is multi-dimensional since implications in these attacks attract international attention and possible financial sanctions on one hand. On the other the spillover effect of situation in Afghanistan could further raise the costs for Pakistan to sustain this cost-effective option.

https://timesofindia.indiatimes.com/blogs/nolimits/drone-attacks-and-the-factor-of-increasing-the-costs-for-the-adversary/

TIMESNOWNEWS.COM

Wed, 07 July 2021

Exclusive: India and Russia agree to have 2 plus 2 strategic dialogue

India has had such meetings only with the United States and Japan

By Srinjoy Chowdhury

New Delhi: In what is being seen as a major strategic move, India, as it has with the United States, will have a 2 plus 2 dialogue with Russia.

The 2 plus 2 dialogue entails an annual meeting between the external affairs minister, Mr S. Jaishankar and the defence minister, Mr Rajnath Singh and their Russian counterparts, foreign minister Sergei Lavrov and defence minister Sergey Shoygu. India has agreed to the Russian offer, but where the first meeting will happen and when is yet to be decided. Much will depend on how acute the Covid situation is in the coming months.

A 2 plus 2 with Russia is being seen as another way of strengthening the already strong military to military relationship between the two countries. India's main battle tank is the Russian T-90, the two squadrons of Rafales apart, the most modern fighter plane is the Russian Sukhoi-30 and the Navy has got nuclear-powered submarines from Moscow. India has not forgotten Russian diplomatic help before the 1971 war with Pakistan.

Of course, the United States has a completely different relationship today, compared with 1971, both diplomatically and militarily-- the nuclear deal, the "foundational" agreements like CISMOA, BECA and LEMOA, the Malabar naval exercises and the Quad meetings being examples of that.

The United States apart, India does not have a ministerial-level 2 plus 2 with any other country except Japan. There is a secretary-level 2 plus 2 relationship with Australia. Russia, pointedly, does not have a 2 plus 2 with China.

Meanwhile, external affairs minister S. Jaishankar will be leaving for Moscow later this week. He will hold discussions with Mr Lavrov. This comes in the wake of the defence secretary's visit to Moscow.

Indo-Russia ties will be on the upswing later this year, with a bilateral between Russian President Vladimir Putin and Prime Minister Narendra Modi likely. Whether it will be 'virtual' or not remains to be seen. A BRICS summit is also on the cards, with Brazil, China and South Africa being the other countries, besides Russia and India, the hosts this year. Again, its structure depends on the Covid situation.

https://www.timesnownews.com/india/article/exclusive-india-and-russia-agree-to-have-2-plus-2-strategic-dialogue/781052

ThePrint

Wed, 07 July 2021

3 reasons why India can't ignore China constructing missile silos to counter US

China has had nuclear missile launch facilities before, but the scale of these constructions is much bigger. India needs to pay close attention

By Kunal Singh, Edited by Prashant Dixit

Researchers at the James Martin Center for Nonproliferation Studies in Monterey have discovered the construction of 119 missile silos in the Chinese province of Gansu. The facilities will likely be used to store China's latest intercontinental ballistic missiles, DF-41, with a range of up to 15,000 kilometres. The construction of these silos is understood to be a part of China's effort to counter US nuclear superiority through an investment in a greater number of survivable nuclear weapons. It is important for New Delhi to observe these developments closely for three reasons.

A Google Earth image grab of Yumen city in Gansu province on the China map | Photo: Google Earth

Outlining future utility of nuclear weapons

First, the competition between the US and China will carry important implications for the role of nuclear weapons in international politics. Nuclear weapons are said to be "the great equalizer", because acquisition of even a small arsenal by inferior powers is supposed to deter their strong rivals. It is the acquisition of nuclear weapons that shields Pakistan from suffering heavy reprisals after sponsoring major sub-conventional attacks on Indian soil. The salience of nuclear weapons is lower in India-China disputes, but it has been almost unimaginable that Beijing could repeat its 1962 military success ever since New Delhi acquired nuclear weapons. Nuclear weapons, though, do not rule out smaller-scale conquests.

Some experts now claim that certain technological developments, like the accuracy revolution in ballistic missiles, enhanced resolution of satellite imagery, and passive acoustic detection of submarines, have eroded the parity that inferior powers gained by acquiring nuclear weapons. Technologically advanced and wealthier powers like the US can now use their satellites to detect the location of nuclear forces of the rival, and use accurate missiles to destroy even hardened shelters. Moreover, the US can also use passive acoustic arrays to detect relatively noisier submarines of weaker powers, thus turning even the most survivable leg of the nuclear forces quite vulnerable. If the US is unable to destroy all the long-range missiles of the rival, then the hope is that the residual force will be small enough to be absorbed by sophisticated missile defences.

China's vulnerability to American technological superiority is driving a number of its counter-measures, with the silo-building being just the latest effort. This US-China cat-and-mouse game, nuclear version, will determine the future utility of the nuclear weapons, including that of Pakistan's against India and India's against China. India is already believed to be tempted to do to Pakistan, using its technological superiority, what the US is doing to its rivals.

China's vulnerability is bad news for India

Second, and counter-intuitively, the vulnerability of Chinese nuclear arsenal might not bode well for India. The most straightforward reason is that if China's modest arsenal is not safe against the US, India's even smaller arsenal might also be at a threat if China decides to invest in

sophisticated counterforce platforms like missile defences and field nuclear attack submarines in the Indian Ocean on explicit missions to seek and eliminate Indian submarines when needed.

There is another reason why China's vulnerability might be bad news for India. Experts are divided on whether China fields a survivable nuclear force. Nuclear weapons scholars Charles L. Glaser and Steve Fetter argue that investment in mobile intercontinental ballistic missiles (ICBMs) has enabled China to build a survivable nuclear force, others like Keir A. Lieber and Daryl Press have their doubts. If the US is confident that it has the capability to wipe out China's long-range missiles in one clean strike, it might be tempted to do so especially if its leadership believes that Beijing may use a city-flattening nuclear missile first.

In the event that the US decides to go for a massive counterforce strike and is reasonably successful, China could still be left with short- and medium-range missiles that can reach US allies and strategic partners like Japan, South Korea, and India. There is a well-known argument that acquisition of long-range missiles by America's rivals tends to weaken the extended deterrence that Washington offers to its allies. The reason is that the rival can now hold US homeland hostage if Washington decides to intervene in favour of its ally. My argument here is exactly the mirror-opposite: as soon as the US perceives an opportunity to pull its own homeland out of this hostage situation, it could well take that chance even if that means putting its allies and partners in danger.

Civilian vs military — nuclear weapons control

Third, the method of seeking survivability should tell us something about the factors involved. While China is responding to the threat of US counterforce and missile defence capabilities, its choice of constructing silos is a little puzzling. Fixed silos can be monitored day and night by using radar satellites. Of course, China might plan to complicate the US attack options by moving around its ICBMs within all those silos or by using some of those silos as dummies or a combination of both. However, it is not guaranteed that any of these methods might retrieve the advantages of mobility.

Having said that, China is likely to move ahead with a combination of silos and mobile ICBMs. However, if it eventually chooses to store a large number of DF-41 missiles in these silos, that might be an indicator of command and control challenges with respect to nuclear weapons in China. The leadership might believe that silos offer better civilian control over use and non-use of nuclear weapons. Silo-based missiles are also considered more responsive: an order to launch can be communicated much faster to a fixed silo than a mobile platform.

China's example points out the variables that determine how States respond to stronger rivals with potential counterforce capabilities. Pakistan, even if faced with Indian counterforce capabilities, might not resort to Beijing's method of ensuring survivability because unlike China, its military enjoys much greater control over nuclear weapons. Besides, if the desire for responsiveness is driving silo-construction in China, it might mean that Beijing thinks a conflict with the US, with all its escalation potential, is closer than ever before. This itself has several implications for India and its foreign policy.

China has had silos before, but the scale of these constructions is much bigger. India needs to pay close attention to these developments, because these will have consequences for everything — from the future of nuclear weapons to the likelihood of a war in the Indo-Pacific region.

(The author is pursuing a PhD at the Department of Political Science, Massachusetts Institute of Technology. He tweets @d_extrovert. Views are personal.)

https://theprint.in/opinion/3-reasons-why-india-cant-ignore-china-constructing-missile-silos-to-counter-us/690433/

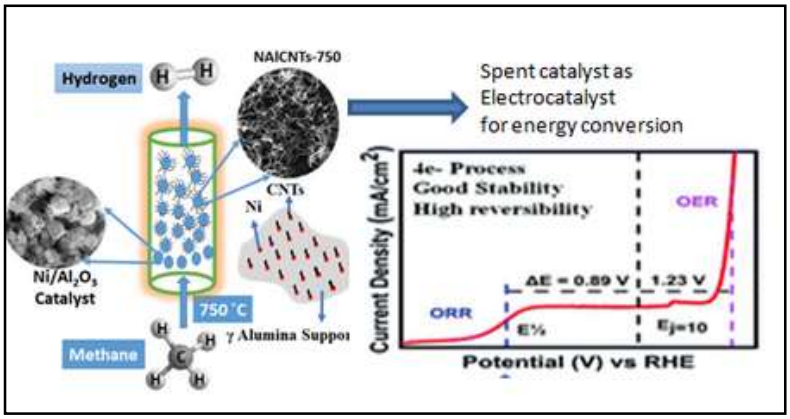
Press Information Bureau
Government of India

Ministry of Science & Technology

Tue, 06 July 2021 6:15PM

Wealth from Waste: Spent catalyst from industry can be an efficient catalyst for batteries

We are perhaps looking at a future in which industrial waste will form the base for energy storage in batteries. Scientists have shown that the spent catalysts from the energy industry or the raw material for recycling operation that deliver fresh catalysts and valuable metals work as an efficient bifunctional oxygen electrocatalyst and can catalyze the core reactions that facilitate the operation of metal-air batteries.



It can help develop new strategies for effectively using industrial waste for energy storage in batteries paving the way to realize the dream of achieving 'today's waste is tomorrow's energy'.

Hydrogen energy offers a promising power generation route for the industry and transport sectors due to high energy density and clean output. One of the ways to produce hydrogen is by catalytic decomposition of methane using nickel catalyst embedded on alumina or zeolite. After several runs, the catalysts get spent due to carbon choking and lose their activity. The spent catalysts are typically subjected to energy-intensive processes such as high-temperature combustion for recycling, releasing a large amount of CO_x into the atmosphere during the process or chemical treatment for the reclamation of metal constituents. These protocols are neither economically viable nor environmentally friendly, thus demanding alternative avenues to efficiently use the spent catalyst.

One of the best possible routes is to use the retrieved spent catalyst for energy generation/storage applications. The composition of the given spent catalyst, Carbon nanotubes with Ni nanoparticles and porous alumina, may be ideal for direct use as electrocatalyst in electrochemical energy applications and thus, opens up a viable strategy for converting waste to wealth.

Dr C. Sathiskumar, Dr Neena S. John and Dr H.S.S. Ramakrishna Matte from the Centre for Nano and Soft Matter Sciences (CeNS), an autonomous institute under the Department of Science & Technology, Government of India, in collaboration with Hindustan Petroleum Corporation Ltd (HPCL) R&D Green Centre, Bengaluru, have demonstrated that the above-spent catalyst works as an efficient bifunctional oxygen electrocatalyst. It can catalyze both electrochemical oxygen evolution (OER) and oxygen reduction reactions (ORR), the core reactions that facilitate the operation of metal-air batteries. This research was recently published in the journal *'Sustainable Energy Fuels'.*

The spent catalyst shows stable current density for 20 hrs and 8 hrs towards OER and ORR. The potential difference for overall oxygen electrocatalyst (ΔE) reveals a superior bifunctional activity

of the spent catalyst. Furthermore, the spent catalyst employed in Zn-air batteries displayed commendable charge-discharge performance up to 45 hrs with high reversibility.

The work supported by the Centre for High Technology (CHT)-Oil and Industry Development Board (OIDB), Hydrogen Corpus Fund help in effectively utilizing industrial waste for energy storage applications, thus producing green energy in a sustainable manner.

https://pib.gov.in/PressReleasePage.aspx?PRID=1733155

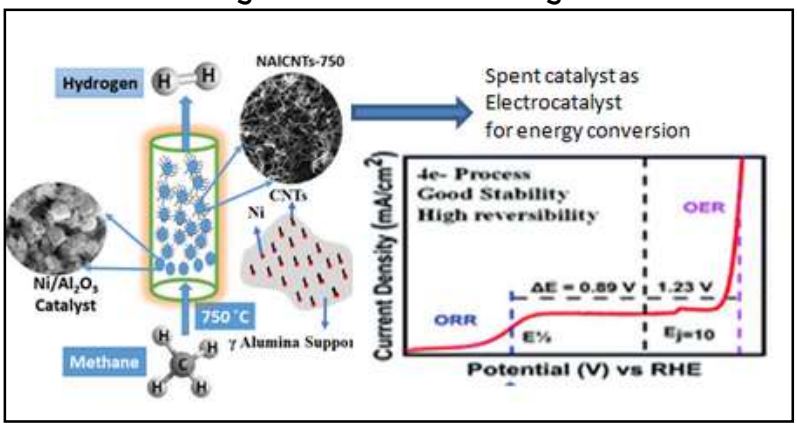
पत्र सूचना कार्यालय
भारत सरकार

विज्ञान एवं प्रौद्योगिकी मंत्रालय

Tue, 06 July 2021 6:15PM

अपशिष्ट से सम्पदा: उद्योग में बैटरी के लिए संभावित उत्प्रेरक के रूप में उपयोग किए जाने वाले कारक

हम शायद एक ऐसे भविष्य की ओर देख रहे हैं जिसमें औद्योगिक अपशिष्ट (कचरा) आगे चल कर बैटरी में ऊर्जा भंडारण का आधार बनेगा। वैज्ञानिकों ने दिखाया है कि ऊर्जा उद्योग में प्रयोग के बाद अपशिष्ट बन चुके पदार्थ उत्प्रेरक या रीसाइक्लिंग ऑपरेशन के लिए कच्चे माल के रूप में जो ताजा उत्प्रेरक और मूल्यवान धातु प्रदान करते हैं वह एक कुशल द्वि-कार्यात्मक ऑक्सीजन इलेक्ट्रोकैटलिस्ट के रूप में काम करते हैं और धातु-वायु बैटरी के संचालन को सुविधाजनक बनाने वाली मुख्य प्रतिक्रियाओं को उत्प्रेरित कर सकते हैं।



यह बैटरी में ऊर्जा भंडारण के लिए औद्योगिक कचरे का प्रभावी ढंग से उपयोग करने के लिए नई रणनीति विकसित करने में मदद कर सकता है, जिससे 'आज का कचरा कल की ऊर्जा' प्राप्त करने के सपने को साकार करने का मार्ग प्रशस्त हो सकता है।

उच्च ऊर्जा घनत्व और स्वच्छ उत्पादन के कारण हाइड्रोजन ऊर्जा उद्योग और परिवहन क्षेत्रों के लिए एक आशाजनक बिजली उत्पादन का मार्ग प्रदान करती है। हाइड्रोजन का उत्पादन करने के तरीकों में से एक एल्यूमिना या जिओलाइट पर एम्बेडेड निकल उत्प्रेरक का उपयोग करके मीथेन का उत्प्रेरक अपघटन है। कई चक्रों के बाद, कार्बन चोकिंग के कारण उत्प्रेरक खर्च हो जाते हैं और अपनी क्रियात्मकता खो देते हैं। खर्च किए गए उत्प्रेरक आमतौर पर ऊर्जा-गहन प्रक्रियाओं के अधीन होते हैं जैसे रीसाइक्लिंग के लिए उच्च तापमान दहन, प्रक्रिया के दौरान वातावरण में बड़ी मात्रा में सीओएक्स जारी करना या धातु घटकों के सुधार के लिए रासायनिक उपचार। ये प्रविधि (प्रोटोकॉल) न तो आर्थिक रूप से व्यवहार्य हैं और न ही पर्यावरण के अनुकूल हैं, इस प्रकार उपयोग किए गए उत्प्रेरक का कुशलता से उपयोग करने के लिए वैकल्पिक रास्ते की मांग को अनिवार्य करते हैं।

सर्वोत्तम संभव उपायों में से एक ऊर्जा उत्पादन/भंडारण अनुप्रयोगों के लिए पुनर्प्राप्त खर्च किए गए उत्प्रेरक का उपयोग करना है। दिए गए खर्च किए गए उत्प्रेरक की संरचना, नी नैनोकणों और पोरस

एल्यूमिना के साथ कार्बन नैनोट्यूब, विद्युत रासायनिक ऊर्जा अनुप्रयोगों में विद्युत उत्प्रेरक के रूप में प्रत्यक्ष उपयोग के लिए आदर्श हो सकते हैं और इस प्रकार, कचरे को सम्पदा (धन) में परिवर्तित करने के लिए एक व्यवहार्य रणनीति सामने आती है।

भारत सरकार के विज्ञान और प्रौद्योगिकी विभाग के तहत एक स्वायत्त संस्थान नैनो और सॉफ्ट मैटर साइंसेज (सीईएनएस) में कार्यरत डॉ सी सथिस कुमार, डॉ नीना एस जॉन और डॉ एच.एस.एस. रामकृष्ण मत्ते भारत सरकार के विज्ञान और प्रौद्योगिकी विभाग के तहत एक स्वायत्त संस्थान नैनो और सॉफ्ट मैटर साइंसेज (सीईएनएस) ने हिंदुस्तान पेट्रोलियम कॉर्पोरेशन लिमिटेड (एचपीसीएल) आर एंड डी ग्रीन सेंटर, बेंगलुरु के सहयोग से प्रदर्शित किया है कि ऊपर प्रयुक्त किया जा चुका उत्प्रेरक एक प्रभावी एवं कुशल द्वि-कार्यात्मक ऑक्सीजन इलेक्ट्रोकैटलिस्ट के रूप में काम करता है। यह इलेक्ट्रोकेमिकल ऑक्सीजन इवोल्यूशन (ओईआर) और ऑक्सीजन रिडक्शन रिएक्शन (ओआरआर) दोनों को उत्प्रेरित कर सकता है, जो ऐसी मुख्य क्रियाएं हैं जो धातु-वायु बैटरी के संचालन की सुविधा प्रदान करती हैं। यह शोध हाल ही में 'सस्टेनेबल एनर्जी फ्यूल्स' जर्नल में प्रकाशित हुआ था।

प्रयुक्त किया जा चुका उत्प्रेरक ओईआर और ओआरआर की ओर 20 घंटे और 8 घंटे के लिए स्थिर वर्तमान घनत्व दिखाता है। साथ ही समग्र ऑक्सीजन इलेक्ट्रोकैटलिस्ट (ΔE) के लिए संभावित अंतर खर्च किए गए उत्प्रेरक की एक बेहतर द्वि-कार्यात्मक गतिविधि को प्रकट करता है। इसके अलावा, जेडएन-एयर बैटरियों में नियोजित खर्च किए गए उत्प्रेरक ने उच्च प्रतिवर्तीता के साथ 45 घंटे तक का सराहनीय चार्ज-डिस्चार्ज प्रदर्शन प्रदर्शित किया।

सेंटर फॉर हाई टेक्नोलॉजी (सीएचटी) -ऑयल एंड इंडस्ट्री डेवलपमेंट बोर्ड (ओआईडीबी), हाइड्रोजन कॉर्पस फंड द्वारा समर्थित कार्य ऊर्जा भंडारण अनुप्रयोगों के लिए औद्योगिक कचरे का प्रभावी ढंग से उपयोग करने में मदद करते हैं और इस प्रकार से एक स्थायी तरीके से हरित ऊर्जा का उत्पादन करते हैं।

https://pib.gov.in/PressReleasePage.aspx?PRID=1733200

THE WEEK

Wed, 07 July 2021

ISRO: Internal assessment of unmanned Gaganyaan mission underway

The aim is to bring out unknown issues which we had not anticipated on ground

By Abhinav Singh

As ISRO prepares to meet the timeline for the first of the unmanned missions of Gaganyaan by December this year, it is currently carrying out an internal assessment as to whether the mission can take off as per its schedule. As per sources in ISRO the mission is expected to take off as planned in December 2021 but the lockdowns due to the two waves of the Covid-19 pandemic has disrupted the delivery schedules of the Gaganyaan mission. Post the report by the internal team ISRO will further update on the exact status of the mission and whether the launch will stick to its December 2021 timeline.

During an earlier exclusive interaction with THE WEEK, the ISRO Chairman K Sivan February 2021 prior to the second wave of the Covid-19 pandemic the designs for the Gaganyaan mission were getting finalised and now the realisation was expected to start. Sivan had informed that initially ISRO's target was to finish the two unmanned Gaganyaan missions by July 2021 and the manned mission by December 2021 but everything was delayed due to the pandemic. It was reported that there was a delay in realisation of hardware systems for the project due to the subsequent lockdowns due to the Second wave of the pandemic.

“We plan to have at least one unmanned Gaganyaan mission this year. We need two successful unmanned missions before the manned missions. In the space environment, there are a lot of ‘unknown unknowns’, which we are not able to understand before the flight. This applies to all missions and not only Gaganyaan. For space missions we take at least two development flights. During the first development flight, we look for any technical deviations of whatever we were expecting and whatever has happened. Based on this observation the second development flight is launched. The aim is to bring out unknown issues which we had not anticipated on ground,” Sivan had remarked.

As per reports Indian and France have signed an agreement for cooperation for the Gaganyaan mission which will enable Indian flight physicians to train at French facilities. Under the agreement the equipment developed by France, tested and operating aboard the International Space Station (ISS) will be available to Indian crews. Besides this Indian is also taking help from Russian and the U.S. space agencies for the Gaganyaan mission. Indian has also gone into an agreement with the Australian space agency for the establishment of a transportable terminal in Australia to support its Gaganyaan mission.

Four astronauts for the Gaganyaan mission in Russia have returned to India in April this year for the second leg of their advanced training in India. Earlier Sivan had told THE WEEK that the four astronauts will be imparted mission-specific training in India. The astronauts are being trained to handle emergency situations as part of the mission-specific training mostly at ISRO’s Satellite Integration and Testing Establishment (ISITE) in Bengaluru. “It will be an ongoing training and will continue till the launch of the mission. The aim of this continuous training is to ensure physical fitness,” Sivan had said.

As per reports ISRO Chairman K Sivan had said that still he was not in a position to comment on whether the agency would be able to meet the target of August 2022 for the manned Gaganyaan mission at the moment or not.

https://www.theweek.in/news/sci-tech/2021/07/06/isro--internal-assessment-of-unmanned-gaganyaan-mission-underway.html

APN NEWS

Wed, 07 July 2021

LPU establishes Space Station for multiple satellites

- ***Station to function under LPU's 'Centre for Space Research', with facilities to support space missions by India***
- ***The centre was inaugurated by Dr Sudhir Mitra distinguished Scientist & Director General (BrahMos), DRDO, Ministry of Defence***
- ***The space station to not only act as a resource for LPU and its researchers but will also be a virtual lab for other educational institutions in India and neighbouring countries***
- ***LPU's Centre for Space Research is closely related to Space Situational Awareness & Management (SSAM) program of ISRO***

New Delhi: Taking another step towards its vision of becoming India's foremost private space research institution, Lovely Professional University (LPU) announced the establishment of 'Professional Space Station for Multiple Satellite Tracking and Telemetry' at its campus. The station will function under LPU's 'Centre for Space Research' which was inaugurated last year by Dr Sudhir Mishra distinguished scientist & Director General (BrahMos), DRDO, Ministry of Defence. The station will not only act as a resource for LPU and its researchers but will also be a virtual lab for other educational institutions in India and neighbouring countries.

With automatic antenna adjustment and precise digital signal processing, this professional station has two major modules-Satellite Tracking and Amateur Radio (HAM radio), along with many other salient features. It can track multiple satellites, which are presently 3000+; and, collect real time satellite images. It can be used for a host of functions, from determining the position of assets like vehicles and cattle, city planning, weather forecast as well as disaster management support. It is also helpful for community connect; communication with mobile assets including drones; monitoring power lines and land slides.

The Space station would allow students and researchers to communicate with the International Space Stations as well as receive data from nanosatellites and other spacecraft. The centre will carry out awareness programs related to space research and remote sensing with the support of Punjab Remote Sensing Centre, as well. Space station at LPU also offers an internet-to-orbit gateway mission control centre, for public use.

Shri Ashok Mittal, Chancellor, Lovely Professional University, said, "Despite the challenging times, we have moved towards fulfilling our dream project. It is the result of collaborative efforts of our researchers, scientists and staff members who have come together to support this mission. The facility will reduce financial and engineering barriers that hinder access to science and engineering data from the orbit. This will provide great opportunities for our researchers and scientists to collaborate with other organizations, government bodies and academia to take space engineering research to the next level."

LPU's Centre for Space Research is closely related to Space Situational Awareness & Management (SSAM) program of ISRO. This area has become internationally significant due to the ever-growing manmade space debris and the increased threat of collisions due to it.

The space centre at LPU engages the trainee students in satellite system design and system engineering; satellite payload and sub-system design and development; satellite assembly, integration and testing; satellite launch, operation; payload data processing, application in the area of navigation, remote sensing, meteorology, and space science. The university's goal is to infuse interest in students for space research, equip them with relevant data and enter the field of space research, including tracking and data acquisition, laser/optical lab for futuristic communication systems and more.

https://www.apnnews.com/lpu-establishes-space-station-for-multiple-satellites/

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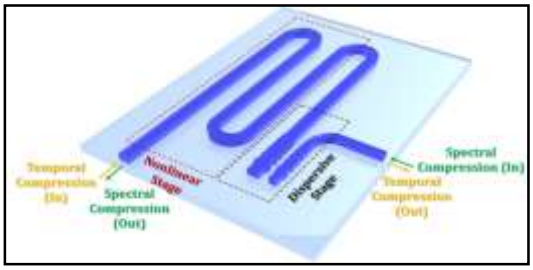
Wed, 07 July 2021

Ultra-strong squeezing of light demonstrated for ultrafast optical signal processing

A train carrying cargo has finite space. The amount of cargo that can be carried onboard is limited by the size of the cargo and the capacity of the train. Analogously, the amount of time taken up by an optical signal limits the amount of data that can be carried. Temporally shorter signals allow more data to be squeezed into a given time duration, in a method called optical time division multiplexing. Photonics researchers have recently succeeded in squeezing light in time by a factor of 11. The developed temporal compression system allows an equivalent increase in the number of bits transmitted by light in a fiber optic network.



Schematic of the USRN compressor system. The system is comprised of separate nonlinear and dispersive stages. For spectral compression (SC), pulses enter the dispersive stage (DS) first before the nonlinear stage (NS), and for temporal compression (TC), pulses enter NS first before DS. Credit: SUTD

By leveraging analogous dualities in space and time, the same system also allows the frequency (or wavelength) content of light to be squeezed as well. For example, light that has red, yellow and blue colors will be spectrally compressed to only possess yellow light. The amount of color in an optical signal also limits the amount of data which can be carried in a fiber optic network when wavelength division multiplexing is used. Consequently, this capability to spectrally squeeze light could allow higher spectral densities of light propagating in a specific medium.

Details of this work appeared in *Light: Science and Applications* on June 18th 2021, and was a collaboration between researchers at the Singapore University of Technology and Design (SUTD), A*STAR Institute of Microelectronics and the Massachusetts Institute of Technology. The ultra-small size of the compressor system provides several orders of magnitude smaller footprint compared to bulky, benchtop compressor systems used for generating short pulses in ultrafast optical signal processing. The high compression achieved was made possible by the two-stage design featuring a dispersive element and a strongly nonlinear component, both of which were integrated on the same chip. "By balancing the contributions from the dispersive and nonlinear stages, we could generate strong compression in either time or frequency. The temporal compression is one of the strongest demonstrated to date on a chip. The spectral compression is also the first of its kind demonstrated on a chip," said Dr. Ju Won Choi, the research fellow who worked on this project.

Providing strong compression on such a small device footprint could facilitate low-cost deployment of short pulses needed in telecommunications, data center, precision manufacturing and hyperspectral imaging. "The demonstrated on-chip integrated system capable of both high temporal and spectral compression allows flexibility in the manipulation of optical pulses, an important capability as the burden on existing high-speed communications becomes more pronounced. The data center, telecommunications and 5G industries will require more and more capacity, and approaches such as these that help squeeze more light into a given medium will aid in this drive towards faster optical communications networks," said Associate Professor Dawn Tan from SUTD who was the principal investigator of this work.

More information: Ju Won Choi et al, High spectro-temporal compression on a nonlinear CMOS-chip, *Light: Science & Applications* (2021). DOI: 10.1038/s41377-021-00572-z

Journal information: *Light: Science & Applications*

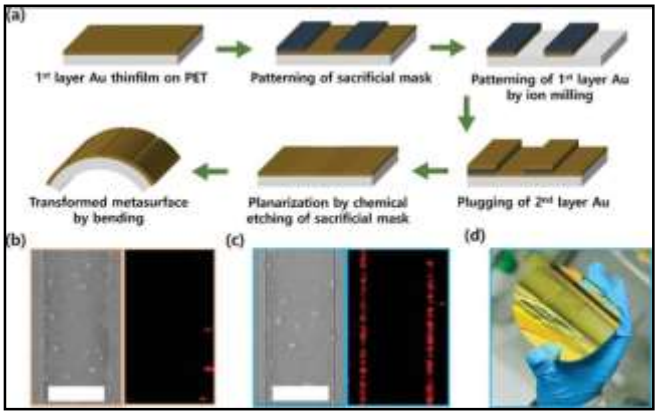
https://phys.org/news/2021-07-ultra-strong-ultrafast-optical.html

Wed, 07 July 2021

A transformative metasurface based on a zerogap embedded template

A research team, led by Professor Dai-Sik Kim in the Department of Physics at UNIST has developed a new technique of predefining the crack pattern on a flexible substrate by a sequential deposition of metallic layers which leads to a formation of a'"zero-nanometer gap', or a 'zerogap,' between the adjacent lateral patterns.

These gaps, according to the research team, readily open and recover with gentle bending and relaxing of the flexible substrate, precisely along the rims of the pre-patterns of centimeter lengths. Furthermore, in a prototypical pattern of densely packed slit arrays, these gaps serve as antennas achieving transparency for polarizations perpendicular to the length of the gap when opened and shut off all the incident lights when closed. These gaps are also fully tunable and healable from widths of zero nanometers to all the way up to several hundreds of nanometers, leading to a very high modulation depth throughout many times of repeated modulations, noted the research team.



Zerogap embedded template (ZET). a) Schematic diagram of fabrication of ZET. After the fourth step, zero-nanometer gaps, or "zerogaps," are formed between neighboring first and second layers of gold. They are optically and electrically connected, but distinguishable such that gentle application of strain readily separates them and opens the zerogap. Scanning electron microscope (SEM) images and optical transmission images of ZET in b) flat and c) bent conditions (scale bar: 5 μm). d) Digital photograph of ZET fabricated on a 4-inch diameter PET substrate. Credit: Ulsan National Institute of Science and Technology

Unlike most reconfigurable metasurfaces, which suffer from fatigue and gradual decline in performances after repeated operations, ZET is effectively fatigue-free and can readily be used in industrial applications where durability of the sample is crucial. Indeed, when the research team investigated the durability of their ZET samples, they exhibited an improved performance over time even after 10,000 repeated stretching/bending cycles.

"While we used an array of slits as a test system in this study, the method can readily be extended to any type of pattern with closed loops such as coaxial apertures, ring resonators, or grooves," noted the research team. "Thus, our zerogap technology bears the potential to significantly improve all kinds of active optical components and therefore finds numerous applications in electromagnetic wave shielding, polarization conversion, and active filters as well as in quantum transport studies resulting from deep sub-nanometer-wide gaps."

More information: Bamadev Das et al, A Transformative Metasurface Based on Zerogap Embedded Template, *Advanced Optical Materials* (2021). DOI: 10.1002/adom.202002164

Journal information: *Advanced Optical Materials*

https://phys.org/news/2021-07-metasurface-based-zerogap-embedded-template.html

PHYS.ORG

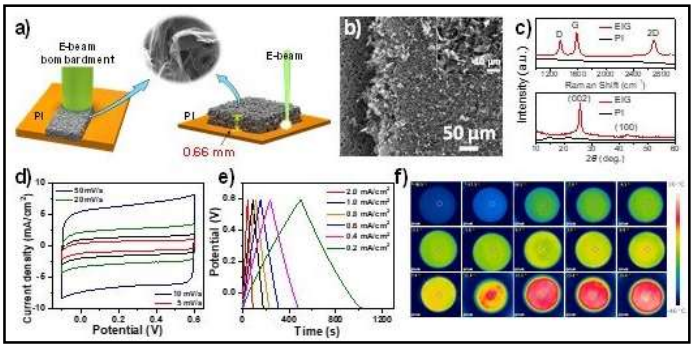
Wed, 07 July 2021

Scientists synthesize 3D graphene films with high-energy E-beam

By Li Nian

Recently, Prof. Wang Zhenyang's research group from the Hefei Institutes of Physical Science (HFIPS) of the Chinese Academy of Sciences (CAS) has prepared macroscopic thick three-dimensional (3D) porous graphene films.

Using a high-energy electron beam as the energy source and taking advantages of the high kinetic energy and low reflection characteristics of e-beam, the researchers directly induced polyimide precursor into a 3D porous graphene crystal film with a thickness of up to 0.66 mm. Related research results were published in the journal *Carbon*.



(a) A schematic diagram of the process of e-beam bombardment to induce graphene on polyimide; (b) SEM image of EIG; (c) Raman spectra (above) and XRD spectra (below) of EIG and polyimide film. (d) The CV curves at different scan rates of EIG electrode; (e) The GCD diagrams at different current densities of EIG electrode; (f) Photothermal performance of EIG materials at -40 °C. Credit: Li Nian

Graphene has proven to be a new strategic material owing to its numerous exceptional chemical and physical properties. Integrating a dimensional (3D) porous graphene network can prevent restacking of graphene sheets and enables easy access and diffusion of ions. However, efficient synthesis of macroscopic thick 3D porous graphene films is still a challenge.

The high instantaneous energy of a laser can induce the direct carbonization of the carbon-containing matrix to form high crystalline quality graphene. But the penetration depth of the laser into the carbon-containing matrix is quite low, resulting in insufficient thickness of the prepared graphene film, which limits its application in actual devices. Therefore, exploring a more effective energy source is a key problem that needs to be solved urgently for the industrial application of high-energy beam-induced graphene.

In this research, the researchers used a high-energy e-beam as a new energy source to realize efficient preparation of macroscopic thick 3D porous graphene crystal films on the polyimide precursor. Compared with lasers, high-energy e-beams possess lots of advantages including zero reflection, high kinetic energy, injection effect, and simple focus control, making the e-beam a better energy source to quickly induce carbonization of polyimide precursors to produce graphene.

Hydrogen, oxygen and some other components in polyimide can rapidly escape in the form of gas, resulting in an abundant 3D pore structure of graphene.

This study exhibits that the thickness of e-beam-induced graphene (EIG) film is as high as 0.66 mm, and the synthesis rate is 84 cm^2/min, which is significantly larger than that offered by a laser. Furthermore, EIG has been successfully applied to the field of supercapacitor electrodes, which shows excellent electrochemical storage capacity.

With prominent photothermal performance, EIG can also be applied to the field of solar photothermal anti-icing and deicing. The temperatures can be -40 °C, which is considered ultra-low.

More information: Shuai Han et al, E-beam direct synthesis of macroscopic thick 3D porous graphene films, *Carbon* (2021). DOI: 10.1016/j.carbon.2021.06.035

Journal information: *Carbon*

https://phys.org/news/2021-07-scientists-3d-graphene-high-energy-e-beam.html

Hindustan Times

Wed, 07 July 2021

Vitamin D significantly reduces Covid mortality: PGIMER study

The use of Vitamin D in high doses, especially injectable preparations, should be strongly discouraged, the doctors say

By Tanbir Dhaliwal

Chandigarh: An analysis by the doctors at Post Graduate Institute of Medical Education and Research (PGIMER) shows that the use of Vitamin D in Covid-19 significantly leads to improved clinical outcomes—reduction in mortality and intensive care unit admission.

The doctors, however, warn against irrational use of Vitamin D, as it can be toxic.

The study, 'Vitamin D supplementation and clinical outcomes in COVID-19: a systematic review and meta-analysis', recently published in the Journal of Endocrinological Investigation, was conducted by Dr Rimesh Pal, Dr Mainak Banerjee, professor Sanjay K Bhadada, Dr Anirudh J Shetty of the endocrinology department of PGIMER; Dr Birgurman Singh of Government Medical College, Patiala; and Dr Abhinav Vyas of Rabindranath Tagore Medical College, Udaipur.

Pooled data from 13 studies with 2,933 Covid-19 patients showed that Vitamin D supplemented after the diagnosis of Covid-19 leads to improved clinical outcomes in terms of reduced mortality and/or intensive care unit admission. (AP)

"As Covid-19 continues to rampage, the search for an effective therapy still remains elusive. Accordingly, multiple existing drugs have been repurposed for Covid management. In this context, Vitamin D, a fat-soluble vitamin, which is primarily related to bone and mineral metabolism, has shown some promising results," said Dr Sanjay K Bhadada, head of the endocrinology department, PGIMER.

"Pooled data from 13 studies with 2,933 Covid-19 patients showed that Vitamin D supplemented after the diagnosis of Covid-19 leads to improved clinical outcomes in terms of reduced mortality and/or intensive care unit admission," said Dr Bhadada.

The study lends ample support to the fact that Vitamin D can be used as an effective adjuvant treatment in patients hospitalised with Covid-19.

He said that the anti-viral and the immune modulatory role of Vitamin D were perhaps helpful in this regard. Nevertheless, the irrational and rampant use of Vitamin D to prevent Covid-19 should not be a norm: "The use of Vitamin D in high doses, especially injectable preparations, to treat Covid-19 should be strongly discouraged. Vitamin D, supplemented prior to the diagnosis of Covid-19, was not found to improve clinical outcomes in our meta-analysis. And overuse can lead to Vitamin D toxicity," explained the doctor.

https://www.hindustantimes.com/cities/chandigarh-news/vitamin-d-significantly-reduces-covid-mortality-pgimer-study-101625602696596.html