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Newspapers Clippings

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DRDO News

DRDO Technology News

DECCAN Chronicle

Thu, 21 Oct 2021

Vizag plans lab in water, food research and testing

Andhra University (AU) expressed interest to operate the lab by providing required prime infrastructure like building and equipment etc

Vishakhapatanam: The Defence Food Research Laboratory (DFRL), a subsidiary of Defence Research and Development Organisation (DRDO) under the Union Ministry of Defence is signing an MoU with Andhra University for establishing water and food research and testing lab in Visakhapatnam.

The laboratory will be equipped with modern state of art analytical instruments and equipment to test food and water samples, Chairman of DRDO, Dr. G Sathish Reddy said. (DC Image)

A team led DRDO chairman Sateesh Reddy and DFRL scientist Dr Kumar visited Visakhapatnam as part of the move to set up the lab. Andhra University (AU) expressed interest to operate the lab by providing required prime infrastructure like building and equipment etc.

Speaking to *Deccan Chronicle*, AU vice-chancellor Prasad Reddy said, "We will shortly sign an MoU and earmarked a 15000 square feet building on our campus for the lab." The lab might be operational by June 2022, he said, adding that it would cater to the needs of the government, educational institutions and the public.

"Vizag will be first in Telugu states having such a unique food and water research lab. Since food and water is a global subject, its research and testing with help of technological solutions are much needed," he said.

The DFRL at Mysore is actively researching various aspects of food science and technologies such as preservation of foods, their nutritional and biochemical evaluation, their safety and food packaging.

"We are preparing a detailed project report (DPR). The DFRL will take the responsibility for all technical guidance," Prasad said.

Speaking to *Deccan Chronicle*, DRDO chairman Sateesh Reddy said that the Vizag's lab is meant for civil food industries and entrepreneurs while the DFRL is at Mysore for the defence.

The laboratory will be equipped with modern state of art analytical instruments and equipment to test food and water samples, Sateesh Reddy said.

The food products grown in the districts of Visakhapatnam and neighbouring districts can be tested both fresh and processed products. The laboratory can analyze nutritional, microbiological quality parameters apart from pesticides and antibiotics residue, Sateesh added.

The scientist Kumar said that DFRL Mysore will be providing necessary technical support in getting the National Accreditation Board for Testing and Calibration Laboratories (NABL)

Accreditation and Food Safety and Standards Association of India (FSSAI) approval to notify as Referral Laboratory.

The lab will also be utilised for samples testing of food in poison-related cases like the one that happened recently in Eluru in West Godavari, where scores of people fainted after consuming food.

The lab may be working on different areas, which are directly and indirectly connected to food, like agriculture and biological sciences. Research studies on the importance of hygienic preserving of food, spoilage of food and safety of processed food may be included in the project, said an AU Professor from the Department of Science.

https://www.deccanchronicle.com/nation/current-affairs/211021/vizag-plans-lab-in-water-food-research-and-testing.html

Analytics Insight

Thu, 21 Oct 2021

Use of Artificial Intelligence by Indian Army in the Borders in 2021

Indian army is on its way to a full-fledged use of artificial intelligence in their warfare

Artificial intelligence-based platforms are the future of any battlefield. They can be easily deployed without being detected easily and cause havoc through enemy fire. They are stealthy and very effective. As has been reported earlier in Financial Express Online, to become a fully network-centric force, the use of artificial intelligence (AI) in the military is expected to begin in the near future. It will take around 3-4 years before the AI tool is used in the Indian Military. The process of this has already started, and the plan is that every army personnel will be having the tools in which Artificial Intelligence will be integrated. A Defence Artificial Intelligence Council is already set up in the Ministry of Defence and the defense minister is the chairman, and the three service chiefs, the defense secretary, and the secretary of defense production are members.

Defense Research and Development Organisation (DRDO) has a specialized laboratory, Centre for Artificial Intelligence and Robotics (CAIR) with about 150 scientists who focus on AI Robotics, Control Systems, Command Control Communications, and Intelligence (C3I), Networking and Communications Secrecy. They have produced a family of robots for surveillance and reconnaissance applications. The robot has been named RoboSen a mobile robot for reconnaissance and surveillance. Further, a miniaturized man-portable UGV for low-intensity conflicts, a wall climbing flapping-wing robot, and a walking robot with four and six legs for logistics support. They have also developed robots with cognitive capabilities which can play Chess and inspect the serviceability of components. Further, intelligent wheelchairs have been developed for physically challenged persons. CAIR has also developed a NetWork Traffic Analysis (NETRA) which can monitor internet traffic. This device can intercept keywords such as bomb blast, kill, and other designated words in real-time.

AI has also been focused upon by the Union Government and in this context, a report was submitted by N Chandrasekaran, Chairman Tata Sons, in 2018 to the Ministry of Defence. Defense AI Council (DAIC) was constituted with Defence Minister as Chairman. It included the three Service Chiefs, the Secretary of Defence; Defence Production; DRDO, Financial Adviser Defence

Services, National Cyber Security Coordinator, and eminent representatives from industry and academia. The council would meet twice a year to provide strategic direction towards AI-driven transformation in defense, provide guidance in addressing issues related to data sharing; enable strategic partnership with industry, decide acquisitions of technology; review ethical, safe, and privacy assured usage of AI in defense. Further, evolve policies in partnership with government institutions and industries.

A Defence AI Project Agency (DAIPA) will also be established with the secretary of defense production as the Chairman. The other members will be from the service headquarters, headquarters integrated defense staff, defense public sector units, DRDO, industry, and academia. Each service headquarters has been directed to earmark Rs 100 crores for AI-specific application development for the next five years. The Indian Navy has taken the lead and has divided AI usage into short, medium, and long-term goals for implementation. The Indian Army during Army Day in 2021 demonstrated a Swarm Attack by drones on multiple targets. Further efforts are being made to directly translate spoken Mandarin to English. In a recent webinar held at Vivekananda International Foundation, the Chief of Defence Staff spoke of the usage of AI for predictive maintenance of equipment in the Indian Army.

https://www.analyticsinsight.net/use-of-artificial-intelligence-by-indian-army-in-the-borders-in-2021/

R. REPUBLICWORLD.COM

Thu, 21 Oct 2021

Pakistan drone drops 1.1 Kg Heroin worth Rs 6 Crore as BSF chases it away near Amritsar

According to the BSF, the narcotics were dropped by Pakistan using a drone. After intercepting the drone near the border, the BSF fired upon the object

By Ananya Varma

The Border Security Force (BSF) on Wednesday seized 1.1 kg heroin worth Rs 6 crores from Amritsar near the Indo-Pakistan border. According to the BSF, the narcotics were dropped by Pakistan using a drone. After intercepting the drone near the border, the BSF fired upon the object following which it flew back to Pakistan. A white bag of approximately 1.1 kg heroin dropped by the drone, was immediately seized by the security forces.

IMAGE: PTI/Republic

This is the second time that Pakistan has attempted to smuggle drugs via drones in the last two months. On September 10, the Border Security Force seized six packets of heroin near Havelian border outpost in Tarn Taran. The incident had occurred at around 11.15 pm. An alert was issued after the jawans heard the sound of the drone, which was followed by the sound of something dropping in the fields. The forces fired 14 rounds at the drone which managed to fly back to Pakistan.

Increasing use of drones by Pakistan

As its infiltration bids continue to be foiled by security forces, Pakistan has been increasingly using drones to smuggle arms and narcotics onto Indian soil. Earlier in October, similar antics were adopted by the Imran Khan-led nation after it used drones to drop an AK47 rifle along with another payload at the Sounjana area in Jammu and Kashmir.

The biggest drone infiltration by Pakistan this year was recorded on June 27 when two low-intensity blasts occurred at Jammu airbase. The explosions were reported in the technical area of the airbase and inflicted injury on two Indian Air Force (IAF) personnel. After the Jammu airbase attacks, three more drone activities were reported the following week including one near an important IAF installation. Since then the Indian security forces have been deploying anti-drone technology including the installation of high-mast lighting and an anti-drone cover to secure its airbases near border areas. A counter-drone technology is also under development at the DRDO.

https://www.republicworld.com/india-news/general-news/pakistan-drone-drops-1-dot-1-kg-heroin-worth-rs-6-crore-as-bsf-chases-it-away-near-amritsar.html

COVID 19: DRDO's Contribution

BusinessToday.In

Thu, 21 Oct 2021

Immunodeficient people may require boster dose, priority to give 2 doses to everyone, says Dr NK Arora

"The whole discussion about administering booster dose has picked up steam in India, but I think our priority of administering two doses to all is an appropriate policy," Arora said

By Rajat Mishra

Immunodeficient and immunocompromised people may require an additional dose of COVID-19 vaccine, but India's current priority is to administer two doses to everybody in the country, said Dr NK Arora, head of the COVID-19 Working Group of National Technical Advisory Group on Immunisation.

"The whole discussion about administering booster dose has picked up steam in India, but I think our priority of administering two doses to all is an appropriate policy," Arora said while speaking at the 15th edition of FICCI Heal 2021.

India is expected to cross the landmark of administering 1 billion doses tomorrow.

Apart from Dr Arora, well-known virologist Dr Gagandeep Kang, Major Gen Aftab Alam and Prof M Vidyasagar were also on the panel for discussion on "Covid Pandemic - What could be India's winning strategy".

Speaking about the current variants of interest and concerns, Kang said, "At any point of time, we always have variants of interest and concern. Currently AY.4.2 is the one, which is called as Delta plus. This variant is said to be 10 per cent more transmissible than Delta variant."

Highlighting the factors that play an instrumental role in the battle against coronavirus, Maj Gen Aftab Alam, Asst. Chief of Integrated Defence Staff (Medical), pointed out that training, collaboration, and capacity enhancement are some of the factors for emerging a winner in this battle against the invisible enemy.

Gen Alam, who played an instrumental role in developing a 500-bed makeshift hospital in Delhi at the peak of second wave, explained the problems he faced.

"The big problem was of communication between patients and their kin, documentation also posed a formidable challenge for us. But with the help of technology, we resolved this issue. With the help of DRDO, we developed an online portal, which was being updated twice in a day and put

out the patient status on that portal. His family member can login and find out all the necessary details about the patient, basically we digitised everything," Alam added.

Arora added that strategic and smart usage of technology in resource-constrained environment is terrific. From vaccine registration to the option of portability, technology is being used efficiently in this battle against COVID-19, he said.

"We have to be ready. Last time the pandemic struck the world 100 years ago, but we must keep in our mind that the next pandemic can be much earlier," he added.

India is expected to cross the landmark of administering 1 billion doses on Thursday. So far, over 99 crore vaccine doses have been administered in the country.

https://www.businesstoday.in/coronavirus/story/immunodeficient-people-may-require-boster-dose-priority-to-give-2-doses-to-everyone-says-dr-nk-arora-309942-2021-10-20

Defence News

Defence Strategic: National/International

INDIA TV

Thu, 21 Oct 2021

Army makes integrated defence locations along LAC in Arunachal Pradesh

It is a total defence mechanism in itself with absolute synergy among all the support system for the troops for the battle. Big guns to military attack helicopters can be mobilised within minutes

Amid the ongoing border dispute with China, the Indian Army has made integrated defence locations along the Line of Actual Control (LAC) in Arunachal Pradesh as the Chinese People's Liberation Army has enhanced military exercises across it. These integrated defence locations is a mechanism in itself at various places across the LAC. It comprises complete communication, surveillance, operations and logistics system.

Image Source : PTI/REPRESENTATIONAL

It is a total defence mechanism in itself with absolute synergy among all the support system for the troops for the battle. Big guns to military attack helicopters can be mobilised within minutes.

Such integrated defence locations are being created along the LAC across Arunachal Pradesh to thwart any kind of threat or contingencies.

Among big guns, the force has deployed upgraded vintage L-70 air defence guns, bofors and M777 howitzer.

The upgraded vintage L-70 air defence guns have enhanced target acquisition and automatic target tracking capabilities under all weather conditions with high resolution electro optical sensors.

It is effective against swarm drones, low flying objects as the upgraded gun can spew out predictive fire after automatically detecting the threat.

Talking to news agency IANS, Indian Army's Captain Sariya Abbasi said: "The gun is able to take fire and engagement projected duration of time. It can now be integrated with tactical control radar and fire control radar."

She also said that the gun is also equipped with a Muzzle Velocity Radar for enhancing the accuracy of fire. The BEL has upgraded around 200 L70 guns for Rs 575 crore. The army has approximately 1,180 guns in service. These guns were first bought off-the-shelf in the late 1960s from Swedish company Bofors AB and later licensed produced by the Ordnance Factory Board (OFB).

Witnessing increased Chinese activities across the LAC, India has enhanced its defence and surveillance capabilities, and also deployed more machines and men to thwart any contingencies.

On Tuesday, Eastern Army Commander Lieutenant General Manoj Pande had said, "Taking note of all these, we have taken number of steps number of measures... foremost is enhancing out surveillance both close to LAC as well as in the depth areas now this we are doing by synergizing

efforts of our all surveillance equipment -- right from the strategic level till the tactical level where our soldiers are actually deployed on the LAC."

He said that secondly, the focus is on the adequacy of troops. "We have adequate forces that are available in each sector to deal with any contingency that may arise and we are also practicing and rehearsing on various contingencies that may come about in certain areas where at deployment are thin."

The officer also stated that they have strengthened the deployment but largely where the deployment was thin. India and China are engaged in border disputes for the last 17 months at the LAC.

https://www.indiatvnews.com/news/india/amid-border-dispute-with-china-indian-army-makes-integrated-defence-locations-along-lac-in-arunachal-pradesh-741413

Thu, 21 Oct 2021

Opinion | Why is China creating tension on LAC?

China is deploying its army in a big way in the eastern sector too, apart from what it has been doing in Ladakh, in the western sector

By Rajat Sharma

Today I would like to describe the ground situation prevailing at the Line of Actual Control in the eastern sector of Arunachal Pradesh. Our defence editor Manish Prasad visited the frontlines in Arunachal for two days and spoke to the General Officer Commanding-in-Chief, Eastern Army Command, Lt. Gen. Manoj Pande.

The eastern army commander gave his frank assessment about the current ground situation and described in detail, how Indian army is gearing up to meet the challenge from China. Of course, due to security reasons, I will not share some of the critical information relating to our defence preparedness, but suffice it to say that our armed forces are fully prepared to meet any eventuality. China is deploying its army in a big way in the eastern sector too, apart from what it has been doing in Ladakh, in the western sector.

The Chinese People's Liberation Army (PLA) has not crossed the LAC in the eastern sector, but, in the guise of doing regular exercises, it has deployed a large number of troops close to the LAC. Reports of the Chinese setting up a model village close to the LAC are correct, says our defence editor. Chinese nationals have been resettled in this village. This village can be easily used to set up army bunkers and fortifications. Since it is a matter of concern for us, the Indian army has also deployed troops in large number near the LAC. Troops on both sides of LAC are on high alert. The posturing of Chinese PLA is not new, but, for the first time, the Indian army has decided to reply to Chinese posturings firmly and resolutely.

Our eastern army commander said that China is busy setting up infrastructure on its side of LAC, and for the first time, India has started building a big network of roads, bridges and corridors in a big way. Several bridges have been set up and border roads are being widened. Several tunnels are also being set up so that our convoy of troops, carrying weapons, can reach the zero point speedily, without use of air assets during adverse weather conditions.

Lt Gen Manoj Pande said, "our first step is to opt for negotiations with the other side, to maintain peace and tranquility and avoid confrontation, but if the other side takes resort to misadventures, we are fully prepared how to respond. Our jawans know how to reply to the enemy effectively."

India has a roughly 3,500 kilometre long border with China, and most parts of this border are properly delineated. China tries to take advantage of this, and its troops occasionally carry out transgressions. To maintain peace and tranquility in the face of such actions by the enemy, required

tremendous restraint. Lt. Gen. Pande said, our forces always follow agreements, but where aggression is needed, they do show it. The PLA has seen how our brave jawans with bare hands and without weapons, fought the Chinese troops in Galwan valley in Ladakh last year.

The Chinese army has deployed drones and long-range UAVs (unmanned aerial vehicles) in the eastern sector. To counter this, the Indian army, for the first time, has set up an integrated command centre, to coordinate with the Indian Air Force, which has deployed Rafale and Sukhoi jet fighters, along with attack helicopters and advanced light helicopters. For the first time, Israeli-made hi-tech UAVs are being used to keep a close watch on enemy troop movements, from a height of 35,000 feet with a range of 35 km.

Lt. Gen. Manoj Pande said that the army intelligence network is working effectively and the Chinese PLA know that each of their movements is being watched by Indian army. Along with satellite surveillance, our jawans keep a physical watch over enemy movements.

The Army in eastern sector has stepped up surveillance capabilities by using new artificial intelligence-enabled software to track movement of Chinese army patrols. Ground and air-based sensors that keep watch over enemy positions are being integrated. A division-level surveillance centre has been set up at Rupa which gets real-time images and inputs of Chinese troop movements along the LAC. All inputs from UAVs, helicopter-based sensors, ground radars and satellite feeds are integrated, collated and analysed to formulate a response strategy. Ground and air sensors are being fused, and latest technology is being used to keep watch on enemy troops. A portable surveillance system is being developed which automatically counts the number of enemy troops transgressing LAC and their mode of transport. This is immediately relayed to senior ground commanders for an effective response.

The LAC in the eastern sector is roughly 1,346 km long which spreads from Sikkim to Arunachal Pradesh. After China deployed large number of troops in Tibet, our army responded by mobilizing more troops to guard the frontier. The 17 Mountain Strike Corps has been deployed specifically to counter challengers from enemy in the eastern sector. Work is going on to set up an Integrated Battle Group consisting of men from artillery, infantry and air force. Howitzer guns, Chinook helicopters have been deployed by Indian army to counter the Chinese threat. Work is going on a war footing to building tunnels under Brahmaputra, Sela, Nuchipu and Sinkhu La. These tunnels are expected to be ready by next year.

At a time when the Chinese state-supported media has become jingoistic and is threatening to teach India a lesson, our armed forces are quietly carrying on with their war preparedness. Chinese media has been showing video of Galwan Valley confrontation to boost the morale of its troops. Their main aim is to show to the world that the Chinese PLA has an upper hand at the LAC, both in the western and eastern sectors, but our army commanders have rejected these claims as rubbish.

The question is: why are the Chinese trying to peddle lies and propaganda, when they know about the huge deployments made by India in both sectors? Whenever China made big claims about grabbing territory, it had to pay a heavy price. Chinese companies have been shown the way out from Indian telecom and hi-tech sectors. Chinese apps were banned by Indian government.

China is no more No. 1 in cellphone manufacturing. For the first time, Apple's iPhone has been manufactured outside China, in India. Apple's 5G inbuilt cellphone will now be manufactured in Tamil Nadu. There has been a 10 per cent drop in cellphone manufacturing in China, after Apple walked out. Korean company Samsung has closed its last manufacturing unit in China. Samsung used to manufacture 30 crore cellphone units in China, but now it has shifted all its factories to Vietnam and India. The biggest Samsung unit in Noida manufactures 12 crore cellphones annually. 58 big companies have shifted from China in the last three years. Most of these companies have shifted to India.

One of the biggest realty companies in China, Evergrande is now on the brink of bankruptcy, with a liability of Rs 23 lakh crore. China's GDP fell almost one-fourth after the collapse of Evergrande company. There are many other similar examples. For the first time, multinational

companies from the West are looking at China with suspicion. This is bad news for the Chinese economy.

As far as India is concerned, it has fought China both on the economic and military fronts. Our armed forces are ready to face any military challenge from China. The Chinese PLA knows the valour, capability and tenacity of the Indian army jawans and officers. A section of people think that in order to divert the Chinese people's attention from domestic economic problems, the Chinese President Xi Jinping is trying to create tension on India-China border.

Pakistan's economic problem is worse. On Tuesday, the FATF (Financial Action Task Force) again decided to keep Pakistan in the grey list of countries. This means that Pakistan will not get loans from international financial institutions. IMF, World Bank have already refused to give loans to Pakistan. The only friend left for Pakistan is China, but already Pakistan is groaning under mounting Chinese debts.

Both these neighbours are therefore trying to create tension on their borders with India in order to divert the attention of their people. Both these countries should know that the Indian armed forces has the resources and capability to counter a two-front challenge.

https://www.google.com/search?q=indian+army+news&ie=utf-8&oe=utf-8&client=firefox-b-ab

mint

Thu, 21 Oct 2021

Rolls-Royce keen to partner Indian Navy for developing electric warships

The company will showcase Indian Navy its capabilities to design, build and deliver customised power and propulsion solutions

Aero engines, power and propulsion systems major Rolls-Royce on Wednesday said it is keen to partner with Indian Navy for development of electric warships for its 'Fleet of the Future'.

The company is all set to showcase to Indian Navy customers its capabilities to design, build and deliver customised power and propulsion solutions for India's naval modernisation requirements as part of the UK's upcoming Carrier Strike Group tour, Rolls-Royce said in a statement.

The Rolls-Royce plans to partner Indian Navy for electric warships (REUTERS)

Rolls-Royce President - India and South Asia, Kishore Jayaraman said the Carrier Strike Group tour is a significant opportunity for the company to showcase the results of decades of innovation in naval power and propulsion.

"As India envisions the fleet of the future, our commitment to support the country's defence modernisation and self-reliance goals remains as strong as ever...

"Our experience of supporting the electrification of the Royal Navy's warships over many years is of particular significance, including the design and deployment of the world's first hybrid-electric naval system," he added.

Jayaraman further said,"We believe that we can bring great learnings and value to any future programme envisioned by the Indian Navy for developing electric warships."

During the UK's upcoming Carrier Strike Group Tour, the company said it will showcase its "capabilities for providing Naval propulsion solutions aboard the mighty HMS Queen Elizabeth warship".

Being a key member of the 'Power and Propulsion Sub-Alliance', Rolls-Royce was responsible for the design, procurement, manufacture, integration, test and delivery of the Queen Elizabeth Carrier ship's power and propulsion system, which includes the mighty MT30 marine gas turbine and a low voltage electrical distribution system.

Rolls-Royce claimed it is the only manufacturer in the world that has provided navalised marine gas turbine generators into front-line integrated full electric propulsion (IFEP) powered destroyers and aircraft carriers.

The company said it has expressed its keenness to explore opportunities for partnering the Navy with end-to-end solutions for electrification of India's future warships.

"Rolls-Royce is well-positioned to partner India for the modernisation of its naval fleet with the right mix of products, experience and capabilities to design, build, deliver and support customised naval systems and solutions," Rolls-Royce Chief of Naval Systems Richard Partridge said.

He further said, "Our technologically superior offerings and expertise provide the ideal solutions for developing integrated hybrid-electric and full-electric propulsion for naval vessels, including the integration of the MT30 that brings the most power dense gas turbine to these next generation warships."

https://www.livemint.com/auto-news/rollsroyce-keen-to-partner-indian-navy-for-developing-electric-warships-11634742562080.html

Thu, 21 Oct 2021

Key magnet installed at sPHENIX detector

After years of careful planning, crews at the U.S. Department of Energy's Brookhaven National Laboratory installed an enormous superconducting magnet that will be the centerpiece of the sPHENIX detector. sPHENIX is an ongoing upgrade to the PHENIX experiment at the Relativistic Heavy Ion Collider (RHIC), a DOE Office of Science user facility for nuclear physics research.

The installation—on Thursday, October 7, 2021—marks a major milestone in the assembly of sPHENIX. The revamped detector is slated to begin collecting data in 2023. It will track particles streaming from RHIC collisions with unprecedented precision, enabling scientists to study detailed features of matter as it existed in the early universe.

On October 7, 2021, crews at Brookhaven National Laboratory installed the 1.4-Tesla, 20-ton superconducting solenoid, which will be the centerpiece of the sPHENIX upgrade. Credit: Brookhaven National Laboratory

"Everything went according to the meticulously prepared plan thanks to the Brookhaven Lab riggers, technicians, designers, engineers, and scientists who were involved in the planning and execution of the installation," said Ed O'Brien, the sPHENIX project director, the day after the big magnet touched down. "sPHENIX has a little over one year left to go in installation activities, but yesterday's installation step was as important as any yet to come.

The landing of the 20-ton magnet on the detector was the culmination of eight years of planning, O'Brien said. The device, originally used in an experiment called BABAR at SLAC National Accelerator Laboratory, arrived at Brookhaven Lab in 2015 after a cross-country journey from California. Since then, crews at Brookhaven have centered the sPHENIX design around it.

The solenoid superconducting electromagnet generates a precise and uniform magnetic field that will help the detector grab snapshots of 15,000 particle collisions per second to help scientists better understand the properties of quark-gluon plasma–a soup of subatomic particles that are the inner building blocks of protons and neutrons. It will bend the trajectories of charged particles produced in the collisions, while different detector components layered within and around the central core measure the energy and other properties of particles emitted from each collision.

"The installation of sPHENIX is a big step forward for RHIC, Brookhaven Lab, and nuclear physics," said Peter Vigliotti, who was the lead rigger on the project. "It was an honor leading the Collider-Accelerator Department riggers and coordinating seamlessly with all the other talents involved. The techs, scientists, engineers, and riggers brought teamwork to a whole new level."

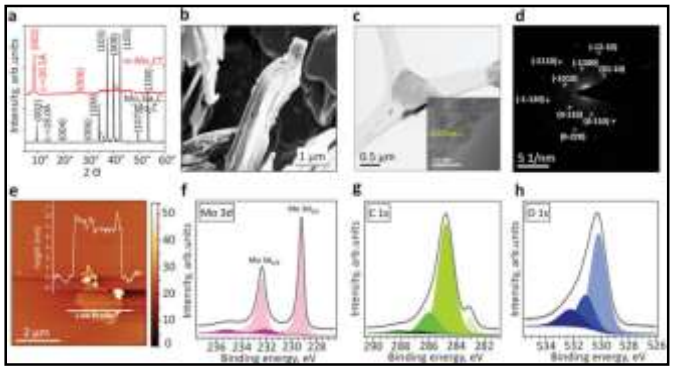
https://phys.org/news/2021-10-key-magnet-sphenix-detector.html

PHYS.ORG

Thu, 21 Oct 2021

New sensor detects low air humidity

Measuring air humidity is important in many areas. However, conventional sensors in hygrometers have so far not been able to determine a very low water vapor content. Physicists at the University of Duisburg-Essen (UDE) and the Yuri Gagarin Technical University in Russia have now developed a new sensor. It detects even the smallest amounts of water molecules that sink to its surface. The detector is based on highly conductive materials known as MXenes.



Structural and chemical characterization of Mo2CTx MXene. a) XRD patterns of Mo2Ga2C nanolaminated carbide precursor (black) and Mo2CTx MXene multilayer (red). b) SEM image of a Mo2CTx MXene multilayer. c) TEM image of Mo2CTx MXene single flakes on lacey carbon grid, inset is a high-resolution image. d) The SAED pattern taken from the single Mo2CTx flake in c). e) AFM image and height profile over an exemplary Mo2CTx flake. f–h) High-resolution XPS spectra recorded from a Mo2CTx MXene layer at Mo-3d f), C-1s g), and O-1s h) energies. Credit: DOI: 10.1002/adma.202104878

Good indoor air is not only important for health. Certain ambient conditions are also needed in production or laboratories, for example in biomedicine or microelectronics. It must be possible to control these precisely. Although powerful humidity sensors are built into commercial measuring devices, they are not able to detect water vapor concentrations below 50 ppm, i.e. below 0.3 percent relative humidity. Consequently, such sensors are not suitable for all purposes.

This problem was tackled by the physics team from the UDE and the Russian University Yuri Gagarin in Saratov with a completely new strategy. They used two-dimensional nanometric materials. These can detect minute amounts of water molecules that sink to their surface. "In this way, the sensor performance improves enormously—the detection limit is pushed far below the previous state of the art. More is really not possible," says UDE experimental physicist Dr. Hanna Pazniak, who played a key role in the development.

These highly conductive materials are called MXenes, or more precisely: Mo_2CT_x MXenes. They consist of compounds of transition metal carbides or transition metal nitrides. The compounds are stacked into layers and are only a few atoms thick. The advantage: The new sensors are ultra-thin and highly sensitive. "They detect water vapors down to 10 ppm, or 0.06 percent relative humidity. That's the lowest value known so far," Pazniak says. The sensors are also promising in another respect: they can be used in mass production.

More information: Hanna Pazniak et al, Two-Dimensional Molybdenum Carbide MXenes for Enhanced Selective Detection of Humidity in Air, *Advanced Materials* (2021). DOI: 10.1002/adma.202104878

Journal information: *Advanced Materials*

https://phys.org/news/2021-10-sensor-air-humidity.html

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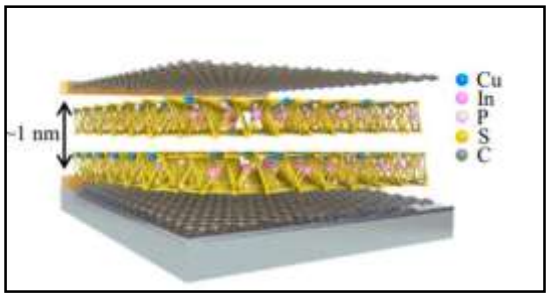
Researchers observe enhanced bulk photovoltaic effect in 2D ferroelectric material

Bulk photovoltaic effect (BPVE) is widely used in generating electricity. As a process of energy transference from photons to electrons and of voltage formation within ferroelectric material, BPVE acts like a dam, raising up "water" (voltage) to generate "power" (electric currents). Researchers have realized high photovoltage beyond theoretical Shockley-Queisser (SQ) limit in previous studies, however, the density of photocurrent generated through conventional methods remains relatively low.



The schematic structure of 2D BPVE device. Credit: LI Yue

In a study published in *Nature Communications*, a research team led by Prof. Zeng Hualing and Prof. Gong Ming from the University of Science and Technology of China (USTC) of the Chinese Academy of Sciences realized remarkable photocurrent density in a two-dimensional (2D) material $CuInP_2S_6$ (CIPS) with layered van der Waals (vdW) structure. They achieved measurable control over the magnitude of BPVE under the condition of applied electric field, incident light field as well as temperature field.

Based on characteristic of the atomic thickness of layered ferroelectric material and the weak vdW force between layers, researchers constructed a vertical structure by combining graphene with a couple of layers of CIPS. In this way, they achieved a high density of photocurrent without applied bias, realizing the measurable control over the magnitude of BPVE. Besides, through the regulation and control of photocurrents, researchers verified that two-dimensional ferroelectric polarization is the main physical mechanism of enhanced BPVE.

Moreover, by altering the thickness of two-dimensional ferroelectric layers, researchers clearly demonstrated dimensional transition of BPVE. And they found that the performance of 2D photovoltaics fell in between the 1D and 3D bulk photovoltaics, indicating that device dimensionality was one of the key factors in developing high-efficiency BPVE-based photovoltaics.

The findings highlight the potential of ultrathin 2D ferroelectrics for developing the third-generation solar cells with high efficiency beyond the fundamental SQ limit.

More information: Yue Li et al, Enhanced bulk photovoltaic effect in two-dimensional ferroelectric CuInP2S6, *Nature Communications* (2021). DOI: 10.1038/s41467-021-26200-3

Journal information: *Nature Communications*

https://phys.org/news/2021-10-bulk-photovoltaic-effect-2d-ferroelectric.html

COVID-19 Research News

Hindustan Times

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100-fold rise in viral load expelled by Covid patients during the second wave: study

There was a 100-fold increase in the viral load of the respiratory particles expelled by Covid-19 patients during the second wave dominated by the Delta variant. These findings are a part of an ongoing study by the Foundation of Medical Research (FMR) and the Brihanmumbai Municipal Corporation (BMC). The study has been selected for poster presentation at the ongoing 52nd Union World Conference on Lung Health being held virtually.

By Jyoti Shelar

There was a 100-fold increase in the viral load of the respiratory particles expelled by Covid-19 patients during the second wave dominated by the Delta variant. These findings are a part of an ongoing study by the Foundation of Medical Research (FMR) and the Brihanmumbai Municipal Corporation (BMC). The study has been selected for poster presentation at the ongoing 52nd Union World Conference on Lung Health being held virtually.

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The preliminary findings of the study shared in the poster also highlight a two-fold rise in the proportion of people expelling the virus from their breath during the second wave. Though the study is being conducted on Mumbai respondents, study authors said that it explains the higher transmission and increased number of Covid-19 cases in the second wave.

An e-poster presentation is a format of presenting at scientific conferences where researchers present the findings of their research using a poster containing the gist of the study.

The study includes a cohort of 75 Covid-19 patients from Mumbai who were asymptomatic or mildly symptomatic and were under home isolation between July to September 2021. These patients were recruited for the research within 48 hours of testing positive for the infection. More patients are also being recruited as the study is ongoing.

In order to understand the viral load expelled through the respiratory particles, the participants were given N95 masks layered with a special gelatin membrane. Their respiratory particles were captured in a 30-minute process that involved talking, reading, coughing and tidal breathing. The field assistants then collected the gelatin membrane from the masks and sent them for Real-Time Reverse Transcription–Polymerase Chain (RT-PCR) testing in a stabilising medium.

“More than 90% of the patients were mask-positive, meaning they were expelling ample of virus in their respiratory particles,” said Kalpana Sriraman, senior research officer at FMR and co-author of the study. “This was very high compared to our previous study when only around 42% of patients were found mask positive,” she said.

Mask positive refers to samples taken from masks that tested positive in RT-PCR tests. In this case, the gelatin membranes were processed.

The previous study, which analysed patients infected in the first wave, was published this April in PLOS One journal.

The ongoing study highlights two other important factors: first, the Cycle Threshold (CT) value of patients during the second wave was much lower on masks as well as the swab samples. A lower CT value indicates a higher viral load as the RNA of the virus could be picked up quickly in the RTPCR. Second, those patients who were partially or fully vaccinated showed a marginal reduction in the viral load expelled by them. Patients who were fully vaccinated and had breakthrough infections still expelled the virus.

"These findings will be important as we design future vaccines to break the chain of transmission," said Dr Nerges Mistry, director of FMR and a co-author of the study.

An important takeaway message from the study is the way masks are disposed of. "It is clear that the masks carry a high amount of viral load even if the patients are asymptomatic. Thus, careful disposal of masks should be encouraged," said chest physician and study co-author Dr Vikas Oswal.

He said that one must avoid touching the inner side of the mask. "Hold the mask carefully from the outer side or by the strings, roll it in a plastic bag or a newspaper and discard it. One must not let the mask touch any surface from the inner side. If someone has symptoms like cough and cold, it is ideal to discard their masks separately in a sealed plastic bag.

The ongoing study has used CT values to arrive at the quantitative aspects of viral load. It is yet to undergo the peer-review process. "The Delta variant which was dominant during the second wave was undoubtedly more infectious as we saw many cases of entire families testing positive," said Dr Kedar Toraskar, critical care specialist at Wockhardt Hospital and member of the Covid-19 task force of Maharashtra. "However, there are many other techniques to look at the quantitative aspect of the viral load other than the CT values," he said.

Maharashtra has recorded over 6.5 million cases and over 139,800 deaths. In July, this year, most districts had a test positivity rate of around 5%. The test positivity rate is now under 2%.

https://www.hindustantimes.com/cities/mumbai-news/100fold-rise-in-viral-load-expelled-by-covid-patients-during-the-second-wave-study-101634748202197.html